

Foray[®] Aqueous Formulations: Technical Information

section 2



2.1 GENERAL DESCRIPTION

Foray products are water-based aqueous suspensions of Btk insecticide designed specifically for forestry and arboricultural applications. These formulations can be sprayed undiluted or (if required) diluted with water. Foray disperses readily into water to form a free-flowing spray suitable for conventional or low volume aerial applications. Foray formulations do not contain formaldehyde, benzene, xylene or other solvents of toxicological concern. Government regulatory agencies worldwide have expressed no concerns of a toxicological nature about Foray. These products are not classified as hazardous materials and are not regulated under DOT (US Department of Transportation or equivalent) hazardous materials regulations (49 CFR 100-199).

When applied undiluted or when tank-mixed with water, Foray suspensions are slightly acidic yet are not corrosive to metal fittings normally encountered on pesticide mixing and application equipment.

Foray is mildly acidic to help ensure product storage stability and microbial purity, and to optimize its efficacy. The different formulations of Foray exhibit the following characteristics:

Physical Properties of Foray 48B, Foray XG

Appearance: Light brown-colored liquid

Potency: 10,600 IU/mg or 48 CLU¹/gal (12.7 CLU/L)

Specific Gravity: 1.14 +/- 0.05 g/mL

Weight: 9.51 +/- 0.42 lb/gal (1.14 +/- 0.05 kg/L)

pH: 4.7 +/- 1.5

Dispersibility: Disperses readily into water

Viscosity: @ 25°C –250-550 cP²

Physical Properties of Foray 76B

Appearance: Light brown-colored liquid

Potency: 16,700 IU/mg or 76 CLU¹/gal (20 CLU¹/L)

Specific Gravity: 1.14 +/- 0.05

Weight: 9.51 +/- 0.42 lb/gal (1.14 +/- 0.05 kg/L)

pH: 4.7 +/- 1.5

Dispersibility: Disperses readily into water

Viscosity: @ 25°C 400-550 cP²

¹ CLU = Cabbage Looper Units

² cP = centipoise

2.2 COMPATIBILITY STATEMENTS

Foray is a fully formulated product with ample, built-in surfactants that ensure wetting and adhesion to forest foliage.

APPLICATION TIP: Never Add Spray Sticker to Undiluted Foray.

As a general rule, Valent BioSciences does not recommend the use of a sticker except when applying extremely diluted applications for arboricultural purposes. If adding an anti-evaporant or a sticker, please check with the manufacturer on the compatibility of those products with Foray.

Never mix undiluted Foray with molasses or any thickening agents and/or evaporation retardants as an excessively viscous spray mix may result.

Do not tank mix Foray with other insecticides, miticides, fungicides, spray oils, foliar nutrients, or herbicides unless the physical compatibility and safety of the tank mixture to plants has been thoroughly evaluated by standard methods.

2.3 HANDLING UNDILUTED AND DILUTED AQUEOUS FORAY

Undiluted Applications

Foray is formulated to be applied as an undiluted ULV spray, but it can be mixed with water for higher volume applications. Undiluted applications increase payload efficiency, reduce application costs, and help ensure that every droplet contains a toxic dose of Btk. The only precaution recommended for handling undiluted Foray is to thoroughly flush all tanks, pumps, hoses, meters

and aircraft systems with clean water, followed by complete draining, before the addition of undiluted Foray. Always clean inline strainers and inspect for holes or gaps. Use strainers between 20 and 30 size mesh. A 30 mesh or slotted strainer is a good general recommendation. For nozzle strainers, follow the equipment manufacturer's recommendations. See section 4 for a detailed description of spray system screens and nozzles.

Foray is specifically formulated with the optimal amount of suspending agents that provides minimal settling of solids during storage and transport. However, it is recommended that the product be thoroughly recirculated immediately prior to use.



Performance

Undiluted Foray applications are generally superior due to increased payload efficiency, reduced application costs, and optimal dose rate.



Photo Courtesy of ENVIROFOTO / SOPFIM

i APPLICATION TIP: During spray operations and ferrying, do not maintain continuous agitation of Foray with bypass flow as this may incorporate air into the formulation thereby ‘whipping’ and thickening the formulation, which affects handling and flowrates.

Diluted Applications

Foray is completely miscible with water and can be mixed in any ratio with water to obtain desired spray volumes. The preferred mixing sequence is to add Foray to water; however, the reverse can also be done. All mixing and transfer equipment should be clean prior to the mixing of Foray. Always clean inline strainers and inspect for holes or gaps. Drums should be stirred, agitated, or rolled prior to dispensing. Water to be used in mixing should be clean and filtered to remove any coarse suspended matter. Water hardness levels should not exceed 340 ppm, and the pH of final mixture should be below 7.0.

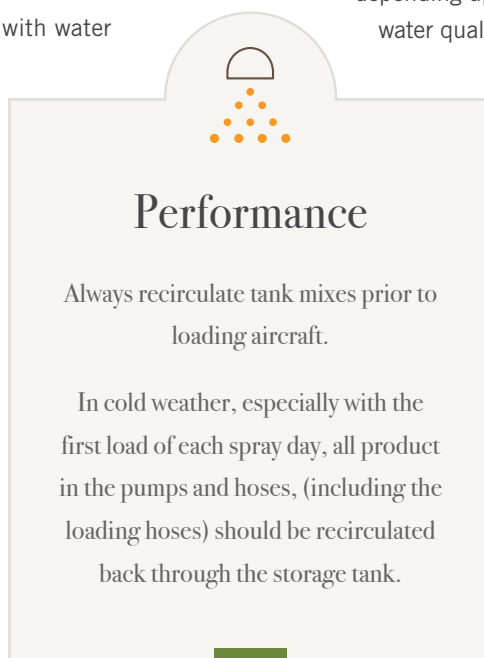
Use strainers between 20 and 50 size mesh. A 30 mesh or slotted strainer is a good general recommendation. For nozzle strainers, follow the manufacturer’s recommendations.

Mixing Procedure

1. Fill the mix tank or aircraft hopper with the necessary volume of water. Start hydraulic or mechanical agitation.
2. If a sticker is being used, add to the water.

3. Add Foray gradually to agitating water.
4. Rinse empty containers and bulk tanks previously holding Foray and use this rinse water for any subsequent mixing.

It is recommended that Foray tank mixes be used immediately. However, in the event of application delays, Foray tank mixtures are stable for 72 hours, depending upon storage temperatures and water quality. **Always recirculate tank mixes prior to loading aircraft.**



Aircraft Loading

In cold weather, especially with the first load of each spray day, all product in the pumps and hoses, (including the loading hoses) should be recirculated back through the storage tank. This will ensure that all pumps, meters, valves and filters are operating properly. In addition, the product in the first load will be of a temperature and viscosity consistent with normal operations.

2.4 CLEANING TRANSFER, MIXING AND SPRAY EQUIPMENT

Periodically, during the spray operation, it is recommended to rinse off any Foray residues which may be on the atomizers or the aircraft.

At the conclusion of the spray program, equipment should be cleaned according to the following recommendations:

- Remove inline screens, nozzle screens and nozzles, and clean these in a detergent/water

solution. If so equipped, Micronair® variable restrictor units (VRU) should be set at #13 or pulled out to the “full open” position.

- Filling the holding mix tank or the aircraft hopper with clean water, followed by agitation and spraying out, is usually sufficient to clean Foray residues from the system. Optionally, a detergent solution can be used, followed by a clean water rinse.

2.5 PUMP SEALS

Many centrifugal pumps used in aerial application programs are fitted with inexpensive carbon-ceramic mechanical seals. Some aircraft spray pumps and pesticide transfer/loading pumps equipped with these seals may have a tendency to leak when using Foray. As Foray is composed of suspended particles in a liquid medium, as with any such material, some buildup on the rotating faces of the seals may occur. **Inexpensive carbon seals should be replaced with harder faced seals** to help minimize the buildup mentioned above. This does not occur with all centrifugal pumps, but if it does, the problem may be alleviated with the substitution of tungsten carbide-silicon seals.

When buildup does occur, it has been our experience that the suspended particles can agglomerate and ‘ball up’ between the rotating and stationary seal faces, which will cause weeping of the seal. Over time, this weeping may increase to become a

noticeable leak. Please note that the Foray will not harm or abrade the seal faces; simply disassemble and remove the seal assembly, rinse, wipe with a dry cloth, inspect and reinstall.

Some pumps will weep from first use while other pumps will not leak at all. Just be aware that loading pumps purchased as lower-priced water pumps available at discount centers and big box stores may not be as well machined, and the seals may be of a lower quality than pumps purchased from a specialty supplier.

Many aircraft spray systems are manufactured and/or distributed by a variety of specialized manufacturers. Please check with your airframe manufacturer or any of the manufacturers shown here for replacement components:

Agrinautics® (www.agrinautics.com), Isolair (www.isolairinc.com), Simplex Aerospace (<https://www.dartaerospace.com/en/>) and/or Transland® (www.translandllc.com).

There are also several manufacturers and numerous distributors for original equipment and/or replacement seals (manufacturers of mechanical pump seals are included in the references section), and technical advice. These manufacturers usually

have international distribution.

Ordering new or replacement seals should be done well in advance of the operational program



Operations

Many centrifugal pumps used in aerial application programs come fitted with inexpensive carbon-ceramic mechanical seals. These should be replaced with higher performance, harder faced seals to help minimize buildup of Foray on the rotating seal face.



Photo Courtesy of U.S. Forest Service

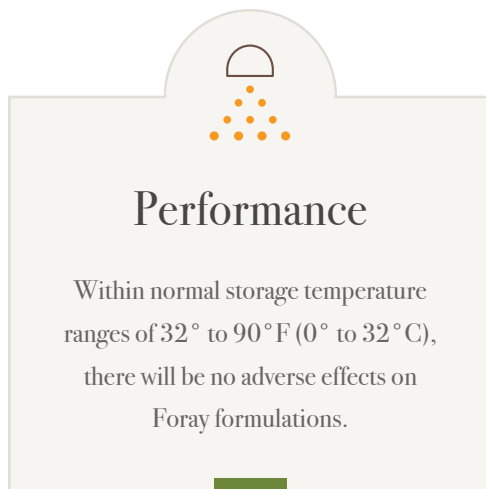
because harder-faced carbide silicone tungsten seals are not generally an inventory item.

WHEN REPLACING PUMP SEALS:

1. **ALWAYS** refer to the manufacturer's directions for mechanical shaft seal replacement.
2. **DO NOT** run pump dry.
3. **ALWAYS** prime pump before starting.
4. In the case of self-priming models, **ALWAYS** fill the pump casing prior to use.

2.6 STORAGE AND DISPOSAL

Do not store Foray in the direct sun where product temperature will exceed 90°F (32°C) for prolonged periods of time. Higher temperatures are more detrimental to the product than freezing temperatures. If exposed to freezing temperatures, the Foray formulation will partially freeze but this



will not reduce efficacy or handling characteristics if used by the “best before date.” Always ensure that the product is well mixed before application.

Consult your local Valent BioSciences representative for further information regarding your specific product storage situation.

Within normal storage temperature ranges of 32° to 90°F (0° to 32°C), there will be no adverse effects on the formulation if used by the “best before date”. Ensure that the product is agitated prior to use after exposure to low temperatures.

Re-close all unused containers. Foray is an EPA Category III pesticide; refer to the caution statement on Foray label for handling and storage.

Follow local regulations regarding container recycling and/or disposal.