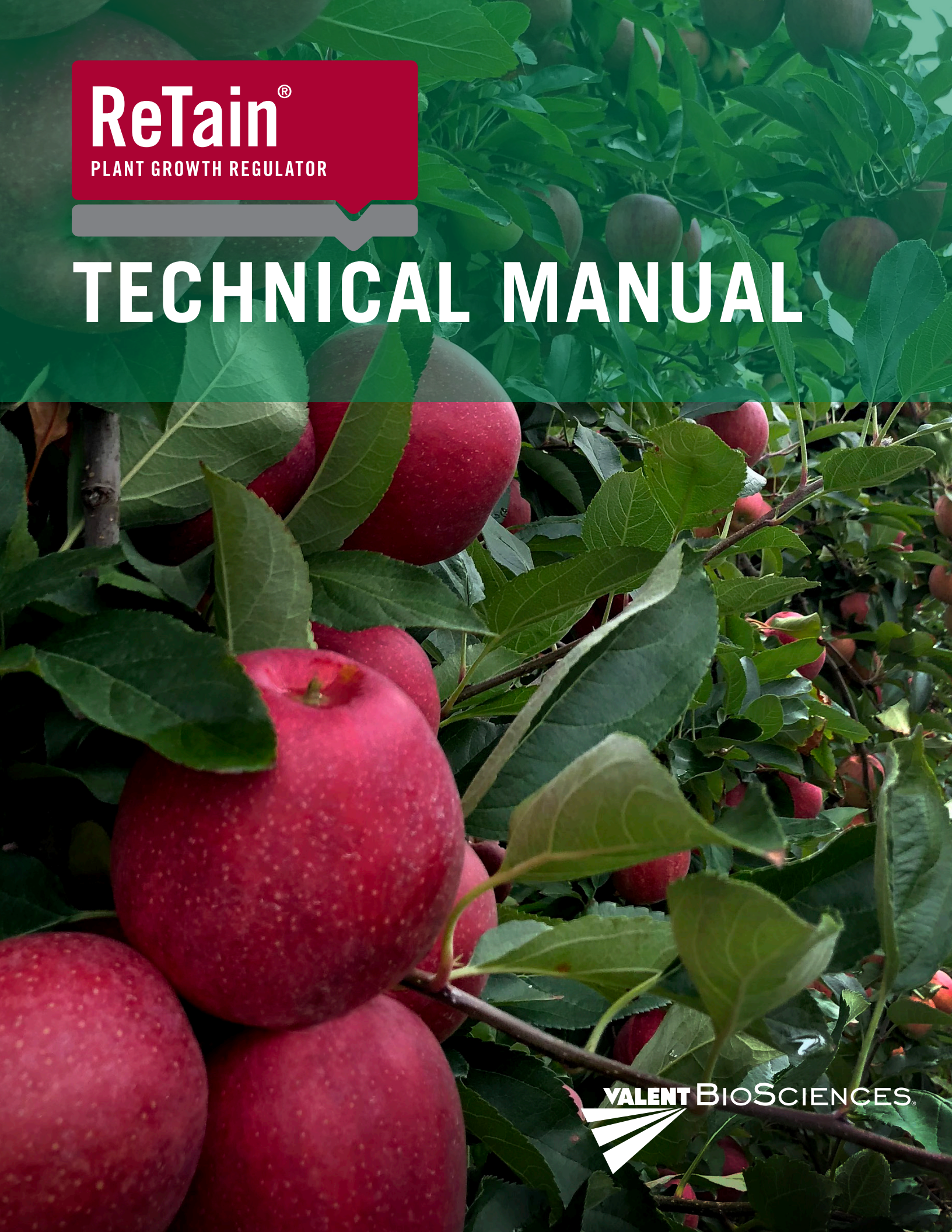
ReTain®

PLANT GROWTH REGULATOR

TECHNICAL MANUAL



VALENT BIOSCIENCES®

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PLANT GROWTH REGULATOR

Technical Manual

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Cover photo courtesy of Poliana Francescatto.

About Valent BioSciences

Valent BioSciences LLC is the global leader in the research, development, and commercialization of biorational products for the agricultural, public health, and forest health markets.

A wholly owned subsidiary of Sumitomo Chemical Co., Ltd., Valent BioSciences is renowned for its innovation, best-in-class quality in manufacturing, and a fully developed portfolio that provides solutions to unmet needs for both growers and customers around the world. These products include environmentally compatible bioinsecticides, plant growth regulators, and mycorrhizal soil inoculants. It's all part of the Valent BioSciences commitment to creating value for customers around the world – and doing so in a sustainable way.

Explore how Valent BioSciences can help you make a positive difference in your world.

VALENT BIOSCIENCES®

We Change the Game™

Since its establishment, Valent BioSciences continues to successfully develop and market innovative plant growth regulators (PGRs) that provide a wide range of customer benefits. Valent BioSciences is the global leader in innovation and technical expertise, and the first company to develop and commercialize products in the five major classes of plant hormones. In addition, Valent BioSciences has a longstanding track record of producing revolutionary new PGRs that create market opportunities and tremendous value for our customers.

We are proud to introduce the new **We Change the Game™** campaign featuring logos of different notable crops that have benefited from our game-changing innovation. This campaign emphasizes our heritage of agricultural advancements and industry leadership. It highlights how our products raise the bar for a variety of crops in the agricultural industry.

The **We Change the Game** campaign is another differentiator that reinforces how Valent BioSciences continues to change the game – for products, markets, and customers.

WE CHANGE THE GAME™

Courtesy of Kyle Ardiel

Preface

RETAIN®: THE REVOLUTIONARY PLANT GROWTH REGULATOR FOR FRUITS AND NUTS

Game-Changing Innovation

Once in a generation, a product so revolutionary is developed that it redefines an industry. That's what ReTain® Plant Growth Regulator did for the apple industry, as it significantly changed the way apples, tree fruits, and nuts are produced and harvested around the world.

ReTain is a versatile plant growth regulator whose formulation is more effective than the products growers used previously. It temporarily inhibits the production of ethylene, a plant hormone that affects flower senescence, fruit maturation, ripening, drop, and other processes, giving growers the ability to dial in desired responses. Consequently, ReTain has become the premier orchard and harvest management tool that growers rely on for a successful and profitable harvest.

Manual Overview

Given the tremendous success and increasingly widespread use of ReTain globally, Valent BioSciences has developed this highly detailed and comprehensive technical manual. It is devoted completely to the application and uses of ReTain on various crops and signifies just how important the product has become globally since its introduction in the late 1990s.

The manual provides a wealth of information about the development, performance, characteristics, usage, and history of ReTain. It is intended to help growers use the product as effectively and productively as possible. The manual includes technical information covering the use of ReTain for harvest and quality management of apple, pear, and stone fruit, as well as the use of ReTain for fruit or nut set increase of apple, pear, cherry, almond, and walnut.

Individual Variety Pages

One of the unique features of the manual is the inclusion of individual apple variety pages for each geography where ReTain is applied. Each page of this manual includes specific recommendations about when and how ReTain can be used according to the grower's needs.

Most of the recommendations in this manual are based on the experiences and findings of growers, researchers, consultants, and internal research trials under actual growing conditions. Because results often vary seasonally and by region, growers should consider the information contained in this manual with their personal experience and knowledge to obtain the best results possible. Make sure to ALWAYS read and follow label instructions.

All of us at Valent BioSciences trust you will find this technical manual to be a beneficial tool and refer to it often. We wish you continued success and welcome your feedback.

Thank you for your confidence in us for the last 20 years and for the next 20 years as well!

– The Valent BioSciences Biorational Crop Enhancement Team

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RETAIN PLANT GROWTH REGULATOR TECHNICAL OVERVIEW

MEASUREMENT CONVERSIONS

RETAIN PRODUCT INFORMATION

United States & Canada				Mexico, Chile, Brazil, South Africa, Australia & New Zealand	
Per Acre				Per Hectare	
ReTain (pouch/acre)	ReTain (gram/acre)	AVG (gram a.i./acre)		ReTain (gram/hectare)	AVG (gram a.i./hectare)
⅓	111	16.7	=	277	41.7
½	166.5	25.0	=	415	62.5
1	**333**	**50.0**	=	**830**	**125.0**
1 ½	499.5	75.0	=	1245	187.5
2	666	100.0	=	1660	250.0

ReTain Application Timing
Weeks before harvest (WBH)
Days before harvest (DBH)

WEIGHTS & MEASURES

Imperial System		Metric System
1 acre (A)	=	0.405 hectare (ha)
100 gallons/acre (gal/acre or GPA)	≈	1000 liters/hectare (L/ha)
1 gallon (gal)	=	3.785 liters (L)
1 fluid ounce (fl. oz.)	=	29.57 milliliters (ml) or cubic centimeters (cc)
1 ounce (oz)	=	28.35 grams (gr)
1 pound (lb)	=	0.454 kilogram (kg)
1 bushel (bu) apples = 42 lbs	=	—
—	=	1 metric ton = 1000 kg
1000 bushels	=	19 metric tons

Other Conversions		
1 part per million (ppm)	=	1 milligram/liter (mg/L)

ReTain Plant Growth Regulator Technical Overview

I. RETAIN INTRODUCTION

The active ingredient in ReTain, aminoethoxyvinylglycine hydrochloride (Aviglycine HCl, or AVG), is a naturally occurring fermentation product that blocks ethylene production in plants. As such, AVG is one of the few molecules that offers tremendous value for growers of commercial tree fruit and other crops. The results obtained from small and large plot research around the world over the past two decades demonstrate how ReTain can be used to effectively manage harvest, as well as improve yield and fruit quality.

This technical manual covers important aspects of the role of ethylene and AVG in plants and serves as a guide for optimal use of ReTain.

RETAIN BACKGROUND AND MODE OF ACTION

ReTain Plant Growth Regulator is formulated as a water-soluble powder containing 15% wt/wt AVG, packaged in a water-soluble bag inside a metallized polyester (foil) pouch.

Common name:	Aminoethoxyvinylglycine (AVG)
ISO name:	Aviglycine Hydrochloride
Chemical Abstracts name:	3-Butenoic acid, 2-amino-4-(2-aminoethoxy)-, hydrochloride (1:1), (*2S,3E*)-
IUPAC name:	(*2S,3E*)-2-amino-4-(2-aminoethoxy)but-3-enoic acid hydrochloride
CAS Number:	55720-26-8
Molecular Formula:	$C_6H_{13}ClN_2O_3$
Molecular Weight:	161.2 g/mole
Solubility:	Soluble in water (>600 g/l)
pH:	6.9 for pure AVG in 1% solution at room temperature; 5.6 for the formulated product, ReTain Plant Growth Regulator Soluble Powder, in 10% solution at room temperature
Color:	Off-white to beige
Shelf life:	At least 10 years in closed containers stored at ≤ 25° C (77° F)

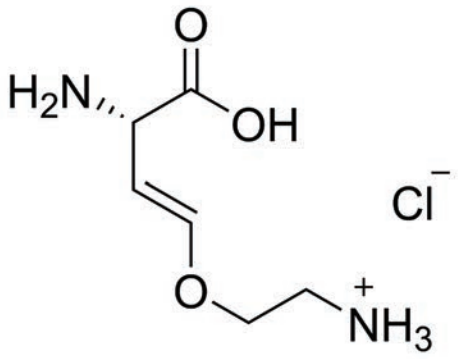


Fig. 1. AVG Structure

Note: Valent BioSciences is in the process of developing and registering an organic formulation of ReTain with equal efficacy, performance, and rate-equivalent applications to the original formulation of ReTain. The new organic liquid formulation, will contain 12.6% wt/wt AVG and will be available specifically for the organic US apple and pear market.

ETHYLENE OVERVIEW

Ethylene (C_2H_4) is one of the five "classic" plant hormones. Among other functions, this colorless and odorless gas acts as a plant ripening hormone. Ethylene is produced by plant tissues as a product of plant metabolism. Ethylene is abundant in nature, with background levels of several parts per billion in the atmosphere of rural environments and higher concentrations in urban areas.

ETHYLENE'S EFFECT ON PLANTS AND FRUIT

Ethylene was first identified as having an effect on plants in 1864 when Girardin demonstrated it to be the component of illuminating gas (coal gas) responsible for leaf abscission on trees near leaking gas lines. In 1901, Dimitry Neljubow, a graduate student at the Botanical Institute of St. Petersburg in Russia, was attempting to grow pea shoots in the laboratory and noted that the ethylene present in the coal gas used for lighting caused radical changes in plant development. These changes have subsequently become known as the "triple response." In peas, the triple response includes short roots, hypocotyl swelling, and exaggerated apical hook.

Since then, it has been discovered that **ethylene plays a key role in many plant systems, including:**

- Seed, spore, and pollen germination
- Seedling development
- Loss of dormancy (seeds, shoots, bulbs)
- Embryogenesis
- Fruit development, including ripening and coloration
- Fruit abscission
- Root formation
- Petiole development
- Disease resistance
- Insect defense
- Senescence
- Flowering, including induction, differentiation, senescence, and abscission.

Ethylene stimulates or inhibits these plant processes by influencing enzymatic activity and/or regulating gene expression.

ETHYLENE BIOSYNTHESIS AND AVG MODE OF ACTION

Many plant physiological processes are ethylene mediated, so blocking ethylene production provides the ability to influence those processes as well.

In plant physiology, there are two systems for ethylene production, known simply as System 1 and System 2. System 1 is characterized by a basal level of ethylene production and known to be ethylene autoinhibitory. It is applicable to all vegetative tissues, including developing fruits. System 1 is constantly present, but is activated only in response to some stressor, e.g., drought, temperature extremes, insect infestation, or pathogen infection. System 2 occurs during climacteric ripening and promotes ethylene production. It becomes active closer to flower senescence and harvest and is part of the maturation and ripening process. In this case, ethylene biosynthesis is associated with increased fruit respiration, fruit softening, increased color development, conversion of starch to sugar, and fruit drop.

Regardless of the system, ethylene biosynthesis within the plant follows a common enzymatic pathway:

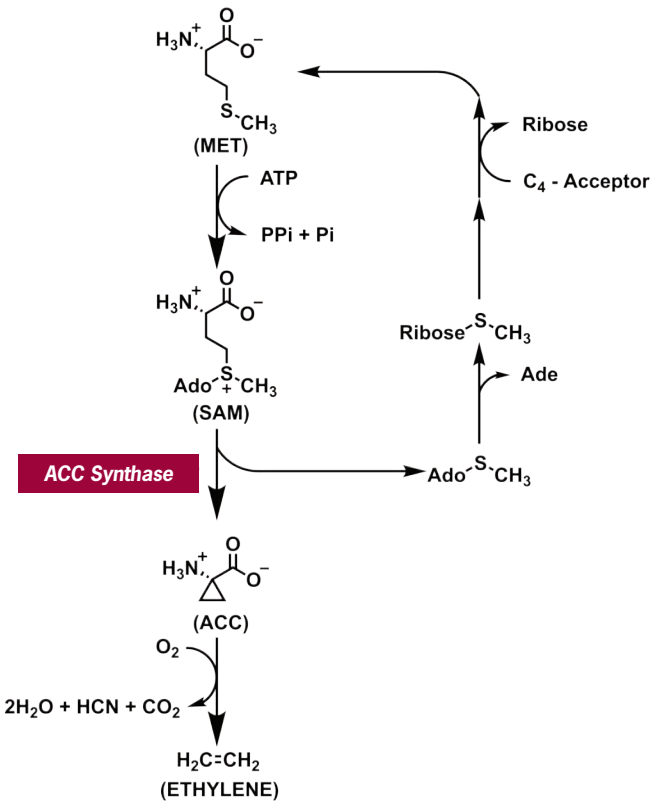


Fig. 2. Ethylene Biosynthesis. Adapted from Miyazaki and Yang, 1987, Physiol. Plantarum, 69:366-370 1987; Yang, 1985, HortScience, 20: 41-45.

In simpler terms, the amino acid methionine is converted to S-adenosylmethionine (SAM) by the enzyme SAM synthetase. SAM is then converted to the amino acid 1-aminocyclopropane-1-carboxylate (ACC) by the enzyme ACC synthase, which in turn is converted to ethylene by the enzyme ACC oxidase:

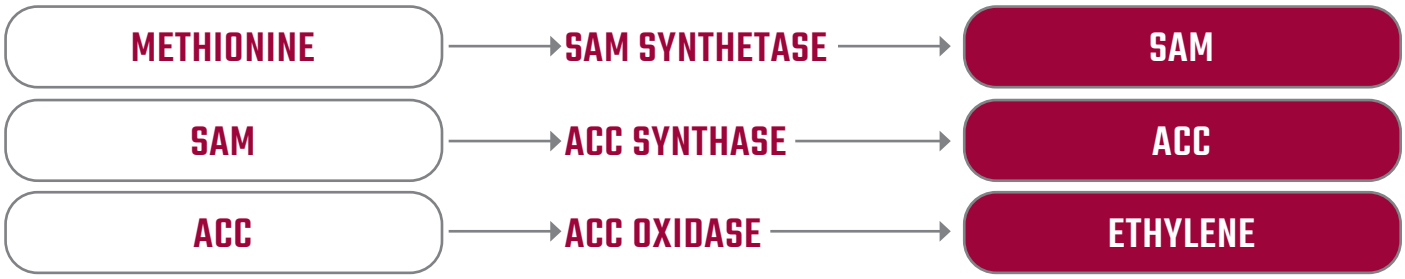


Fig. 3 Ethylene Biosynthesis Enzymatic Pathway

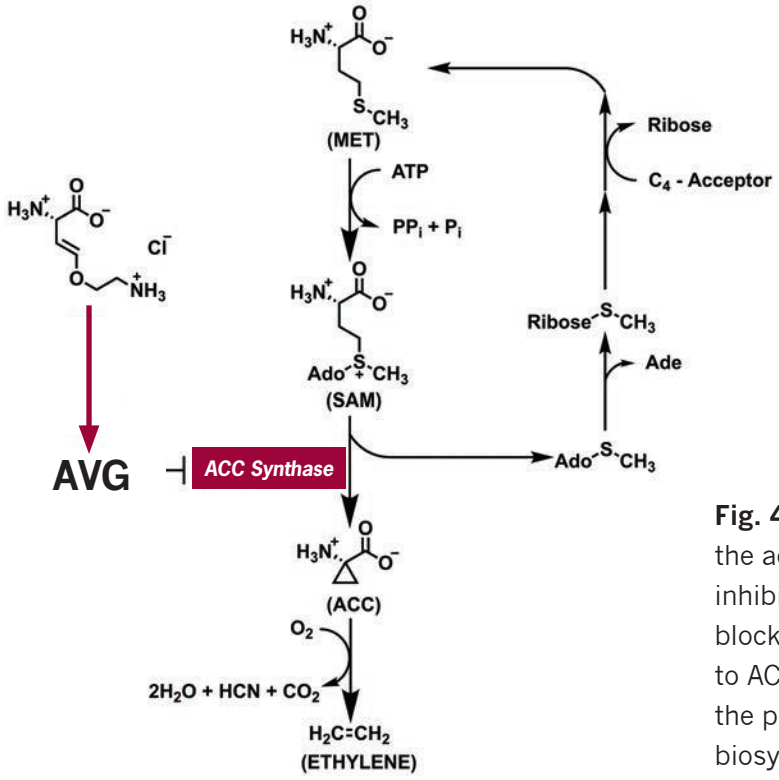


Fig. 4. AVG Mode of Action. AVG, the active ingredient in ReTain, inhibits the enzyme ACC synthase, blocking the conversion of SAM to ACC, and ultimately blocking the production of ethylene biosynthesized by the plant tissues.

RETAIN ABSORPTION, UPTAKE, AND METABOLISM

ABSORPTION

As leaves age, they accumulate embedded waxes in the leaf. Late in the summer, there may be a continuous and almost impenetrable layer of highly oriented waxes, especially on the upper surface (adaxial). Hydrophilic molecules such as AVG are able to penetrate the cuticle membrane possibly through diffusion by polar pathway or by mass flow through openings provided by stomata, lenticels, or fissures, such as microcracks.

UPTAKE

In the early studies of AVG use, it was accepted that there is almost no translocation of AVG or its metabolites from apple leaves into fruit. This research concluded that AVG incorporation into apple fruit tissues results from **absorption through the peel of the apple** rather than through translocation from the leaves.

However, even though AVG may not be translocated directly from leaves to fruit, some recent studies have demonstrated that **leaves and shoots may also play a significant role in response**. This may be from direct exposure of the abscission zone to AVG, or from a modification of leaf-fruit signaling associated with fruit ripening. Either way, **good coverage of both fruit or flowers and leaves is important to the response**.

METABOLISM

AVG is metabolized in tissues to one major and several minor metabolites. The major metabolite is terminal N-acetyl AVG, a compound that is stable to base hydrolysis and sensitive to acid hydrolysis. All the minor metabolites are stable.

The rate of metabolism of AVG is temperature-dependent, and most of the metabolism in apples occurs in the first 7 to 10 days after application.

AVG is also partially degraded on the surface of the apple to four water-soluble products. However, these degradates are most likely a result of microbial and/or photodegradation processes and not direct plant metabolism.

ETHYLENE MANAGEMENT

Research has demonstrated a variety of ways to manage ethylene levels in plants. Among them are:

1) Inhibition of ethylene production: Several compounds are known to inhibit ethylene production by disrupting the enzymatic pathway leading to its production. In addition to AVG, aminooxyacetic acid (AOA) also blocks the activity of ACC synthase. Cobalt (Co^{+2}) and cobalt chloride ($CoCl_2$) block the conversion of ACC to ethylene by inhibiting ACC oxidase. It is important to remember that while these compounds suppress ethylene production, they do not protect crops, including fruits and vegetables, from the detrimental effects of exogenous sources of ethylene.

2) Inhibition of ethylene action: There are also compounds that inhibit the action of ethylene in plants or reduce plant sensitivity to ethylene. Silver ions, such as silver nitrate (AgNO3), inhibit sensitivity to ethylene. Silver is not available as a commercial product on crops. However, silver thiosulfate is registered for use on ornamental crops, such as cut flowers. 1-Methylcyclopropene (1-MCP) binds to ethylene receptors, which blocks ethylene binding and thus ethylene action. Products treated with 1-MCP cannot respond to ethylene. 1-MCP can be a potent inhibitor of ethylene action and is registered for pre- and post-harvest uses on food crops. However, 1-MCP is not organically certified.

EXPRESSION OF ACC SYNTHASE GENES

The mapping of the entire genome sequence of apple has identified 19 ACC synthase genes. Some are active in ethylene biosynthesis System 1, some in System 2, and some in both. Of these, six are expressed in the fruit.

Five of those six play some role in fruit ripening, but only three of them have been shown to have a direct role in System 2 ethylene biosynthesis: MdACS1, MdACS3a, and MdACS6.

MdACS1 has only been observed post-harvest. A recent study conducted by Li et al. (2013) demonstrated that MdACS3a was expressed 14 days before commercial harvest, and that MdACS6 expression began 60 days before commercial harvest (System 1) and increased five days after harvest when climacteric ethylene began evolving (System 2).

Understanding more about these genetic expressions involved in apple ripening – up-regulation and down-regulation after ReTain application – and the use of advanced mRNA techniques would facilitate more precise application timing for ReTain in the future.

II. PLANT RESPONSES AND BENEFITS OF RETAIN

By inhibiting ACC synthase activity, **ReTain delays and temporarily reduces the production of ethylene in plant tissues**. Biological responses to the delayed ethylene biosynthesis vary and depend upon the physiological processes associated with the phenological stage of development. Moreover, **the effects of ReTain on the plant are dependent on timing, dose, and variety**.

ETHYLENE LEVEL EFFECTS

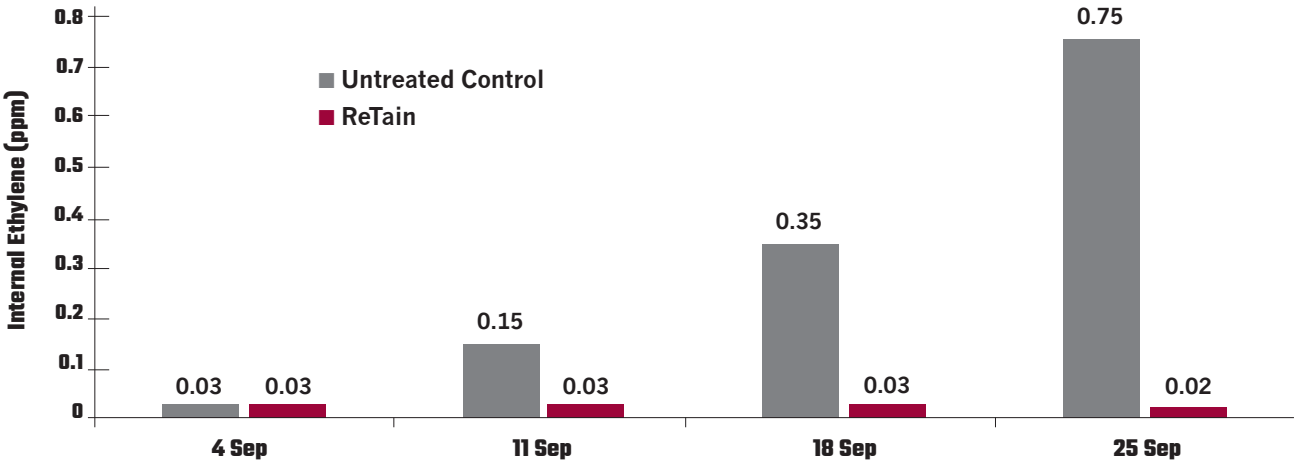
ReTain can suppress ethylene production in fruit for prolonged periods of time and can last as long as several weeks. This effect occurs despite the breakdown of AVG within several days of application. The key to ReTain's extended performance is the suppression of ethylene production during a critical time in the growth stage of the fruit. As fruit matures, natural ethylene production escalates in a cascading fashion (System 2), leading to accelerated fruit maturation and abscission. Once this cascading event occurs, the "switch" has been turned on and the final maturation process begins. **When ReTain is applied just prior to the increase of natural ethylene production in fruit, this switch is prevented from being turned on and allows fruit to mature at a much slower rate.**

It is important to note that while ReTain delays internal ethylene production in plant tissues, it does not block plant responses to ethylene. Consequently, maturation delay caused by AVG application can later be overcome by a subsequent application of ethylene-generating compounds, such as ethephon or ACC.

Examples of ReTain's effects on ethylene suppression are shown in **Fig. 1 through 6**. In these examples, 0.05 to 0.1% organosilicone surfactant was included in ReTain treatments.

Note the different scales of the ethylene levels for the different varieties. These natural differences in ethylene production may explain in part why some varieties of fruit are more responsive to ReTain than others.

Fig. 1. ReTain Effect on Ethylene Production: Red Delicious

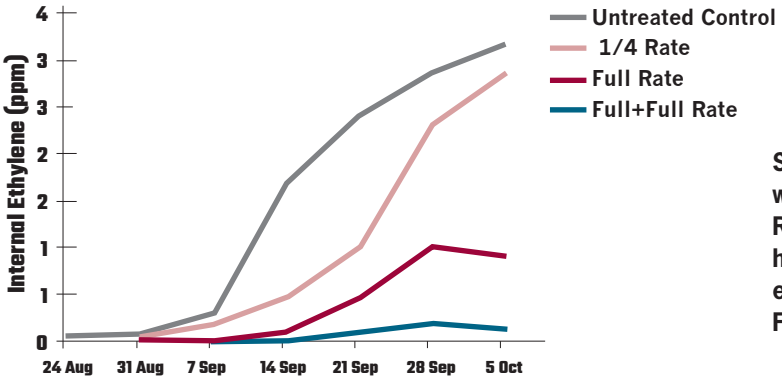


ReTain 1 pouch/acre (333 g/acre) applied at 4 weeks before harvest provided superior ethylene management benefits in Red Delicious.

Lead Researcher: Valent USA
Location: Wapato, Washington, US

ETHYLENE LEVEL EFFECTS

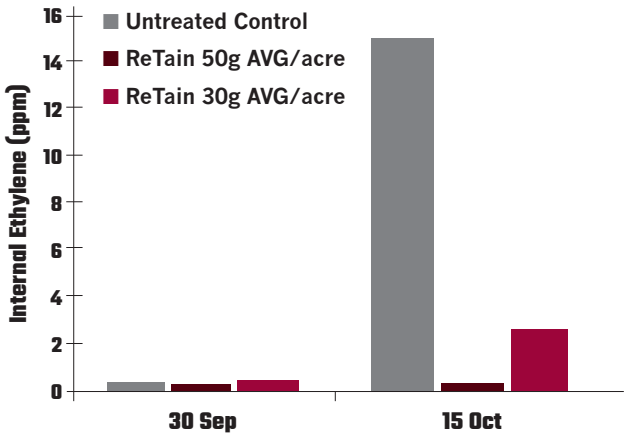
Fig. 2. ReTain Effect on Ethylene Production: Gala



Single applications of ReTain were applied 4 weeks before harvest. Double application of ReTain was applied at 4 and 1 week(s) before harvest. Higher rates of ReTain provide better ethylene suppression in Gala fruit.
Full rate: ReTain 333 g/acre.

Lead Researcher: Schwallier, P.
Location: Michigan State University, US
Year: 2015

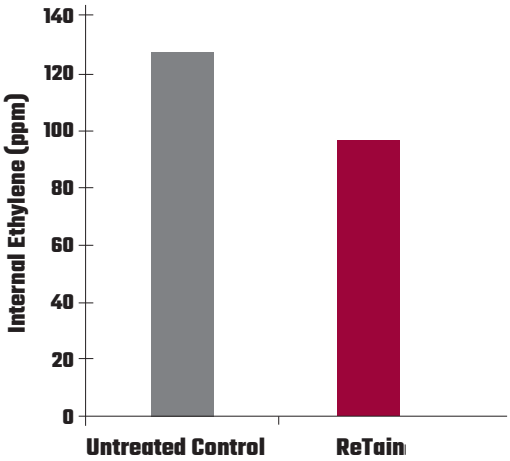
Fig. 3. ReTain Effect on Ethylene Production: Golden Delicious



ReTain applied at 4 weeks before harvest provided superior ethylene management benefits in Golden Delicious. The higher the rate of ReTain, the better the control.

Lead Researcher: Reality Research & Watkins, C.
Location: Sodus, New York, US

Fig. 4. ReTain Effect on Ethylene Production: Honeycrisp

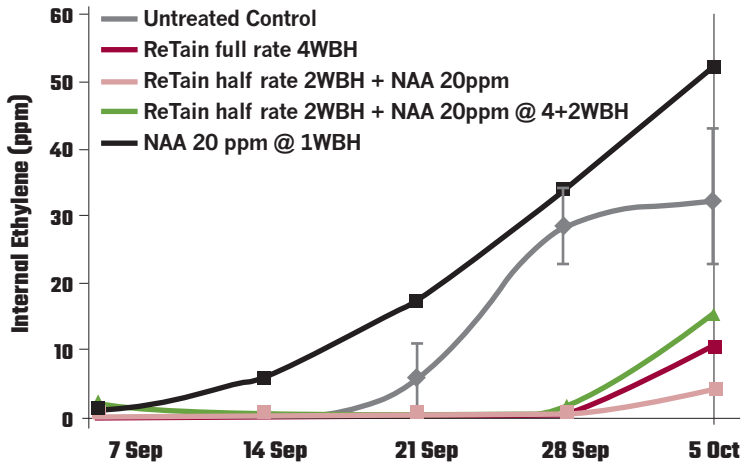


ReTain 1 pouch/acre (333 g/acre) applied at 7 days before harvest kept ethylene levels down in Honeycrisp at 7 days after harvest.

Lead Researcher: Valent USA/Cornell University
Location: New York, US
Year: 2017

For conversion from/to metric or imperial systems, see page 2.

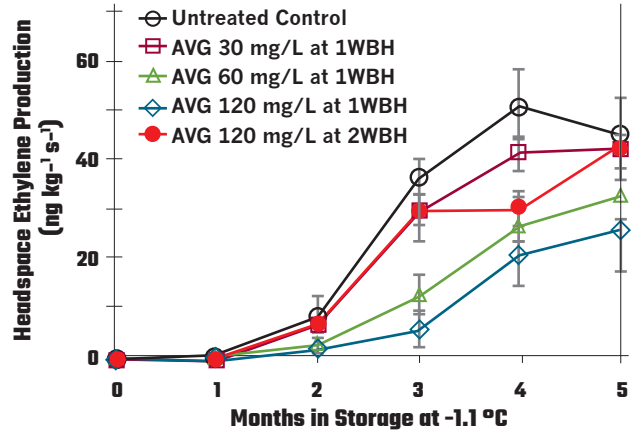
Fig. 5. ReTain + NAA Effect on Ethylene Production: McIntosh



ReTain at half rate or full rate, or in combination with NAA, effectively blocked ethylene production of the high-ethylene variety McIntosh. NAA alone may sometimes provide modest drop control, but ethylene levels may not be inhibited and may severely affect fruit quality.
Full rate: ReTain 333 g/acre.

Lead Researcher: Robinson, T.
Location: Cornell University, New York, US

Fig. 6. ReTain Effect on Ethylene Management: Bartlett pear



According to the study published by Wang et al. (2016), preharvest ReTain application at either 1 or 2 week(s) before harvest (WBH) suppressed ethylene production of Bartlett pears. Suppressed ethylene production delays losses in firmness and green color, and reduces senescence disorders.

Fruit were harvested at commercial maturity (fruit firmness=84.5 N), and ethylene measurements were taken from 0 to 5 months in cold storage.

Lead Researcher: Wang et al., 2016 (Postharvest Biology and Technology)
Location: Hood River, Oregon US
Year: 2016

FRUIT SET INCREASE

Flowering and fruit set are affected by genetics and the environment. Flower senescence involves an ordered sequence of events. This sequence is coordinated at the tissue and cellular level and can be regulated by endogenous signaling mechanisms, such as plant hormones, and by environmental factors, such as temperature, nutrients, light, and pathogen attack. All major plant hormones can affect flower senescence, including ethylene.

Ethylene dynamics can impact fruit set in at least two ways. **Reducing ethylene production can slow flower senescence**. This regulation can improve flower longevity and extend the effective pollination period.

Alternatively, inhibition of ethylene synthesis can slow the development of the abscission layer of flowers and young fruit. Either way, control of ethylene may be critical to increasing fruit set and yields.

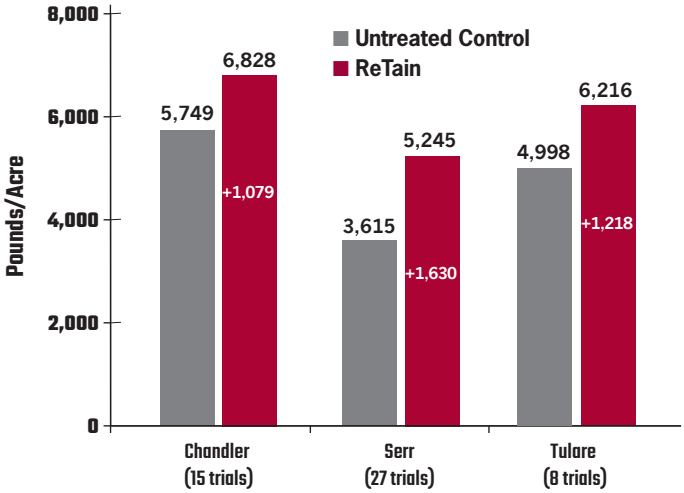
Early season applications of ReTain can reduce ethylene production and have the following effects:

1) REDUCED PISTILLATE FLOWER ABORTION (PFA) – WALNUT

One of the biggest problems walnut growers have is PFA. During bloom, excessive pollen load stimulates ethylene production and causes nut-producing pistillate (female) flowers to abscise. Flowers exhibiting PFA stop growing at the 2-3 mm size and abscise about 10 days after bloom, thus reducing fruit set and yields. ReTain inhibits the production of ethylene that causes PFA during bloom and results in higher fruit set.

Examples of the effect of ReTain on reduced PFA are shown in **Fig. 7 through 9**. In these examples, surfactant was not included with ReTain.

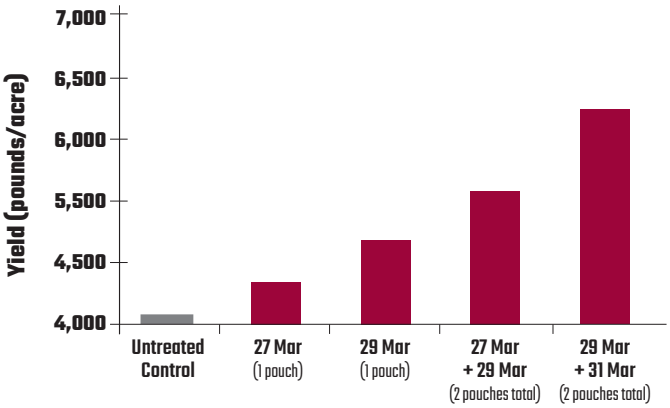
Fig. 7. ReTain Effect on Walnut Yield: 'Chandler', 'Serr', 'Tulare'



ReTain 1 pouch/acre (333 g/acre) applied at 5-30% bloom consistently increases yield in walnut orchards that suffer from low nut set due to Pistillate Flower Abortion (PFA).

Lead Researcher: Valent USA/University Cooperators
Location: California, US
Year: 2003

Fig. 8. ReTain Effect on Serr Walnut Yield: Double Applications



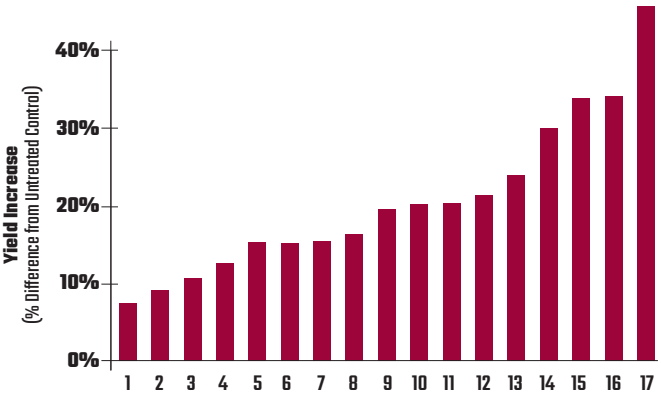
A second application of ReTain at 40-60% bloom (typically 2-4 days after the first application) can increase walnut yields beyond the benefits of a single application.

ReTain 1 pouch/acre = 333 g/acre
ReTain 2 pouches/acre = 666 g/acre

Lead Researcher: Valent USA/University Cooperators
Location: California, US
Year: 2010

For conversion from/to metric or imperial systems, see page 2.

Fig. 9. ReTain Effect on Walnut Yield: 'Chandler' — 9-Year Summary



In field trials conducted in Chile between 2008 and 2016, walnut yield increases with ReTain 830 g/ha ranged from 8% to 45%.

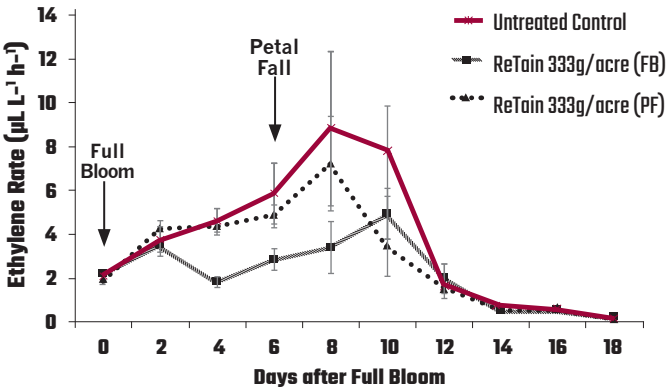
Lead Researcher: Sumitomo Chemical Chile and Cooperators
Location: Chile
Year: 2008-2016

2) DELAYED SENESCENCE OF FLORAL ORGANS: OVARIES, OVULES, AND STIGMATIC SURFACES – APPLE, PEAR, CHERRY, ALMOND, PECAN

Flowers are most receptive to pollination in the early stages of bloom. Once flowers are fully open and begin to produce ethylene, the flower receptivity to pollen declines. Extending flower viability increases the opportunity for successful pollination and fertilization. In this way, ReTain overcomes some of the cultivar, weather, and pollinator issues that may have limited fertilization. ReTain can be applied at early bloom on varieties with low natural fruit set or in advance of poor pollinating conditions such as cool, wet weather, desiccating winds, and/or low pollinator activity.

Examples of the effect of ReTain on fruit set increase of apple, pear, cherry, and almond are shown in **Fig. 10 through 21**. In these examples, surfactant was not included with ReTain.

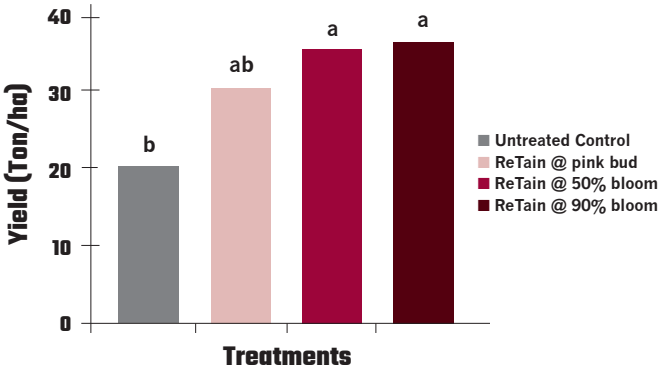
Fig. 10. ReTain Effect on Ethylene (Fruit Set Study) — Minneiska



ReTain applied during the bloom period inhibits ethylene production of apple flowers, delaying flower senescence, and/or keeping the abscission zone intact.

Lead Researcher: Francescatto, P.
Location: Cornell University, New York, US
Year: 2018

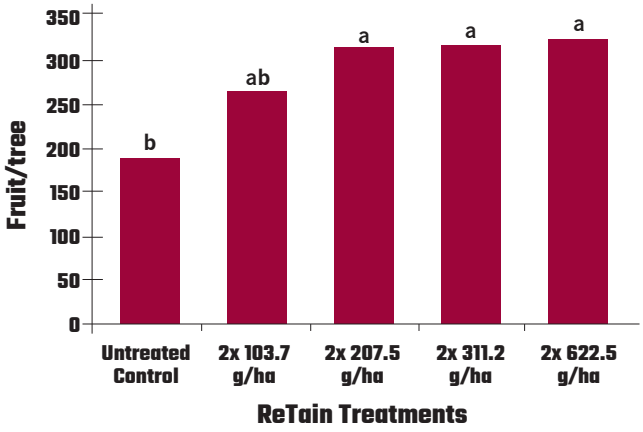
Fig. 11. ReTain Effect on Yield: Apple – Royal Gala



ReTain 830 g/ha applied during the bloom period provided dramatic increases in yield (>50%) of Royal Gala orchards.

Lead Researcher: Lotze, G.
Location: Stellenbosch University, South Africa
Year: 2009

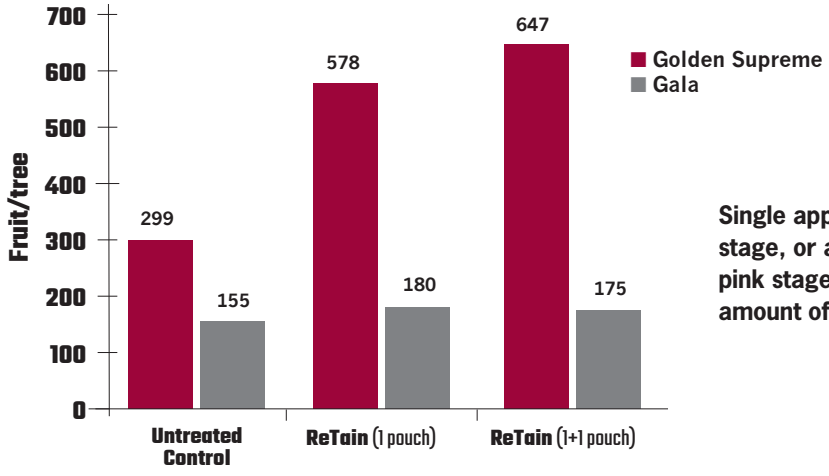
Fig. 12. ReTain Effect on Fruit Set: Apple – Gala



Double applications of ReTain (full bloom and petal fall) resulted in an average fruit set increase of approximately 60%.

Lead Researcher: Sumitomo Chemical Brazil – Katsurayama, Y.
Location: Sao Joaquim, Santa Catarina, Brazil
Year: 2019

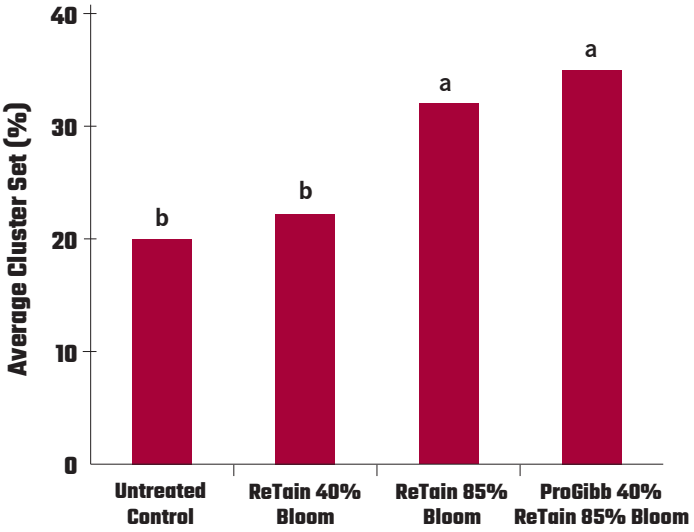
Fig. 13. ReTain Effect on Fruit Set: Apple – Golden Supreme and Gala



Single application of ReTain 1 pouch (333 g/acre) at pink stage, or a double application of ReTain (1+1 pouch) at pink stage and king bloom (4 days apart), increased the amount of fruit per tree.

Researcher: Schwallier, P.
Location: Michigan State University, US
Year: 2015

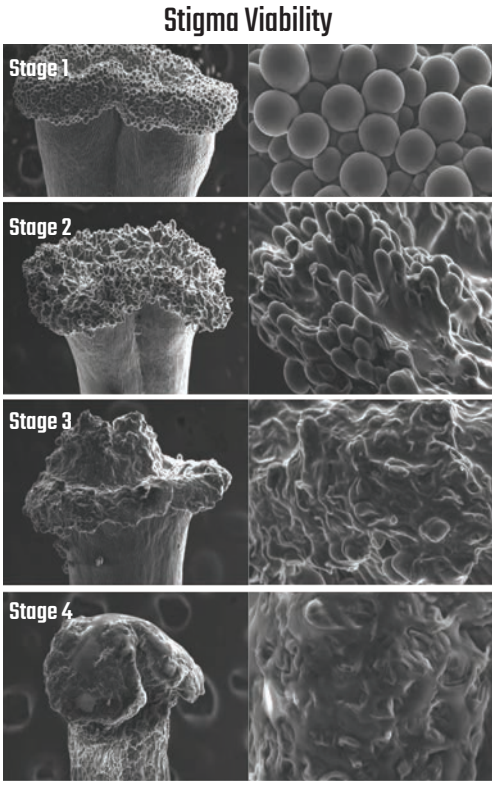
Fig. 14. ReTain Effect on Fruit Set: Pear – Forelle

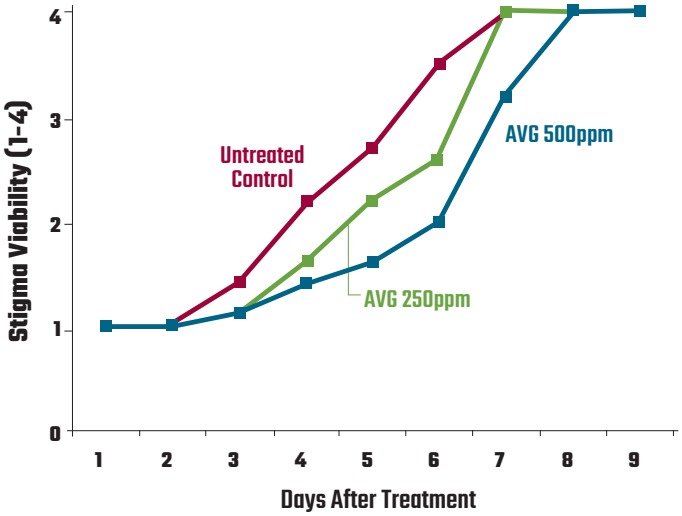


ReTain 333 g/acre applied at 85% bloom provides fruit set benefits to Forelle pears.

Lead Researcher: Valent USA
Location: Washington, US
Year: 2009

Fig. 15. ReTain Effect on Fruit Set: Sweet Cherry

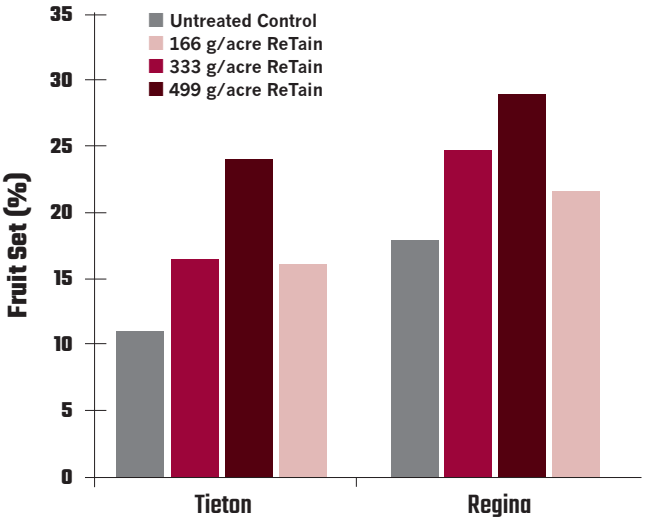




ReTain application during popcorn stage reduces ethylene evolution in cherry flowers, delaying flower and stigmatic senescence. ReTain may keep flowers viable for an additional 2-3 days, increasing chances for pollination and fertilization, and therefore higher fruit set.

Lead Researcher: Racsko, J.
Location: Ohio State University, US
Year: 2011

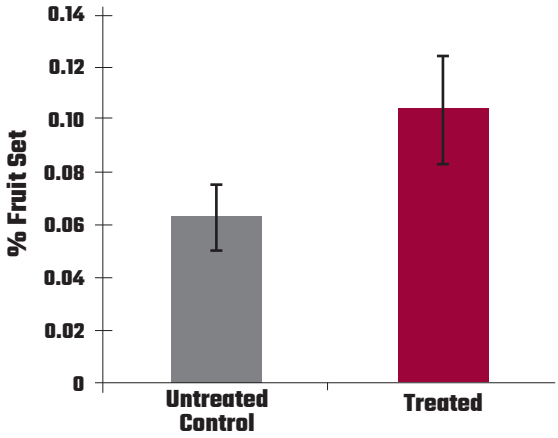
Fig. 16. ReTain Effect on Fruit Set: Sweet Cherry – Tieton and Regina



In Washington, US, ReTain applied at 10% bloom increased fruit set for both 'Regina' and 'Tieton' cherry cultivars. The higher the rate, the better the efficacy on improving fruit set.

Lead Researcher: Lu Zhang (thesis)
Location: Washington State University, US
Year: 2014

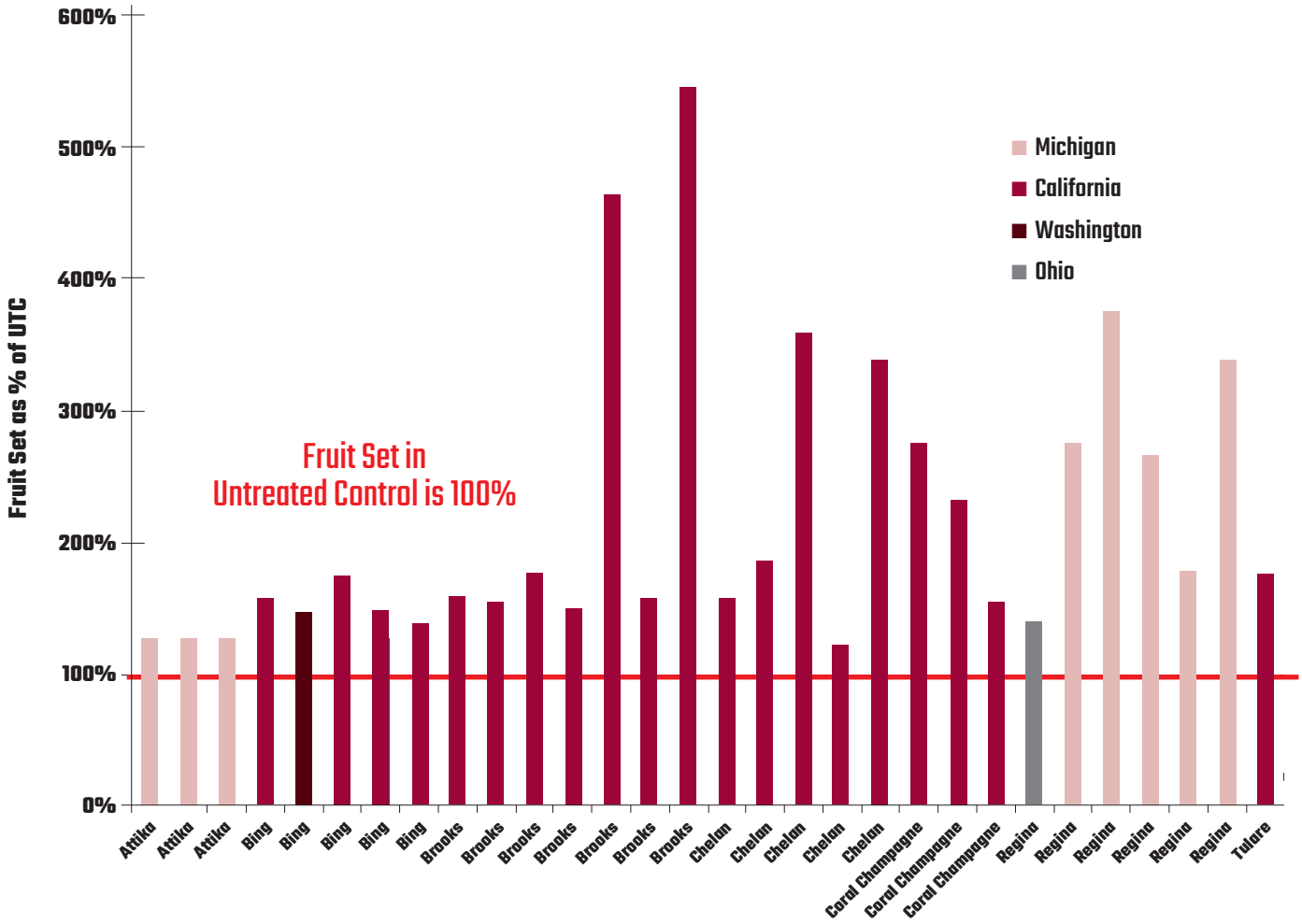
Fig. 17. Effect of ReTain on Fruit Set: Tart Cherry – Balaton



ReTain 1 pouch per acre (333 g/acre) applied at 10% bloom to the tart cherry 'Balaton' resulted in significantly higher fruit set compared to the untreated control.

Lead Researcher: Rothwell, N. and Powers, K.
Location: Michigan State University, US
Year: 2019

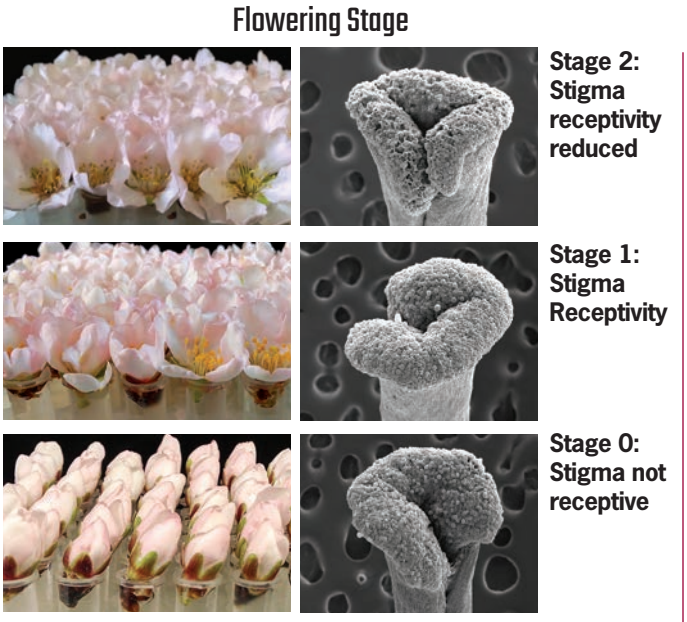
Fig. 18. ReTain Effect on Fruit Set: Sweet Cherry



ReTain 1 pouch per acre (333 g/acre) applied to sweet cherries at 10% bloom shows great fruit set efficacy in field trials conducted in the US between 2010 and 2014.

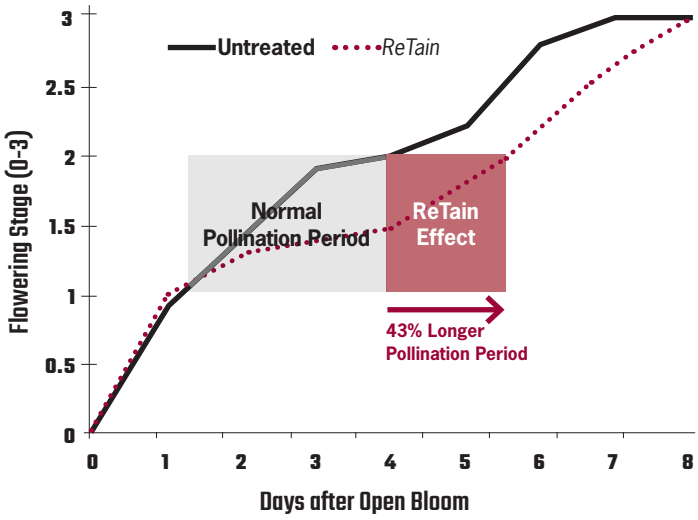
Lead Researcher: Valent USA
Location: US
Year: 2010-2014

Fig. 19. ReTain Effect on Fruit Set: Almond



ReTain Increases Stigma Receptivity In Almond Flowers

By reducing ethylene synthesis, ReTain helps maintain the receptivity of floral stigma, resulting in a greater potential for fertilization and increased nut set.

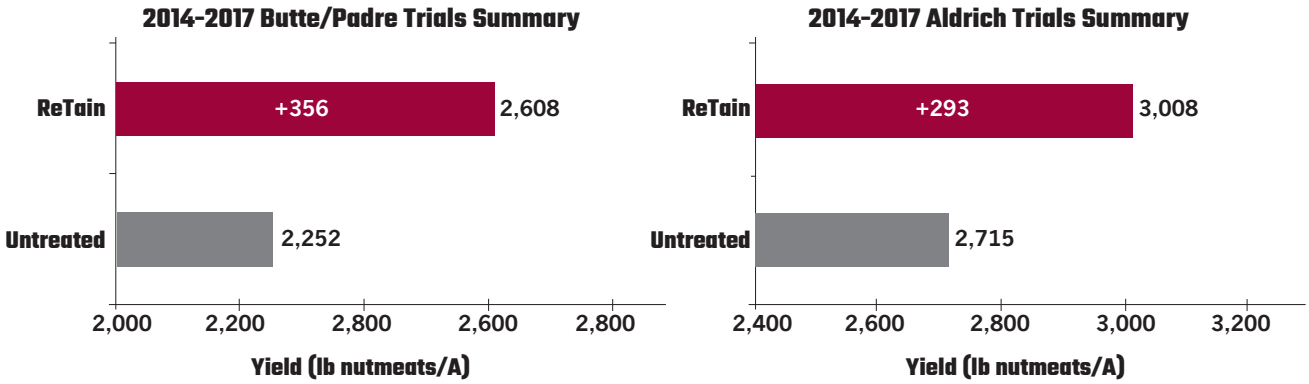


ReTain Extends the Pollination Period to Increase Nut Set

ReTain effectively delayed flower senescence in almonds, thus improving the chances for pollination by 43%.

Lead Researcher: Racsko, J.
Location: California, US
Year: 2014

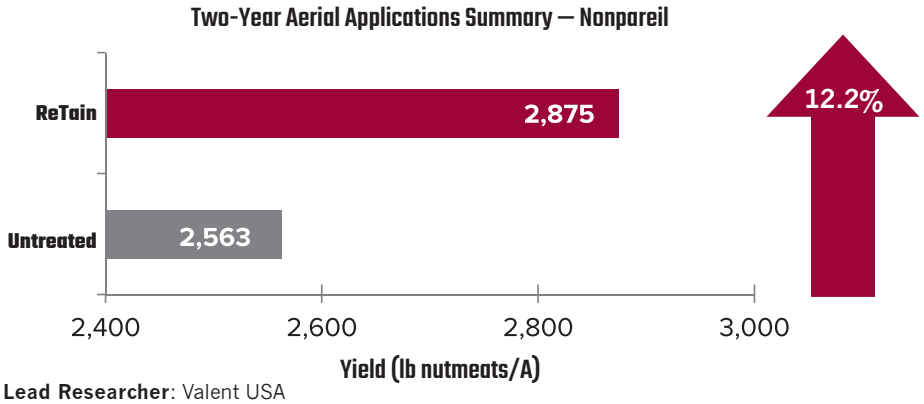
Fig. 20. ReTain Effect on Fruit Set: Almond – Aldrich, Butte/Padre



In field trials between 2014 and 2017, ReTain increased Butte/Padre variety yield +356 lb/A and Aldrich variety yield + 293 lb/A over the untreated check.

Lead Researcher: Valent USA
Location: California, US
Year: 2014-2017

Fig. 21. ReTain Effect on Fruit Set: Almond – Aerial Application



Lead Researcher: Valent USA
Location: California, US
Year: 2016-2017

In aerial application trials conducted in 2016 and 2017 with ReTain on Nonpareil almonds, nutmeat yields increased on average by 312 lb/A – a 12.2% yield increase over the untreated control. Applications were made via fixed-wing or rotary-wing aircraft at application volumes ranging from 15 to 20 gal/A. This compares to a 7.5% average yield increase for ground applications.

3) REDUCED ABSCISSION OF FLOWERS AND YOUNG FRUIT – PEAR

Application of ReTain to fruit trees with flowers and young fruit may work directly to inhibit the development of the abscission zones. Consequently, ReTain reduces flower and young fruit abscission and yields are maintained.

Examples of the effect of ReTain on reduced flower and young fruit abscission are shown in **Fig. 22 through 23**. In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

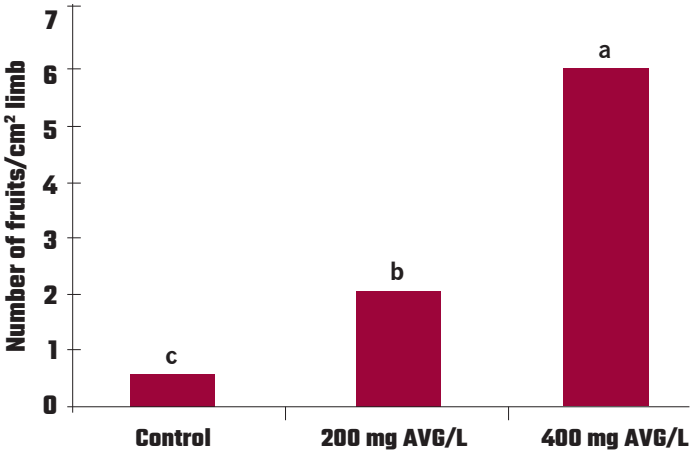
Fig. 22. ReTain Effect on Fruit Set: Pear – Columbia Red d'Anjou

Treatment	Mean No. Fruit / Tree	Fruit / TCSA (cm^2)
Untreated Control	7.50 b	0.18 b
ReTain 333 g/acre at 10 mm	20.00 ab	0.54 a
ReTain 666 g/acre at 10 mm	31.25 a	0.79 a

ReTain applied to Columbia Red d'Anjou® pears at 10mm fruit size inhibits fruitlet abscission ('June Drop') and consequently increases the final amount of fruit at harvest.

Lead Researcher: Valent USA
Location: California, US
Year: 2014

Fig. 23. ReTain Effect on Fruit Set: Pear – Packham's Triumph



According to the study published by Dussi et al., 2002, the number of fruits per limb cross sectional area of the pear 'Packham's Triumph' pears increased considerably with ReTain (AVG) applied at 2 weeks after full bloom. Higher rates of ReTain provided better efficacy.

Lead Researcher: Dussi et al., 2002 (Acta Hort 596)
Location: Argentina
Year: 2012

ReTain can also be of great benefit in increasing fruit set in some years and under certain conditions, regardless of the fruit crop. This includes frost events and low/colder areas of orchards, in blocks prone to poor set in the bottom half of the tree, and in processing blocks where yield is the primary objective and size and return bloom are not a concern (e.g., cider varieties and tart cherries).

HARVEST MANAGEMENT

The ultimate challenge to achieving greater profitability in pome and stone fruit production is to consistently produce fruit that can meet market demand for size, firmness, fruit finish, and storage ability. The result: **Control quality**. The use of ReTain will not only help deliver quality fruit, but will aid another important aspect of production–harvest management by unlocking a critical limiting factor. The result: **Control time**.

Labor costs dramatically impact a grower's bottom line. Organizing picking crews, packing bins, and transportation, all while monitoring advancing fruit maturity to ensure harvests of fruit of the highest possible grade, can be a major challenge. **Using ReTain to delay the maturity of part or all of an orchard provides growers with much-needed flexibility by expanding their management decision window**. Monitoring fruit maturation is critical to ensuring that pick dates are optimally set to maximize high-quality fruit.

Since its introduction in 1997, ReTain has become the premier harvest management tool in many commercial apple tree fruit regions of the world. **ReTain extends harvest time and allows growers to harvest with fewer workers, while at the same time allowing fruit to mature to optimal size, color, and condition**:

- **ReTain promotes orderly harvest of large acreage of single varieties**. By treating portions of the crop with different rates or timings of ReTain, maturity and subsequent harvest of those blocks are delayed. This allows growers to harvest fruit of optimum quality over longer periods.
- **ReTain extends the availability of popular varieties** over more weekends in pick-your-own operations (PYO).
- **ReTain enables more efficient use of smaller crews** to harvest fruit at optimum quality.

Examples of the effect of ReTain on harvest management are shown in **Fig. 24 through 27**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 24. ReTain Effect on Labor Management: Gala

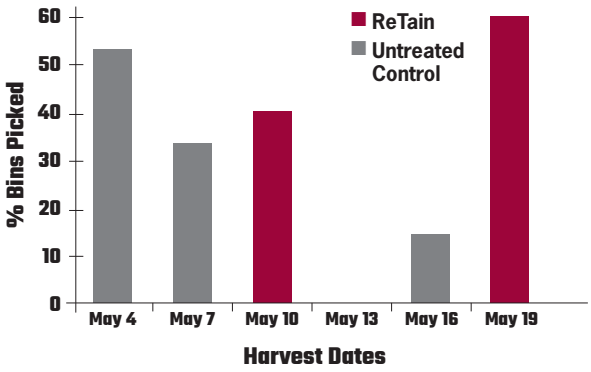
	No ReTain	ReTain
Acres	30	30
Bins/Acre	60	60
Total Bins	1,800	1,800
Harvest Days	**8**	**15**
Bins/Day to Harvest	225	120
Picking Rate (Bins/Day)	8	8
Number of Pickers	**28**	**15**

Lead Researcher: Valent USA
Location: Washington, US

By picking the untreated block in one week and the ReTain-treated block the next week, this grower was able to reduce the number of pickers by nearly half over the same area and was better able to manage operations over this extended harvest period.

For conversion from/to metric or imperial systems, see page 2.

Fig. 25. ReTain Effect on Harvest Management: Cripps Pink



The logistics of picking large blocks at peak quality is difficult, and labor availability is always a concern. By extending harvest time, ReTain helps growers harvest their apples at optimum quality, protecting their considerable investment in production, harvest and post-harvest technology.

Lead Researcher: Sumitomo Chemical Australia
Location: Yarra Valley, Victoria, Australia

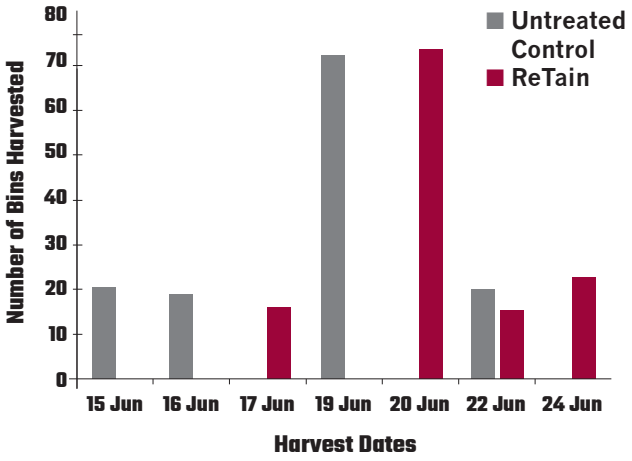
Fig. 26. ReTain Effect on Fruit Maturity/Harvest Management: Imperial Gala

Treatments	Cumulative % of Fruit Harvested						Fruit size (g)
	13 Feb	20 Feb	03 Mar	13 Mar	22 Mar	29 Mar	
Untreated Control	7	32	96	100	–	–	117
ReTain 830 g.ha^{-1} applied at 28 days before harvest	–	–	19	75	96	100	135

ReTain will delay apple maturity, allowing precise harvest management of large blocks of one variety. In this trial, ReTain extended the harvest window by nearly three weeks. Fruit size was also increased, as there was more time for the fruit to grow on the tree.

Lead Researcher: Petri et al., 2010 (Bragantia, 69)
Location: Fraiburgo, Santa Catarina, Brazil
Year: 2006

Fig. 27. ReTain Effect on Harvest Delay: Honey Fire Nectarine



ReTain 1 pouch per acre (333 g/acre) applied at 2 weeks before harvest delays maturity by 1-3 days, giving growers more flexibility when harvesting large acreage of one variety.

Lead Researcher: Valent USA
Location: Parlier, California, US
Year: 2011

MATURITY MANAGEMENT

As fruit matures, several physiological, biochemical, and developmental events take place: the fruit softens, flesh firmness decreases, soluble sugars and flavor compound levels increase, color changes, drop intensifies, and overall fruit quality eventually declines. Therefore, indicators such as background color, starch content, and firmness are important factors in determining the time of optimum harvest. To some extent, they correlate with sugar content, acidity, flavor, aroma, texture, internal ethylene, and potential storage life.

Harvest timing is also influenced by the intended destination markets and prime marketing windows, whether the fruit are intended for immediate sale in domestic or export fresh markets, short- or long-term storage, or destined for processing.

ReTain helps growers manage fruit maturity to meet the demands and schedules of their markets in the following ways:

1. Reduced pre-harvest fruit drop
2. Slower rate of starch to sugar conversion
3. Slower rate of fruit softening
4. Reduced fruit cracking
5. Reduced/delayed development of watercore and internal bleeding
6. Reduced/delayed development of skin greasiness
7 Delayed background color shift
8. Improved fruit color due to harvest delay in some apple varieties
9. Increased fruit size due to harvest delay
10. More uniform maturity development

PRE-HARVEST FRUIT DROP

There are many potential reasons why fruit drop prematurely. Some fruit crops and varieties are naturally more prone to preharvest fruit drop than others. Pre-harvest drop is also increased by low leaf Mg and high K and B. Other factors known to increase fruit drop include excessive summer pruning, high levels of mites, leaf miners or other insects, drought, and periods of extreme heat.

Abscising organs, such as senescing flowers, leaves and fruits, produce ethylene that is released to the abscission zone cells of the stem. Ethylene stimulates the production of enzymes that break down the cell walls of the abscission zone, allowing the organ to detach from the plant.

By inhibiting ethylene production, **ReTain interferes with the enzymatic breakdown of the cell wall and therefore keeps the abscission zone from developing, delaying the onset of fruit drop and allowing more fruit to be harvested**.

In those years with stressful hot and dry summer conditions, fruit begin ripening early and can also drop early. In such years, ReTain will be more effective at stopping drop if applied early enough and at higher rates to provide control before ethylene production begins to increase and drop commences.

RETAIN PLUS NAA

1-Naphthaleneacetic acid (NAA) also provides modest drop control in apples because it inhibits abscission. However, unlike ReTain, NAA is known to increase ethylene production and thereby induce fruit softening and reduce storage life, especially if applied alone or if warm weather follows application. ReTain offers the distinct advantage that it does not stimulate ethylene production. In fact, **the combination of ReTain and NAA has been shown to provide excellent control of preharvest drop due to multiple modes of action for drop control and the ability of ReTain to keep ethylene in check**.

This activity is the result of the combined effect of AVG and NAA on two polygalacturonase (PG) genes that express during the fruit-ripening process. PG is the major enzyme responsible for depolymerization of cell walls and the softening of fruit tissues.

The gene identified as MdPG1 is responsible for fruit softening during the ripening process. This gene expression is amplified by NAA, but diminished and/or delayed by AVG. The effects of AVG on expression of MdPG1 are stronger and overpower the effects of NAA on the same gene. Fruit treated with a tank-mix of the two products maintain firmness at the same level as if treated with AVG alone.

Another gene, identified as MdPG2, has similar activity, but is expressed in a different location. Expression of this gene results in the formation of the abscission layer between the pedicel and spur, causing fruit loosening.

NAA and AVG both suppress the expression of MdPG2, and the effect when the two are combined is additive.

Examples of the effect of ReTain on preharvest fruit drop control are shown in **Fig. 28 through 32**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 28A. ReTain Effect on Pre-Harvest Drop: Gala

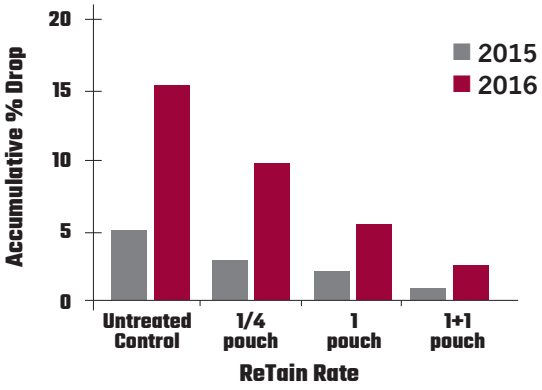
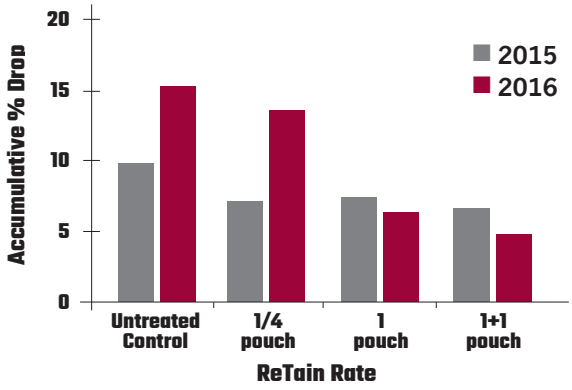


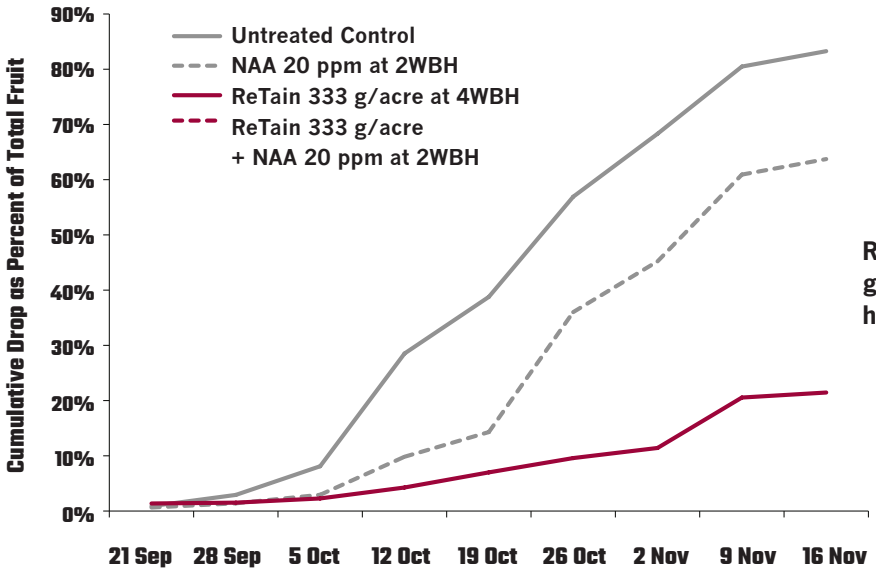
Fig. 28B. ReTain Effect on Pre-Harvest Drop: Honeycrisp



Single applications of ReTain (333 g/acre) were applied 4 weeks before harvest. Double application of ReTain was applied at 4 and 1 week(s) before harvest. All ReTain treatments effectively reduced fruit drop; however, the response is dose-dependent – the more applied, the stronger the effect.

Lead Researcher: Schwallier, P.
Location: Michigan State University
Year: 2015-2016

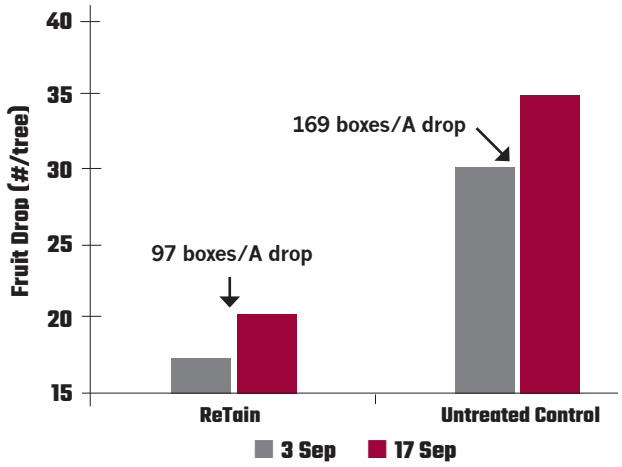
Fig. 29. ReTain + NAA Effect on Pre-Harvest Drop: Red Delicious



ReTain alone or in combination with NAA greatly reduced fruit drop throughout harvest of Red Delicious apple.

Lead Researcher: Valent USA
Location: Zillah, Washington, US
Year: 2014

Fig. 30. ReTain Effect on Pre-Harvest Drop: Honeycrisp



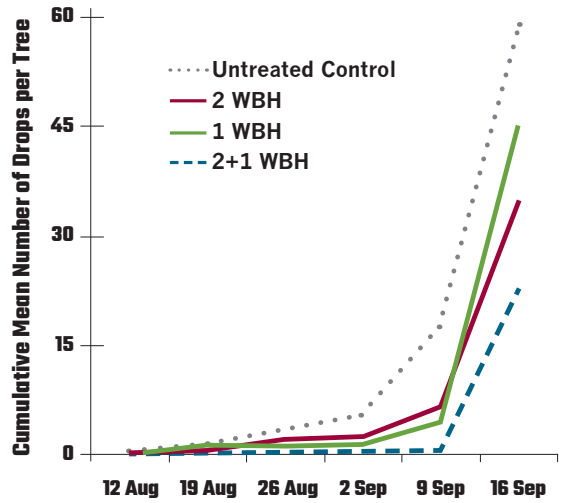
Boxes/A calculation based on number of dropped apples per tree (78 sq ft/tree) and assumed size 100 apples.

Lead Researcher: Valent USA
Location: Zillah, Washington, US
Year: 2010

ReTain applied at ½ pouch per acre (167 g/acre), 2 weeks before harvest.

- ReTain Difference: 72 boxes/acre
- Average Price for all grades and sizes Honeycrisp (2010) - $54.40/box ($1.36/lb)
- Value of 72 boxes @ 85% packout = $3916.80/acre
- Estimated Net ROI after harvest, hauling, packing: - $3281.80/acre or 2117%

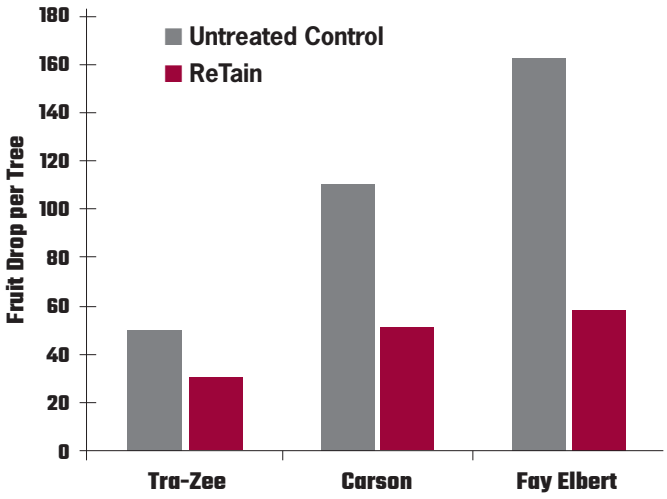
Fig. 31. ReTain Effect on Pre-Harvest Drop: Bartlett Pear



ReTain 1 or 2 pouch per acre (333 or 666 g/acre) applied at 2 and/or 1 week(s) before harvest prevents fruit drop.

Source: Valent USA
Location: Washington, US
Year: 2016

Fig. 32. ReTain Effect on Pre-Harvest Drop: Stone Fruit – Canning Peaches



ReTain 1 pouch per acre (333 g/acre) applied at 2 weeks before harvest reduced fruit drop of canning peaches varieties, allowing more fruit to be harvested.

Lead Researcher: Valent BioSciences
Location: Dinuba/Reedley, California, US

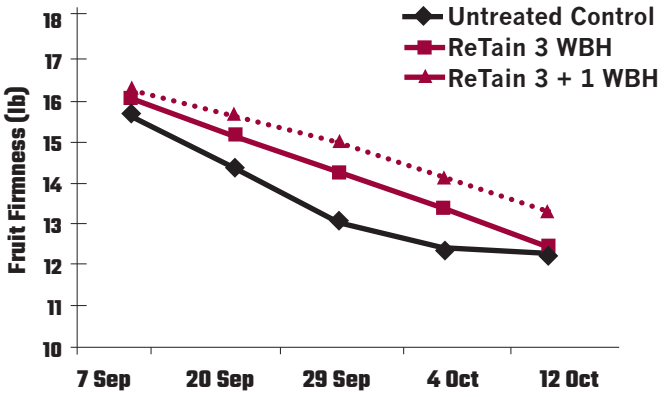
FIRMNESS EFFECTS

Fruit flesh firmness is one of the criteria that is used to determine the quality, maturity, and readiness to harvest. **As fruit ripen, the flesh generally softens**. The reduction in firmness in some fruit, such as apples and pears, is relatively slow. In other fruit, such as peaches and plums, reduction in firmness is more rapid.

The optimum firmness at harvest varies according to crop, variety, storage strategy, and market destination. **The advantage of using ReTain is that fruit is firmer than untreated fruit at harvest. The firmer the fruit, the greater its potential storage life and salability**. This is significant, as larger grade and higher-value fruit is typically softer than small fruit. With ReTain there is the benefit of larger and firmer fruit.

Examples of the effect of ReTain on increased fruit firmness are shown in **Fig. 33 through 38**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 33. ReTain Effect on Fruit Firmness: Red Delicious



Lead Researcher: Kon, T. and Valent USA
Location: North Carolina State University, US
Year: 2017

ReTain 1 pouch per acre (333 g/acre) applied at 3 weeks before harvest or 1 pouch/acre at 3 and 1 week(s) before harvest provided firmer fruit. The more ReTain applied, the greater the increase in firmness.

Fig. 34. ReTain Effect on Fruit Firmness: Imperial Gala

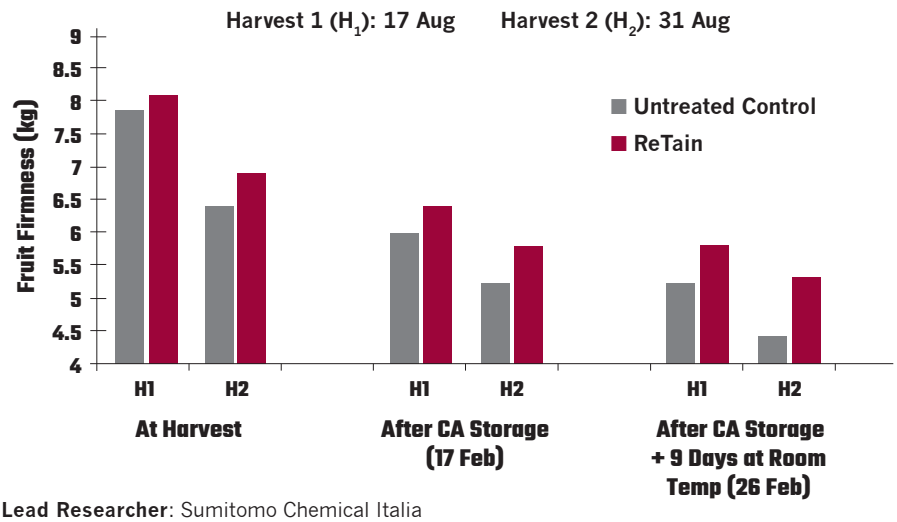
Rate	Timing	No. Applications	Firmness (lb) H0	Firmness (lb) H2
Untreated Control	–	–	15.9	12.7
ReTain ½ pouch/acre	4 WBH	1	15.9	13
ReTain 1 pouch/acre	4 WBH	1	16.6	14.6
ReTain ½ pouch/acre	1 WBH	1	16.7	14.4
ReTain 1 pouch/acre	1 WBH	1	16.5	15.7
ReTain ½ pouch/acre	4 + 1 WBH	2	16.7	15.1
ReTain 1 pouch/acre	4 + 1 WBH	2	16.5	15.2
	Significance		***p value***	
	Control vs ReTain		0.0752	**0.0003**
	½ pouch vs 1 pouch		0.6249	**0.0099**
	1 WBH vs 4 WBH		0.2386	**0.0082**
	1 appl. vs 2 appl.		0.5038	0.0670

WBH: weeks before harvest **H0**: Harvest 1 **H2**: 2 weeks after H0

ReTain applied 1 to 2 weeks before harvest typically will not delay the start of the harvest (first pick), but will help control the maturation rate of the later picks.

Lead Researcher: Kon, T. and Valent USA
Location: North Carolina State University, US
Year: 2018

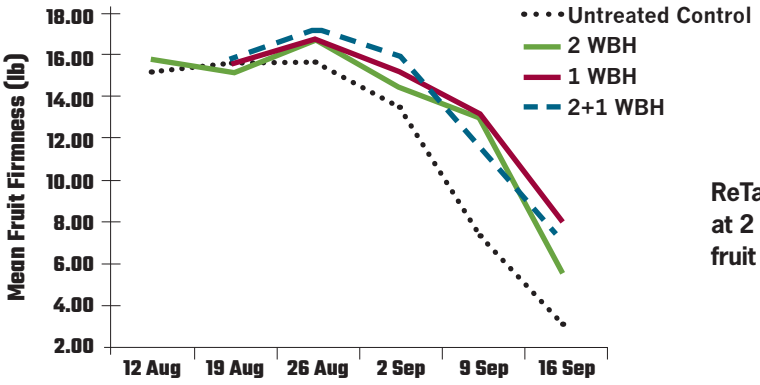
Fig. 35. ReTain Effect on Firmness after Storage: Golden Delicious



ReTain 830 grams per hectare applied at 4 weeks before harvest resulted in higher quality and firmer fruit after storage. CA Conditions: ULO (1°C, 2.0% CO_2, 1.2% O_2).

Lead Researcher: Sumitomo Chemical Italia
Location: South Tyrol, Italy

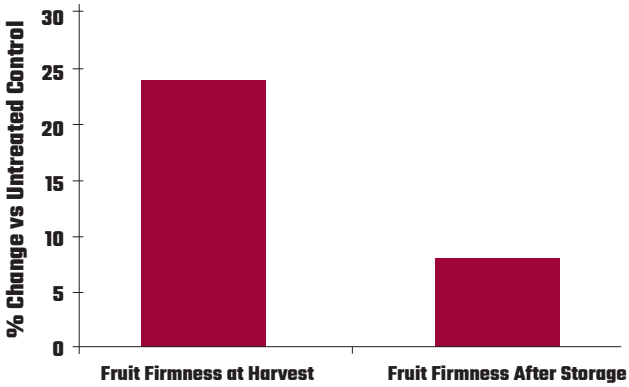
Fig. 36. ReTain Effect on Fruit Firmness: Bartlett Pear



Lead Researcher: Valent USA
Location: Washington, US
Year: 2016

ReTain 1-2 pouch per acre (333-666 g/acre) applied at 2 and/or 1 week(s) before harvest helped maintain fruit firmness on Bartlett pear.

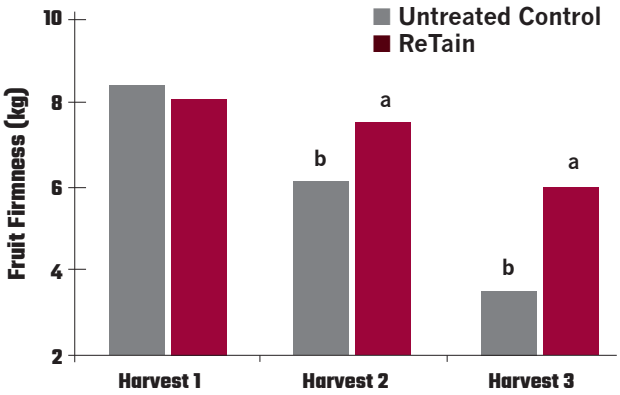
Fig. 37. ReTain Effect on Fruit Firmness: Stone Fruit Peach/Nectarine



Preharvest applications of ReTain have a positive impact on peach and nectarine fruit firmness at harvest and in storage.

Lead Researcher: Valent USA
Location: Fresno, California, US
Year: 2011

Fig. 38. ReTain Effect on Fruit Firmness: Stone Fruit Plum



Flesh firmness in plums is maintained longer in cold storage on ReTain-treated fruit, especially in fruits from the second and third picks. Flesh firmness of Pioneer plums after cold storage for 10 days at -0.5 °C, 7 days at 7.5 °C and 18 days at -0.5 °C.

Lead Researcher: de Kock, A. and Philagro
Location: Western Cape, South Africa

For conversion from/to metric or imperial systems, see page 2.

STARCH DEGRADATION EFFECTS

Starch levels naturally decrease a few weeks before harvest and continue to decline during fruit ripening on-tree and off-tree in storage. The starch-iodine test is used to assess the levels of starch remaining in fruit and is generally a good indicator of fruit maturity. Several visual rating scales have been developed to assist with understanding how to rate the various degrees of starch development. All charts give a rating scale for starch conversion, depending on color intensity – the higher the index, the less dark staining and the more mature the fruit is.

Fruit treated with ReTain typically exhibit higher levels of starch retention compared to untreated fruit, providing evidence that overall maturity has also been delayed. Another common finding is that ReTain decreases the variability in starch content across a population of fruit. This would indicate a crop of consistent maturity without the extremes of over-mature and under-mature fruit and could allow for a reduced number of picks for some varieties.

Be aware that starch degradation is largely independent from ethylene action. In fact, there are some unusual strains that maintain a significant amount of starch, even when the fruit is fully ripe. In these cases, other assessments of fruit maturity (e.g., firmness, background color) must be used.

Starch levels are also dependent on a variety of environment and biological factors and may not always be linked directly to fruit development. Fruit on trees with a light crop load will accumulate more starch than fruit on more heavily loaded trees, for example. It should also be noted that "starch" is a term for several closely related carbohydrate molecules, and that certain varieties express higher levels of one type of starch or another. For instance, Fuji apples tend to stain poorly, likely because of a higher proportion of amylopectin, which does not bind the iodine stain as efficiently. Since not all types of starch stain equally, staining results may be difficult to interpret accurately. Environmental conditions (such as warm nights or other abiotic stresses) may also induce physiological responses by the tree that may temporarily affect starch levels in the fruit.

Examples of the effect of ReTain on delayed starch degradation are shown in **Fig. 39 through 43**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 39. ReTain Effect on Starch Index: Imperial Gala

	Starch Index (1-9)				
Treatment/Date	**Harvest 13 Feb**	**19 DAH 20 Mar**	**30 DAH 13 Mar**	**38 DAH 21 Mar**	**46 DAH 29 Mar**
Untreated Control	3.0	6.8	7.0	6.6	7.5
AVG 124.5 g.ha^{-1} applied at 4WBH	0.3	3.3	4.3	5.8	6.4

DAH: days after harvest; **WBH**: weeks before harvest

Starch breakdown in ReTain-treated Imperial Gala apples is shown to be significantly slower than in untreated fruit up to a month after harvest.

Lead Researcher: Petri et al./Sumitomo Brazil
Location: Fraiburgo, Santa Catarina, Brazil
Year: 2006

Fig. 40. ReTain Effect on Starch Index: Fuji Suprema

	Starch Index (1-9)				
Treatment/Date	**13 Apr**	**19 Apr**	**26 Apr**	**4 May**	**11 May**
Untreated Control	7.0	6.8	6.6	8.5	6.2
AVG 124.5 g.ha^{-1} applied at 4WBH	4.6	5.0	5.4	8.0	6.6

WBH: weeks before harvest

Starch breakdown in ReTain-treated Fuji Suprema apples is shown to be significantly slower than in untreated fruit up to 2-3 weeks after harvest.

Lead Researcher: Petri et al./Sumitomo Brazil
Location: Fraiburgo, Santa Catarina, Brazil
Year: 2004

Fig. 41. ReTain Effect on Starch Index: Imperial Gala

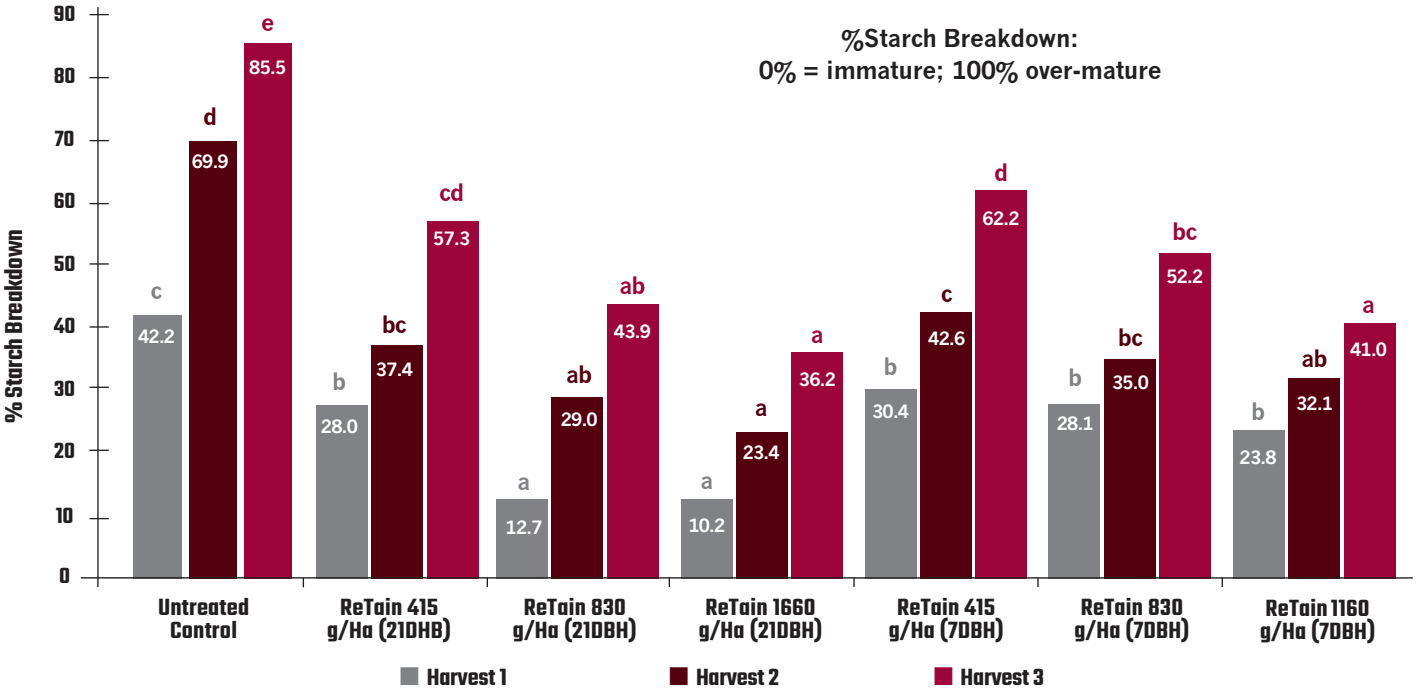
Rate	Timing	No. Applications	Starch rating (1-8) H0	H2
Untreated Control	–	–	6.8	7.8
ReTain ½ pouch/acre	4 WBH	1	6	7.6
ReTain 1 pouch/acre	4 WBH	1	5.1	7.1
ReTain ½ pouch/acre	1 WBH	1	5.4	7.1
ReTain 1 pouch/acre	1 WBH	1	6.3	6.4
ReTain ½ pouch/acre	4 + 1 WBH	2	5	6.6
ReTain 1 pouch/acre	4 + 1 WBH	2	4.9	6.3
	Significance		***p value***	
	Control vs ReTain		**0.0045**	**0.0087**
	½ pouch vs 1 pouch		0.9871	0.0669
	1 WBH vs 4 WBH		0.4891	**0.0373**
	1 appl. vs 2 appl.		**0.0465**	**0.0289**

WBH: weeks before harvest **H0**: Harvest 1 **H2**: 2 weeks after H0

ReTain applied one to two weeks before harvest typically will not delay the start of the harvest (first pick), but will help control the maturation rate of the later picks.

Lead Researcher: Kon, T. and Valent USA
Location: North Carolina State University, US
Year: 2018

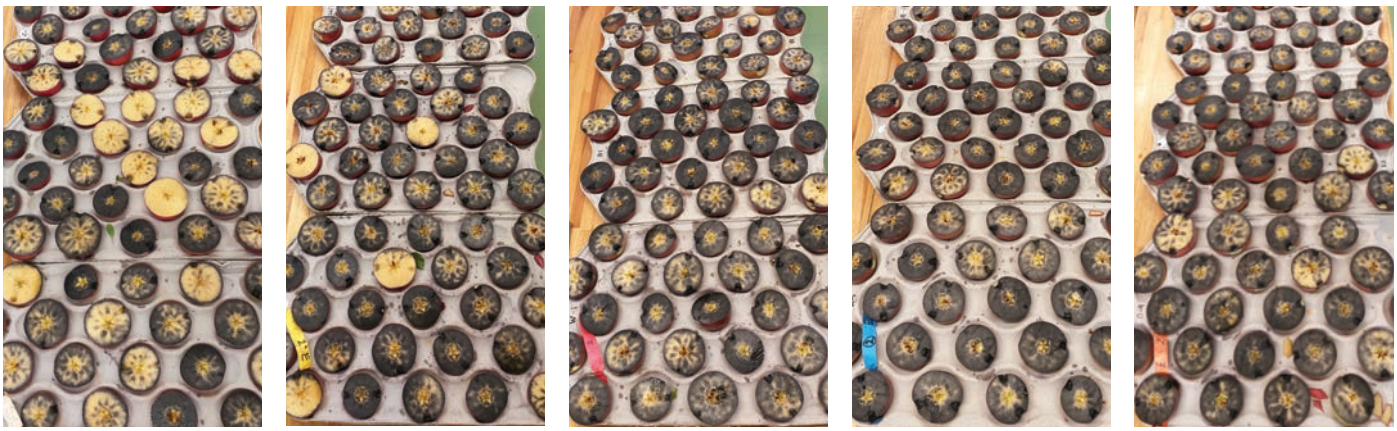
Fig. 42. ReTain Effect on Starch Index: Flash Gala™ (Bigbucks)



The earlier ReTain is applied (21 DBH), the greater the effect there is on maturation of the first, second, and third picks. This is important, especially when flowering is not uniform and growers are aiming to strip-pick high-colored varieties.

Lead Researcher: Philagro
Location: Beauli, Elgin, South Africa
Year: 2019

Fig. 43. ReTain Effect on Starch Index: Golden Delicious



Untreated Control | ReTain 41.5 g/100 L @ 21 DHB | ReTain 41.5 g/100 L @ 21 & 7 DHB | ReTain 83 g/100 L @ 21 DHB | ReTain 166 g/100 L @ 21 DHB

Starch convertion of ReTain-treated fruit is more consistent in appearance than untreated fruit. By delaying harvest, ReTain provides a more consistent maturity.

Lead Researcher: Philagro/Stellenbosch University
Location: Beauli, Elgin, South Africa
Year: 2019

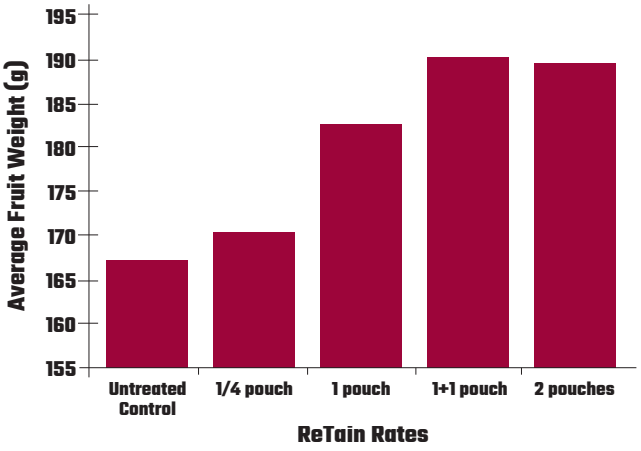
FRUIT SIZE EFFECTS

In addition to all biological responses, **delaying maturity, and therefore delaying harvest, can also result in larger fruit size, as fruit have more time to grow while hanging on the tree longer**.

For instance, apples on unstressed healthy trees will continue to grow about 1 mm per day following a ReTain treatment. This means that an additional week on the tree can add 7 mm (about 0.25 inch) to the fruit's diameter.

Examples of the effect of ReTain on fruit size increase are shown in **Fig. 44 through 50**. **Note**: In these examples, all the ReTain treatments included 0.05%–0.1% organosilicone surfactant.

Fig. 44. ReTain Effect on Fruit Size: Gala

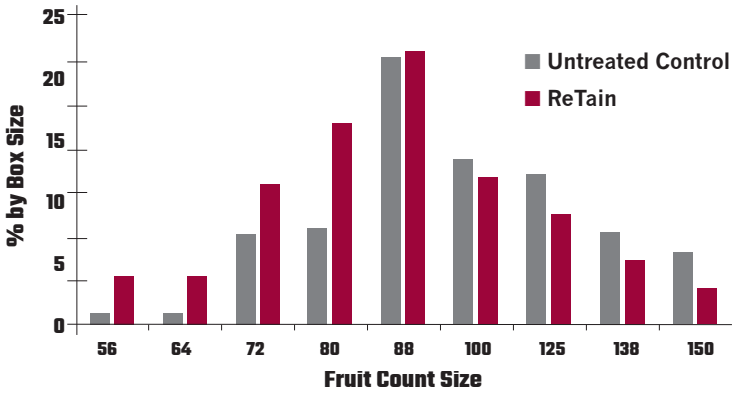


ReTain allows fruit to stay on the tree longer, resulting in significant (and profitable) gains in fruit size. The higher the rate of ReTain, the better the benefit in size.

Note: Each rate of ReTain was harvested when the fruit were at an equivalent stage of maturity for the treatment.

Lead Researcher: Schwallier, P.
Location: Michigan State University, US
Year: 2016

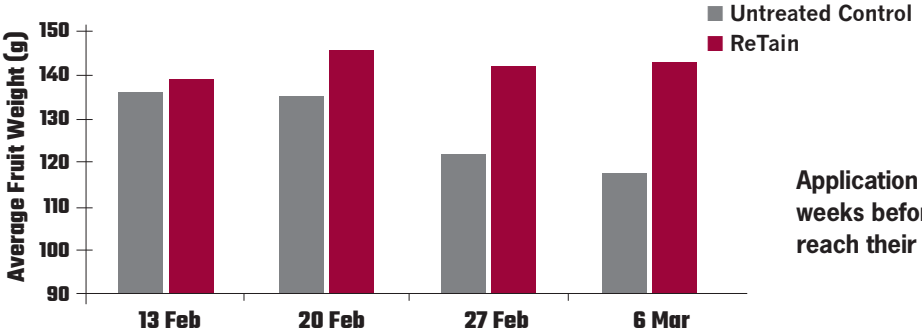
Fig. 45. ReTain Effect on Fruit Size: Red Delicious



ReTain 1 pouch per acre (333 g/acre) at 4 WBH has a major impact on returns by shifting packout toward larger sizes.

Lead Researcher: Valent BioSciences, Valent USA
Location: Chelan, Washington, US

Fig. 46. ReTain Effect on Fruit Size: Royal Gala



Application of a full rate of ReTain (830 g/ha) at 4 weeks before harvest allows fruit from all picks to reach their maximum size potential.

Lead Researcher: Theron, K. and Philagro
Location: Stellenbosch University, Ceres, South Africa
Year: 2001

Fig. 47. ReTain Effect on Fruit Size: Fuji Suprema

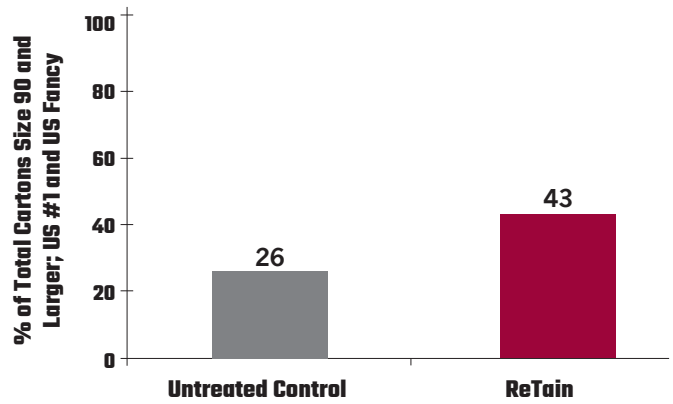
Treatment	Fruit Size (g) 2004	Fruit Size (g) 2006
Untreated Control	126.5	116.7
ReTain 830 g ha^{-1} at 4 WBH	135.3	123.3

ReTain applications made 4 weeks before harvest resulted in significant increases in fruit size on Fuji Suprema vs. untreated control.

Note: Each rate of ReTain was harvested when the fruit were at an equivalent stage of maturity for the treatment.

Lead Researcher: Petri et al./Sumitomo Brazil
Location: Fraiburgo, Santa Catarina, Brazil
Year: 2004 and 2006

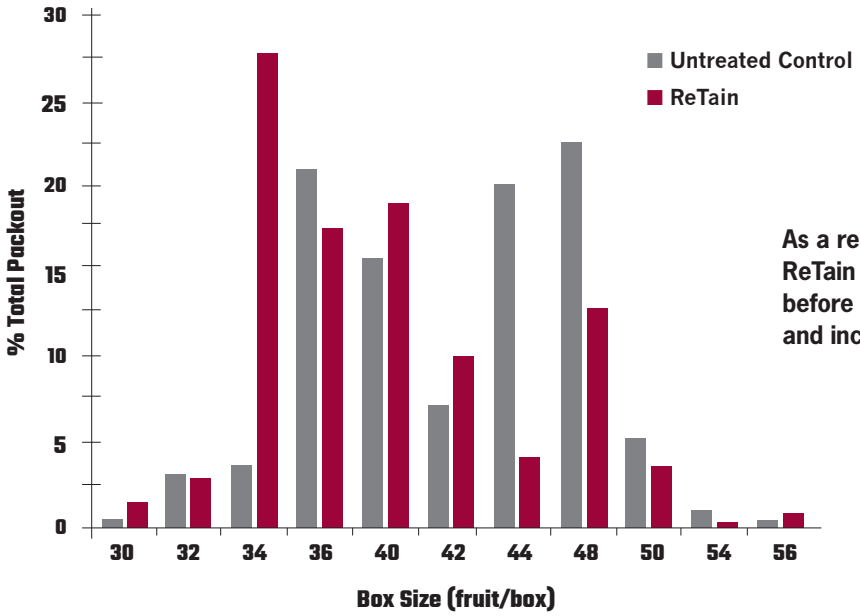
Fig. 48. ReTain Effect on Fruit Size: Bartlett Pear



By delaying harvest, ReTain also increases fruit size in pear. UTC harvested Aug 18; ReTain at 1 pouch per acre (333 g/acre) harvested Aug 21.

Lead Researcher: Valent USA
Location: Chelan, Washington, US
Year: 2001

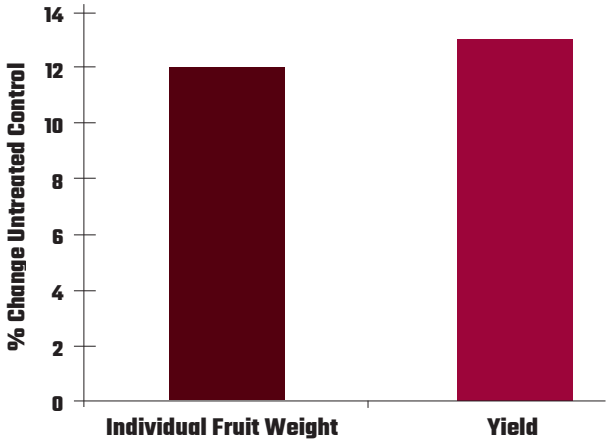
Fig. 49. ReTain Effect on Fruit Size: Summer Sweet Peach



As a result of delayed fruit maturation in peach, ReTain 1 pouch per acre (333 g/acre) at 2 weeks before harvest provides impressive packout results and increases grower's return.

Lead Researcher: Valent USA
Location: Dinuba/Reedley, California, US
Year: 2003

Fig. 50. ReTain Effect on Fruit Size: Stone Fruit Peach/Nectarine



Summary Data – California peach and nectarine ReTain trials. Peach and nectarine trials clearly demonstrate ReTain's ability to increase fruit size and yield, which in turn enhance profitability. ReTain 1 pouch per acre (333 g/acre) at 1-2 weeks before harvest.

Lead Researcher: Valent USA
Location: Fresno area, California, US
Year: 2011

COLOR DEVELOPMENT EFFECTS

Background color change from green to yellow is a well-known indicator of advancing maturity in bicolor varieties, and this process can be slowed by the use of ReTain. Similarly, the pace of red color development in some varieties is tied to maturity and can be delayed by ReTain use. This is especially true when ReTain is applied early (30 DBPH). Delaying a ReTain application until fruit are closer to harvest (10 to 7 DBPH) or split applications of ReTain may be used as an option to minimize the negative effect on red color development, but may also have less impact on stop drop.

However, the harvest delay often associated with ReTain use can result in a net increase in color development, as the fruit have more time in the field. Red blush color can be enhanced as ReTain-treated fruit is harvested later when lower nighttime temperatures can be more favorable to color development. However, because this effect is weather-dependent, this may not always be the case for some apple-growing regions with long seasons. In such regions, later-season varieties are more likely to have enhanced blush color development because of the colder autumn nights. Mid-season varieties may have less color development at harvest than that shown in untreated blocks given the warmer weather conditions. Growers must continue to monitor all fruit quality characteristics in order to determine the optimal time for harvest. It is important to note that in some regions or for some varieties, the increased fruit size that occurs with ReTain use may be more economically important than high fruit color.

On the other hand, maintaining green color could be a very significant benefit from ReTain for the yellow-green type of varieties such as Golden Delicious, Granny Smith, etc. Some markets offer growers higher prices on blemish-free fruit with uniformly green skin.

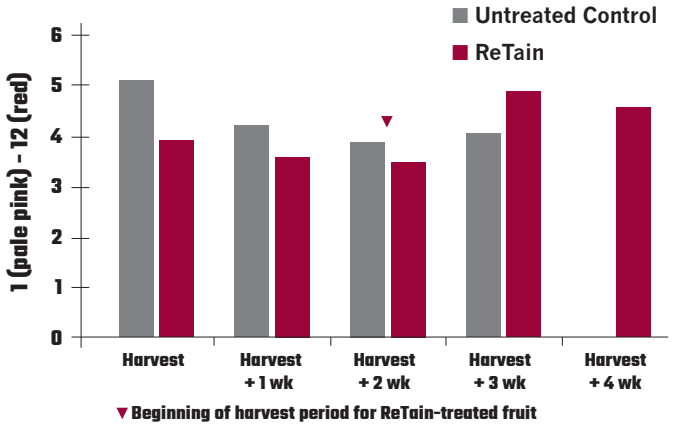
Examples of the effect of ReTain on fruit color development are shown in **Fig. 51 through 54. Note:** In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 51. Late Season ReTain Applications: Honeycrisp

ReTain 333 g/acre was applied to Honeycrisp apples 7 days before harvest, resulting in even color throughout the block. Research has shown that well-timed, double applications of ReTain are effective in multiple picks without impacting color. ReTain won't make red fruit green. Shown here, fruit five days after a ReTain application.

Lead Researcher: Valent USA
Location: Western New York, US
Year: 2018

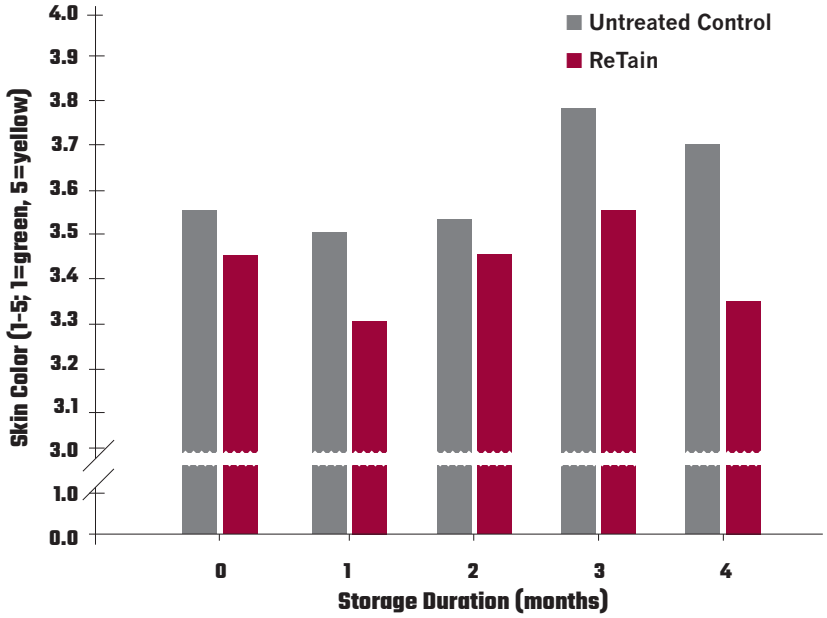
Fig. 52. ReTain Effect on Color Development: Cripps Pink



ReTain 830 g/ha at 4 weeks before harvest delays fruit maturation, which allows for longer hanging time with the potential for more favorable weather conditions to improve color development.

Lead Researcher: Philagro
Location: Elgin, South Africa

Fig. 53. ReTain Effect on Color Development: Golden Delicious



Applying ReTain 830 g/ha at 4 weeks before harvest delays fruit maturation results in the maintenance of green background color on Golden Delicious, both at harvest and after storage.

Lead Researcher: HORTEC/Philagro
Location: South Africa

Fig. 54. ReTain Effect on Color Development: Gala

ReTain 1 pouch (333 g/acre) at 4 weeks before harvest **ReTain 1 pouch (333 g/acre) at 2 weeks before harvest**

Application of ReTain closer to harvest may be a preferred option for those varieties susceptible to color development challenges.

Lead Researcher: Wargo, J. Valent USA
Location: Peru, New York, US
Year: 2018

PHYSIOLOGICAL DISORDER EFFECTS

ReTain has been shown to reduce some common physiological disorders that often affect fruit quality and storability.

STEM-BOWL CRACKING

Stem-bowl fruit cracking is a common physiological disorder that develops in susceptible apple varieties as they mature during the final weeks before harvest. Cracking can be aggravated during periods of high humidity following rains or when heavy rains follow a period of drought. Fruit located in the periphery of the tree canopy, fruit with high sugar content, or skin-russeted apples are most prone to cracking. Unlike other late season "stop drop" agents, application of **ReTain before harvest can significantly reduce the incidence of this disorder, leading to improved packout and quality**.

Examples of the effect of ReTain on fruit cracking reduction are shown in **Fig. 55 through 59**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 55. ReTain Effect on Cracking/Stem End Splitting: Gala

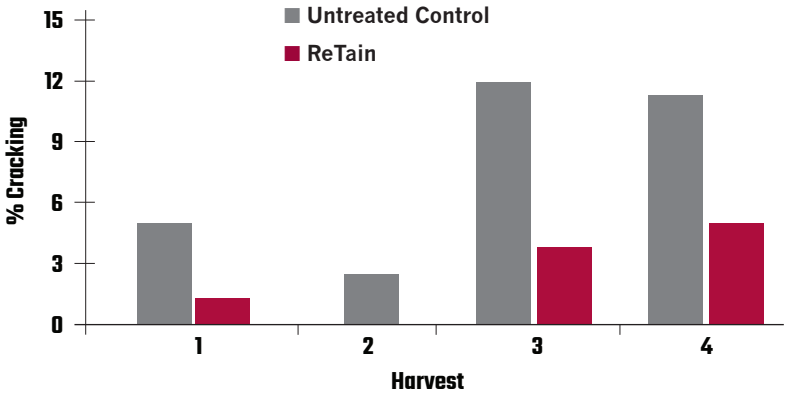
Untreated Control

ReTain (1 + 1 pouch)

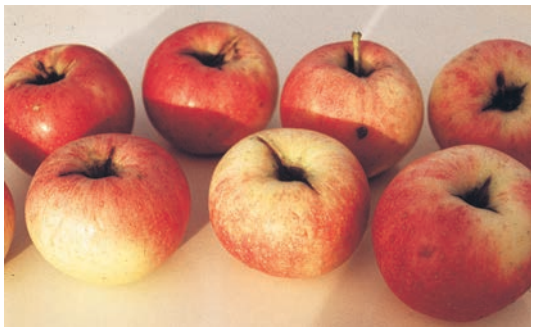
ReTain: 1 pouch per acre (333 g/acre) applied at 30 days before harvest + 1 pouch/acre applied at 7 days before harvest.

Lead Researcher: Schwallier, P.
Location: Michigan State University, US
Year: 2015

Fig. 56. ReTain Effect on Stem Bowl Cracking: Royal Gala

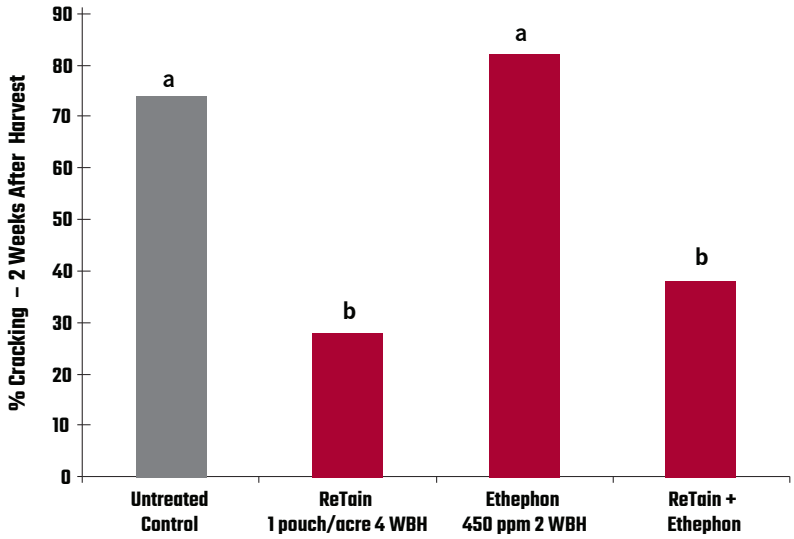


Lead Researcher: Valent BioSciences
Location: East Malling, UK
Year: 2002



ReTain 830 grams per hectare applied at 4 weeks before harvest helps cracking suppression throughout the whole picking time.

Fig. 57. ReTain Effect on Stem Bowl Cracking: Gale Gala



ReTain applied at 4 weeks before harvest significantly reduces cracking, even when applied in a program with ethephon.

Lead Researcher: Drake, et al.
Location: East Wenatchee, Washington, US
Year: 2006

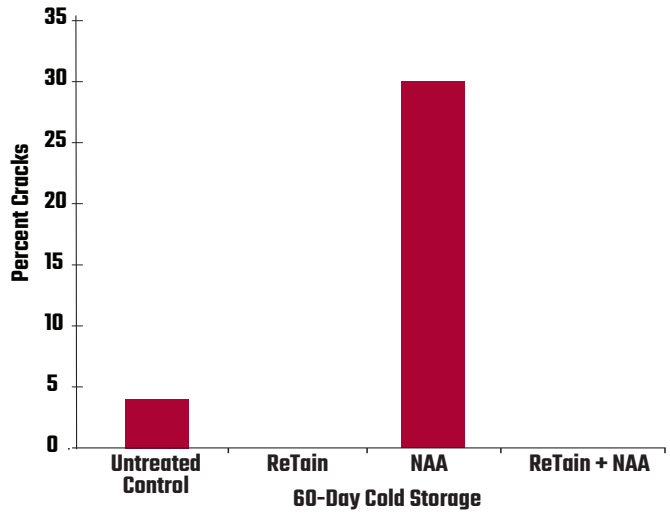
Fig. 58. ReTain Effect on Stem Bowl Cracking: Fuji Suprema

Treatment	Stem Bowl % Cracking	Flesh % Cracking/ Splitting
Untreated Control	8.1a	19.5a
AVG 124.5 g ha^{-1} at 4 DBH	3.2b	6.9b

ReTain 830 grams per hectare applied at 4 weeks before harvest greatly reduces stem bowl and flesh cracking/splitting in Fuji Suprema.

Lead Researcher: Petri et al., 2005
Location: Fraiburgo, SC, Brazil
Year: 2005

Fig. 59. ReTain Effect on Cracking in Cold Storage: Gala



ReTain's positive impact on stem end splitting prevention is observed not only at harvest, but also after storage. NAA, when used alone for fruit drop control, can aggravate cracking

Lead Researcher: Schwallier, P.
Location: Michigan State University, US
Year: 2012

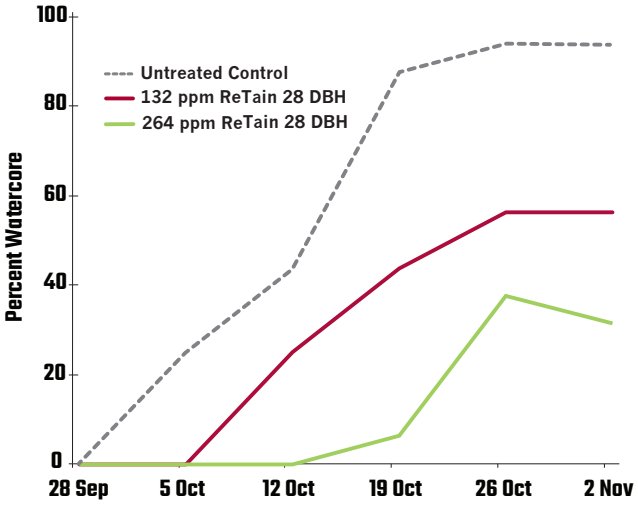
WATERCORE

Watercore is a physiological disorder of apples that occurs while they are still on the tree. It is characterized by water-soaked areas of the cortex, which cause the tissue to become translucent. The disorder is highly cultivar-dependent, but is very common in late-harvested apples. Watercore is also more of a challenge in production areas where heat and sunlight are intense and when high temperatures are experienced close to maturity. Watercore often increases rapidly in overmature fruit. Upon storage, slight watercore symptoms may dissipate, but in some cases, affected fruit are more likely to exhibit internal browning and off-flavors during mid- to long-term storage.

ReTain use will potentially delay or prevent the development of watercore in susceptible varieties. ReTain is particularly effective in reducing the incidence of watercore in Red Delicious and can help reduce severity of the disorder in Fuji.

Examples of the effect of ReTain on watercore reduction are shown in **Fig. 60 through 62**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 60. ReTain Effect on Watercore: Red Delicious



ReTain Treated **Untreated**

ReTain 1 or 2 pouches (333 or 666 g/acre) applied at 4 weeks before harvest helps control watercore throughout harvest. Higher rates of ReTain can result in better control of watercore.

Lead Researcher: Valent USA
Location: Washington, US
Year: 2014

Fig. 61. Effect of ReTain on Watercore: Fuji

	Untreated Control	ReTain
% Incidence of Watercore	75	15
Average Severity of Watercore (1–6 scale: 1 = low)	5.3	3.0

ReTain 830 grams per hectare applied at 4 weeks before harvest consistently reduced the incidence, as well as severity, of watercore in Fuji apples at harvest.

Lead Researcher: Sumitomo Chemical Australia
Location: Nelson, New Zealand
Year: 2001

Fig. 62. Effect of ReTain on Watercore: Fuji Suprema

Treatment	Watercore %		
	2004	2005	2006
Untreated Control	17.0	8.3	45.0
AVG 124.5 g ha[1] at 28 DBH	7.0	1.9	27.0

ReTain 830 grams per hectare applied at 4 weeks before harvest consistently reduced the incidence, as well as severity, of watercore in Fuji apples at harvest.

Lead Researcher: Petri et al.
Location: Fraiburgo, SC, Brazil
Year: 2004-2006

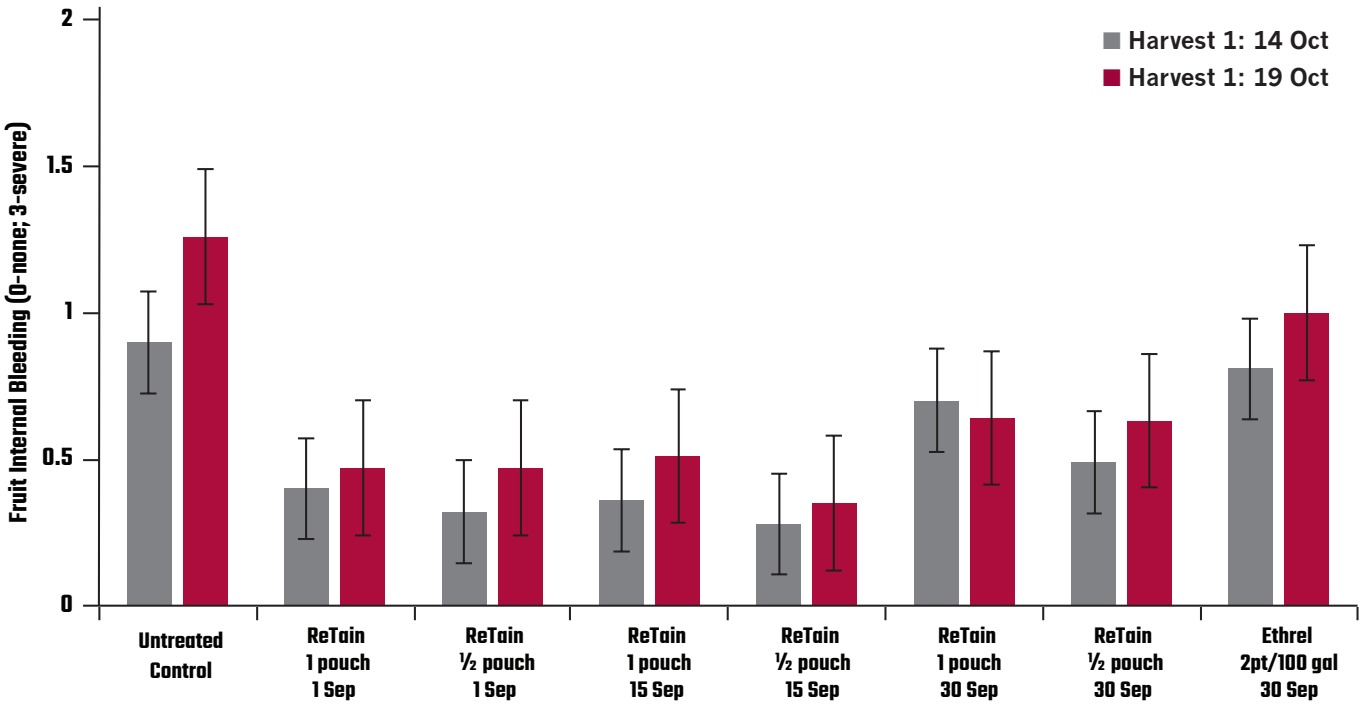
INTERNAL FLESH BLEEDING

Apple fruits that produce anthocyanin pigment in the flesh often experience a condition referred to as bleeding that results in a pink-colored applesauce when processed. This effect is undesirable and is not marketable in the traditional applesauce market. Increased internal bleeding on susceptible apple varieties such as Rome and IdaRed is, to some degree, an inevitable side effect of very good fruit coloring conditions. With as few as 5% of the apples with red pigmented flesh, the applesauce is too pink for sale. This has caused rejections of loads of fruit with diversion to lower-priced juice use, resulting in significant loses to both the growers and processors.

Red pigment synthesis is also stimulated by ethylene. Since maturation of fruit is involved in the process of pigment synthesis in the skin, **ReTain is an excellent tool to reduce the severity and onset of the internal flesh bleeding**.

Examples of the effect of ReTain on internal flesh bleeding control are shown in **Fig. 63 through 64. Note:** In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 63. ReTain Effect on Internal Flesh Bleeding: Idared



ReTain applications greatly reduced Internal flesh bleeding in Idared as compared to Ethrel and untreated fruit.

Lead Researcher: Robinson, T.
Location: Cornell University, New York, US
Year: 2011

Fig. 64. Internal Red Pigment Rejection Standards

Lead Researcher: Mott's/Cornell University
Location: New York, US
Year: 2011

SKIN GREASINESS

Some apple varieties become greasy or waxy as they mature both on the tree and during cold storage due to disturbances in the surface lipid composition of fruit. Fruit skin greasiness is among the most unappealing defects of fresh fruits to the consumer. **ReTain applications are of significant value, as ReTain-treated apples have been shown to have significantly less greasiness compared to untreated fruit at harvest and while in storage**.

Examples of the effect of ReTain on skin greasiness reduction are shown in **Fig. 65 through 68**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

Fig. 65. ReTain Effect on Greasiness: Gala

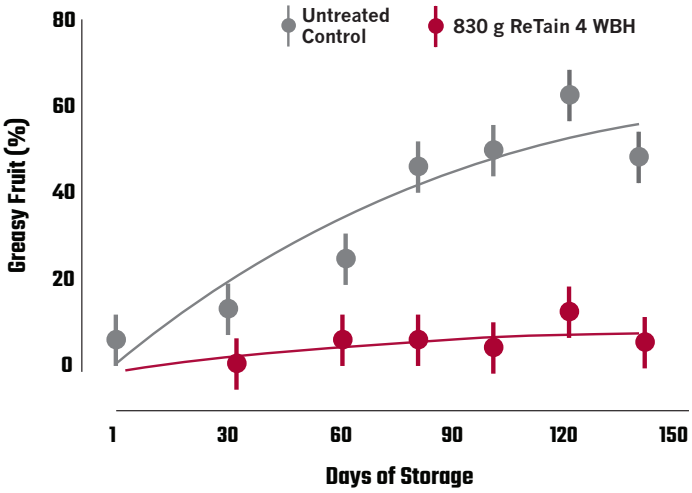
Untreated

ReTain treated with full rate 7 days before harvest

ReTain treated Gala – applied at the full rate, 7 days before harvest – displayed a marked reduction in greasiness as compared to untreated fruit.

Lead Researcher: Valent USA
Location: New York, US
Year: 2018

Fig. 66. ReTain Effect on Greasiness: Gala

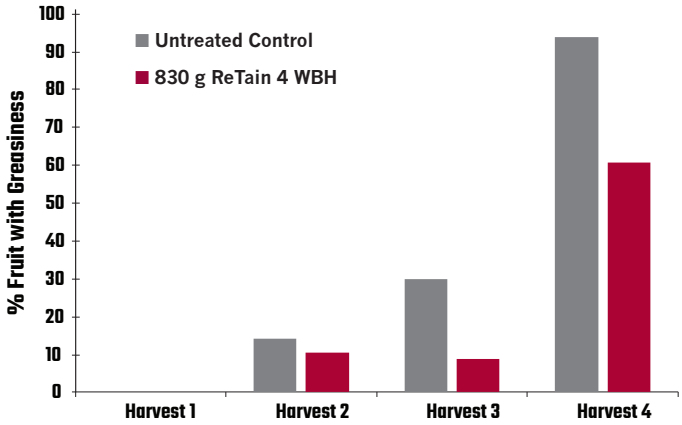


The relative benefit of greasiness control from use of ReTain will increase fruit quality and consequently packouts after storage.

Apples were kept in regular cold storage at 0.5 °C, and sampled at 20-30 day intervals for up to 140 days.

Lead Researcher: Volz, R. et al; HortResearch
Location: Hawkes Bay, New Zealand
Year: 1999

Fig. 67. ReTain Effect on Greasiness: Cripps Pink



In Cripps Pink, ReTain 830 grams per hectare applied 4 weeks before harvest delivered lasting greasiness reduction benefits across multiple picks.

Lead Researcher: Philagro
Location: Elgin, South Africa

Fig. 68. ReTain Effect on Post-Harvest Fruit Quality: Gala

Treatments	Decay (%)	Mealiness (%)	Fruit Cracking (%)	Internal Breakdown (%)
Untreated Control	4.76 b	75.46 a	8.52 b	84.59 a
NAAm (20µl.L^{-1})	8.36 ab	82.08 a	17.23 a	94.1 a
AVG (125g.ha^{-1})	1.37 c	4.16 c	0.68 d	9.59 c
AVG (125g.ha^{-1}) + LE (<0.04µl.L^{-1})	0.7 c	2.50 c	0.00 d	7.50 c
AVG (125g.ha^{-1}) + NAAm (20µl.L^{-1})	11.58 a	19.89 b	2.89 c	25.00 b

Mean separation, Duncan's M.R.T within a column, values lacking the same letter are significantly different at P<0.05

Pronounced benefits on various physiological disorders reduction from ReTain applications and low-ethylene (LE) controlled atmosphere storage can be observed in this data tracking treated and untreated fruit after 8 months.

Lead Researcher: Brackman and Waclawovsky, 2001 (Acta Hort. 553)
Year: 2001

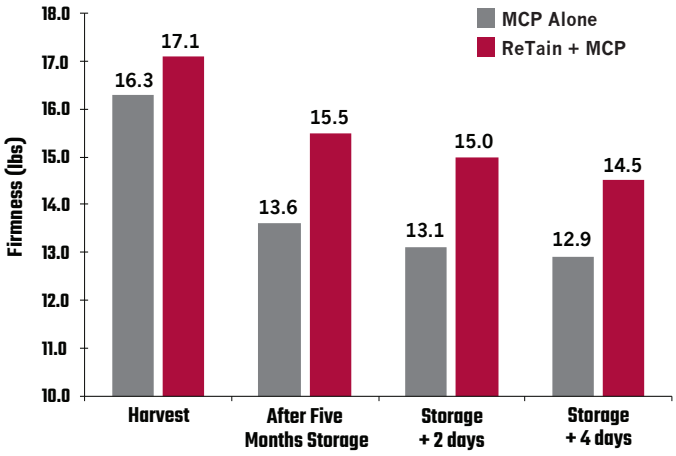
PRECONDITIONING FRUIT TO 1-MCP IN STORAGE

Initial fruit quality has a strong effect on long-term storability. In addition to the effects of ReTain that result in firmer fruit of the right maturity, they are low in physiological disorders. The fact that ReTain-treated fruit are also producing very low levels of ethylene makes them well-suited for subsequent treatment with 1-MCP in storage. **The combined effects of ReTain reducing internal ethylene production and 1-MCP inhibiting ethylene action can produce fruit of the highest quality**.

For instance, Honeycrisp apples always have some internal ethylene in storage, even with 1-MCP in storage. If ReTain is applied in the field prior to 1-MCP in the storage, internal ethylene levels will be lower, generating a more uniform response across all fruit, lower packout losses, and higher-quality eating apples.

Examples of the effect of ReTain on fruit preconditioning for postharvest 1-MCP applications are shown in **Fig. 69A through 69B**. **Note**: In these examples, all the ReTain treatments included 0.05%-0.1% organosilicone surfactant.

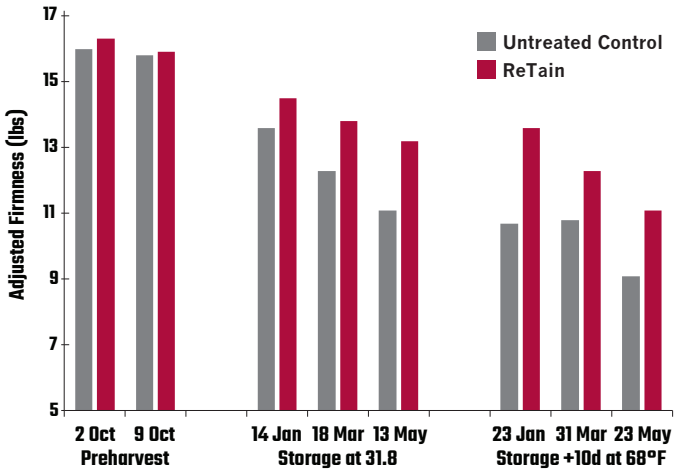
Fig. 69A. Effect of ReTain + 1-MCP After 5 Months' Storage: Gala



Harvest Aug 16 – placed into CA storage. Fruit removed from CA storage Jan 19.

Lead Researcher: Valent USA
Location: Outlook, Washington, US
Year: 2005

Fig. 69B. Effect of ReTain + 1-MCP After 6 Months' Storage: Red Delicious



Unsegregated CA Storage at 31.8 °F, 2.0% CO_2; 1.4% O_2.

In Gala and Red Delicious, ReTain + MCP demonstrated significantly improved efficacy in storage vs. 1-MCP alone.

Lead Researcher: Rice Fruit Co./Valent USA
Location: Rice Fruit Co./Valent USA
Year: 2005

III. GENERAL TECHNICAL INFORMATION

AVG activity occurs at a very specific point in the ethylene biosynthesis pathway. AVG blocks the activity of ACC synthase and prevents the conversion of SAM to ACC (see p. 6). **For AVG to be effective, it must be applied in advance of the rise in ethylene production that signals the onset of fruit maturity or flower senescence or fruitlet drop**. Applications made too early will result in AVG metabolizing too soon and yield a shorter-lasting effect. AVG applied too late will not be effective because ethylene will have been synthesized and will have affected ethylene-mediated responses.

APPLICATION TIMING

FRUIT SET USES

The optimum timing of ReTain application to improve fruit set is crop-dependent. To properly time applications, it is important to understand when ethylene production begins or when ethylene activity negatively affects flowering and fruit set. **ReTain must be applied prior to the time in which ethylene has a deleterious effect on flowering and fruit set**.

Cherry is a good example of the importance of application timing. During the bloom period, no significant leaf surface is present. For this crop/use, the application target for ReTain is the flower parts, where all ReTain absorption will occur. Once a flower opens, ethylene production starts quickly and internal flower organs begin to desiccate. At this stage, it is too late for ReTain to have the desired effect on that flower. To maximize absorption in this case, the ideal timing is to have as much white (flower petals) showing as possible, with as few flowers open as possible. In cherries, this typically occurs between popcorn and about 20% open bloom.

Ethylene production in **apples** varies across varieties and years, but in general, high levels are seen during the period from bloom to petal fall. **Pears**, on the other hand, produce a spike in ethylene between 10 and 14 days after bloom.

In **almond** and **pecan** flowers, ethylene production also begins at bloom. For ReTain applications, timing between 10% bloom and full bloom is ideal to impact the greatest number of flowers. Later applications, such as late bloom and early fruit set, have been effective in crops such as almond and avocado.

The stimulation of ethylene production in **walnut** flowers is somewhat different than for other tree nuts and tree fruit. For walnut, pistillate (female) flower abortion (PFA) occurs when excessive pollen loads up on the pistillate flowers, resulting in stress that triggers ethylene production and causes flower abscission. For PFA in walnut, the pistillate flowers need to be receptive to pollination. Based on this physiology, application timing for walnut is best at 5 to 30% pistillate flower bloom, followed by a second application at 45 to 65% bloom.

MATURITY MANAGEMENT

For climacteric fruit, it is important to understand that the ethylene-related rise in respiration occurs at different times for different crops. In other words, optimal timing for AVG will differ relative to proximity to harvest for peaches, for example, rather than for apples.

Here again, **it is important to understand that ethylene biosynthesis begins at different times for various fruits of the same crop within the orchard and even on the same tree**. Hence the activity of ACC synthase and the resulting ethylene production is not a sharp, sudden curve, but is rather a gradual escalation across the whole population of fruit.

Pre-harvest applications of ReTain are always recommended based on days or weeks before predicted (anticipated or normal) harvest, which refers to the timing of harvest when fruit are not treated with ReTain. To help determine the beginning of the predicted harvest period, growers generally rely on experience, historical trends, a variety of data/sample collection (firmness, soluble solid concentration, and starch degradation index) and science, such as the interval between full bloom to beginning of harvest, which is typical for every cultivar and growing region, and/or accumulated heat units (growing degree days) over the course of the growing season.

For apples, the standard use recommendation for ReTain is to make an application 28 days prior to anticipated harvest (or 4 weeks before harvest). The earlier ReTain is applied, the greater the red color drag effect. However, this early application will provide maximum ethylene control, maturity delay, and stop drop protection. It will delay harvest by 7 to 10 days. When delay in ripening is desired, ReTain will be highly beneficial, especially if additional follow-up ReTain application is made. It is also a good option for long-term CA storage based on maturity parameters for the specific variety. Effects from later applications can also bring some benefits, depending on the variety (see variety pages) and market destination. ReTain applied 1-2 weeks before harvest typically will not delay the start of the harvest (first pick), but will help control the maturation rate of later picks. However, growers should be aware that late applications of ReTain may also have some consequences; for instance, less control of internal ethylene and therefore increased fruit drop. **Varieties highly prone to drop should receive a ReTain application no later than 2 weeks before predicted harvest, but 3 weeks before harvest would be preferable**.

For **stone fruit** except cherries, ethylene biosynthesis pathways begin establishing closer to harvest than in apples. Here, optimal timing occurs somewhere between 10 and 14 days prior to the anticipated first pick of untreated blocks. ReTain applied a few weeks prior to harvest will improve harvest management by allowing peaches and nectarines to develop excellent flavor without becoming soft and dropping prematurely. Slowing the drop rate while delaying harvest also allows stone fruit to continue to increase in size. In varieties prone to soft tip, ReTain applied two weeks prior to harvest can help reduce this condition.

Pears have been challenging for establishing consistent ReTain performance. One of the primary reasons for this inconsistency is that **European pear** cultivars are typically harvested when they are still immature, while the climacteric rise in internal ethylene concentration occurs well after harvest. In fact, the d'Anjou cultivar has a chilling requirement of 6-8 weeks of cold storage at 0° to -1.1°C (32°F to 30°F) before it can produce ACC synthase, which is necessary for ethylene production.

Despite the challenges, some important European pear varieties do respond to pre-harvest applications of ReTain. These include Bartlett, Bosc, Comice, Red Clapps, and Starkrimson. Optimal timing depends on the variety and the desired result, but typically ranges from between 1 to 3 weeks before anticipated harvest of untreated fruit.

Asian pears are also challenging, but in a different way. Some cultivars of Asian pears, such as Nijisseiki, Kosui, Niitaka, etc., are not climacteric, and as such will not respond to AVG. Other cultivars, for example Tsu Li, Ya Li, Chojuro, Shinsui, Kikusui, Hosui, etc., however, do have a climacteric respiratory pattern and are responsive to ReTain applications made 2-4 weeks prior to the anticipated harvest of untreated fruit.

RATE

The standard rate for AVG for tree fruit has historically been 125 grams of active ingredient (a.i.) per hectare or 50 grams of a.i. per acre. In terms of formulated product, that means 830 grams ReTain per hectare or 333 grams ReTain per acre, respectively.

Effects of AVG are rate-related, with higher rates having a greater impact on both the intensity of effect and duration of the response. Depending on the harvest goal, reduced rates (or split rates) have been used successfully on varieties that are especially sensitive to AVG (e.g., Honeycrisp, Gala, and Jonagold).

In the US, in 2015, ReTain was granted registration allowing for application of up to 100 grams of a.i. per acre (250 g a.i. per hectare), as either a single application or two sequential applications for maturity management of apples and pears, and for increasing fruit set in cherries, pecans, and walnuts. In California, on the other hand, ReTain is registered only for a single application of up to 50 grams a.i. per acre (125 g a.i. per hectare) on all crops except walnuts. The use of sequential applications of up to a total of 100 grams a.i. per acre (250 g a.i. per hectare) provides the flexibility to adjust application strategies to target a broader range of maturity, such as with multiple-pick apple varieties and to greatly prolong the activity of AVG and resulting maturity delay. In some cases, sequential applications of full rates have provided 30 days or more of maturity delay.

ADJUVANTS

The use of a surfactant with AVG applications made during bloom to increase fruit or nut set is not recommended. Certain surfactants or surfactants at high rates applied at bloom have been shown to reduce set. Organosilicone surfactants, for example, can cause accelerated desiccation of stigmas, anthers, and pollen, and stickers can create a physical barrier over the top of the stigmatic surface, impeding pollen germination.

ORGANOSILICONE (OSi)

When applied for fruit maturity management, an appropriate surfactant is highly beneficial to ReTain performance. Early work demonstrated that use of a 100% organosilicone surfactant product greatly improves performance. The combination of formulated ReTain at 125 grams of a.i. per hectare (50 grams a.i. per acre) plus a 100% organosilicone surfactant performed as well as or better than 250 grams of a.i. per hectare (100 grams a.i. per acre) of technical grade AVG powder plus nonionic surfactant. Further, 100% organosilicone surfactants resulted in better ReTain performance than did silicone blends.

Organosilicone surfactants not only provide superior spreading of the spray solution on plant surfaces, but also enhance AVG penetration via the aqueous pores through the waxy cuticle and increase mass flow through lenticels, stomata, and cuticular microcracks.

For optimum cuticle penetration of and response to AVG, it is recommended that a 100% organosilicone surfactant be used at a rate of 0.05% to 0.1% v/v. This is equivalent to 0.5-1 liter per 1000 liters of water or 6.4 to 12.8 fluid ounces per 100 gallons of water.

Note that not all OSi surfactants are labeled for use at that high rate, so care should be taken to choose one that does allow up to 0.1% v/v. Several such products have a dedicated section on the label for use with ReTain. Poor response to AVG has been experienced when the OSi label only allows an application rate of 150 ml to 300 ml per 1000 liters of water or 2 to 4 fluid ounces per 100 gallons of water (0.015 to 0.03% v/v).

It must also be noted that use of organosilicone adjuvants at these higher rates can also be detrimental to the fruit if application volumes exceed 100 gallons per acre, or during prolonged periods of hot weather. In such cases, consider reducing the OSi rate by half or using an alternative surfactant such as a lightweight summer oil (superior class horticultural mineral oil) at 0.5% v/v. If switching to an oil, be certain that no Captan has been applied in the preceding 30 days or will be applied in the following 14 days (see Tank-Mixing, p. 54).

Both AVG and the formulated ReTain products are stable and do not hydrolyze under alkaline conditions. A spray tank pH of 6 to 8 maintains stability. However, studies with 14C-AVG have shown **greater uptake at lower pHs on certain crops, including apples and pears**. For applications to those crops, the addition of a buffer or acidifying agent in the spray tank may improve uptake and response. However, dropping the pH too low (less than pH 4) will degrade the OSi surfactant.

For other crops, such as **peaches and nectarines, the pH of the spray solution does not appear to negatively affect uptake until it exceeds 8.0**.

Other factors to consider when using OSi surfactants include rapid degradation in low-pH environments, ability to cause phytotoxicity at higher temperatures, and their propensity to cause foaming in the spray tank.

The addition of a defoamer during mixing to prevent foam can be considered if foaming is an issue. Adding the surfactant last will also help reduce foaming; however, vigorous agitation should be avoided.

Phytotoxicity Associated with OSi Used with ReTain

More than 23 years of global commercial use on tree fruit, AVG and formulated ReTain products has been demonstrated to be free of phytotoxological effects. In that time, not a single case of fruit or foliage injury directly attributable to the ReTain has been reported. However, there have been documented instances of injury resulting from the surfactant used with ReTain applications under certain circumstances.

HEAT STRESS: organosilicone surfactants (OSi) may cause fruit spotting when the applications are made mid-day in the heat to hot fruit surfaces (Fig. 70-71).

Fig. 70. Fruit spotting from an OSi surfactant applied in the heat of the day.

Fig. 71. Lenticel injury from an OSi surfactant applied in the heat of the day.

OSi AND CALCIUM CHLORIDE: Use of calcium chloride sprays is one of the most common practices by apple growers around the world. Sometimes, calcium chloride may accumulate on leaf surfaces during periods of dry weather when calcium sprays are not washed off and/or with higher temperatures and/or higher humidity that prolong drying times. If ReTain is applied while there is still significant calcium chloride present on leaf surfaces, the surfactant will increase the uptake of calcium chloride on leaves and cause fruit spotting (Fig. 72), significant leaf abscission, and advanced ripening.

Fig. 72. Fruit spotting on SciFresh (Jazz®) apple from an OSi surfactant applied over the top of 20+ seasonal $CaCl_2$ applications.

OSi AND OIL: Both organosilicones and oil used as a surfactant in ReTain applications may cause fruit and foliage phytotoxicity when applied over the top of a Captan residue (Fig. 73 through 75).

Fig. 73. Fruit injury resulting from an application of OSi surfactant applied 3 days after Captan + calcium.

Fig. 74. Fruit and foliage injury from a tank-mix of ReTain + Captan + OSi surfactant.

Fig. 75. Foliage and fruit injury on apricot from a ReTain application when residual oil remained in the spray tank, subsequently applied over the top of an earlier Captan application.

APPLICATION VOLUME

Optimum application volumes for ReTain require thorough and uniform coverage of both fruit and foliage without excessive runoff.

Application volume will vary, depending on factors such as the tree canopy area and density, weather conditions, and application equipment. **With orchard airblast sprayers, application volumes of 1000 liters per hectare or 100 gallons per acre are effective**.

Larger trees with denser canopies (e.g., almond, walnut, and some pears) may require higher application volumes of up to 2000 liters per hectare (200 gallons per acre). However, be aware **that over-diluting ReTain concentration with high water volumes will decrease performance**. Coverage issues should be always addressed by reducing ground speed, adjusting fan speed and pitch, and/or changing nozzles in lieu of increasing spray volume. **For pears**, application volumes should not be lower than 750 liters per hectare or 75 gallons per acre.

Aerial applications have been shown to be effective in an application volume of 150 liters of finished spray per hectare or 15 gallons per acre. Supplemental labels are in place for aerial application via fixed-wing aircraft or helicopter on almonds and walnuts in California, US, and via helicopter on apples in Washington, US. Aerial applications in volumes lower than 150 liters per hectare or 15 gallons per acre have not been as effective. **Note**: The organosilicone surfactant is generally expressed in percentage (%) of water volume. Therefore, it should be calculated based on the water volume used, and not concentrated.

WEATHER

For bloom period applications designed to increase fruit or nut set, weather affects AVG uptake and performance primarily through the influence of temperature on product absorption and the rate of flower development. **Applications during bloom should only be made when temperatures are above 10°C (50°F) and rising, but below 30°C (86°F)**. Prolonged drying of ReTain will increase absorption, so applications during conditions of higher humidity and low wind speeds of less than 11 km/h (7 mph) are optimal.

Efficacy of later season applications for maturity management of climacteric fruit is strongly influenced by weather conditions before, during, and following application. As stated previously, temperature, humidity, sunlight, and rain (or overhead irrigation or cooling) all have the capacity to either enhance or diminish uptake and performance of ReTain.

Temperatures prior to application impact AVG uptake by influencing factors such as cuticle development, carbohydrate demand, and stress. Cooler temperatures result in less cuticle development, increasing penetration of plant growth regulators, such as AVG. Cooler temperatures also reduce stress on the tree, both directly and through a reduction in carbohydrate demand.

The importance of tree and fruit stress on absorption of AVG cannot be overstated. Fruit maturity on trees that are under stress – whether it is from heat, drought, severe pathogen attack, or other causes – likely will be advanced. Thus, the response to ReTain will be reduced, if not entirely negated.

Strategies that reduce heat stress, such as shade cloth, overhead evaporative cooling or trickle irrigation – especially on dwarf plantings – and cool the fruit surface and orchard microclimate temperatures will enhance absorption of AVG and therefore increase ReTain's efficacy.

For conversion from/to metric or imperial systems, see page 2.

TEMPERATURE

The temperature during an application is also critical to uptake of AVG. **Applications made to hot fruit will not be effective**. Absorption generally occurs at temperatures between 15° to 32°C (60° to 90°F), but is optimum at temperatures of 21° to 24°C (70° to 75°F).

For optimum uptake and response during periods of hot weather, **applications should be made in the early morning hours when air, fruit surface, and internal fruit temperatures are at their lowest**. Starting applications a few hours before sunrise will take advantage of lower temperatures and higher humidity, producing better results than starting at midnight. However, applications during heavy dew should be avoided, as they can lead to ReTain runoff.

HUMIDITY

Humidity influences absorption and uptake of ReTain through its effect on drying time and cuticle hydration. Higher humidity increases the time it takes for the spray droplet to dry, which is important for AVG. Absorption of AVG occurs as long as the spray droplet is moist. The longer the droplet stays moist, the absorption continues. Once the droplet dries, absorption of AVG decreases markedly. So, **prolonging drying time increases ReTain absorption and performance**. Humidity also contributes to keeping the cuticle membrane fully hydrated, a requirement of polar pathway penetration of the cuticle membrane via aqueous pores, promoting the mobility of the AVG molecule.

RAIN/OVERHEAD IRRIGATION

Rain and/or overhead irrigation or overhead evaporative cooling can have either positive or negative effects on AVG uptake, depending on when it occurs, the amount, and the duration of the event. Rain that occurs prior to application can be beneficial in mitigating stress effects from heat and/or drought. However, too much rain occurring too soon after a ReTain application can wash off the spray deposit. Very light rains and mists from overhead evaporative cooling systems following application can significantly increase uptake and response. ReTain should not be applied if rain is expected within 8 hours of application. As mentioned, once the spray droplet is dry, penetration of AVG through the cuticle membrane slows dramatically. However, each time the dried residue on the fruit surface is re-wetted, additional absorption occurs.

Cooling systems that use a fine mist or micro-spray that are cycled on and off at regular intervals following application result in additional AVG uptake and improved performance. Conversely, cooling systems that consist of large impact sprinklers that are allowed to run non-stop all day long will just wash the dried residues off the fruit. In other words, evaporative cooling will increase AVG uptake, but hydro-cooling will not.

SUNLIGHT

Sunlight may also have both positive and negative impacts on AVG uptake. Some degradation of dried AVG residues on fruit surfaces occurs as a result of exposure to ultraviolet light, although such degradation would be relatively minor. On the other hand, sunlight has been shown to increase absorption of plant growth regulators through lower leaf surfaces. Moreover, sunlight drives photosynthesis and increases carbohydrate production, thereby reducing stress.

CROP LOAD

The performance of ReTain can be influenced by crop load in one of two ways. Excessively heavy crop loads create stress on the tree, resulting in seasonal ethylene biosynthesis through System 1 (see p. 5). Heavy crop loads also render the tree more vulnerable to stress from heat and/or drought. Trees with very light cropload begin producing ethylene earlier than trees with moderate or heavy crop loads, as well as more ethylene earlier in the ripening process. This may require an adjustment in the ReTain application timing.

CULTIVAR SENSITIVITY

Varieties, specially apples, vary in their level of sensitivity to AVG because of variety-specific differences in pre-climacteric and climacteric respiration rates and levels of ethylene production. This difference in demonstrated sensitivity influences response to AVG.

Jonagold, Gala, Ambrosia, and Honeycrisp apples are known to have high sensitivity to AVG. In certain conditions and climates, these varieties may respond more favorably to reduced rates of ReTain and to applications made closer to harvest.

Most other varieties, including **Red Delicious, Golden Delicious, and Fuji, have ‘‘normal’’ sensitivity to AVG. Granny Smith, while responsive to AVG, appears to have lower sensitivity** than other important commercial varieties.

Most apple varieties, however, require a full rate of ReTain in order to obtain satisfactory results. For more details regarding varieties, see pages 57-181. for variety-specific ReTain recommendations.

TANK-MIXING

Product labels state that ReTain can be tank-mixed with DiPel® and XenTari®, two of Valent BioSciences’ biological insecticides, but that **a standard jar test should be performed to ascertain compatibility for any other potential tank-mix partners**. A small application test to evaluate phytotoxicity and effectiveness is also recommended.

The AVG molecule itself is very stable, but there are a few compounds that should be avoided as a tank-mix partner. **Avoid anything that contains zinc, iron, or copper, as well as any +3 cations. Do not tank-mix ReTain with sunburn protection products**. If sunburn protection products are used, apply at least 3 days before or after ReTain application.

Because ReTain is packaged in a water-soluble bag (polyvinyl alcohol – PVA), extra caution should be taken when tank-mixing ReTain with products containing boron. Boron will inhibit the solubility of the water-soluble bag material, causing it to precipitate. Although the amount of PVA in a ReTain bag when diluted in the spray tank is minimal, **always add ReTain and thoroughly dissolve it in the recommended water volume before adding any boron-containing formulation to the mixture to help avoid formation of any precipitate**.

Typically, the biggest concern with tank mixes is the potential conflict in desired drying time. Slow drying is desirable for ReTain applications, while quick drying is optimal for most other products. Compatibility between the OSi surfactant and potential tank-mix partners (e.g. chloride salt or captan) or the surfactant and residues on the fruit may also be of concern (see Organosilicone (OSi), p. 48).

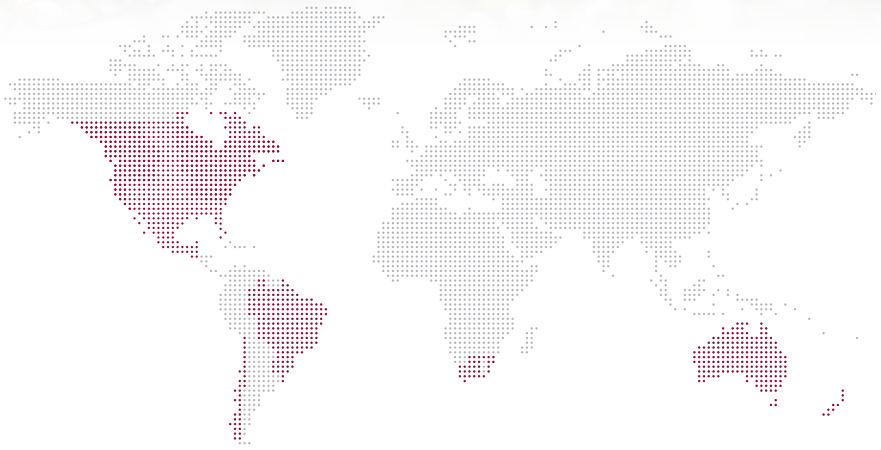
1-NAPHTHALENEACETIC ACID (NAA)

1-Naphthaleneacetic acid (NAA) is an auxin compound used early in the season as a chemical thinning agent, mid-season as a return bloom enhancer, and late-season to reduce pre-harvest fruit drop. The early- and mid-season application rates are too low to be of concern. However, late-season NAA applications to reduce pre-harvest drop are known to advance ripening as a result of auxin-induced ethylene production, especially if applied at high rates and under hot weather conditions (>30 °C or >85 °F).

Unlike ReTain, NAA is used as a stop drop agent only. NAA, however, does not delay apple fruit maturation and in fact, NAA at high rates and in warm weather may accelerate firmness loss during storage. Timing an NAA stop-drop spray requires monitoring of fruit maturity. NAA must be applied 1 to 2 weeks before harvest. A single spray application of 10 to 20 ppm NAA can control drop for 7 to 10 days, but requires 2 or 3 days to become effective. **If NAA is applied too early, drop control may wear off too soon. If NAA is applied too late, a significant portion of the crop may drop before NAA takes effect**.

AVG can prevent NAA-induced ethylene production if the two are applied at the same time, or if AVG is applied first. However, if high rates of NAA are applied before AVG, ACC synthase has already been activated and ethylene production has already commenced. Furthermore, NAA preloading or repeated applications for early season varieties and high-ethylene varieties are not recommended. A good use for NAA is to apply it with late ReTain applications, such as 2 weeks before harvest. It provides drop control until ReTain can become effective. If 10 ppm NAA is applied with or near the time of ReTain application, (at least) an extra ½ rate of ReTain is required to counteract most negative effects of NAA. If NAA- and ReTain-treated fruit is harvested late, there is the possibility of fruit cracking either on the tree or in storage even though it may appear that ReTain has counteracted most other ethylene-mediated ripening responses.

Courtesy of Kyle Ardiel



HARVEST AND QUALITY MANAGEMENT

Apples

REGIONS

US & CANADA

Western

	Harvested Area[1] (Acres)[2]	Total Production[1] (Million Bushels – 42 lbs)[3]
Total US	291,200	269.2
Canada	38,894	22.3

[1CA] 2018 Data, Food and Agriculture Organization of the United Nations

[1US] 2018 Data, USDA, National Agricultural Statistics Service

[2] 1 acre = 0.404686 hectare

[3] 1000 bushels = 19 metric tons

Apple production in the Western US represents about 70% of the total US apple production, with Washington State accounting for around 90% of the total apple acreage.

British Columbia represents 27% of the total Canadian apple production.

ReTain® ON APPLE

Detailed Technical Information for all ReTain uses can be found on pages 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: US* Label Information
(Except California)

Harvest/Quality Management	Up to 2 pouches/acre (666 g/acre) applied at 7-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	7 days

ReTain for Apple: Canada And California** Label Information

Harvest/Quality Management	Up to 1 pouch/acre (333 g/acre) applied at 7-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	7 days

**ReTain is sold in the US (except California) under the brand name "ReTain® Plant Growth Regulator Soluble Powder."*

***ReTain is sold in California under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder."*

US & CANADA
Western

VARIETIES

The following recommendations are based on the experiences of Growers, Consultants, and Researchers in the Western US and Canada.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Valent representative (US) and Nufarm representative (Canada) and apply the product based on previous experience and recommendations. And of course, ***always read and follow label instructions****.*

Ambrosia

US & CANADA
Western

AMBROSIA was discovered as a chance seedling in British Columbia, Canada, in the early 1990s. Its parentage is unknown, but there is speculation it is likely a cross between Jonagold and Golden Delicious. Ambrosia is a bicolored medium-sized apple that can be challenging to color, especially in warm sites. Coloring often occurs late in the season and is heavily dependent on diurnal temperature variations. Ambrosia harvest is mid- to late-season and it ripens at the same time, or just before, Jonagold.

ReTain sensitivity varies by variety, and Ambrosia is among the most sensitive cultivars. For this reason, lower use rates are common, depending on harvest management objectives. In particular, Ambrosia has a very narrow starch degradation range at which fruit need to be harvested for optimum storage. ReTain helps Western US and Canada growers maintain fruit in that narrow window longer, allowing harvest to be spread out over time and managed with fewer pickers.

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 3 to 4 weeks before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS AMBROSIA US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Fuji (all strains)

FUJI was developed in Japan in the late 1930s and released in 1962. It is a cross between Red Delicious and Ralls Janet. Many strains (mutants or sports) have since been recognized and propagated. The color variation of Fuji is quite wide, ranging from light pink to crimson pink.

In general, Fuji is a late-ripening variety with a very long shelf life. Some Fuji strains, however, have a slightly earlier harvest. The most common Fuji strains are Aztec Fuji®, Rising Sun Fuji®, Autumn Rose, Red Fuji, Desert Rose, Myra, September Wonder®, Stark® Super Red, Kiku® Fuji, and Fuji Suprema.

Fuji is very susceptible to watercore and, in some years, to fruit cracking. If harvested too early, Fuji may develop soft scald. In addition to its proven range of harvest management benefits, ReTain reduces severity of watercore in Fuji in a rate-dependent manner.

RETAIN RATE/TIMING*

STANDARD SPLIT PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest, plus ReTain ½-1 pouch at 7-10 days before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS FUJI US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Gala (All Strains)

US & CANADA
Western

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size.

ReTain provides growers with numerous profit-driving benefits in Gala production.

When ReTain is applied on Galas:

- Fruit will remain on the tree an additional 7-14 days.
- Improved fruit size is achieved (1% per day).
- Reduced stem bowl splits and greasiness is achieved in second and third picks.
- Maturity is delayed and becomes more even on the tree, potentially reducing the number of picks.

(continued on next page)

RETAIN BENEFITS GALA US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☐ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Gala (All Strains) continued

RETAIN RATE/TIMING*

PROGRAM FOR SINGLE-PICK STRAINS (higher coloring sports such as Brookfield®, Buckeye®, Gale® Gala, Ultima®, etc.): ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest. If labor is a concern and/or if further delay is needed, apply an additional ½-1 pouch per acre 2-3 weeks later (keeping in mind the 7-day PHI).

PROGRAM FOR MULTIPLE-PICK STRAINS (Standards, Royals, Imperials, etc.): WITH AN EARLY POOL OPTION: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 1 week before harvest (7-day PHI). This will have no effect on the first harvest so that fruit will qualify for an early pool, but will delay maturity and development of stem bowl splits and greasiness for second pick fruit.

PROGRAM FOR MULTIPLE PICK STRAINS WITH NO EARLY POOL OPTION: ReTain ½ pouch per acre (167 g/acre) applied at 3-4 weeks before harvest. Apply an additional ½-1 pouch per acre 2 weeks later (keeping in mind the 7-day PHI).

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather. A lightweight summer oil can be substituted for the OSi at 0.05% v/v.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

RETAIN BENEFITS GALA US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☐ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Golden Delicious

US & CANADA
Western

GOLDEN DELICIOUS is a chance seedling found in West Virginia, US, in the early 1900s. Possibly a hybrid of Grimes Golden and Golden Reinette, it is a mid-season apple and small to medium in size. Fruit is pale green to golden yellow in color and very prone to bruising and shriveling. As a result, Goldens require careful handling and storage.

ReTain has been used in this variety for several reasons: to delay maturity, reduce fruit drop, and improve storage quality. ReTain also maintains green skin color longer, which can be an important attribute for some markets.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest.

WHEN ADDITIONAL HARVEST DELAY IS NEEDED: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest, plus ReTain ½-1 pouch per acre at 2-3 weeks later.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS GOLDEN DELICIOUS US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Granny Smith

GRANNY SMITH is a chance seedling originating in Australia in 1868. The tree is thought to be a hybrid of Malus sylvestris, the European wild apple, with the domesticated apple Malus pumila as the pollinizer. Granny Smith has medium to large fruit.

The long storage life of this variety has been attributed to its relatively low level of ethylene production. However, if the condition of the fruit is not right at harvest, Granny Smith becomes more susceptible to bruising and greasiness the longer it is stored.

ReTain can be used on Granny Smith to delay harvest and provide better fruit quality after storage. In addition, most markets prefer blemish-free Granny Smith fruit with uniformly green skin color; fruit with both red or orange blush development and whitening of the skin is considered undesirable. ReTain will help growers maintain green color. While ReTain is effective in extending the harvest window, there is some risk for the development of red blush if harvest is delayed too long.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS GRANNY SMITH US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☐ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☐ Increased Firmness
- ☐ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Honeycrisp (All Strains)

US & CANADA
Western

HONEYCRISP (also known as the 'Honeycrunch' Apple) is a modern apple variety, developed in the 1960s and introduced in 1991 by the University of Minnesota, US. It is a cross between Keepsake and 'MN1627' (no longer available). Honeycrisp is a bicolor, mid-season apple variety with medium-to-large fruit. New, redder strains (mutant or sports) of Honeycrisp have been identified, the two most familiar being Premier Honeycrisp and Royal Red Honeycrisp.

Honeycrisp is prone to several storage disorders (e.g. bitter pit, soft scald, soggy breakdown, and senescent breakdown) and storage rots, which make long-term storage extremely risky. While it is a low-ethylene-producing variety, Honeycrisp can have significant pre-harvest fruit drop in hot years.

Honeycrisp has an intermediate level of sensitivity to ReTain. As most of its early strains struggle with color development, growers often seek to delay harvest to give the fruit more time to color. This delay can lead to earlier development of greasiness and cracking, however.

ReTain helps Honeycrisp growers in the Western US and Canada manage these challenges. Reduced fruit drop, cracking, and skin greasiness benefits derived from ReTain applications help drive Honeycrisp profitability.

(continued on next page)

RETAIN BENEFITS HONEYCRISP US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Honeycrisp (All Strains) continued

RETAIN RATE/TIMING*

STANDARD PROGRAM:

- ReTain ½ pouch per acre (167 g/acre), tank-mixed with NAA (such as K-Salt® Fruit Fix® 800**) applied at 2 weeks before harvest. This provides excellent drop control and about 5-7 days of maturity delay without impacting red color development.
- If there is a need to stretch the Honeycrisp harvest out further, spray part of the block at 3 weeks before harvest and the remainder of the block at 2 weeks before harvest. The latter will add a delay of approximately 3 days. NAA (4 fl. oz. per acre of K-Salt® Fruit Fix® 800**) can be included with the ReTain.

PROGRAM FOR BETTER CONDITION OF SECOND AND LATER PICKS:

- ReTain ½ pouch per acre (167 g/acre) applied at 3 weeks before harvest, plus an additional ½ pouch per acre 1 week before harvest of first pick fruit (7-day PHI). This program provides extended drop control and much better quality of second pick fruit. This provides excellent drop control on its own, but if additional drop control is desired, NAA (such as K-Salt® Fruit Fix® 800**) may also be added to either or both ReTain applications.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

***The brand K-Salt® Fruit Fix® 800 is not registered in Canada or California. Consult your local Valent representative for a recommended NAA brand.*

RETAIN BENEFITS HONEYCRISP US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather. A lightweight summer oil can be substituted for the OSi at 0.05% v/v.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Jonagold

US & CANADA
Western

JONAGOLD is a cross between the crisp Golden Delicious and the blush-crimson Jonathan, and was developed at Cornell University, New York, US, in 1953. It is a mid-late season, large apple variety, excellent for eating fresh and for cooking.

Fruit of most Jonagold strains does not develop sufficient red blush, even when firmness, starch index, and other maturity indices suggest the fruit is ready for harvest. To improve color, growers often seek to delay harvest to give the fruit more time, but Jonagold may then become greasy and vulnerable to rapid breakdown during subsequent cold storage.

In the Western US and Canada, the primary use of ReTain in Jonagold is for reduced skin greasiness and better storage quality. ReTain also has been an excellent option for harvest management and reduced fruit drop. Like Gala, this variety is generally quite sensitive to ReTain. When greasiness is not a concern, lower rates and applications closer to harvest may reduce impact on color development while maintaining good fruit quality and drop control.

RETAIN BENEFITS JONAGOLD US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½ pouch per acre (167 g/acre) applied at 3 weeks before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Lucy™ Rose and Lucy™ Glo (TC-2 and TC-3)

LUCY™ROSE AND LUCY™GLO are brand names of the apple varieties TC-2 and TC-3, respectively. These two club varieties originated from crosses between Arlee Red X Honeycrisp and a proprietary variety managed by Bill Howell at Prosser, Washington, US. They are mid-season apple varieties, being harvested near Honeycrisp.

Although these varieties differ in their exterior color (TC-2 has a red skin, while TC-3 has a yellow skin), both varieties have the unusual characteristic of red-colored flesh, for which they are known. In the case of TC-2, the ability to attain internal red flesh is known to be more specific to the site of the block, whereas TC-3 tends to produce red flesh more consistently.

Harvest management, maturity delay, and fruit drop control are key benefits provided by ReTain on these two important varieties.

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT AND STOP DROP: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

Lucy™ Rose and Lucy™ Glow apples are proprietary varieties controlled by Chelan Fruit.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS LUCY™ROSE & LUCY™GLO US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☐ Increased Firmness
- ☐ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Rave® (MN 55)

US & CANADA
Western

Image supplied by Stemilt Growers LLC

RAVE® is the registered trademark name for the apple variety MN 55, developed by the University of Minnesota, US, around 1997, and marketed by Stemilt Growers. MN 55 is a cross between Honeycrisp and the unreleased variety AA44 from the University of Arkansas. It is an early-season variety, ripening in late July under the Pacific Northwest conditions. The fruit is mostly dark red color and medium to large in size, with a round to conical shape. It has a crisp, juicy texture, similar in flavor to Honeycrisp, with a long storage life. MN 55 is highly susceptible to pre-harvest fruit drop, and therefore, ReTain provides MN 55 excellent fruit drop control.

RETAIN RATE/TIMING*

PROGRAM FOR FRUIT DROP CONTROL: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before normal harvest and again at 1 week before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS RAVE® US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☐ Increased Firmness
- ☐ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Rave® is a registered trademark of Regents of the University of Minnesota, and grown exclusively by Stemilt Growers in North America.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

Red Delicious
(and Red Types)

RED DELICIOUS is a chance seedling discovered in 1870 on a farm in Iowa, US. It is a medium-sized apple, with a tall conical shape (typiness) which is characteristic of this variety. Red Delicious is a mid-late season variety prone to pre-harvest fruit drop and, in some years, bitter pit. Numerous strains (sports or mutants) of Red Delicious have been developed, including Oregon Spur, Otago, Red Chief, Red King, Red Spur, Richared, Starking, Starkrimson®, and Starkspur®.

Red Delicious is susceptible to watercore development during maturation on the tree and during storage. Red Delicious growers in the Western US and Canada have achieved excellent control of watercore incidence and severity, along with increased fruit firmness, from pre-harvest applications of ReTain – resulting in better fruit quality going into storage. Labor management of Red Delicious is also another key benefit cited by ReTain users in this region.

(continued on next page)

RETAIN BENEFITS RED DELICIOUS US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Red Delicious

(and Red Types) continued

US & CANADA

Western

RETAIN RATE/TIMING*

TRADITIONAL PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest. This will give approximately 7-10 days of maturity delay and drop control.

PROGRAM FOR IMPROVED DROP CONTROL: ReTain 1 pouch per acre (333 g/acre) tank-mixed with NAA applied at 2 weeks before harvest. NAA (such as K-Salt® Fruit Fix® 800 at 4-8 fl. oz. per acre**) has worked well in this tank-mix.

PROGRAM FOR EXTENDED MATURITY DELAY:

- Option 1: ReTain 2 pouches per acre (666 g/acre) applied at 4 weeks before harvest. This results in ±21 days of maturity delay.
- Option 2: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest, followed by another ½-1 pouch per acre 2-3 weeks later (7-day PHI). This provides a slightly longer maturity delay at ± 28 days, along with additional flexibility to accommodate labor and improve fruit quality going into storage. NAA can be added to the second application for additional drop control, if desired.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

***The brand K-Salt® Fruit Fix® 800 is not registered in Canada or California. Consult your local Valent representative for a recommended NAA brand.*

RETAIN BENEFITS RED DELICIOUS US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55. For more information on use of ReTain, please consult your local representative.*

US & CANADA
Western

Rome Beauty

ROME BEAUTY (also known as Red Rome, Rome Beauty, or Gillett's Seedling) is a processing apple originated by chance in Ohio, US, in the early 19th century. It is a late-season variety and generally produces medium to large fruit. Rome Beauty is one of the few US heirloom varieties that can be found in many of the warmer apple-growing regions.

Like Idared, Rome Beauty apples are prone to producing excessive anthocyanins in the flesh (called flesh bleeding), resulting in an undesirable pink-colored applesauce when processed. Maintained fruit firmness, reduced greasiness, and low levels of internal flesh bleeding are important characteristics processing Rome apple growers seek at harvest. ReTain has been used successfully by processing growers to meet these fruit quality objectives.

RETAIN RATE/TIMING*

STANDARD SPLIT APPLICATION PROGRAM FOR ENHANCED FIRMNESS AND FLESH BLEEDING CONTROL: ReTain 1 pouch per acre (333 g/acre) applied at both 3-4 weeks before harvest and +/- ½ pouch (167 g/acre) at 1 week before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS ROME BEAUTY US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☑ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Smitten® (PremA17)

US & CANADA
Western

SMITTEN® is the trademark of the cultivar PremA17 bred by Plant and Food Research, New Zealand, in 1995, and object of the catchy tagline "Once bitten, forever Smitten." The parentage is a Falstaff x Fiesta sibling and a Braeburn x Gala sibling.

PremA17 is an early- to mid-season bicolored apple, ripening at the same time or a few days earlier than Gala. When oversetting occurs, PremA17 can be roughly similar to a Royal Gala in appearance and fruit size. Although this variety does not have the same splitting-at-maturity tendency as Gala, it is known to be slightly greasy and prone to pre-harvest drop. PremA17 growers typically use ReTain to help reduce fruit drop, increase fruit size, and improve overall fruit quality.

RETAIN BENEFITS SMITTEN® US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest, followed by another ReTain ½ pouch (167 g/acre) per acre tank-mixed with NAA (such as K-Salt® Fruit Fix® 800 at 4 fl. oz. per acre**) at 1 week before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

***The brand K-Salt® Fruit Fix® 800 is not registered in Canada or California. Consult your local Valent representative for a recommended NAA brand.*

Smitten® is a registered trademark of Prevar™ Ltd.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Western

SugarBee® (CN-121)

SUGARBEE® is the club variety trademark brand name of the variety CN-121. It is an open-pollinated cross variety discovered in a Honeycrisp block by Chuck Nystrom in the early 1990s, then developed in Minnesota, US. CN-121 is a bi-colored, medium to large apple, ranging from 30% to 100% red. Like its parentage Honeycrisp, this variety also has a short stem that can exacerbate preharvest fruit drop. CN-121 is a mid-late season apple variety with very high sugar levels at maturity, being harvested at the same timing as Red Delicious. It is emerging as an apple with exceptional durability at the retail level and high demand among consumers. CN-121 growers typically use ReTain to help reduce fruit drop, increase fruit size, and improve overall fruit quality.

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest, followed by another ReTain ½-1 pouch (167-333 g/acre) per acre at 1 week before harvest.

**In Canada and California, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

SugarBee® is a proprietary variety controlled by Chelan Fruit.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (6.4 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

RETAIN BENEFITS SUGARBEE® US & CANADA WESTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Courtesy of Orchard Dale Fruit Company

US & CANADA
Eastern

	Harvested Area[1] (Acres)[2]	Total Production[1] (Million Bushels – 42 lbs)[3]
Total US	291,200	269.2
Canada	38,894	22.3

[1CA] 2018 Data, Food and Agriculture Organization of the United Nations

[1US] 2018 Data, USDA, National Agricultural Statistics Service

[2] 1 acre = 0.404686 hectare

[3] 1000 bushels = 19 metric tons

Apple production in the Eastern US represents about 30% of the total US apple production, with New York and Michigan being the top apple-producing states of this region.

Ontario, Quebec, and Nova Scotia represent 73% of the total Canadian apple production.

ReTain® ON APPLE

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: US* Label Information
(Except California)

Harvest/Quality Management	Up to 2 pouches/acre (666 g/acre) applied at 7-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	7 days

ReTain for Apple: Canada Label Information

Harvest/Quality Management	Up to 1 pouch/acre (333 g/acre) applied at 7-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	7 days

**ReTain is sold in the US (except California) under the brand name "ReTain® Plant Growth Regulator Soluble Powder."*

US & CANADA
Eastern

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN THE EASTERN US AND CANADA.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Valent representative (US) and Nufarm representative (Canada) and apply the product based on previous experience and recommendations. And of course, ***always read and follow label instructions****.*

Ambrosia

US & CANADA
Eastern

AMBROSIA was discovered as a chance seedling in British Columbia, Canada, in the early 1990s. Its parentage is unknown, but there is speculation it is likely a cross between Jonagold and Golden Delicious.

Ambrosia is a bicolored medium-sized apple that can be challenging to color, especially in warm sites. Coloring often occurs late in the season and is heavily dependent on diurnal temperature variations. Ambrosia harvest is mid- to late-season and it ripens at the same time, or just before, Jonagold. It is highly sensitive to ReTain, meaning usage at the lower rates is common, depending on harvest management objectives. Growers indicate cracking and greasiness prevention, along with an extended harvest window, are the most important ReTain benefits for this variety.

RETAIN BENEFITS AMBROSIA US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

Note: Color development may be delayed by a standard ReTain use pattern. Consider 10-14 day timing to allow natural color development.

PROGRAM FOR POOR COLORING CONDITIONS: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 1-2 weeks before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Cameo® (Caudle)

CAMEO® is the trademark brand name of the Caudle variety, discovered by chance in Washington State, US, in 1987, near orchards of Red Delicious and Golden Delicious. It is widely used for baking/cooking due to its sweet-tart taste and resistance to flesh browning. Caudle is a medium to large apple. Its color varies considerably, from a dark red flush to a pale green with orange flushes.

Caudle is a late apple variety maturing one to two weeks before Fuji and has a long harvest window with comparable storage life. It has an intermediate tendency for pre-harvest fruit drop, a key benefit of ReTain.

Image supplied by New York Apple Association©

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

FOR EXTENDED HARVEST MANAGEMENT AND PICK-YOUR-OWN: ReTain 2 pouches per acre (666 g/acre): 1 pouch applied at 3 weeks before harvest, plus 1 pouch applied at 1 week before harvest.

SPLIT APPLICATION PROGRAM IN POOR COLORING CONDITIONS: ReTain ½ pouch per acre (167 g/acre) applied at 3-4 weeks before harvest, plus ½ pouch applied at 1 week before harvest.

When fruit drop is a concern: PoMaxa/Fruitone L 2-4 fl. oz. per acre (NAA 5-10 ppm) can be added in the second application.
Note: When NAA is included, a minimum of ½ pouch (167 g) of ReTain should be applied at the same time as the NAA.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS CAMEO® US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Cameo® is a trademarked apple that is owned and promoted by the Cameo® Apple Marketing Association.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Cortland

US & CANADA
Eastern

Image supplied by New York Apple Association©

CORTLAND is a cross between McIntosh and Ben Davis, first raised at the New York State Agricultural Experiment Station in Geneva, New York, US, in 1898. It is a medium- to large-fruited variety with multiple purposes. It is excellent for cooking/baking and for use in salads, as the flesh is non-browning.

Cortland is a mid-season apple variety and is a high ethylene producer like its parent, McIntosh. The delay in ripening following ReTain applications allows Cortland fruit to remain on the tree longer, resulting in a much firmer and better-tasting apple, especially when cooler temperatures are expected after regular harvest timing. Over-mature Cortland is known to become greasy and have a shorter storage life. ReTain applied 3 weeks before normal harvest can be a highly effective control strategy for greasiness.

RETAIN BENEFITS CORTLAND US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

PROGRAM TO EXTEND HARVEST (in pick-your-own operations or to prioritize harvest of earlier varieties) AND AID STORAGE QUALITY:

- ReTain 2 pouches per acre (666 g/acre) applied at 4-4½ weeks before harvest, **or**
- ReTain 1 pouch per acre (333 g/acre) applied at 4 weeks before harvest, followed by ReTain 1 pouch applied at 2 weeks before harvest.

Note: Best storage quality is achieved when apples are treated with 1-MCP after receiving a total of 2 pouches of ReTain per acre.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55. For more information on use of ReTain, please consult your local representative.*

US & CANADA
Eastern

Empire

EMPIRE is a cross between McIntosh and Red Delicious, developed at Cornell University, New York, US, in 1945, and introduced in the 1960s. Empire apples do not bruise easily and are excellent for eating and salads. They are also good for sauce, baking, and freezing.

Empire is a mid-late season small apple variety bred to resist pre-harvest fruit drop. If left on the tree too long for coloring purposes, its storage quality drops quickly without ReTain. ReTain is an excellent tool for fruit drop control and increased storage potential, especially by maintaining firmness. Targeted use of ReTain on Empire, Delicious varieties, and Jonagold provides excellent flexibility in harvest dates, since those three varieties need to be harvested at about the same time.

Image supplied by New York Apple Association©

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT, FIRMNESS RETENTION, AND AIDING STORAGE QUALITY: ReTain 1 pouch per acre (333 g/acre), applied at 2-4 weeks before harvest. Applying ReTain 3 weeks before harvest is ideal.

PROGRAM FOR MAXIMUM QUALITY RETENTION FOR LONG-TERM STORAGE: ReTain 1 pouch per acre (333 g/acre) applied at 3 weeks before harvest, plus ReTain ½-1 pouch per acre (167-333 g/acre) applied at 1 week before harvest. If color is a concern, a total of 1 pouch split at 3 and 1 week(s) before harvest should be considered.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS EMPIRE US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55. For more information on use of ReTain, please consult your local representative.*

Fuji (All Strains)

US & CANADA
Eastern

FUJI was developed in Japan in the late 1930s and released in 1962. It is a cross between Red Delicious and Ralls Janet. Many strains (mutants or sports) have since been recognized and propagated. The color variation of Fuji is quite wide, ranging from light pink to crimson pink.

In general, Fuji is a late-ripening variety with a very long shelf life. Some Fuji strains, however, have a slightly earlier harvest. The most common Fuji strains are Aztec Fuji®, Rising Sun Fuji®, Autumn Rose, Red Fuji, Desert Rose, Myra, September Wonder®, Stark® Super Red, Kiku® Fuji, and Fuji Suprema.

Fuji is very susceptible to watercore and, in some years, to fruit cracking. If harvested too early, it may develop soft scald. ReTain reduces severity of watercore in a rate-dependent manner.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 2-3 weeks before harvest.

PROGRAM FOR POOR COLORING OR LATE RIPENING STRAINS: Reduce rate to ½ pouch per acre (167 g/acre) and apply at 2 weeks before harvest.

PROGRAM FOR WATERCORE REDUCTION: Apply a minimum of ½ pouch ReTain per acre (167 g/acre) no closer than 2 weeks before harvest. Best results for watercore reduction are achieved at the full 1 pouch rate.

SPLIT APPLICATION* PROGRAM FOR EARLY RIPENING STRAINS (such as September Wonder and Rising Sun Fuji) WHERE EXTENDED HARVEST MANAGEMENT IS DESIRED USE: ReTain at ½-1 pouch per acre (167-333 g/acre) applied at both 3 and 1 week(s) before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS FUJI US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Gala (All Strains)

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size.

ReTain provides growers with numerous profit-driving benefits in Gala production.

When ReTain is applied on Galas: 1) Fruit will remain on the tree an additional 7-14 days; 2) Improved fruit size is achieved; 3) Reduced stem end cracking and greasiness is achieved in second and third picks; 4) Maturity is delayed and more consistent overall, potentially reducing the number of picks.

RETAIN RATE/TIMING*

STANDARD HARVEST MANAGEMENT AND FOR HIGH COLORING RED STRAINS (Brookfield®, Buckeye®, Gale® Gala, etc.):

- **Single application program**: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 3 weeks before harvest. When very hot weather prior to harvest is expected, maturity maybe be hastened, and stem cracking and greasiness can develop very rapidly. Higher rates in this case should be used.

  In blocks prone to fruit cracking, no less than one full pouch of ReTain should be applied either as a single or split application.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

(continued on next page)

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

RETAIN BENEFITS GALA US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Gala (All Strains) continued

US & CANADA
Eastern

RETAIN RATE/TIMING*

- **Split application program (to minimize color delay)**: ReTain ½ pouch per acre (167 g/acre) applied 3 weeks before harvest, followed by ½ pouch per acre applied 1 week prior to harvest. **Note**: Use of a single half rate should not be expected to provide more than 7 days of harvest management and fruit quality retention.
- **Split applications of full rates**: In situations where maximum maturity delay and quality retention is desired (including pick-your-own operations), apply 1 pouch (333 g/acre) per acre at 3 weeks before harvest and 1 pouch (333 g/acre) per acre 1 week before harvest. This program will allow growers to postpone harvest for 3+ weeks without sacrificing fruit quality. It also allows for maximum fruit size attainment, since fruit will continue to grow while it remains on the tree.

When fruit drop is a concern: PoMaxa/Fruitone L 2-4 fl. oz. per acre (NAA 5-10 ppm) can be added in the second application. When NAA is included, a minimum of ½ pouch (167 g/acre) of ReTain should be applied at the same time as the NAA.

COLOR-SENSITIVE, MULTI-PICK VARIETY PROGRAMS (Standards, Royals, Imperials, etc.):

- ReTain 1 pouch per acre (333 g/acre) applied at 1-2 weeks before harvest. Applications closer to harvest will have less impact on color development; therefore, higher rates can be used. Half rates at this timing will have limited effect on fruit quality retention for second and third picks (7+ days after the first pick). Less than full rates may not provide adequate control of skin cracking.

First harvest will be "on time;" second harvest will be delayed, but quality maintained.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS GALA US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Ginger Gold

GINGER GOLD was discovered as a chance seedling growing near a Golden Delicious orchard in Virginia, US, in the 1960s. The parents are likely to be Golden Delicious, Albemarle Pippin, and another unknown variety.

The color, shape, and distinctive long stem of Ginger Gold are characteristics of its Golden Delicious parent, yet it has a much earlier season, a very short harvest window, and can quickly over-mature. The fruit starts out a very pale green, though if left on the tree it will ripen to a soft yellow with a slightly waxy appearance. Growers typically use ReTain with Ginger Gold to help delay maturity, reduce greasiness, and maintain fruit quality through the harvest window.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½-1 pouch per acre (167-333 g/acre) at 2-3 weeks before harvest.

Note: No late or double rate program is recommended for this variety. It is an early variety and growers want to harvest it before the main varieties arrive on the market.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS GINGER GOLD US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Golden Delicious

US & CANADA
Eastern

GOLDEN DELICIOUS is a chance seedling found in West Virginia, US, in the early 1900s. It is possibly a hybrid of Grimes Golden and Golden Reinette. It is a mid-season apple and small to medium in size. Fruit is pale green to golden yellow in color and very prone to bruising and shriveling. As a result, Goldens require careful handling and storage.

ReTain has been used in this variety for several reasons: to delay maturity, reduce fruit drop, and improve storage quality. ReTain also maintains green skin color longer, which can be an important attribute for some markets. For fresh fruit, ReTain application timing should correspond to natural maturity of this variety, generally the same time as applications to Red Delicious. For fresh fruit or processing, rates greater than 1 pouch per acre* (333 g/acre) can be effective to maintain good fruit quality over a long harvest window.

RETAIN BENEFITS GOLDEN DELICIOUS US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest. Note: For extended harvest management and fruit size benefits, use ReTain 2 pouches per acre (666 g/acre).

SPLIT APPLICATION PROGRAM: ReTain at ½-1 pouch per acre (167-333 g/acre) applied at both 3 and 1 week(s) before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Golden Supreme

GOLDEN SUPREME is a Golden Delicious-like fruit that occasionally has a pink blush. It was discovered as a chance seedling in an orchard in Idaho, US, in the 1960s. Fruit tends to be medium to large and russet-resistant. It is a mid-season apple and is harvested around two weeks earlier than Golden Delicious.

Golden Supreme has a highly uneven maturity and therefore requires multiple harvests. It is also prone to pre-harvest drop. For this variety, growers have found ReTain to be especially effective to reduce fruit drop, even-out maturity, maintain firmness, and reduce greasiness.

Image supplied by Bar Lois Weeks, courtesy New England Apple Association

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

PROGRAM FOR PICK-YOUR-OWN AND RETAIL ROADSIDE MARKETS: When an extended season or delayed harvest is typically desired, ReTain at 2 pouches (666 g/acre) per acre 3-4 weeks before harvest may be used.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS GOLDEN SUPREME US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

GoldRush

US & CANADA
Eastern

Image supplied by Bar Lois Weeks, courtesy New England Apple Association

GOLDRUSH came from Purdue University and is derived from a cross made in 1972 between Golden Delicious and Co-op 17 (PRI 1689-110). The skin is greenish-yellow with an occasional bronze to red blush at harvest, becoming entirely deep yellow in storage. The color is much more pronounced than in Golden Delicious.

GoldRush is a late-maturing apple with excellent fruit quality and long storage ability. The low internal ethylene concentration of GoldRush may be responsible for its longer storage life, but the moisture content needs to be regulated to prevent shriveling. As it is a very late variety, the use of ReTain is more appropriate in regions with a longer growing season.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 3-4 weeks before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS GOLDRUSH US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Honeycrisp (All Strains)

HONEYCRISP (also known as 'Honeycrunch') is a modern apple variety, developed in the 1960s and introduced in 1990 by the University of Minnesota, US. It is a cross between Keepsake and the no longer available 'MN1627.' Honeycrisp is a bicolor, mid-season apple variety with medium to large fruit. New, redder strains (mutant or sports) of Honeycrisp have been identified, the two most familiar being Premier Honeycrisp™ and Royal Red Honeycrisp®. The variety is known for its exceptional taste balancing sweet and tart.

Honeycrisp is prone to several storage disorders (e.g. bitter pit, soft scald, soggy breakdown, and senescent breakdown) and storage rots, which make long-term storage challenging. It is a low-ethylene-producing variety, but Honeycrisp can have significant pre-harvest drop in hot years. Honeycrisp has an intermediate level of sensitivity to ReTain.

Split applications and higher rates of ReTain can greatly extend the harvest window of this variety. This strategy also helps delay harvest until weather conditions are generally cooler and more favorable for red color development. As ReTain can also cause delay in red color development in warmer regions, applications closer to harvest will allow more natural color development while maintaining good fruit quality and drop control. Extended harvest windows may also be particularly beneficial to pick-your-own operations that do not intend to place fruit into long-term storage.

(continued on next page)

RETAIN BENEFITS HONEYCRISP US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Honeycrisp (All Strains) continued

US & CANADA
Eastern

RETAIN BENEFITS HONEYCRISP US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT, DROP CONTROL:

½-1 pouch per acre (167-333 g/acre) applied at 3 weeks before harvest. Higher rates result in longer delays in maturity and color development of up to 2-3 weeks.

PROGRAM FOR EXTENDED HARVEST WINDOW AND DROP CONTROL:

- Split application of ½-1 pouch (167-333 g/acre) applied at 3 weeks before harvest plus ½-1 pouch at 1 week before harvest;
- Higher rates (2 pouches total–666 g/acre) will result in longer delays in maturity (up to 4 weeks).

When fruit drop is a concern: PoMaxa/Fruitone L 2-4 fl. oz. per acre (NAA 5-10 ppm) can be added in the second application. When NAA is included, a minimum of ½ pouch of ReTain should be applied at the same time as the NAA. **Combinations with NAA are not recommended in regions with very warm conditions at harvest, as NAA may counteract the ReTain effect**. **Note**: Do not store Honeycrisp that have been harvested more than 2 weeks outside the normal harvest window for longer than 4-6 weeks.

PROGRAM TO MINIMIZE COLOR DELAY ON COLOR SENSITIVE STRAINS:

- ReTain ½-1 pouch per acre (167-333 g/acre) applied at 7-14 days before harvest. NAA 10 ppm may be added for additional drop control (See NAA note above).
- Lower rates (less than ½ pouch) will provide shorter drop control and quality retention.
- When ReTain is applied close to harvest, the first pick may occur "on time," but subsequent harvests are likely to be delayed. Monitor fruit maturity closely.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Idared

IDARED was developed at the University of Idaho, US, in 1942. It is a cross between Jonathan and Wagener. The fruit is tangy, tart, and very firm; excellent for the processing market (sauce, pie, and cakes).

Idared is a late-season apple variety and has a remarkably long storage potential. In years with very good fruit coloring conditions, Idared apples (as well Rome apples) are prone to producing excessive anthocyanins in the flesh which, when processed, results in an undesirable pink-colored applesauce. ReTain has been successfully used by processing growers to delay the appearance of flesh pigments (known as internal flesh bleeding).

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest. Best results to minimize internal flesh bleeding are obtained with applications applied at 4 weeks before harvest.

If further harvest delay is needed, a second pouch of ReTain can be applied at one week prior to harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS IDARED US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☑ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Jonagold

US & CANADA
Eastern

JONAGOLD is a cross between the crisp Golden Delicious and the blush-crimson Jonathan, and was developed at Cornell University, New York, US, in 1953. It is a mid-late season, large apple variety, excellent for eating fresh and for cooking.

Fruit of most Jonagold strains do not develop sufficient red blush, even when firmness, starch index, and other maturity indices suggest the fruit is ready for harvest. To improve fruit color, growers tend to delay harvest, but Jonagold may then become greasy and vulnerable to rapid breakdown during subsequent cold storage.

Like Gala, this variety is generally quite sensitive to ReTain. When greasiness is not a concern, lower rates and applications closer to harvest may reduce impact on color development while maintaining good fruit quality and drop control.

When greasiness is a concern, ReTain applied 3 weeks before normal harvest can be effective. Targeted use of ReTain on Empire, Delicious varieties, and Jonagold provides excellent flexibility in harvest dates since those three varieties need to be harvested at about the same time.

RETAIN BENEFITS JONAGOLD US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

PROGRAM FOR HARVEST MANAGEMENT AND REDUCED GREASINESS (good coloring strains): ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

PROGRAM FOR HARVEST MANAGEMENT AND REDUCED GREASINESS (poor coloring conditions): ReTain ½-1 pouch per acre (167-333 g/acre) applied at 1-2 weeks before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Macoun

MACOUN apples are a cross between the McIntosh and Jersey Black, developed by Cornell University, New York, US, in 1923. They are a mid-season variety very popular in New York and New England.

Similar to its parent, McIntosh, Macoun is a high-ethylene-producing variety and notorious for pre-harvest fruit drop. Macoun also has a short stem, which can exacerbate fruit drop if trees are overcropped, as there is a tendency for the apple to push itself off the branch as the fruit matures.

Image supplied by New York Apple Association©

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

- When extended harvest management or when better drop control is desired, higher rates should be used
- In New York and New England, pick-your-own operations can use higher rates to keep fruit on the trees through early- to mid-October.

SPLIT APPLICATION PROGRAM:

- ReTain ½-1 pouch per acre (167-333 g/acre) applied at both 3 and 1 week(s) before harvest
- Two full rates will provide the longest drop control and harvest window extension

When fruit drop is a concern: PoMaxa/Fruitone L 2-4 fl. oz. per acre (NAA 5-10 ppm) can be added in the second application. When NAA is included, a minimum of ½ pouch of ReTain should be applied at the same time as the NAA.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS MACOUN US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

McIntosh (and Mac Types)

US & CANADA
Eastern

McINTOSH (Mac) is a chance seedling variety discovered in Ontario, Canada, in the early 18th century, with small- to medium-sized round fruit and a short stem. McIntosh grows best in cool areas with cold nights; otherwise, it suffers from poor color, soft flesh, and excessive pre-harvest fruit drop. Macs are also prone to scald, flesh softening, and chilling sensitivity. Currently, there are several Mac-type apples (RubyMac®, Acey Mac, Rogers Mac, etc.) that vary in color, harvest time, and susceptibility to fruit drop.

McIntosh is unique because it is a high producer of internal ethylene and has considerable variation in ripening. Some apples may mature early and produce significant ethylene, while many others on the same tree remain green. McIntosh starts producing ethylene up to 3 weeks before harvest in some fruits, resulting in early drop in some years.

To successfully manage this early ethylene production tendency, McIntosh should be treated with ReTain no later than 14 days before harvest. If the first ReTain application is delayed until as late as 7 days before harvest, the risk of drop will increase. This is particularly important during years when summer heat/drought stress is high, as these stresses can elevate ethylene early and runaway fruit drop may occur.

The same applies for ReTain rates. In warm years, pre-harvest fruit drop of McIntosh is exaggerated and the half rate of ReTain will not give satisfactory control. For maximum drop control, the full rate of ReTain is recommended. Lower rates are recommended only when growers do not need more than 7-10 days of drop control and cannot wait for color to develop.

(continued on next page)

RETAIN BENEFITS MCINTOSH US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

McIntosh (and Mac Types) continued

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR MATURITY DELAY AND STOP DROP:

ReTain 1 pouch per acre (333 g/acre) applied at 3-3½ weeks before harvest. ReTain at this timing will keep drop below 20% for 32-35 days.

PROGRAM TO MINIMIZE COLOR DELAY ON COLOR SENSITIVE STRAINS (e.g. Rogers Mac):

- One half pouch (167 g/acre) applied at 2 weeks prior to harvest for short-term delay and pre-harvest drop control. Fruit treated with half rates should be harvested within the normal harvest window. If drop is still a concern, higher rates should be used — a red apple is not very valuable if it is on the ground.
- For longer drop control and harvest management, use ½ pouch (167 g/acre) 3-4 weeks prior to harvest followed by ½ pouch 1-2 weeks prior to harvest. PoMaxa/Fruitone L 4 fl. oz. per acre (NAA at 10 ppm) may be included in the second ReTain application for additional drop control.

When fruit drop is a concern: NAA can be added in the second application. When NAA is included, a minimum of ½ pouch of ReTain should be applied at the same time as the NAA.

PROGRAM FOR MAXIMUM HARVEST WINDOW EXTENSION AND DROP CONTROL:

- Split application of 1 pouch (167 g/acre) at 3-4 weeks before harvest plus ½-1 pouch (167-333 g/acre) at 1 week before harvest. NAA at 10 ppm may be included in the second ReTain application for additional drop control (see NAA note above).

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

RETAIN BENEFITS MCINTOSH US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Pink Lady®
(Cripps Pink)

US & CANADA
Eastern

Cripps Pink (sold under the trademarked name **PINK LADY®**) was developed in the 1970s in Western Australia. It is a cross between Golden Delicious and Lady Williams. It has a distinctive pink/red color mixed with a green background. Cripps Pink is a very late variety, normally harvested after Fuji, that requires a 200-day growth period. For this reason, it is not grown in higher latitudes or regions subjected to early winter freezes.

Cripps Pink is a relatively moderate to high ethylene producer. Internal ethylene concentrations of Cripps Pink can increase dramatically over the first 50 days of storage. Early Cripps Pink strains such as Barnsby or Maslin ripen about 3 weeks earlier than the regular Cripps Pink, and, in some years, may develop fruit drop issues. These strains would benefit from ½ to 1 pouch of ReTain (167-333 g/acre) prior to harvest.

RETAIN BENEFITS PINK LADY® US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☐ Increased Firmness
- ☐ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT AND LONG STORAGE: ReTain ½ pouch per acre (167 g/acre) applied at 1-2 weeks before harvest. Use full rate (333 g/acre) in earlier strains or if a longer delay in harvest is desired.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Red Delicious
(and Red Types)

RED DELICIOUS is a chance seedling discovered in 1870 on a farm in Iowa, US. It is a medium-sized apple, with a tall conical shape (typiness) which is characteristic of this variety. Red Delicious is a mid-late season variety prone to pre-harvest fruit drop and, in some years, bitter-pit. Numerous sports (strains or mutants) of Red Delicious have been developed, including Oregon Spur, Otago, Red Chief, Red King, Red Spur, Richared, Starking, Starkrimson®, and Starkspur®.

Red Delicious is susceptible to watercore development during maturation on the tree and during storage. Research shows it responds well to increasing rates of ReTain to reduce drop, maintain fruit quality, reduce incidence and severity of watercore, and manage harvest. ReTain may be effectively combined with NAA products in tank mixes or in split applications to enhance drop control. Targeted use of ReTain on Empire, Delicious, and Jonagold can provide significant labor management, since those three varieties are generally harvested at the same time.

(continued on next page)

RETAIN BENEFITS RED DELICIOUS US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Red Delicious

(and Red Types) continued

US & CANADA
Eastern

RETAIN BENEFITS RED DELICIOUS US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING*

STANDARD PROGRAM FOR HARVEST MANAGEMENT, DROP CONTROL, REDUCTION IN WATERCORE: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest.

PROGRAM FOR ENHANCED DROP CONTROL PROGRAMS PLUS WATERCORE REDUCTION:

- 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest plus NAA at 5-10 ppm at 1 week before harvest. **Or**;
- 1 pouch per acre (333 g/acre) applied at 2 weeks before harvest combined with NAA at 10 ppm. See "When fruit drop is a concern" below. **Or**;
- Split application: ReTain ½-1 pouch (167-333 g/acre) applied at 3 weeks before harvest plus ½-1 pouch combined with NAA 5-10 ppm at 1-2 weeks before harvest.
- Use full rates for maximum watercore reduction
- Split application program of full rates will provide the longest drop control and harvest window extension.

When fruit drop is a concern: PoMaxa/Fruitone L (NAA) can be added in the second ReTain application to provide protection from early drop until the ReTain develops the ability to control drop. When NAA is included, a minimum of ½ pouch (167 g/acre) of ReTain should be applied at the same time as the NAA.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Rome Beauty

ROME BEAUTY (also known as Red Rome, Rome Beauty, or Gillett's Seedling) is a processing apple originated by chance in Ohio, US, in the early 19th century. It is a late-season variety and generally produces medium to large fruit. Rome Beauty is one of the few US heirloom varieties that can be found in many of the warmer apple-growing regions.

Like Idared, Rome Beauty apples are prone to producing excessive anthocyanins in the flesh (called flesh bleeding), resulting in an undesirable pink-colored applesauce when processed. Maintained fruit firmness, reduced greasiness, and low levels of internal flesh bleeding are important characteristics processing Rome apple growers seek at harvest. ReTain has been used successfully by processing growers to meet these fruit quality objectives.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) applied at 3-4 weeks before harvest. **Note**: Less than full rates will not provide complete control of flesh bleeding in Law Rome and other red strains.

SPLIT APPLICATION PROGRAM FOR EXTENDED HARVEST MANAGEMENT AND FLESH BLEEDING CONTROL: ReTain at ½-1 pouch (167-333 g/acre) per acre applied at both 3 and 1 week(s) before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS ROME BEAUTY US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☑ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

RubyFrost® (NY 2)

US & CANADA
Eastern

Image supplied by Crunch Time Apple Growers

RUBYFROST® is the club variety trademark brand name of NY 2 club variety released to growers in 2013 by Crunch Time Apple Growers, US. The NY 2 apple variety is a cross between Braeburn and Autumn Crisp, notable for its deep red color and late harvest period.

NY 2 has good resistance to flesh browning after cutting, good for fresh-cut slices. In certain years, fruit can develop stress-induced watercore that can lead to the development of internal browning upon storage. Interestingly, better flavor tends to develop after several months of storage.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½-1 pouch per acre (167-333 g/acre) applied at 2-3 weeks before harvest. **Note**: Use full rate for maximum watercore reduction.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS RUBYFROST® US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☐ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RubyFrost® apples are patented and trademarked managed apple varieties developed by Cornell University and marketed exclusively by Crunch Time Apple Growers (CTAG) LLC.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

SnapDragon® (NY 1)

SNAPDRAGON® is the club variety trademarked brand name of NY 1 released to growers in 2013 by Crunch Time Apple Growers, US. The NY 1 apple variety is a cross between Honeycrisp and a New York advanced selection, NY752, whose parents were Golden Delicious and a New York cross of Monroe and Melrose.

NY 1 is an early-season variety, maturing in late September to early October in New York. NY 1 is a weak-growing tree, slightly weaker than Honeycrisp, with medium-sized fruit and an attractive red color and thin skin. It can be susceptible to scarfskin under certain conditions. It stores well, but tends to lose flavor over time.

Image supplied by Crunch Time Apple Growers

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½-1 pouch (167-333 g/acre) per acre applied at 2-3 weeks before harvest. **Note**: Use full rate for maximum harvest window extension and to maximize quality retention.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS SNAPDRAGON® US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

SnapDragon® apples are patented and trademarked managed apple varieties developed by Cornell University and marketed exclusively by Crunch Time Apple Growers (CTAG) LLC.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

York

US & CANADA
Eastern

Image supplied by Bor Lois Weeks, courtesy New England Apple Association

YORK or York Imperial was discovered in Pennsylvania, US, in 1820. It is a late-season apple variety harvested just ahead of Granny Smith. It produces fruit of medium to large size, and is juicy and slightly aromatic, with a semi-sweet flavor that is excellent for baking and cider making.

ReTain can be an effective option for old variety processing apples both for drop control and improved quality (firmness and starch). When trees of this variety are over-cropped, ReTain will not prevent fruit push-off. ReTain can be an effective option for this processing variety.

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain 1 pouch (333 g/acre) per acre applied at 3-4 weeks before harvest followed by NAA 5-10 ppm at 1 week before harvest for additional drop control.

When fruit drop is a concern: When ReTain is applied at 2 weeks before harvest, PoMaxa/Fruitone L (NAA) could be included to provide protection from early drop. When NAA is included, a minimum of ½ pouch (167 g) of ReTain should be applied at the same time as the NAA.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS YORK US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

US & CANADA
Eastern

Zestar!® (Minnewashta)

The **ZESTAR!®** apple (Minnewashta cultivar) is an early-season variety that comes from the University of Minnesota breeding program in the US. Minnewashta is the product of a hybridization of State Fair and MN 1691. It has become a favorite of direct-market and small wholesale apple growers in the East and Midwest.

Minnewashta is praised for its shelf life, not for its storage. This variety is also prone to drop. Red color development can sometimes be inadequate since temperatures tend to increase during harvest. Fortunately, this variety is sensitive to ReTain and a low rate, close to harvest, will help with maturity, especially for slowing starch degradation and reducing fruit drop.

Image supplied by New York Apple Association©

RETAIN RATE/TIMING*

STANDARD PROGRAM: ReTain ½ pouch per acre (167 g/acre) applied at 1-2 weeks before harvest.

**In Canada, ReTain use is only labeled for 1 pouch per acre and single (not split) applications.*

RETAIN BENEFITS ZESTAR!® US & CANADA EASTERN

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

Zestar!® is a trademark of Regents of the University of Minnesota, and is registered in the United States and other countries for use in connection with trees and apples of the Minnewashta cultivar.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05-0.1% v/v (6.4-12.8 fl. oz./100 gal). Use lower rate during periods of hot weather.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Courtesy of Mikel Letkeman

MEXICO

Harvested Area[1] (Hectares)[2]	Total Production[1] (Million Tonnes)[3]
52,389	0.66

[1] 2018 Data, Food and Agriculture Organization of the United Nations

[2] 1 hectare = 2.471044 acres

[3] 1 metric ton = 52 bushels (42 lbs.)

Chihuahua is the largest apple-producing state in Mexico, representing 80% of the country's total production, followed by Coahuila (7%), Puebla (5%), and Durango (3%). Golden Delicious is the most popular apple variety in the country, accounting for about 70% of the market.

ReTain® ON APPLE

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: Mexico Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	28 days

MEXICO

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN MEXICO.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Valent representative and apply the product based on previous experience and recommendations.

And of course, ***always read and follow label instructions****.*

Gala (All Strains)

MEXICO

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world (Ultima Gala®, Imperial, Galaxy, etc). The main selection criteria of these strains has always been improved red color and size.

ReTain has brought significant benefits to apple growers in Mexico. For Galas, in particular, ReTain provides:

- Protection of yield through drop control – resulting in increased yields.
- Increased fruit size due to harvest delay – greatly improving packout.
- Improved fruit color – Gala's red color is enhanced as ReTain-treated fruit is harvested later once cooler Chihuahua region nights become more favorable to color development.
- Improved fruit quality and reduced stem end cracking control.

RETAIN BENEFITS GALA MEXICO

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

STANDARD SPLIT PROGRAM: ReTain 415 g per hectare applied at both 3-4 and 1-2 weeks before harvest. **Note**: The long flowering period that this variety experiences in this region is known to result in uneven maturity. Split applications of ReTain on Gala help address this variability and are more efficacious.

FULL RATE PROGRAM FOR UNIFORM FLOWERING CONDITIONS AND FULL RED STRAINS: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as Kinetic® at 0.05 v/v (500 ml/1000 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

MEXICO

Golden Delicious

GOLDEN DELICIOUS is a chance seedling found in West Virginia, US, in the early 1900s. It is possibly a hybrid of Grimes Golden and Golden Reinette. It is a mid-season apple and small to medium in size. Golden Delicious fruit are typified by pale green to golden yellow color and are very prone to bruising and shriveling. As a result, Goldens require careful handling and storage.

Golden Delicious (including the two russet-resistant strains, Smoothee and Golden Glory) is the most important variety in Mexico, accounting for 70% of all areas under production. ReTain has helped Mexican growers manage their large areas of Goldens efficiently by delaying maturity and promoting an orderly harvest. ReTain's cornerstone benefits of pre-harvest fruit drop control and fruit size increase marketable yields and significantly increase grower profits. ReTain also maintains green skin color longer while adding fruit quality and storage potential — all important attributes for Mexican markets.

RETAIN RATE/TIMING

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

SPLIT APPLICATION PROGRAM: ReTain 415 g per hectare applied at both 4 and 2 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as Kinetic® at 0.05 v/v (500 ml/1000 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

RETAIN BENEFITS GOLDEN DELICIOUS MEXICO

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Golden Supreme

MEXICO

Image supplied by Bar Lois Weeks, courtesy New England Apple Association

GOLDEN SUPREME is a Golden Delicious-like fruit that occasionally has a pink blush. It was discovered as a chance seedling in an orchard in Idaho, US, in the 1960s. Golden Supreme fruit tends to be medium to large and is russet resistant. It is an early- to mid-season apple typically harvested about two weeks earlier than Golden Delicious. As it is one of the first apple varieties harvested in Mexico, Golden Supreme apples are sold quickly.

Golden Supreme displays highly uneven maturity characteristics and therefore requires multiple harvests. It is also prone to pre-harvest drop. For these reasons, growers have found ReTain to be especially valuable in maximizing the return on the whole of their investment. ReTain reduces fruit drop, evens-out maturity, and helps maintain postharvest fruit firmness.

RETAIN BENEFITS GOLDEN SUPREME MEXICO

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☐ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

SPLIT APPLICATION PROGRAM: ReTain 415 g per hectare applied at both 4 and 2 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as Kinetic® at 0.05 v/v (500 ml/1000 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

MEXICO

Red Delicious
(and Red Types)

RED DELICIOUS is a chance seedling discovered in 1870 on a farm in Iowa, US. It is a medium-sized apple, with a tall conical shape (typiness), characteristic of this variety. Numerous strains (sports or mutants) of Red Delicious have been developed over the years, including Oregon Spur, Top Red, Otago, Red Chief, Red King, Red Spur, Richared, Starking, Starkrimson®, and Starkspur®.

Red Delicious is a mid-late season variety prone to pre-harvest fruit drop and, in some years, bitter pit. Red Delicious is also particulary susceptible to watercore development during maturation on the tree and during storage. ReTain has been used successfully by Mexican growers to control drop, increase fruit size and color, maintain fruit firmness, and reduce physiological disorders (especially watercore) during storage.

RETAIN RATE/TIMING

FULL RATE PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

STANDARD SPLIT PROGRAM: ReTain 415 g per hectare applied at both 3-4 and 1-2 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as Kinetic® at 0.05 v/v (500 ml/1000 L).

RETAIN BENEFITS RED DELICIOUS MEXICO

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

CHILE

Harvested Area[1] (Hectares)[2]	Total Production[1] (Million Tonnes)[3]
34,427	1.73

[1] 2018 Data, Food and Agriculture Organization of the United Nations

[2] 1 hectare = 2.471044 acres

[3] 1 metric ton = 52 bushels (42 lbs.)

Chile's apple production is mostly located in the central part of the country between Rancagua and Chillan, in El Maule and O'Higgins, and represents 91% of the country's total production. Around 7% of the apples are grown in Southern Chile in the La Araucania region. Although new apple varieties are gaining importance in the country, Gala and Pink Lady, including their red strains, are by far Chile's leading varieties.

ReTain® ON APPLE

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: Chile Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 21-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	21 days

CHILE

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN CHILE.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Sumitomo representative and apply the product based on previous experience and recommendations.

And of course, ***always read and follow label instructions****.*

Gala (All Strains)

CHILE

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size. In Chile, Gala is the most important variety for both domestic and export marketing, representing 60% of the total area under production.

Since its development, ReTain has become an essential and profit-driving tool for Chilean growers, as it has been helping growers efficiently manage their large Gala blocks and pick fruit of optimal quality and value.

ReTain on Galas: 1) reduces fruit drop; 2) delays harvest in part, or all, of the orchard to allow a more orderly pick; 3) delays fruit maturation, allowing for natural size enhancement and color development while still meeting stringent export and domestic quality standards; 4) improves fruit quality (e.g., reduced greasiness and cracking); and 5) enhances storage potential.

RETAIN BENEFITS GALA CHILE

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

STANDARD PROGRAM FOR HARVEST MANAGEMENT AND RED STRAINS: ReTain 830 g per hectare applied at 3-4 weeks before harvest. **Note**: Under warm temperatures, applications of ReTain should be made 3 weeks before harvest, and NAA-800 can be tank mixed if fruit drop is a concern. In normal weather conditions, ReTain may be applied at 4 weeks before harvest.

PROGRAM FOR COLOR-SENSITIVE, MULTI-PICK VARIETIES: ReTain 830 g per hectare applied at 3-4 weeks before harvest should be directed only to the upper part of the tree. Under warm temperatures, applications of ReTain should be made 3 weeks before.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77at 0.01% v/v (10 cc/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

CHILE

Pink Lady® (Cripps Pink)

Cripps Pink (sold under the trademarked name **PINK LADY®**) was developed in the 1970s in Western Australia. It is a cross between Golden Delicious and Lady Williams. It has a distinctive pink/red color mixed with a green background. Since its introduction, several high-colored sports or strains have been discovered. Two of them are well known in Chile: Rosy Glow (from Australia) and Lady in Red (from New Zealand). Cripps Pink is a very late variety, normally harvested after Fuji, that requires a 200-day growth period.

Cripps Pink is a relatively moderate to high ethylene producer. Internal ethylene concentrations of Cripps Pink can increase dramatically over the first 50 days of storage. High temperature conditions during harvest may cause early pre-harvest fruit drop of this variety. By inhibiting ethylene production, ReTain delays the onset of fruit drop, allowing more fruit to be harvested. Maintained fruit firmness is also a key benefit of ReTain, as growers are seeing reduction in bruising on firmer fruit.

RETAIN RATE/TIMING

STANDARD PROGRAM: ReTain 415 g per hectare applied at 3 weeks before harvest. When color in the lower part of the tree is a concern, apply ReTain only to the upper part of the tree; however, make sure to keep the same amount of ReTain per hectare.

RETAIN BENEFITS PINK LADY® CHILE

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☐ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.01% v/v (10 cc/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Courtesy of Celito Soldá

BRAZIL

Harvested Area[1] (Hectares)[2]	Total Production[1] (Million Tonnes)[3]
33,029	1.19

[1] 2018 Data, Food and Agriculture Organization of the United Nations

[2] 1 hectare = 2.471044 acres

[3] 1 metric ton = 52 bushels (42 lbs.)

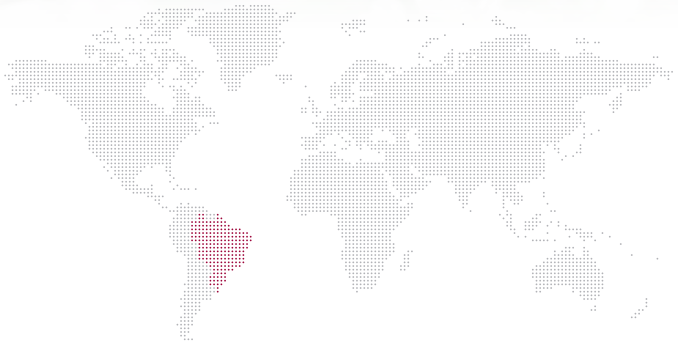
The main apple production areas in Brazil are in the South: Santa Catarina (48%), Rio Grande do Sul (47%), and Parana (3%). Fuji and Gala represent about 90% of the country's total apple production.

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: Brazil Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 7-28 days before harvest
Restricted-Entry Interval	24 hours
Pre-Harvest Interval	7 days



BRAZIL

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN CHILE.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Sumitomo representative and apply the product based on previous experience and recommendations.

And of course, ***always read and follow label instructions****.*

Fuji (All Strains)

BRAZIL

FUJI was developed in Japan in the late 1930s and released in 1962. It is a cross between Red Delicious and Ralls Janet. Many strains (mutants or sports) have since been recognized and propagated. The color variation of Fuji is quite wide, ranging from light pink to crimson pink.

In general, Fuji is a late-ripening variety with a very long shelf life. Some Fuji strains, however, have a slightly earlier harvest. The most common Fuji strains are Aztec Fuji®, Rising Sun Fuji®, Autumn Rose, Red Fuji, Desert Rose, Myra, September Wonder®, Stark® Super Red, Kiku® Fuji, and Fuji Suprema. Fuji is highly susceptible to watercore and, in some years, to fruit cracking. If harvested too early, it may develop soft scald. ReTain reduces severity of watercore in a rate-dependent manner.

ReTain has brought great benefits for labor management to growers in Brazil. ReTain permits growers to have an orderly harvest of large Fuji blocks by treating portions of the crop with different rates/timings, delaying maturity and subsequent harvest of those blocks. The result is eliminating "crunch periods," allowing growers to utilize resources and harvest fruit of optimum quality over longer periods of time. Under the Brazilian climate conditions, the delay in harvest will allow more time for color development and fruit growth. When growers use ReTain on Fuji:

- Fruit will remain on the tree an additional 15-20 days.
- Improved fruit size of approximately 8-12%.
- Reduced watercore stem end cracking. ReTain will keep the firmness and delay the starch degradation.

(continued on next page)

RETAIN BENEFITS FUJI BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

BRAZIL

Fuji (All Strains) continued

RETAIN RATE/TIMING

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain 830 g per hectare applied at 4 weeks before harvest.

PROGRAM FOR HARVEST MANAGEMENT AND REDUCED NUMBER OF PICKS (uniform maturation): ReTain 415g-830 g per hectare applied at 4 weeks before harvest.

- ReTain may be applied only to the upper or bottom part of the tree to facilitate harvest management and reduce the number of picks. When applied only to the upper part of the tree, ReTain will allow growers to spot pick the bottom of the tree at the normal harvest time and strip off the whole tree in the second pick. The advantage of this is that growers will be able to reduce labor costs and potential bruising caused by the picking ladder.
- **Note**: Do not apply more than 2.074 grams per hectare per season.

RETAIN BENEFITS FUJI BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Gala (All Strains)

BRAZIL

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size. The most familiar and grown Gala strains are Royal Gala, Brookfield®, Galaxy Gala, Imperial Gala, etc.

ReTain has brought great benefits for labor management to growers in Brazil. ReTain permits growers to have an orderly harvest of large Gala blocks by treating portions of the crop with different rates/timings, delaying maturity and subsequent harvest of those blocks. The result is eliminating "crunch periods," allowing growers to utilize resources and harvest fruit of optimum quality over longer periods of time. When growers use ReTain on Galas:

- Fruit will remain on the tree for an additional 10-18 days.
- Fruit size will increase by approximately 8-12%.
- Maturity is delayed and becomes more even on the tree. It may even be possible to reduce the number of picks – down to two or one on the upper half of the tree.
- ReTain reduces fruit drop and stem end cracking.
- ReTain preconditions fruit to optimize its response to postharvest 1-MCP by keeping ethylene levels low, resulting in a more uniform response across all fruit and longer storage.
- ReTain also has become a great benefit to Gala growers in Brazil when applied during the bloom period to increase fruit set. See page 11 for detailed information on use of ReTain for fruit set in apple.

(continued on next page)

RETAIN BENEFITS GALA BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

BRAZIL

Gala (All Strains) continued

RETAIN RATE/TIMING

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain 830 g per hectare applied at 4 weeks before harvest

PROGRAM FOR IMPROVING FRUIT QUALITY (SIZE) OF THE SECOND AND THIRD PICKS: 415g-830 g per hectare applied immediately after the first pick.

PROGRAM FOR HARVEST MANAGEMENT AND IMPROVING FRUIT QUALITY (SIZE) OF THE SECOND AND THIRD PICKS: ReTain 830 g per hectare applied at 4 weeks before harvest followed by ReTain 415g-830 g per hectare applied immediately after the first pick.

- The additional application of ReTain 415-830 g should respect the 7-day PHI. Subsequent harvests (second, third, and fourth) will be delayed in about 7-12 days. It could also be applied only to the upper or bottom part of the tree to facilitate harvest management.
- **Note**: Do not apply more than 2.074 grams per hectare per season.

RETAIN BENEFITS GALA BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Pink Lady® (Cripps Pink)

BRAZIL

Cripps Pink (sold under the trademarked name **PINK LADY®**) was developed in the 1970s in Western Australia. It is a cross between Golden Delicious and Lady Williams. It has a distinctive pink/red color mixed with a green background. Cripps Pink is a very late variety, normally harvested after Fuji, that requires a 200-day growth period. Cripps Pink is a relatively moderate to high ethylene producer. Internal ethylene concentrations of Cripps Pink can increase dramatically over the first 50 days of storage.

ReTain brings a combination of benefits for Cripps Pink growers in Brazil. Due to Brazil's climate conditions, the harvest delay promoted by ReTain permits growers to pick redder, higher-quality fruit. Increased yields resulting from fruit drop control and increased size are also important, profit-driving benefits of ReTain. When using ReTain on Cripps Pink:

- Fruit will remain on the tree for an additional 15-20 days.
- Fruit size will increase approximately 8-12%.
- Maturity is delayed and becomes more even on the tree, promoting a more uniform harvest.
- Stem end cracking and greasiness are reduced; these are important aspects for quality in storage.
- ReTain also has become a great benefit to Cripps Pink growers in Brazil when applied during the bloom period to increase fruit set. See page 11 for detailed information on use of ReTain for fruit set in apple.

(continued on next page)

RETAIN BENEFITS PINK LADY® BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

BRAZIL

Pink Lady® (Cripps Pink) continued

RETAIN RATE/TIMING

STANDARD PROGRAM FOR HARVEST MANAGEMENT: ReTain 830 g per hectare applied at 4 weeks before harvest.

PROGRAM FOR HARVEST MANAGEMENT AND REDUCED NUMBER OF PICKS (uniform maturation): ReTain 415g-830 g per hectare at 4 weeks before harvest.

- ReTain can also be applied only to the upper or bottom part of the tree to facilitate harvest management and reduce the number of picks. When applied only to the upper part of the tree, ReTain will allow growers to spot-pick the bottom of the tree at the normal harvest time and strip off the whole tree in the second pick. The advantage of this is that growers will be able to reduce labor costs and potential bruising caused by the picking ladder.
- **Note**: Do not apply more than 2.074 grams per hectare per season.

RETAIN BENEFITS PINK LADY® BRAZIL

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

SOUTH AFRICA

Harvested Area[1] (Hectares)[2]	Total Production[1] (Million Tonnes)[3]
22,970	0.89

[1] 2019 Hortgro Tree Census

[2] 1 hectare = 2.471044 acres

[3] 1 metric ton = 52 bushels (42 lbs.)

The Western Cape accounts for more than half the total South African apple production, followed by the Langkloof region in the Eastern Cape (18%). Free State, Mpumalanga, and the Limpopo Province together represent 20% of the country's production. The main apple varieties are Golden Delicious, Gala, Granny Smith, Top Red, Cripps Pink, Fuji, and Joya.

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: South Africa Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 7-28 days before harvest
Restricted-Entry Interval	12 hours
Pre-Harvest Interval	28 days

SOUTH AFRICA

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN SOUTH AFRICA.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Philagro representative and apply the product based on previous experience and recommendations.

And of course, ***always read and follow label instructions****.*

Gala (All Strains)

SOUTH AFRICA

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (mutants or sports) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size.

Most growers in South Africa use ReTain as a harvest management tool that helps to optimize the harvest potential of their crop by decreasing harvest peaks and maintaining fruit quality. Generally speaking, Gala apples are small and require multiple picks, as poor color can lower pack-outs on some of the older Gala strains.

As a result, the benefits of increased fruit size and fewer picks are significant, profit-driving benefits for growers of Gala in South Africa. ReTain delays the maturity of the treated orchards, extending picking time and decreasing pressure on the grower's labor inputs. For this same reason, ReTain gives growers peace of mind when untimely rains occur during harvest.

RETAIN BENEFITS GALA SOUTH AFRICA

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

STANDARD PROGRAM FOR DELAYING ALL PICKS AND MAXIMIZING FRUIT SIZE (Gala, all strains, including full red strains): ReTain 830 g per hectare applied at 4 weeks before harvest.

PROGRAM TO EXTEND SECOND AND THIRD PICK FOR FRUIT SIZE BENEFIT (all strains): ReTain 550 g per hectare applied at 1 week before harvest. The late application will delay fruit maturity and improve fruit quality and storage potential of later picked apples. **Note**: This late application will not delay the start of harvest (first pick), but will help control the maturation rate of the later picks, with one or more of the benefits as listed above.

RECOMMENDED ADJUVANT (ALL PROGRAMS)

Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

SOUTH AFRICA

Golden Delicious

GOLDEN DELICIOUS is a chance seedling found in West Virginia, US, in the early 1900s. It is possibly a hybrid of Grimes Golden and Golden Reinette. It is a mid-season apple and small to medium in size. Fruit is pale green to golden yellow in color and very prone to bruising and shriveling. As a result, Goldens require careful handling and storage.

Most growers in South Africa use ReTain as a harvest management tool in Golden Delicious. ReTain helps optimize the harvest potential of their crop by decreasing harvest peaks and maintaining fruit quality. This is especially true for Goldens, as there is a high harvest peak in Galas, Golden Delicious, and Red varieties that needs to be harvested within a relatively short picking window.

Maintaining green color is another significant benefit for ReTain users in South Africa, as most of its Golden Delicious apples are exported to Africa, where green Golden Delicious obtains higher prices due to optimum quality.

RETAIN RATE/TIMING

STANDARD PROGRAM: ReTain 830 g per hectare applied at 4 weeks before harvest.

RETAIN BENEFITS GOLDEN DELICIOUS SOUTH AFRICA

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Pink Lady® (Cripps Pink)

SOUTH AFRICA

Cripps Pink (sold under the trademarked name **PINK LADY®**) was developed in the 1970s in Western Australia. It is a cross between Golden Delicious and Lady Williams and has a distinctive pink/red color mixed with a green background. Since its introduction, several high-colored sports or strains have been discovered. Two of them are well known in South Africa: Rosy Glow (from Australia) and Lady in Red (from New Zealand). Cripps Pink is a very late variety, normally harvested after Fuji, that requires a 200-day growth period.

Cripps Pink is a relatively moderate to high ethylene producer. Internal ethylene concentrations of Cripps Pink can increase dramatically over the first 50 days of storage.

Most growers in South Africa use ReTain as a harvest management tool that helps optimize the harvest potential of their crop by decreasing harvest peaks and maintaining fruit quality. Low pack-outs of Cripps Pink due to poor red color are a major concern. ReTain delays the maturity of the treated orchards, which allows longer hanging time and therefore more favorable coloring conditions. This is a significant benefit for ReTain users, as Cripps Pink apples obtain much higher prices once a certain color threshold (% red blush) is achieved. ReTain also reduces the incidence of skin greasiness, as treated apples are harvested at optimum maturity. ReTain gives growers peace of mind when untimely rains occur during harvest.

(continued on next page)

RETAIN BENEFITS PINK LADY® SOUTH AFRICA

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

SOUTH AFRICA

Pink Lady® (Cripps Pink) continued

RETAIN RATE/TIMING

STANDARD PROGRAM FOR EXTENDED HARVEST (DELAY): ReTain 830 g per hectare applied at 4 weeks before harvest.

PROGRAM TO EXTEND SECOND AND THIRD PICK: ReTain 830 g per hectare applied at 1 week before harvest. The late application will delay fruit maturity, as well as improve fruit quality and storage potential of later picked apples. **Note**: This late application will not delay the start of harvest (first pick), but will help control the maturation rate of the later picks, with one or more of the benefits as listed above.

RETAIN BENEFITS PINK LADY® SOUTH AFRICA

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for (1-MCP) in Storage

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.

Red Delicious
(and Red Varieties)

SOUTH AFRICA

RED DELICIOUS is a chance seedling discovered in 1870 on a farm in Iowa, US. It is a medium-sized apple, with a tall conical shape (typiness) which is characteristic of this variety. Red Delicious is a mid-late season variety prone to pre-harvest fruit drop and, in some years, bitter pit. Numerous strains (sports or mutants) of Red Delicious have been developed; however, the main strains grown in South Africa are Oregon Spur, Starking, Top Red, and Early Red One.

Most South African Red Delicious growers use ReTain as a harvest management tool that helps to optimize the harvest potential of their crop by decreasing harvest peaks and maintaining fruit quality. This is a significant benefit for ReTain users, as there is typically a big harvest peak of Goldens and Reds that needs to be picked in the same window. Profit-draining fruit drop is a major concern for Reds, and ReTain helps growers protect their investment by keeping fruit on the tree. This effect also allows longer hanging time, which enables growers to pick more fruit at optimum maturity. ReTain also gives growers piece of mind when untimely rains occur during harvest time.

RETAIN BENEFITS RED DELICIOUS SOUTH AFRICA

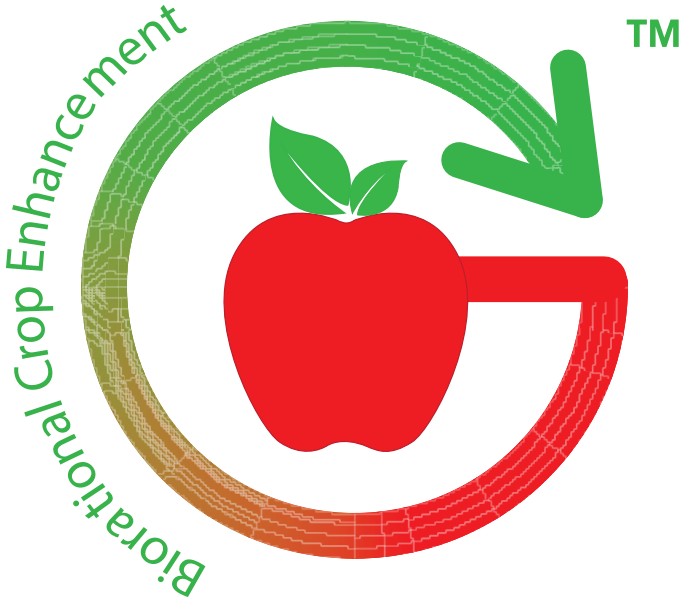
- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

STANDARD PROGRAM: ReTain 830 g per hectare applied at 4 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.05% v/v (50 ml/100 L).

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*
For more information on use of ReTain, please consult your local representative.


Biorational Crop Enhancement
TM

AUSTRALIA & NEW ZEALAND

	Harvested Area[1] (Hectares)[2]	Total Production[1] (Million Bushels – 42 lbs)[3]
Australia	9,375	0.29
New Zealand	8,540	0.44

[1AUS] 2016-17 Plant Health Australia

[1NZ] 2018 Data, Food and Agriculture Organization of the United Nations

[2] 1 hectare = 2.471044 acres

[3] 1 metric ton = 52 bushels (42 lbs.)

Apples are grown in all states in Australia. The key regions are Stanthorpe (QLD), Orange and Batlow (NSW), the Goulburn Valley, Yarra Valley and Gippsland (Vic), Adelaide Hills (SA), and Donnybrook and Manjimup (WA). A large selection of varieties is grown, with the leading one by volume being Pink Lady.

Apples are grown on both islands of New Zealand, with Hawkes Bay (North Island) and Nelson (South Island) being the major regions. The New Zealand apple industry has a strong export focus and reputation for innovation and world-class production.

ReTain® ON APPLE

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

ReTain for Apple: Australia Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 7-28 days before harvest
Restricted-Entry Interval	7 days (without protective clothing)
Pre-Harvest Interval	7 days

ReTain for Apple: New Zealand Label Information

Harvest/Quality Management	Up to 830 grams/hectare applied at 7-28 days before harvest
Restricted-Entry Interval	—
Pre-Harvest Interval	7 days

AUSTRALIA & NEW ZEALAND

VARIETIES

THE FOLLOWING RECOMMENDATIONS ARE BASED ON THE EXPERIENCES OF GROWERS, CONSULTANTS, AND RESEARCHERS IN THE AUSTRALIA AND NEW ZEALAND.

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Consult your Sumitomo representative (Australia) or Nufarm representative (New Zealand) and apply the product based on previous experience and recommendations.

And of course, ***always read and follow label instructions****.*

For conversion from/to metric or imperial systems, see page 2.

Ambrosia

AUSTRALIA &
NEW ZEALAND

AMBROSIA was discovered as a chance seedling in British Columbia, Canada, in the early 1990s. Its parentage is unknown, but there is speculation it is likely a cross between Jonagold and Golden Delicious.

Ambrosia is a bicolored medium-sized apple that can be challenging to color, especially in warm sites. Coloring often occurs late in the season and is heavily dependent on diurnal temperature variations. Ambrosia harvest is mid- to late-season and it ripens at the same time, or just before, Jonagold. It is highly sensitive to ReTain.

ReTain is used on Ambrosia predominantly for harvest management and improving the quality of fruit while in storage.

(continued on next page)

RETAIN BENEFITS AMBROSIA AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Ambrosia
continued

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS AMBROSIA AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Braeburn

AUSTRALIA &
NEW ZEALAND

BRAEBURN is believed to be a cross between Lady Hamilton and Granny Smith developed in the 1950s in New Zealand. It is a bicolor and medium to large apple. Braeburn is a late-season variety that grows better in regions with a longer growing season.

Sensitivity to ReTain is variety-specific, and Braeburn is generally less responsive to ReTain than Gala or Red Delicious apples. However, growers have found there can be a useful delay in starch conversion, which aids in harvest management and fruit size. Benefits in storage include reduced water loss and less shrivel.

(continued on next page)

RETAIN BENEFITS BRAEBURN AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Braeburn
continued

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS BRAEBURN AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Bravo™ (ANABP 01)

AUSTRALIA & NEW ZEALAND

Image supplied by Fruit West Co-operative Ltd.

BRAVO™ is the registered trademark for the Australian apple variety ANABP 01, developed in and commercially released in 2016. It is a cross between Cripps Red and Royal Gala apple. The fruit has a dark color, is oblate in shape, and medium to large in size. It is a mid- to late-season variety, ripening about a month after Golden Delicious and around two weeks before Cripps Pink. It performs well in regions with long warm to hot summers.

According to ANABP 01 growers, harvest management, fruit drop control, and cracking and greasiness reduction are the most important benefits provided by ReTain.

(continued on next page)

RETAIN BENEFITS BRAVO™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

The Bravo™ trademark is registered by the Western Australian Agriculture Authority.

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Bravo™ (ANABP 01) continued

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

Image supplied by Fruit West Co-operative Ltd.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS BRAVO™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

The Bravo™ trademark is registered by the Western Australian Agriculture Authority

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Cox's Orange Pippin

NEW ZEALAND

COX'S ORANGE PIPPIN (often referred as Cox) was discovered as a chance seedling in England in 1825. Though the parentage of the cultivar is unknown, a cross of Ribston Pippin and Blenheim Orange seems a likely candidate. The apples are of medium size and orange-red in color. It is a high-quality dessert apple, but can also be freshly consumed.

Cox is an early- to mid-season variety that softens rapidly after harvest. Cox apples are mostly grown in England and New Zealand; partly because Cox trees have very particular climate needs and thrive best in mild summers and rainy conditions, but also because demand exists predominantly in the UK market.

The maintenance of flesh firmness in Cox is the major quality benefit from ReTain.

RETAIN BENEFITS COX'S ORANGE PIPPIN AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Envy™ (Scilate)

ENVY™ is a trademarked brand of the Scilate apple variety. Scilate is the result of a cross between Royal Gala and Braeburn in the 1980s, developed in New Zealand by Plant & Food Research. Scilate captures the sweet crispness of Royal Gala and the crisp, white, and juicy flesh of Braeburn. It has higher sweetness and color than either parent.

Scilate is a medium to large, conical apple, mostly red-orange over yellow skin, sometimes with prominent white lenticels. It is a very late season apple variety and, depending on the season, can be susceptible to russeting, shriveling, bitter pit, and internal browning.

Harvest management, reduced greasiness, and a more consistent maturity due to the delay in starch degradation are major benefits from ReTain for this variety.

(continued on next page)

Image supplied by Montague Pty Ltd

RETAIN BENEFITS ENVY™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Envy™ (Scilate) continued

AUSTRALIA & NEW ZEALAND

Image supplied by Montague Pty Ltd

RETAIN BENEFITS ENVY™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

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ON APPLE

AUSTRALIA & NEW ZEALAND

eve™ apples are a red strain of Braeburn discovered in New Zealand. They are a late-season variety with slightly later maturity than standard Braeburn. This red-colored apple resists turning brown when cut. The fruit is oblong and medium in size. The flesh is white, firm, and crisp, with a central fibrous core that encases tough, brown seeds. eve™ apples are crunchy and juicy with a sweet and tangy flavor similar to a Braeburn apple.

Harvest management, reduced greasiness, and a more consistent maturity due to the delay in starch degradation are major benefits from ReTain for this variety.

(continued on next page)

Image supplied by Montague Pty Ltd

RETAIN BENEFITS eve™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

eve™ is licensed to Montague Pty Ltd in Australia by Heartland Group NZ.

***Always consult the product label** for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

eve™ continued

AUSTRALIA & NEW ZEALAND

Image supplied by Montague Pty Ltd

RETAIN BENEFITS eve™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

eve™ is licensed to Montague Pty Ltd in Australia by Heartland Group NZ.

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AUSTRALIA &
NEW ZEALAND

Fuji (All Strains)

FUJI was developed in Japan in the late 1930s and released in 1962. It is a cross between Red Delicious and Ralls Janet. Many strains (mutants or sports) have since been recognized and propagated. The color variation of Fuji is quite wide, ranging from light pink to crimson pink.

In general, Fuji is a late-ripening variety with a very long shelf life. Some Fuji strains, however, have a slightly earlier harvest. The most common Fuji strains are Aztec Fuji®, Rising Sun Fuji®, Autumn Rose, Red Fuji, Desert Rose, Myra, September Wonder®, Stark® Super Red, Kiku® Fuji, and Fuji Suprema.

Fuji is very susceptible to watercore and, in some years, to fruit cracking. Fuji apples produce little ethylene and typically maintain their firmness during harvest and in storage. ReTain, by suppressing the small amount of ethylene that is produced, can delay the harvest by several days to provide harvest management benefits, as well as firmness, fruit size, and physiological benefits in storage.

(continued on next page)

RETAIN BENEFITS FUJI AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Fuji (All Strains) continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest. **NOTE**: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS FUJI AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Gala (All Strains)

GALA is a cross between Golden Delicious and Kidd's Orange Red apples, discovered in New Zealand in 1934. Gala is an early- to mid-season variety and generally produces small fruit, particularly if trees are not well managed. It can vary in color, from cream to red- and yellow-striped. There are many different strains (sports or mutants) of Gala selected and grown successfully in all parts of the world. The main selection criteria of these strains has always been improved red color and size.

ReTain will help assist in harvest management by allowing selected blocks to have their harvest date delayed. In addition to the usual storage potential benefits, many growers use ReTain for improved fruit size, particularly in years when climatic conditions make this a critical factor.

(continued on next page)

RETAIN BENEFITS GALA AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Gala (All Strains) continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions

RETAIN BENEFITS GALA AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☑ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Golden Delicious

GOLDEN DELICIOUS is a chance seedling found in West Virginia, US, in the early 1900s. It is possibly a hybrid of Grimes Golden and Golden Reinette. It is a mid-season apple and small to medium in size. Fruit is pale green to golden yellow in color and very prone to bruising and shriveling. As a result, Goldens require careful handling and storage.

Golden Delicious and related varieties are less responsive to ReTain applications than varieties such as Gala; however, benefits may include good delays in harvest (increasing fruit size), reduced fruit drop, and better quality in storage. ReTain also maintains green skin color longer, which can be an important attribute for some markets.

(continued on next page)

RETAIN BENEFITS GOLDEN DELICIOUS AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Golden Delicious
continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS GOLDEN DELICIOUS AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Granny Smith

Granny Smith is a chance seedling originating in Australia in 1868. The tree is thought to be a hybrid of *Malus sylvestris*, the European wild apple, with the domesticated apple *Malus pumila* as the pollinizer. It is a medium to large fruit. Its long storage life has been attributed to its fairly low levels of ethylene production; however, if the condition of the fruit is not right at harvest, it becomes more susceptible to bruising and greasiness the longer it is stored.

Growers in this region typically use ReTain to delay harvest and provide fruit with better quality after storage. Most markets prefer blemish-free fruit with uniformly green skin color; fruit with both red or orange blush development and whitening of the skin are considered undesirable. ReTain also meets these challenges by helping maintain green color.

(continued on next page)

RETAIN BENEFITS GRANNY SMITH AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☐ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Granny Smith
continued

AUSTRALIA & NEW ZEALAND

RETAIN BENEFITS GRANNY SMITH AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☐ Ethylene Reduction
- ☑ Increased Firmness
- ☐ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Jazz™ (Scifresh)

JAZZ™ is a trademarked brand of the Scifresh cultivar derived from crosses between Braeburn and Royal Gala made in 1985 at Plant & Food Research, New Zealand. Jazz™ fruit matures 1-2 weeks after Royal Gala. It is a bicolored apple with a defined fleck on a green-yellow to lemon-yellow background. This variety is extremely firm at harvest. Size is medium, similar to Gala, and productivity is moderate.

ReTain provides Jazz™ growers multiple profit-driving benefits. The ability of ReTain to delay harvest by few days gives this apple more time to grow and color while maintaining quality. ReTain is also an excellent tool to prevent pre-harvest fruit drop in this variety.

(continued on next page)

Image supplied by Montague Pty Ltd

RETAIN BENEFITS JAZZ™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

JAZZ™ (Scifresh) continued

AUSTRALIA & NEW ZEALAND

Image supplied by Montague Pty Ltd

RETAIN BENEFITS JAZZ™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
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Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Jonagold

Jonagold is a cross between the crisp Golden Delicious and the blush-crimson Jonathan, and was developed at Cornell University, New York, US, in 1953. It is a mid- to late-season, large apple variety, excellent for eating fresh and for cooking.

Fruit of most Jonagold strains do not develop sufficient red blush, even when firmness, starch index, and other maturity indices suggest the fruit is ready for harvest. To improve fruit color, growers tend to delay harvest, but Jonagold may then become greasy and vulnerable to rapid breakdown during subsequent cold storage.

Like Gala, this variety is generally quite sensitive to ReTain. ReTain can provide a harvest benefits through delayed firmness decline, retention of background color, and starch progression. Jonagold continue to grow during this delayed harvest. Greasiness is reduced in storage.

(continued on next page)

RETAIN BENEFITS JONAGOLD AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Jonagold continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS JONAGOLD AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Kanzi® (Nicoter)

KANZI® is the trademarked name of the Nicoter variety developed in Belgium by Better3fruit and Greenstar Kanzi Europe, and is a cross between Gala and Braeburn. It is a bicolored, medium-sized, and rounded apple, characterized by a firm texture and very low ethylene production. Nicoter is a mid-season variety.

ReTain will delay harvest date to allow fruit size increase, as well as assist in overall orchard harvest management. Nicoter growers also use ReTain to provide fruit with better quality after storage.

(continued on next page)

Image supplied by GKE NV.

RETAIN BENEFITS KANZI® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Kanzi® is a registered trademark of GKE NV.

***Always consult the product label** for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Kanzi® (Nicoter) continued

AUSTRALIA & NEW ZEALAND

Image supplied by SKE NV.

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

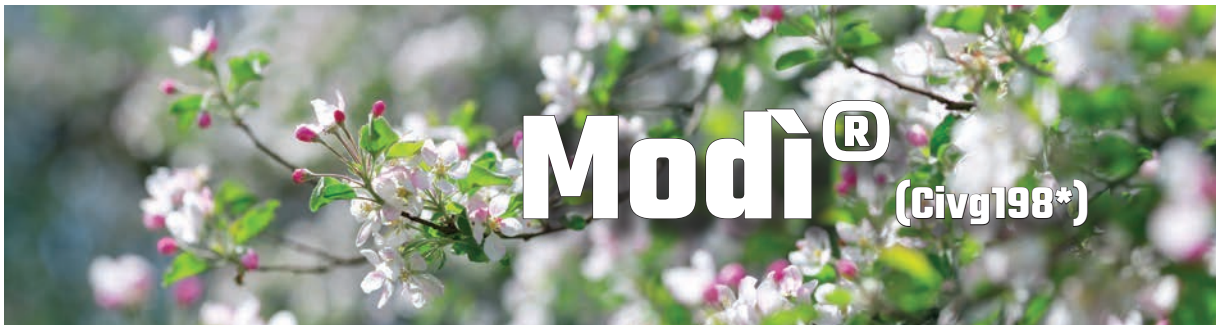
RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS KANZI® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND



Modì® is the trademarked name of the Civg198* variety created at the Consorzio Italiano Vivaist in Italy, in the 2000s. It is a cross between the Gala and Liberty apple. Civg198* is scab-resistant, but prone to russet and is scald-susceptible. Civg198* apples are dark red in color, medium to large in size, and are round to conical in shape. This variety needs good pollination to prevent misshapen fruits. It is an early maturing variety, maturing around 10 days before Red Delicious. It grows better in warm, sunny valleys.

ReTain will delay Civg198* harvest to allow fruit size increase, as well as assisting in overall orchard harvest management. ReTain will also provide fruit with better quality after storage

(continued on next page)

Image supplied by Freshmax Australia Pty Ltd.

RETAIN BENEFITS MODI® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Modì® (Civg198*)
continued

AUSTRALIA & NEW ZEALAND

Image supplied by Freshmax Australia Pty Ltd

RETAIN BENEFITS MODI® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Pacific Rose™ (Sciros)

PACIFIC ROSE™ is the trademarked name of the Sciros variety. It is a cross between Gala and Splendour, developed in New Zealand in 1984. It is a late-season apple with a very attractive rosy-red blush color. Sciros is a genotype of apple with reduced capacity for ethylene biosynthesis and action, meaning it is a slow-softening variety. However, Sciros can be susceptible to calyx-end splitting.

Pacific Rose apples are somewhat responsive to ReTain, giving around 5-7 days' delay in harvest. Increased fruit size and firmer fruit are also ReTain benefits highlighted by growers.

(continued on next page)

RETAIN BENEFITS PACIFIC ROSE™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Pacific Rose™ is a trademark of ENZAFRUIT New Zealand International Ltd.

***Always consult the product label** for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Pacific Rose™ (Sciros)
continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS PACIFIC ROSE™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Pink Lady® (Cripps Pink)

Cripps Pink (sold under the trademark name **PINK LADY®**) was developed in the 1970s in Western Australia. It is a cross between Golden Delicious and Lady Williams. It has a distinctive pink/red color mixed with a green background. Cripps Pink is a very late variety, normally harvested after Fuji, which requires a 200-day growth period.

Cripps Pink is a relatively moderate to high ethylene producer. Internal ethylene concentrations of Cripps Pink can increase dramatically over the first 50 days of storage. Early Cripps Pink strains such as Barnsby or Maslin ripen about 3 weeks earlier than the regular Cripps Pink, and in some years may develop fruit drop issues.

Cripps Pink apples treated with ReTain are delayed in starch conversion and background color and have maintained firmness, protecting a grower's investment.

(continued on next page)

RETAIN BENEFITS PINK LADY® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Pink Lady® (Cripps Pink)
continued

AUSTRALIA & NEW ZEALAND

RETAIN BENEFITS PINK LADY® AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☐ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Red Delicious
(and Red Types)

Red Delicious is a chance seedling discovered in 1870 on a farm in Iowa, US. It is a medium-sized apple, with a tall conical shape (typiness) that is characteristic of this variety. Red Delicious is a mid-late season variety prone to pre-harvest fruit drop and, in some years, bitter pit. Numerous strains (sports or mutants) of Red Delicious have been developed, including Oregon Spur, Otago, Red Chief, Red King, Red Spur, Richared, Starking, Starkrimson®, and Starkspur®.

ReTain is predominantly used as a harvest management tool in Red Delicious operations, and also allows fruit to increase in size while it is held on the tree. While Red Delicious generally has good storage potential, ReTain can help improve this, particularly in later picks. These benefits combine to significantly enhance year-on-year profitability.

(continued on next page)

RETAIN BENEFITS RED DELICIOUS AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Red Delicious
(and Red Types) continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05-0.1% v/v (50-100 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS RED DELICIOUS AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

AUSTRALIA &
NEW ZEALAND

Rockit™ (PremA96)

ROCKIT™ is miniature apple bred by Plant and Food Research, New Zealand in 1996. It is the trademarked name of the PremA96 variety and is a cross between Royal Gala and 'GS 2184'.

PremA96 fruit is bicolored and serves naturally as a snack-sized apple. It is a mid- to late-season variety and somewhat prone to russeting around the stem.

ReTain helps improve the storage potential of PremA96 fruit due to the maintenance of high fruit quality at harvest. Harvest management and fruit drop control are also additional, profit-driving benefits provided by ReTain.

(continued on next page)

RETAIN BENEFITS ROCKIT™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

Rockit™ (PremA96)
continued

AUSTRALIA & NEW ZEALAND

RETAIN RATE/TIMING

Australian Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before the average starch pattern index (SPI) of the block is 1.5.

PROGRAM FOR IMPROVED FRUIT QUALITY AND STORAGE POTENTIAL: ReTain 830 g per hectare applied at 1 week before SPI 1.5.

RECOMMENDED ADJUVANT (ALL AU PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
Organosilicone surfactant (such as Silwet® L-77, Sylgard® 309 or Freeway®) at 0.05% v/v (50 ml/100 L). Use lower rate during periods of hot and dry growing conditions.

RETAIN BENEFITS ROCKIT™ AUSTRALIA & NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☑ Color Development Management
- ☐ Cracking Reduction
- ☐ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Rockit™ apple is a registered trademark of Rockit Global Limited.

***Always consult the product label** for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*

NEW ZEALAND

Southern Snap® (Sciglo)

SOUTHERN SNAP® is the trademarked name of the Sciglo variety. Sciglo was originated in 1974 by the Plant & Food Research, New Zealand. A cross between Gala and Splendour, it is a mid-season apple and medium in size.

Sensitivity to ReTain is variety-specific, and Sciglo is a highly responsive cultivar. Sciglo growers use ReTain to take advantage of a 2-3 week harvest delay and excellent fruit drop control.

RETAIN RATE/TIMING

New Zealand Recommendations

STANDARD PROGRAM: ReTain 830 g per hectare applied at 3-4 weeks before harvest.

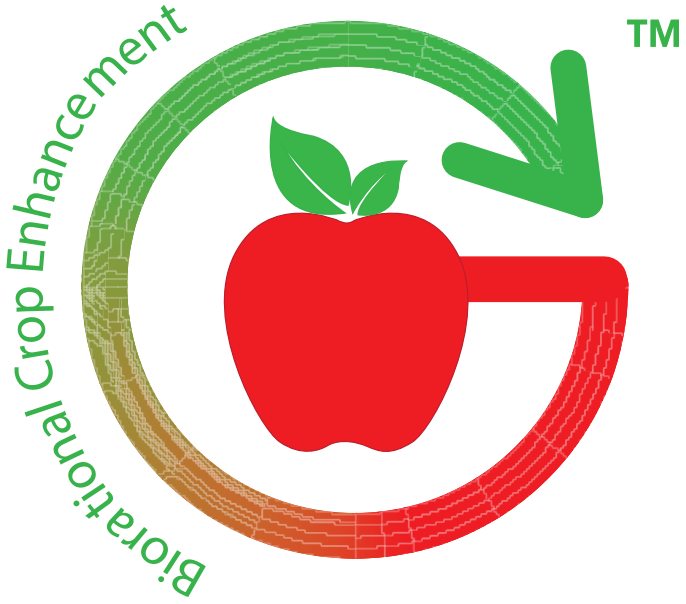
PROGRAM TO IMPROVE FRUIT QUALITY AND STORAGE POTENTIAL OF LATER PICKS IN THE NORMAL HARVEST PERIOD: ReTain 830 g per hectare applied at 1 week before harvest.
NOTE: This late application will slow the rapid maturation of later pick fruits (second, third, and fourth picks), increasing harvest quality and storage potential. It will NOT delay the start of harvest.

RECOMMENDED ADJUVANT (ALL NZ PROGRAMS)
A nonionic surfactant, such as Regulaid® at 250 ml/100 L in the spray tank. Southern Snap is particularly sensitive to organosilicone surfactants.

RETAIN BENEFITS SOUTHERN SNAP® NEW ZEALAND

- ☑ Harvest Management
- ☑ Fruit Quality/Maturity Management
- ☑ Fruit Drop Reduction
- ☑ Ethylene Reduction
- ☑ Increased Firmness
- ☑ Delayed Starch Degradation
- ☑ Fruit Size Increase
- ☐ Color Development Management
- ☐ Cracking Reduction
- ☑ Watercore Reduction
- ☐ Internal Flesh Bleeding Reduction
- ☑ Skin Greasiness Reduction
- ☑ Precondition Fruit for 1-MCP in Storage

Always consult the product label *for specific guidance on using surfactants with ReTain to avoid the increased risk of fruit spotting. For in-depth technical information on use of ReTain, see pages 46-55. For conversion from/to metric or imperial systems, see page 2.*


Biorational Crop Enhancement
TM

HARVEST & QUALITY MANAGEMENT

OTHER CROPS

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

HARVEST & QUALITY MANAGEMENT:

Stone Fruit

(Peach, Nectarine, Plum, and Apricot)

PROPER MATURITY AT HARVEST is essential to marketing good, quality stone fruit (peaches, nectarines, Asian and European plums, and apricots). Immature fruits are more subject to shriveling, internal breakdown, mechanical damage, and inferior quality when ripe; the rock-hard, low-sugar fruit found in many retail outlets is not preferred by consumers, but over-mature fruits are likely to become soft, mealy, and flavorless soon after harvest.

Practical Benefits from ReTain

- **Reduced number of picks** due to effect on fruit firmness.
- **Season extension** – delay harvest to fill gaps in the marketing window or extend the sales season of late-season varieties.
- **Harvest management** – ReTain may give growers more time (1-5 days) to harvest higher-quality fruit, increasing their return on investment. Those extra few days are an important benefit for the plum Sun Kiss, grown in South Africa, for instance, which is harvested in late December. Moving the picking window by 5 days helps growers avoid picking over weekends or during Christmas, when labor availability is compromised.
- **Flexibility** – keeping fruit on the tree longer rather than picking and placing in cold storage.
- **Harvest flexibility under adverse weather conditions** – ReTain gives growers peace of mind when it rains during harvest time.
- **Larger fruit** – maintaining fruit firmness allows fruit to hang on the tree longer and gain size, improving packout grade.
- **Better taste and flavor** – by keeping fruit on the tree long enough to develop extra sugar/flavor.
- **Enhanced storage potential** – firmer fruit stores better and is less likely to become over-ripe and mealy.
- **Reduced pre-harvest fruit drop** and, consequently, increased yield.
- **Increased fruit quality** – in plums, ReTain reduces gel breakdown. In peaches and nectarines, ReTain prevents soft tips.

(continued on next page)

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

HARVEST & QUALITY MANAGEMENT:

Stone Fruit

(Peach, Nectarine, Plum, and Apricot)

Why ReTain on Early-Season Varieties?

Early season varieties have a short growing window, meaning growers want to delay the maturity as long as possible to gain one size category and reduce one harvest, as volume is so small vs. later season varieties. By delaying the ripening of early varieties (up to 3 days) on the tree, fruit will naturally increase in size.

Why ReTain on Mid- and Late-Season Varieties?

ReTain can benefit mid- to late-season varieties with a tendency for fruit drop, or an existing crop that may experience fruit drop (mid- and late-season) due to weather issues.

RETAIN RATE/TIMING

US EASTERN

STANDARD PROGRAM FOR PEACH, NECTARINE, AND PLUM: ReTain 1 pouch per acre (333 g/acre) applied at 1 to 2 weeks before harvest. **NOTE**: Fruit color is generally not affected on red blush peach or nectarine varieties, but may be delayed on yellow cling stone varieties.

FOR ENHANCED PERFORMANCE ON PEACHES: Growers can include ProGibb® LV Plus 20 fl. oz. per acre to the ReTain tank.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at 0.05 v/v (6.4 fl. oz/100 gal.)
Use lower rate during periods of hot weather.

(Continued on next page)

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

HARVEST & QUALITY MANAGEMENT:

Stone Fruit

(Peach, Nectarine, Plum, and Apricot) continued

RETAIN RATE/TIMING

US Western & California*

STANDARD PROGRAM FOR PEACH, NECTARINE, PLUM, AND APRICOT: ReTain 1 pouch per acre (333 g/acre) applied at 1 to 2 weeks before harvest.

PROGRAM FOR MID- TO LATE-SEASON VARIETIES THAT ARE PRONE TO PRE-HARVEST FRUIT DROP, OR, ARE UNDER SEVERE WEATHER CONDITIONS THAT MAY TRIGGER FRUIT DROP: ReTain 1 pouch (333 g/acre) applied at 2 weeks before harvest or when fruit is first visible on the ground.

**ReTain is sold in California under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder."*

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant at at 0.05-0.1% v/v (6.4 – 12.8 fl. oz/100 gal.).
Use lower rate during periods of hot weather.

South Africa

STANDARD PROGRAM FOR PEACH, NECTARINE, AND PLUM: ReTain 830 g per hectare applied at 1 to 2 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant such as BREAK-THRU® or Silwet® L-77 at 0.05% v/v (50 ml/100 L).

Australia & New Zealand

STANDARD PROGRAM FOR PEACH, NECTARINE, PLUM, AND APRICOT: ReTain 830 g per hectare applied at 1 to 2 weeks before harvest.

RECOMMENDED ADJUVANT (ALL PROGRAMS)
Organosilicone surfactant (such as Maxx®) at 0.05-0.1% v/v (50-100 ml/100 L) in the spray tank.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

HARVEST & QUALITY MANAGEMENT: Pear

THERE ARE MORE THAN 3,000 PEAR VARIETIES GROWN WORLDWIDE; however, only 10 principal varieties are grown commercially in the US.

Depending on the harvest time, pears can be categorized into summer pears (**Bartlett** or **Williams Bon Chrétien** varieties, **Starkrimson**, and **Tosca**) and winter pears (all other varieties: **Bosc**, **Comice**, **Concorde**, **D'Anjou**, etc.). Most European pears grown in the US are stored and marketed over 6 to 8 months or longer. As a general rule, European pears require a pre-cooling stage followed by exposure to room temperature. However, as not all pears are marketed during the harvest season, they can continue to be held in cold storage until a suitable marketing opportunity arises. The D'Anjou pear produces very little ethylene, and is very sensitive to it, while Bartlett and Bosc varieties produce much higher levels of ethylene by comparison.

Reducing fruit ethylene production may reduce the incidence of premature ripening of pears on the tree, enhance storage life, and slow the rate of ripening of European pears. ReTain has been used successfully in European pears to delay maturity, help maintain firmness and quality, reduce premature fruit abscission, and indirectly increase fruit size by delaying harvest (by about 7 days) of slower-maturing fruit – particularly on varieties such as Bartlett and Bosc. By delaying harvest, ReTain also provide flexibility for scheduling of labor, fruit processing and packaging, cold storage, and marketing.

RETAIN RATE/TIMING

US Eastern

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre). Best timing on **Bartlett**, **Clapps**, **Starkrimson**, and **Comice** is about 7-10 days before harvest. If stop-drop on **Bartlett** is the primary goal, then an earlier timing works better – 14-20 days before normal harvest.

For **Bosc**, the best timing is 14-16 days before normal harvest.

SPLIT APPLICATION PROGRAM FOR EXTENDED HARVEST: First application at 21-28 days before harvest followed by a second application at 7-14 days before harvest. Up to 1 pouch of ReTain (333 g/acre) may be used in each application (total 2 pouches – 666 g/acre); however, 1 pouch per acre is generally recommended in the Eastern US.

RECOMMENDED ADJUVANT (ALL PROGRAMS AND REGIONS):
Horticultural mineral oil at 0.25-0.5% v/v (32-64 fl. oz/100 gal) instead of organosilicone.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

HARVEST & QUALITY MANAGEMENT: Pear

RETAIN RATE/TIMING

US Western*

Bartlett, Bosc, Starkrimson, Clapps, Comice

PROGRAM FOR HARVEST MANAGEMENT: ReTain 1 pouch per acre (333 g/acre) in 100 to 150 gallons of water per acre (GPA) at 7 to 10 days before harvest (at 20 to 21 pounds fruit firmness)

- 150 GPA is satisfactory if needed to penetrate dense waterspout growth on big trees, but don't dilute the ReTain any weaker than 1 pouch (333 g) per 150 gallons.
- NAA (such as K-Salt® Fruit Fix® 800**) can be added; however, a better option than adding NAA is to increase the rate of ReTain to 1½-2 pouches per acre (500-666 g/acre).

Bosc: Best timing is 14 to 16 days before harvest.

Starkrimson: Best timing is 7 days before harvest; harvest at 14-16 pounds fruit firmness.

PROGRAM FOR STOP DROP ONLY: ReTain 1 pouch (333 g/acre) applied at 14 days before harvest.

PROGRAM TO REDUCE DISORDERS ONLY: ReTain 1 pouch (333 g/acre) applied at 7 days before harvest. Cladosporium rot in storage may be reduced by tank-mixes of NAA + ReTain.

PROGRAM FOR FRUIT SIZING ONLY: If **Bartlett** sizing is an issue, the 2 pouch rate (666 g/acre) would be beneficial in allowing the fruit to hang even longer to gain additional size.

Two possible programs:

- 2 pouches per acre applied as a single application 2-3 weeks before harvest or
- Split application of 1 pouch per acre applied at 2-3 weeks before harvest, followed by an additional 1 pouch per acre applied 1 week later. Risk: Reward equals larger Bartletts, but if nights turn cooler, an increase of pink end might occur.

(continued on next page)

RECOMMENDED ADJUVANT (ALL PROGRAMS AND REGIONS):
Horticultural mineral oil at 0.25-0.5% v/v (32-64 fl. oz/100 gal) instead of organosilicone.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

HARVEST & QUALITY MANAGEMENT: Pear continued

RETAIN RATE/TIMING

US Western*

D'Anjou

PROGRAM FOR STORAGE CONDITIONS:

Increased maturity equals increased susceptibility to scald, especially in hot years.

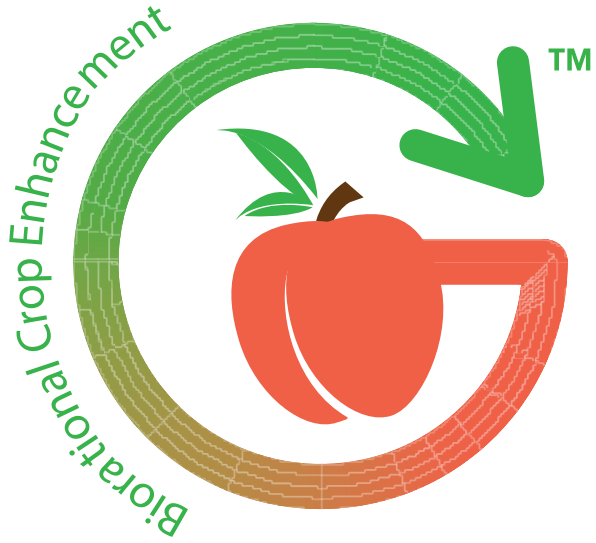
ReTain 1 pouch (333 g/acre) applied at 1 week before harvest. Applications at 3 days have shown better efficacy; however, the label does not currently allow this timing.

**In California, ReTain is sold under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder," and use is only labeled for 1 pouch per acre and single (not split) applications applied at 7-16 days before harvest.*

***The brand K-Salt® Fruit Fix® 800 is not registered in California. Consult your local Valent representative for a recommended NAA brand.*

RECOMMENDED ADJUVANT (ALL PROGRAMS AND REGIONS):
Horticultural mineral oil at 0.25-0.5% v/v (32-64 fl. oz/100 gal) instead of organosilicone.

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*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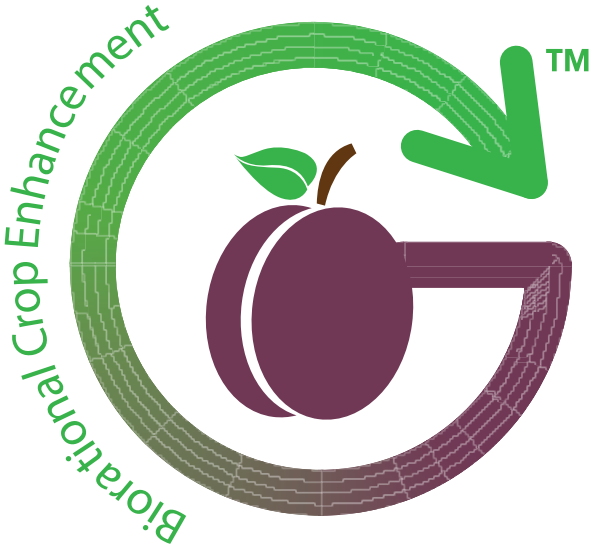
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FRUIT SET INCREASE

CROPS

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

FRUIT SET INCREASE: Apple

IN GENERAL, MOST APPLE VARIETIES SET MORE FRUIT THAN IS DESIRABLE. However, there could be certain conditions under which increasing fruit set translates into improved quality and profitability.

During bloom, apple flowers produce ethylene. High levels of ethylene during bloom will speed up flower aging and shorten the window for pollination. Depending on the situation, this could negatively affect fertilization and fruit set. Growers use ReTain to slow that process by shutting down ethylene production and consequently extending the life of blossoms. This allows more time for successful pollination and better fruit set. Under some conditions, ReTain applications may also help keep the abscission zone inactive, thereby preventing flower and fruitlet drop.

ReTain can provide fruit set benefits for:

- Apple varieties prone to poor fruit set, even with good return bloom: Minneiska, MAIA-1, Golden Supreme, etc.
- Poor pollination weather during bloom (rain, cold, or cold and hot temperatures and wind leading to poor bee activity) where extending flower viability and the pollination window are deemed necessary.
- Blocks, areas, or even parts of the trees where bloom is lacking and additional setting is needed. For instance, poor return bloom or winter damage where growers want to ensure flowers that are still viable set a fruit.
- Cider and processing varieties where size and return bloom are not a concern.
- Regions with poor winter conditions. If apple trees are grown where winter cold is insufficient to satisfy the variety's chilling requirement, blooming and foliation will be delayed, extended, and erratic, which may lead to low fruit set.

(continued on next page)

FRUIT SET INCREASE: Apple

RETAIN RATE/TIMING

US (except California)

STANDARD PROGRAM: ReTain up to 1 pouch per acre (333 g/acre) from pink to full bloom. Timing depends on the variety. To extend flower viability (increase stigma and ovule longevity); earlier applications are best.

Watch for flowering uniformity: The bottom part of the tree tends to bloom earlier than the top part, and fruit set usually is lower in that area. If such is the case, and increased fruit set in those lower areas is an objective, shutting off the top nozzles (leaving ⅔ of the nozzles open) may be recommended; however, delivering the same amount of product per acre is important.

Brazil

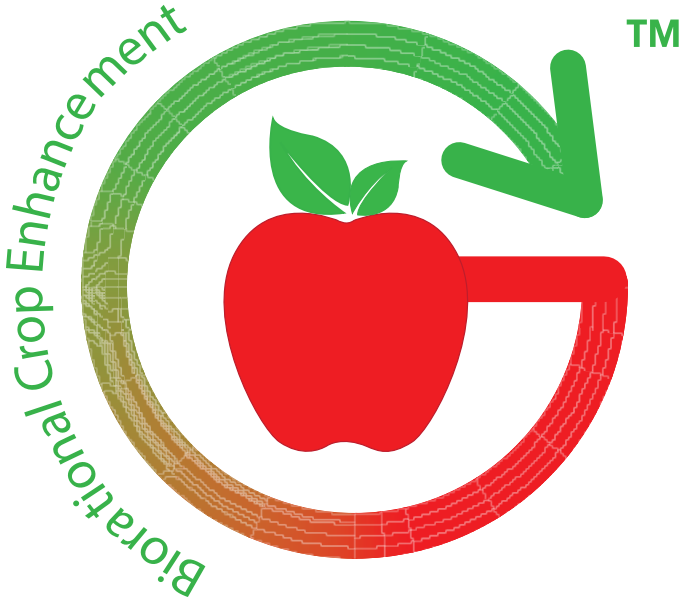
MULTIPLE APPLICATION PROGRAM:

- First application: ReTain 208-622 g per hectare applied at 60-80% open flowers (stage F2, BBCH 65);
- Second application: ReTain 208-622 g per hectare applied at beginning of petal fall (stage H, BBCH 67).

Note: Higher rates provide better efficacy and should be considered in situations where fruit set is critical.

USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*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ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

FRUIT SET INCREASE: European Pear

GROWING EUROPEAN PEARS can sometimes be challenging. Pears usually have late bearing (slow to come into production), excessive vigor, fire blight, and pear psylla issues, and some varieties may show variable yields due to the poor fruit set.

Poor fruit set in pears can be attributed either to the short ovule longevity period or to young fruitlet abscission. ReTain has proven efficacy in improving fruit set of European pear varieties (**Comice**, **Bosc**, **Bartlet**, **D'Anjou**, **Forelle**, etc.) by reducing the ethylene levels of flowers and young fruit. If applied at bloom, ReTain will extend the life of the ovules, thereby increasing the chance for fertilization. When used in a postbloom application, ReTain will reduce fruitlet abscission ("June Drop").

ReTain can be used to increase yield and profitability in:

- Varieties prone to low fruit set.
- Processing blocks where size and return bloom are not a concern.
- Old pear orchards with poor flower efficiency.
- Young trees to promote early productivity.

RETAIN RATE/TIMING

US (except California)

PROGRAM TO IMPROVE FRUIT SET: ReTain 1 pouch per acre (333 g/acre) applied from white bud stage to full bloom.

USE OF ADJUVANTS:
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

PROGRAM TO REDUCE FRUIT DROP ("JUNE DROP"): ReTain 1 pouch per acre (333 g/acre) applied at the 10 mm fruitlet diameter.

RECOMMENDED ADJUVANT
Organosilicone surfactant at 0.05 v/v (6.4 fl. oz/100 gal)

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

POLLINATION AND FRUIT SET BOTH play a dramatic role in the yield and fruit quality of cherries. Yet both are unpredictable and can vary dramatically from year to year. This combination of cruciality and variability makes proper management of pollination and fruit set a major consideration for cherry growers.

Some varieties of sweet cherry (e.g. **Kordia**, **Regina**, **Tieton**, **Bing**, and the MG-200 variety, **Orondo Ruby**®), are notoriously prone to shy bearing and routinely under-set, even with good return bloom. This has been attributed to the short life of the flower, in particular the ovule. Poor pollinating conditions (cool, wet weather, desiccating winds, and/or low bee activity) tend to exacerbate this problem. Yet in other cases, unusually high temperatures during bloom will also have a negative effect on fruit set, as bloom will occur over a very short time (flash bloom) and flowers (petals, stigma, ovules) may senesce before successful pollination/fertilization.

Extending cherry flower viability by delaying flower, ovule, and stigmatic senescence is an important use of ReTain. ReTain gives cherry growers the ability to control the pollination window, offering a better chance at fertilization, which may translate into better fruit set, higher yields, and increased profitability.

RETAIN RATE/TIMING

US (except California)

STANDARD PROGRAM: ReTain 1-2 pouches per acre (333-666 g/acre) applied as either a single application (up to 2 pouches) or as two applications at 1 pouch each during bloom.

- Applications made between popcorn stage to first bloom (~20%) are more effective than later applications.
- Effects of ReTain are rate-dependent, so higher rates or split application on cherry may improve responses.

(continued on next page)

USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

FRUIT SET INCREASE: Cherry continued

RETAIN RATE/TIMING

US California* & Canada

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre) as a single application during bloom.

- Applications made between popcorn stage to first bloom (~20%) are more effective than later applications.

**ReTain is sold in California under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder."*

Chile

STANDARD PROGRAM: ReTain 830-1245 g per hectare in 1000 L of water during flowering period.
Note: Best results are obtained when ReTain is applied during 30%-50% flowering period.

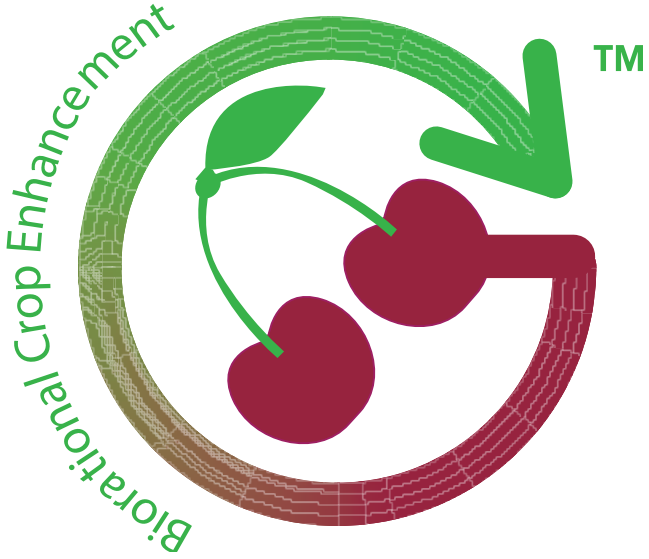
Australia & New Zealand

STANDARD PROGRAM: ReTain 830 g per hectare in 1000-1500 L of water.

Note: ReTain application timing has a direct impact on results. Applications made too early (pre-bloom) or too late (full bloom or later) will significantly reduce the efficacy of the treatment. **Application must be made between 30-60% flowering/bloom**. Do NOT apply to cherry trees after 60% flowering.

USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*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ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

FRUIT SET INCREASE: Almond

CALIFORNIA PRODUCES MORE THAN 80% OF THE WORLD'S ALMONDS, and the area devoted to this crop is growing continuously. Between 15% and 40% of flowers set a nut, with most trees falling in the 20% to 30% nut set range.

If the weather cooperates, the longer the bloom, the better chance for an individual bloom to become pollinated and the better the chance for a strong almond nut set and yield potential. ReTain extends the viability of almond bloom and improves the chances for pollination by 43%, allowing more opportunity for nut set, thus ensuring optimum crop load potential.

RETAIN RATE/TIMING

ReTain Application Timing

10% Bloom

30% Bloom

60% Bloom

90% Bloom

(continued on next page)

FRUIT SET INCREASE: Almond continued

RETAIN RATE/TIMING

US California* only

STANDARD PROGRAM: ReTain 1 pouch per acre (333 g/acre).

Timing: From 10% bloom to petal fall. Recommended timing: 30-60% bloom (see Figure X above).

Application methods: Ground (air blast sprayer) or aerial (fixed wing or helicopter).

Spray volume:
- **Ground**: Use a minimum of 100 gallons of spray per acre with a ground speed of 1-2 mph to ensure thorough coverage without excessive runoff.
- **Aerial**: Use a minimum spray volume of 15 gallons per acre.

**ReTain is sold in California under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder."*

Australia

STANDARD PROGRAM: ReTain 830 g per hectare. DO NOT apply more than once per season. Ensure adequate irrigation and nutrition throughout the growing season to treated trees so that an increased crop load can be carried.

Timing: Apply when the main almond varieties in the orchard are from 30% to 90% flower bloom, usually in August, depending on the area and variety (see Figure x above).
- Applications made too early (<20% bloom) or too late (full bloom or later) will reduce efficacy of the treatment.

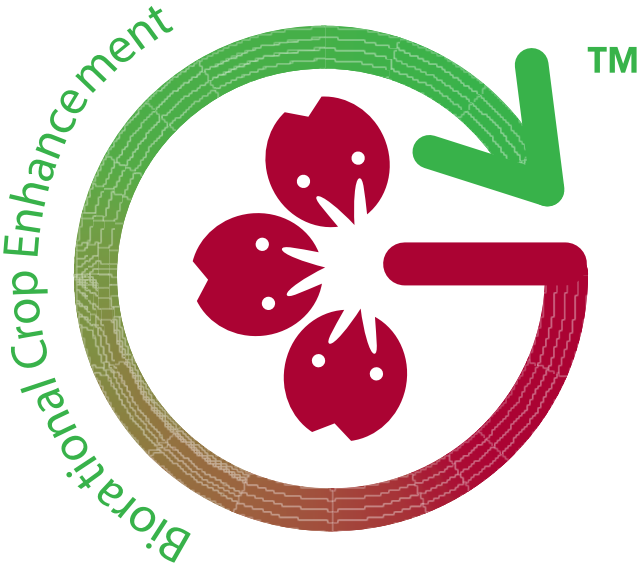
Application Method: Ground application.

Spray Volume: Use 1200 L water per hectare for mature trees 5m+ in height. Young trees (less than 4 years old) may not be able to hold an increased crop load.

***Note**: Use of ReTain has often been shown to increase the occurrence of doubles (two nut kernels per shell) in almond.*

USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*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ReTain responses may vary seasonally, across regions, and due to local weather conditions. Please consult your ReTain product specialist and use your judgment to adjust rates and timing. And of course, ***always read and follow label instructions****.*

DETAILED TECHNICAL INFORMATION FOR ALL RETAIN USES CAN BE FOUND ON PAGES 46-55

We strongly encourage growers to cross-reference these variety pages with the technical information section for best practices regarding environmental conditions, use of adjuvants, water volume, etc.

FRUIT SET INCREASE: Walnut

ONE OF THE BIGGEST PROBLEMS WALNUT GROWERS STRUGGLE WITH IS PISTILLATE FLOWER ABSCISSION OR ABORTION (PFA). Occurring during bloom, PFA is the loss of nut-producing pistillate (female) flowers due to an excessive pollen load. PFA can reduce yields in several popular varieties, including **Serr** (where PFA can reduce yields by as much as 90%), **Chandler**, **Hartley**, and **Tulare**.

ReTain is the first commercial tool available to growers to combat PFA. The use of ReTain on walnut orchards with PFA problems offers significant return on investment because it delivers reduced PFA pressure, increased fruit set, increased yield, and improved balance between nut production and tree canopy management. In fact, it may be appropriate for growers to adjust their fertilizer and nutrition programs and to prune trees appropriately in order to support the higher crop load that will result when PFA is reduced.

RETAIN RATE/TIMING

ReTain Application Timing

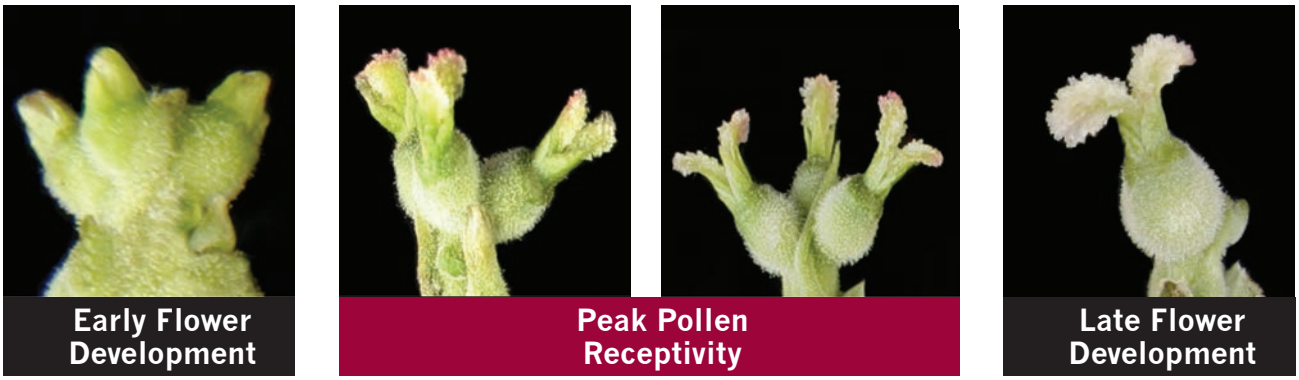

Photo source: González et al, 2008 – Chilean Journal of Agricultural Research

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USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

FRUIT SET INCREASE: Walnut

RETAIN RATE/TIMING

US

STANDARD PROGRAM: ReTain* 1-2 pouches per acre (333-666 g/acre). Higher rates or split applications will provide better efficacy.

Timing: First application at 5-30% pistillate (female flower) bloom. If a second application is required, apply when 40-60% of pistillate flowers are at peak receptivity (see ReTain Application Timing on p. 209).

Application methods: Ground or aerial application.

Spray Volume: Ground: 100-200 gallons per acre (GPA); aerial: 15 GPA minimum.

Note: Before Using ReTain for walnut, be sure the problem is PFA. Signs that point to PFA include high year-to-year yield variability, yields below county average for your variety, and PFA-sensitive variety.

**ReTain is sold in California under the brand name "ReTain® Plant Growth Regulator for California Soluble Powder."*

Chile

STANDARD PROGRAM: Apply ReTain 830-1660 g per hectare.

Timing: Focus on new shoots by looking at the open and receptive female flower. (5-10% in these first growing shoots).

Application method: Ground Application.

Spray volume: Apply in 1000-2000 L water/hectare.

Note: When trees require more wetting, higher water volumes may be applied; however, higher rates should be considered. For instance, in 1500 L/ha, use 1245 g per hectare.

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USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

***Always read and follow label instructions**. For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

FRUIT SET INCREASE:

Walnut

continued

RETAIN RATE/TIMING

Australia

STANDARD PROGRAM: Apply ReTain 83 grams per 100 liters in 1000-1500 L/ha. Do not apply more than once per season.

Timing: Apply at onset of pistillate flower bloom (5-30% pistillate flower receptivity), around late September to early October, depending on the area and variety (see ReTain Application Timing on p. 209).

Note: Applications made too early (pre-bloom) or too late (full bloom or later) will significantly reduce efficacy of the treatment.

Application Method: Ground application.

Spray Volume: Apply in 1000-1500 L water/hectare, using high-volume spraying equipment.

USE OF ADJUVANTS (ALL REGIONS):
Use of adjuvants with ReTain for bloom applications is **NOT recommended**. Some adjuvants will cause a bloom thinning effect and will reduce the benefits of ReTain.

Always read and follow label instructions. *For conversion from/to metric or imperial systems, see page 2. For in-depth technical information on use of ReTain, see pages 46-55.*

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