Increased Yields and Return on Investment (ROI)

Some representative field trials demonstrating yield enhancement with DiTera® Biological Nematicide:

### Grapes

**Cabernet Sauvignon wine grapes, Clos du Bois, Geyserville, CA**

- **ROI**
  - Yearly DiTera® cost: $300/Ac.
  - Additional revenue generated: $1,000/Ac.
  - DiTera® ROI: 3:1

  Four applications made on 11/13, 4/14, 10/11, 4/15

### Tomatoes

**Tomato, FL**

- **ROI**
  - Yearly DiTera® cost: $300/Ac.
  - Additional revenue generated: $2,400/Ac.
  - DiTera® ROI: 8:1

  Drip applied four weeks post plant.

### Kiwi

**Fruit/Vine, Kiwi Kingsberg, CA**

- **ROI**
  - Yearly DiTera® cost: $150/Ac. (3 x 3.0 lb)
  - Additional revenue generated: $3,000/Ac.
  - DiTera® ROI: 20:1

  Harvested: 10/10

### Almonds

**Tree Nuts, Almonds Caruthers, CA**

- **ROI**
  - Yearly DiTera® cost: $300/Ac.
  - Additional revenue generated: $2,300/Ac.
  - DiTera® ROI: 7:1

  Harvested: 8/16 8/23
Plant Health Effects

DiTera® Biological Nematicide provides significant plant health effects leading to more vigorous and higher yielding crops.

- Increases plant shoot and root weights
- Reduces damaging effects of nematodes to root systems
  - Roots are more efficient, providing greater plant vigor
  - Enhances nutrient uptake
- Enhances plant foliage, visual greening effect

Healthier roots, better yields

Root systems from pepper plants treated with DiTera® (left) and a standard nematicide (right). The DiTera® treated plots boosted yield nearly 1000 crates/ha over that of the grower standard.

Healthier, lusher plants

This illustrates the plant benefits of DiTera® on okra.
Product Description

DiTera® is:

- Derived from the fermentation solids and solubles of the naturally occurring fungus *Myrothecium verrucaria*
- Formulated as a dry flowable (DF)
  - Low dust
  - Easy suspension
- Packaged in 10-pound (5 kg) bags
- Bioassayed for nematode activity before packaging
- Compatible with most chemical inputs
- Applied via drip irrigation
- Applied in-season with **positive** plant root health and growth effects
- Proprietary to Valent BioSciences Corporation
Nematicide Mode of Action

DiTera® has laboratory-demonstrated, scientifically-validated physiological effects on pest nematodes, resulting in excellent plant protection:

- Kills adult and juvenile plant-parasitic nematodes on contact by affecting the nematode nervous system
- Causes nematode muscular paralysis that permanently inhibits feeding and locomotion
- Disrupts sensory organs causing disorientation of juvenile nematodes preventing them from locating and feeding on plant roots
- Prevents development of eggs of some species, reducing the nematode population of subsequent generations

Vigorous and healthy growing plant roots are an excellent food source for nematodes. If left unchecked, nematode populations will rapidly increase.

- DiTera® suppresses nematode populations compared to untreated controls under vigorous plant growth conditions.
- Due to an increased amount of healthy roots in DiTera®-treated plants, typical soil counts for nematodes may not show a population decrease.
  ◊ However, more efficient (less galled) plant roots providing improved plant health will reliably occur using DiTera®.

Soil nematode populations naturally change dramatically due to:

- Soil moisture and temperature
- Amount of new plant root growth
- Amount and source of irrigation water
- Nematode movement about the localized soil profiles
DiTera® inhibits nematode feeding through paralysis of the feeding stylet.

<table>
<thead>
<tr>
<th>Treatment (Exposure Time)</th>
<th>1.0 Minutes (thrusts/minute)</th>
<th>3.0 Minutes (thrusts/minute)</th>
<th>5.0 Minutes (thrusts/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>39.0</td>
<td>40.8</td>
<td>36.6</td>
</tr>
<tr>
<td>1% DiTera® (1.0 h)</td>
<td>13.0</td>
<td>21.6</td>
<td>14.0</td>
</tr>
</tbody>
</table>

DiTera® Biological Nematicide inhibits feeding by incapacitating the nematode stylet. The lower the number of stylet thrusts, the less the feeding capability. The stylet is used to penetrate plant roots causing plant damage.

**DiTera® inhibits nematode movement.**

DiTera® inhibits the ability of nematodes to locate roots.

Nematodes locate roots through responding to root chemical exudates. DiTera® disrupts this ability as this electrophysiological study on *Globodera* shows:

<table>
<thead>
<tr>
<th>Test Fraction</th>
<th>Electrophysiological response to potato exudates (spikes/sec.)</th>
<th>% reduction in physiological response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.75</td>
<td>–</td>
</tr>
<tr>
<td>DiTera® (1%)</td>
<td>0.09</td>
<td>88%</td>
</tr>
</tbody>
</table>

Lower recovery means lower nematode movement and decreased capacity to move to roots.
Spectrum of Activity

Meloidogyne spp. (root knot nematodes)

Heterodera spp. (cyst nematode)

Globodera spp. (cyst nematode)

Pratylenchus spp. (lesion nematodes)

Tylenchulus semipenetrans (citrus nematode)

Longidorus spp. (needle nematodes)

Paratylenchus spp. (pin nematodes)

Rotylenchulus spp. (reniform nematodes)

Xiphinema spp. (dagger nematodes)

Belonolaimus spp. (sting nematodes)

Criconemoides spp. (ring nematodes)

Criconemella spp. (ring nematodes)

Tylenchorhynchus spp. (stunt nematodes)

Hoplolaimus spp. (lance nematodes)

Rotylenchus spp. (spiral nematodes)

Heliocotylenchus spp. (spiral nematodes)

Radopholus spp. (burrowing nematodes)
Soil Enhancement Effects

DiTera® stimulates growth of the beneficial organisms in the root rhizosphere increasing root health and plant nutrient availability.

DiTera® also enhances water holding capacity. This laboratory study shows that addition of DiTera® at 0.5 g/pot increased the water holding capacity by 40%. The surfactant Tween™ 20 had no effect.

<table>
<thead>
<tr>
<th>TRT</th>
<th>Weight (g)/Pot (Before Watering)</th>
<th>Weight (g)/Pot (After Watering)</th>
<th>Weight of Not Drained Water in Pot (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>156.7</td>
<td>177.2</td>
<td>20.8</td>
</tr>
<tr>
<td>Tween™ 20 at 0.05%</td>
<td>158.5</td>
<td>178.7</td>
<td>21.8</td>
</tr>
<tr>
<td>DiTera® at 0.5g/Pot</td>
<td>158.8</td>
<td>188</td>
<td>29.2</td>
</tr>
</tbody>
</table>
Leafy Vegetables and Cole crops

Cucumber
Melon
Squash
Eggplant
Pepper
Tomato
Celery
Head and leaf lettuce
Spinach
Broccoli
Cabbage

Ornamentals, Transplants

Ferns
Hosta
Bedding plants
Tulips
Tobacco for transplant

Turf

Spices

Ginseng
Basil
Black pepper
Chive
Celery seed
Dill seed

Labeled Crops

Perennial Nut and Fruit Crops

Citrus (orange, lemon, grapefruit)
Tree nuts (almond, pecan, walnut)
Kiwi
Pome Fruit (apple, pear)
Stone Fruit (peach, plum, prune)
Avocado
Pomegranate

Berries

Blackberry
Raspberry
Blueberry

Grape (table and wine)

Field Crops

Cotton
Soybean
Sugarcane
Peanut
Tobacco

Tropical perennial crops

Banana
Cacao bean
Mango
Globe papaya
Pawpaw
Persimmon
Plantain
Best Rates and Practices

Annuals
Number of applications: 4
Interval: 10-15 days
Application Rate: see drip irrigation application chart
Timing: Start at plant or first irrigation and continue through 1/2 to 2/3 of crop cycle

Perennials
Number of applications: 3
Interval: 10-15 days
Application Rate: see drip irrigation application chart
Timing: Two applications in spring at time of main root flush. One application in fall.

Notes:
DiTera® should be applied through drip irrigation. Sufficient water needs to be used to move the product into the root zone and maintain it there. Optimal activity can be expected when the soil is near moisture capacity and at the end of the irrigation cycle.

Multiple in-season DiTera® applications are encouraged to gain maximum plant health benefits while suppressing nematodes.

Drip Irrigation Application Chart

<table>
<thead>
<tr>
<th>Band Width Inches</th>
<th>Pounds of DiTera® per 1,000 Feet of Row (= 15 lb/Ac. Broadcast)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>0.36</td>
</tr>
<tr>
<td>18</td>
<td>0.54</td>
</tr>
<tr>
<td>24</td>
<td>0.73</td>
</tr>
<tr>
<td>30</td>
<td>0.91</td>
</tr>
<tr>
<td>36</td>
<td>1.08</td>
</tr>
<tr>
<td>48</td>
<td>1.45</td>
</tr>
<tr>
<td>60</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Drip Irrigation
Drip irrigation is an optimal DiTera® application method. This method releases DiTera® at a constant rate directly to the plant base keeping the active material around the root mass where it can enhance root health and suppress nematode populations.
**Resistance Management**

Nematode populations may be as high as thousands of individuals per 2 ounces of soil. Female nematodes are highly productive egg layers and some do not require mating, as in the case of the female root knot nematode, which can lay 200-500 eggs during her life. These high populations and rapid development can lead to nematicide resistance.

- Contaminated irrigation water can be an ongoing source of resistant nematode populations.
- Most of the major nematicides belong to one of two classes of neurotoxin chemistry: organophosphates or carbamates.
  - This includes heavily used products like Mocap®, Nemacur®, Rugby®, Furadan®, Vydate® and Temik®.
- DiTera® has several different modes of action and will work against nematode populations that have demonstrated resistance or reduced susceptibility to standard nematicidal products.
  - DiTera® is easy to incorporate into your existing program.

![Globodera restochiensis spp.](Ulrich Zunke, University of Hamburg, Bugwood.org)

![Radopholus similis spp.](Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services, Bugwood.org)

![Globodera restochiensis spp.](Ulrich Zunke, University of Hamburg, Bugwood.org)
Safety Profile

**DiTera® advantages**

- Minimum re-entry interval of only 4 hours
- Non-restricted usage means more flexibility than other nematicides
- Highly specific for pest nematodes; only affects plant-parasitic nematodes, not beneficial nematodes
- Low toxicology profile, Category IV
- No preharvest interval allowing you to use it up to time of harvest
- Excellent environmental profile: low toxicity for birds, fish, insects, earthworms
- DiTera® can be used around schools, waterways, public buildings, etc.
- Organic registration

**DiTera® safety characteristics compared to nematicidal standards:**

<table>
<thead>
<tr>
<th>Product</th>
<th>REI hours</th>
<th>PHI days</th>
<th>LD50 - Oral Rat (mg/kg)</th>
<th>Label Signal Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>DiTera®</td>
<td>4</td>
<td>0</td>
<td>&gt;5000</td>
<td>Caution</td>
</tr>
<tr>
<td>Nemacur® 3</td>
<td>48</td>
<td>72</td>
<td>10</td>
<td>Danger</td>
</tr>
<tr>
<td>Furadan®</td>
<td>48</td>
<td>14</td>
<td>11</td>
<td>Danger</td>
</tr>
<tr>
<td>Vydate®</td>
<td>48</td>
<td>14</td>
<td>9</td>
<td>Danger</td>
</tr>
<tr>
<td>Mocap® 20G</td>
<td>48-72</td>
<td>90</td>
<td>61</td>
<td>Danger</td>
</tr>
<tr>
<td>Temik® 15G</td>
<td>48</td>
<td>90</td>
<td>1</td>
<td>Danger</td>
</tr>
<tr>
<td>Telone® II</td>
<td>120</td>
<td>120</td>
<td>1</td>
<td>Danger</td>
</tr>
</tbody>
</table>

DiTera® provides you with a safe and effective alternative to the highly toxic nematicides currently on the market. DiTera® offers scientifically-proven, broad-spectrum nematode control and unique plant-health benefits resulting in vigorous, high yielding crops and an excellent return on your investment.
Benefits Summary

• Outstanding grower return on investment

• Provides significant plant health benefits resulting in higher yield
  — Increased root vigor
  — Increased shoot vigor
  — Enhanced foliage color
  — Enhanced nutrient uptake by roots

• Broad-range nematicide with activity against numerous species including root knot and cyst nematodes

• Multiple modes of action for enhanced efficacy and nematicide resistance management
  — Nematode muscular paralysis inhibiting feeding and movement
  — Block of sensory organs preventing location and feeding on plant roots
  — Inhibition of egg development

• Soil Enhancement
  — Increases beneficial microbe populations
  — Improves soil water-holding capacities

• Harvest and application flexibility
  — Excellent worker safety profile
  — Excellent environmental profile
  — No use restrictions: in-season applications allowed
  — No residue issues giving harvest management flexibility
  — Can be used alone or part of a season-long nematicide-treatment program

• Resistance management
  — Alternative mode of action to commercial nematicides
  — Use as rotation partner with standard nematicides
  — Excellent tool for control of nematode populations suspected to be resistant to standard nematicides

• OMRI listed and USDA National Organic Program certified
VBC – WHO WE ARE

Valent BioSciences Corporation, an agricultural science and technology company, brings the power of biotechnology and biorational products to solve problems and to create value for our customers around the world. These products include environmentally compatible bioinsecticides, microbials and plant growth regulators that are naturally occurring or chemically derived and are used in a manner that is sustainable for both the environment and the industry. Our customers and industry peers consider our technology assessment, formulation expertise, development experience, product quality and market positioning as “best-in-class”.

CREATING VALUE THROUGH TECHNOLOGY AND PEOPLE™