



TECHNICAL INFORMATION BULLETIN

OVERVIEW

Leap® ES Bacterial Disease Management Biological Insecticide Emulsifiable Suspension is the only alternative to copper-based products that, as part of a program, manages both bacterial disease and the yield-diminishing lepidopteran (worm) pests that can increase pathogens points of entry.

Leap provides two-way protection: disease management and control of worm pests that can significantly damage crop foliage, fruit and plant health, while reducing crop quality and yield.

LEAP®

BACTERIAL DISEASE MANAGEMENT
BIOLOGICAL INSECTICIDE



Bacterial leaf spot disease of tomato caused by *Xanthomonas* spp.

DISEASE PROTECTION

Disease Activity	<i>Xanthomonas</i> spp.
	<i>Pseudomonas</i> spp.

INSECT ACTIVITY

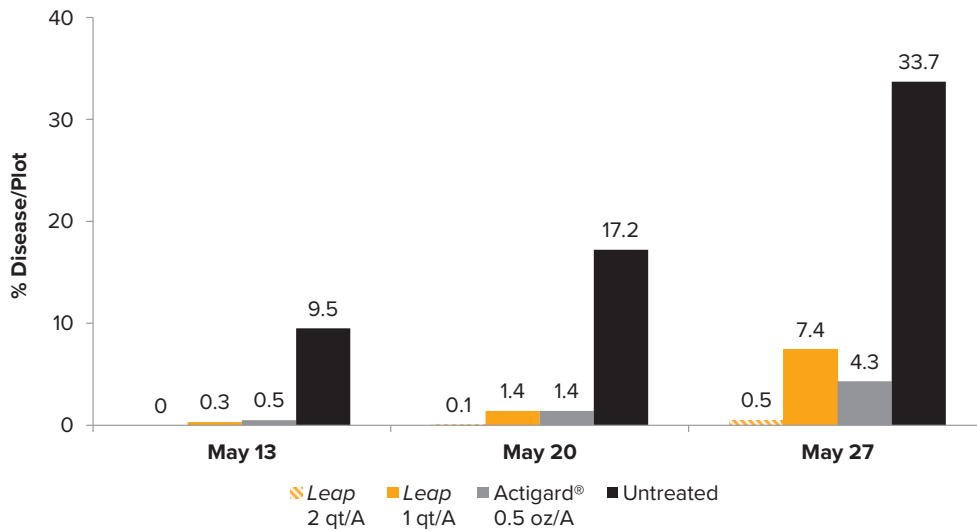
Common Name	Scientific Name	Common Name	Scientific Name
Achema Sphinx Moth (Hornworm)	<i>Eumorpha achemon</i>	Melonworm	<i>Diaphania hyalinata</i>
Armyworm	<i>Spodoptera</i> spp., e.g. <i>exigua</i> , <i>frugiperda</i> , <i>littoralis</i> , <i>Pseudaletia unipuncta</i>	Obliquebanded Leafroller	<i>Choristoneura rosaceana</i>
Cherry Fruitworm	<i>Grapholita packardii</i>	Omnivorous Leafroller	<i>Platynota stultana</i>
Corn Earworm, Cotton Bollworm, Tomato Fruitworm	<i>Helicoverpa</i> spp., e.g. <i>zea</i>	Orange Tortrix	<i>Argyrotaenia citrana</i>
Cranberry Fruitworm	<i>Acrobasis vaccinii</i>	Rindworm Complex	Various <i>Lepidoptera</i>
Cross-striped Cabbageworm	<i>Evergestis rimosalis</i>	Saltmarsh Caterpillar	<i>Estigmene acrea</i>
Cutworm	Various <i>Noctuid</i> species, e.g. <i>Agrotis ipsilon</i>	Soybean Looper	<i>Pseudoplusia includens</i>
Diamondback Moth	<i>Plutella xylostella</i>	Spanworm	<i>Ennomos subsignaria</i>
Ello Moth (Hornworm)	<i>Erinnyis ello</i>	Tent Caterpillar	Various <i>Lasiocampidae</i>
Grape Berry Moth	<i>Paralobesia viteana</i>	Tobacco Budworm	<i>Heliothis virescens</i>
Grape Leafroller	<i>Platynota stultana</i>	Tobacco Hornworm	<i>Manduca sexta</i>
Grapeleaf Skeletonizer (ground only)	<i>Harrisina americana</i>	Tobacco Moth	<i>Ephestia elutella</i>
Green Cloverworm	<i>Plathypena scabra</i>	Variiegated Cutworm	<i>Peridroma saucia</i>
Gypsy Moth	<i>Lymantria dispar</i>	Velvetbean Caterpillar	<i>Anticarsia gemmatalis</i>
Hornworm	<i>Manduca</i> spp.	Southern Cornstalk Borer	<i>Diatraea crambidoides</i>
Imported Cabbageworm	<i>Pieris rapae</i>	Sugarcane Borer	<i>Diatraea saccharalis</i>
Looper	Various <i>Noctuidae</i> , e.g. <i>Trichoplusia ni</i>		

DISEASE CONTROL—MODE OF ACTION

Leap contains methyl salicylate (MeSA), a powerful plant compound that elicits a plant's natural defense systems against pathogen infections. The presence of MeSA can trigger a whole-plant immunity response through a physiological process that helps protect the plant from pathogen spread and further infection. Normally triggered by a localized infection from diseases such as bacterial speck or spot, this defense response is started in the absence of the pathogen by treating the plant with *Leap*. Due to the unique properties of the MeSA molecule, *Leap*'s mode of action provides long-distance signaling to other leaves remote from the infection and even to other plants. This signal response results in production and accumulation of pathogenesis-related (PR) proteins that help the plant defend itself against invasion by pathogens. As such, plants should be treated in low pressure periods—before an infection starts—or early on in an infection.

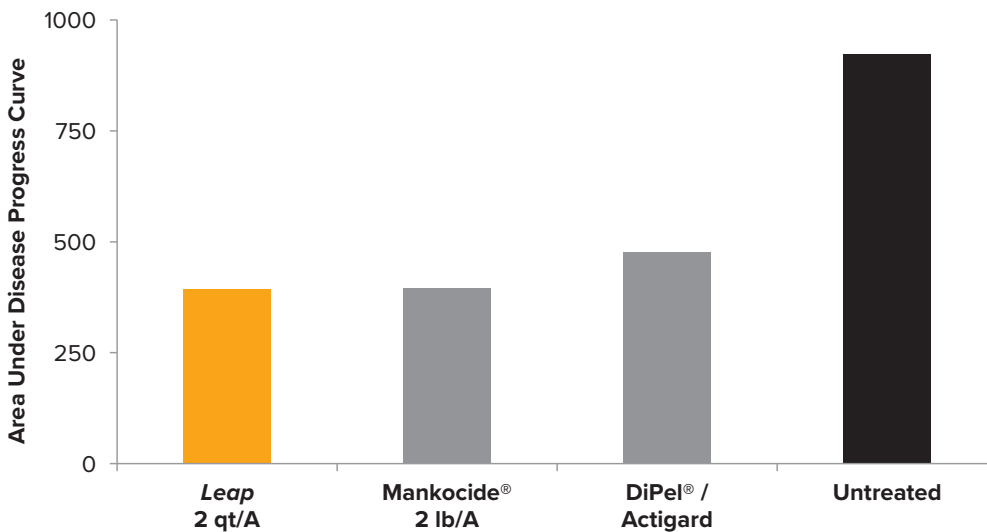
Leap is also a good resistance management tool since it has not demonstrated cross-resistance with any other fungicides/bactericides, making it ideal in rotation or as a tank mix partner with other materials. Use of *Leap* can reduce disease control costs by decreasing or delaying conventional fungicide/bactericide applications.

EFFECTIVENESS OF A ROTATIONAL PROGRAM



Leap Manages Bacterial Spot and Prevents Spreading Vertically

Leap and ManKocide® (3 lb/A) were applied on alternating weeks for 8 weeks. Actigard®, also rotated with ManKocide, was used at the 0.5 oz/A rate.



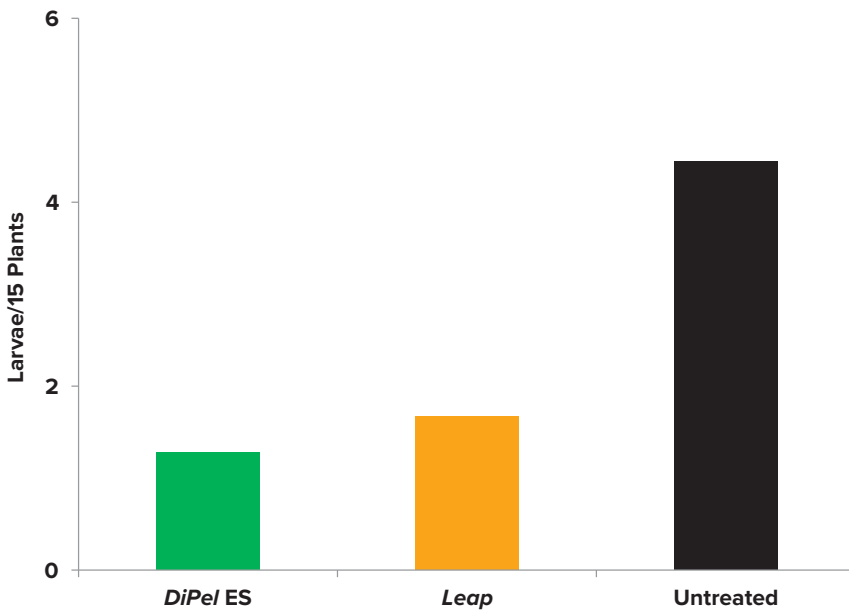
Leap Controlled Bacterial Spot and Copper-Based Products, Reducing Copper Applications by Half

Leap (or Actigard (0.5 oz/A) in a tank-mix with DiPel® Biological Insecticide) was applied on alternating weeks with ManKocide (2 lb/A) for 8 weeks. ManKocide was also used weekly as a stand-alone treatment.

INSECT CONTROL—MODE OF ACTION

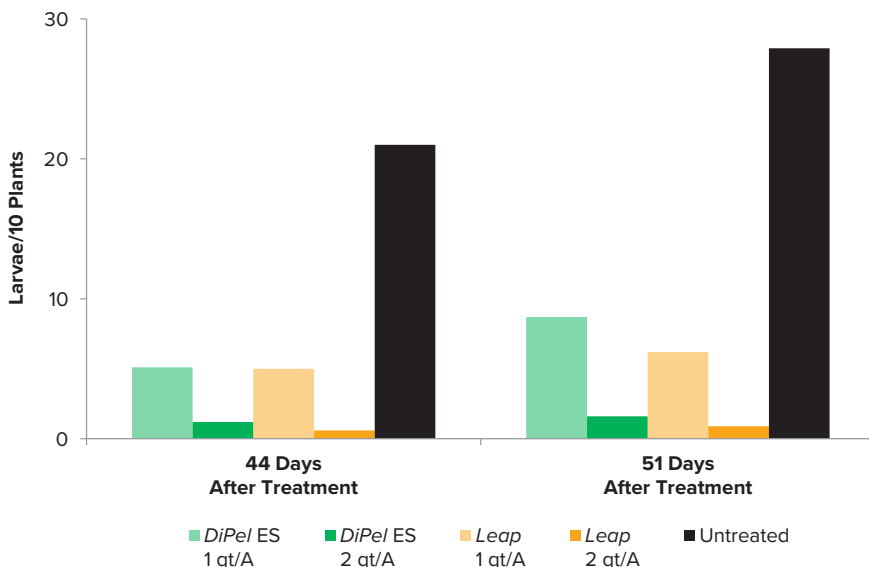
The lepidopteran larvicidal properties of *Leap* are due to the well-known biorational control agent *Bacillus thuringiensis* subsp. *kurstaki* (Btk) strain ABTS-351. *Leap* contains the same strain of Btk found in *DiPel*, the most used Bt insecticide in the world. Btk strain ABTS-351 produces Bt spores and four different insecticidal proteins (Cry toxins) that form a crystalline matrix in the Bt bacteria. When sprayed on a plant and ingested by susceptible Lepidoptera larvae, these crystals dissolve in the caterpillar stomach, releasing the Cry toxins, which bind to insect-specific receptors in the gut walls. The toxin proteins break down midgut cell walls causing a massive physiological imbalance, which results in localized cell death. Cell disruption allows viable Bt spores to invade and colonize the insect body. Minutes after consuming *Leap*, insects stop feeding and ultimately die. *Leap*'s fast-acting insecticide mode of action helps lessen disease incidence by reducing leaf damage from caterpillar feeding, thereby limiting potential entry points for pathogens.

LEAP VS. INDUSTRY STANDARD



In addition to its proven disease management, *Leap* is as effective as *DiPel ES* to control beet armyworm (*Spodoptera exigua*).

*All applications 1 qt/A Yuma, AZ.
Two applications: first at 2-leaf stage, second application at 4–5 leaf stage.



Leap is also as effective as *DiPel ES* in the control of tomato hornworm (*Manduca quinquemaculata*).

Leap and *DiPel ES** applied every other week, for a total of four applications.

*Note: 1 quart of *DiPel ES* is equivalent to 1 lb of *DiPel DF*.



SPECIFICATIONS

Description	Specification	Description	Specification
Active Ingredients	MeSA 5.9% wt/wt	Biopotency	Not less than 17,600 IU/mg
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> (Btk), strain ABTS 351	pH	4.9–6.5
Formulation	Emulsifiable Suspension (ES)	Odor	Wintergreen mint
Appearance	Oily liquid suspension	Boiling Point	212°F/100°C
Color	Tan to brown	Tank-Mix Property	Readily emulsifies in water and forms sprayable suspension
Density	0.98	Biological Activity	Plant defense inducer/insecticide

LEAP ACTIVE INGREDIENTS

Leap is a biorational pesticide containing Btk. Btk has a very specific mode of action and only kills Lepidoptera pests. Therefore, it is soft on beneficial insects such as lady bird beetles or lacewings. These beneficial insects help keep other pests such as mites and aphids in check, which means *Leap* won't flare secondary pests that may require additional insecticide treatments. Furthermore, *Leap* does not have an adverse effect on foraging bees. *Leap* also contains MeSA, which is a naturally occurring compound in many plants and is a natural flavor constituent of commonly consumed fruits and vegetables. It is used extensively in the flavor and fragrance of foods and beverages.

PROPERTIES

Rate	0.5–2 qt/A; under heavy pest or disease pressure, use higher label rates
Bacterial Management	<i>Leap</i> must be used before the disease is observed. For best results, use preventively as part of a disease control program in rotation or tank mixed with other commercial bactericides and fungicides. If disease is already present in the field, <i>Leap</i> should be tank mixed with other registered fungicides or bactericides to ensure adequate control.
Insect Management	<ul style="list-style-type: none"> • Treat when larvae are young and before economic thresholds have been exceeded • Treat only when larvae are actively feeding; must be ingested for insecticidal activity • Ensure complete coverage of foliage and fruit, including all areas where insects may be feeding, such as the underside of leaves. Use of overhead and drop nozzles may help in achieving full coverage.
General Information	<ul style="list-style-type: none"> • As crop matures, water volumes should be increased to enhance coverage and to penetrate foliage • Repeat applications to maintain disease and pest control, generally every 5–14 days (<i>Leap</i> may not be applied at an interval more frequent than every 5 days and no more than 8 quarts/A per season)
PPE	Safety glasses, long-sleeved shirt, long pants, chemical-resistant gloves, shoes plus socks. A dust/mist respirator is required for mixers/loaders and applicators.
Crops	Peppers, tomatoes
Restrictions	Non-restricted use pesticide
Residue / PHI	No residue issues / PHI: 0 days
Container Size	Convenient 2.5 gallon containers



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