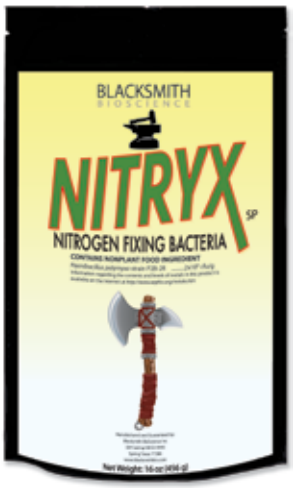
Product Catalog



BLACKSMITH
BIOSCIENCE

NITRYX SP

NITROGEN FIXING BACTERIA

Nitryx SP packaging:
4 oz sachett (12/case)
16 oz bag (12/case)
20 lb pail (4/case)

What Is It

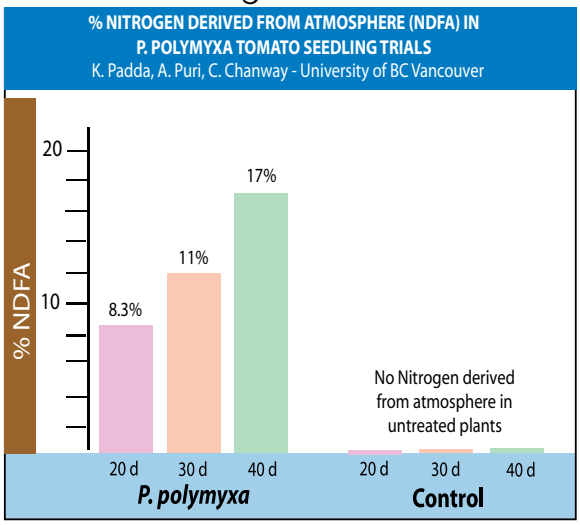
Nitryx is a high concentration of proprietary beneficial bacteria, *Paenibacillus polymyxa* strain P2B-2R, on a 100% water soluble powder. This powerful new technology effectively fixates nitrogen from the atmosphere and transfer it to the plant, thereby making fertilizer use much more efficient.

How it Works

When applied Nitryx colonizes and grows around the roots and foliage of the plant at which time it does two distinct things: 1) forms a synergetic relationship, feeding off of the plant's waste materials while secreting beneficial and plant strengthening by-products. 2) sequesters nitrogen from the atmosphere and is transfers it to the plant.

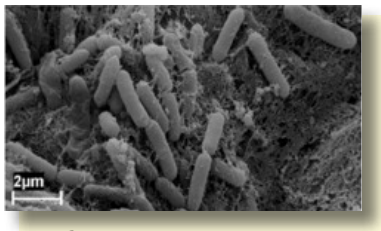
This combination of probiotic colonization and nitrogen fixation creates a vigorous, more robust plant that produces higher yields and more easliy defends itself against stressfull environmental conditions.

Tomato Nitrogen Fixation Trial



FEATURES & BENEFITS

- Fixates nitrogen
- Increases yield
- Enhances fertilizers
- Encourages root growth
- No preharvest or re-entry intervals
- Safe & Natural
- 100% water soluble



Left: Electron microscope photograph Colonization of *Paenibacillus polymyxa* and biofilm formation on roots of Arabidopsis thaliana. Adapted from Timmusk et al 2005.

Technical Information

Organism (Active Ingredient):
Paenibacillus polymyxa strain P2B-2R

General Description:
Faculative anerobic endospore forming Bacillus

Primary plant function
Nitrogen fixation, yield enhancement

Origin:
Isolated from a lodgepole pine

Metabolism
Organoheterotrophic: ferments glucose and variety of other carbohydrates

Nitrogen Reduction (to Nitrite)
Positive

Nitrogen Fixation Positive
Catalase Positive
Biofilm Positive

Temperature Tolerance:
45° -110° F

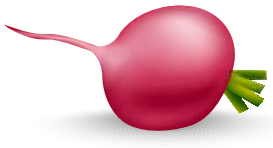
PH Tolerance
P. polymyxa can survive a pH range 4.0-10.0. The organism is active between 5.0 and 9.1 pH.

Longevity
2 years at room temperature

Chemical Compatibility
P. polymyxa is compatible with all chemical fungicides and fertilizers.

UV Sensitivity
The bacterium is not UV sensitive.

By-Products:
Fusaricidin, polymixin, xlanase, acetylmethyl



REGISTERED cdfa ORGANIC INPUT MATERIAL

OMRI LISTED
For Organic Use

ARMORY® SP

Armory packaging:
2 oz sachett (12/case)
8 oz bag (12/case)
200 oz pail (4/case)

Armory SP is a high concentration of several select beneficial plant bacteria. These powerful species of *Bacillus* and *Streptomyces* are all scientifically proven plant growth, yield and vigor promoting bacteria, each with it's own unique function that compliments the entire group and provides maximum aid to the plant.

What's Inside

Armory contains the following beneficial bacteria species:

Bacillus subtilus (4 distinct strains)
Bacillus amyloliquefaceans
Bacillus lichiniformis
Streptomyces griseus

In addition, Armory's proprietary formulation provides a ready food source to the *Bacillus* and *Streptomyces* strains, allowing them to thrive in the environment and provide the maximum potential benfits to the plant.

Directions For Use

Armory can be used as a drench, liquid feed, irrigation, spray or seed treatment. It is compatible with fungicides, insecticides, fertilizers and biological stimulants. Armory is 100% soluble and does not need constant agitation to keep it suspended in a solution. It will not clog machinery.

Soil Drench: Use 2-8 oz of Armory per acre. Apply in the greenhouse, during transplant or through precision irrigation.

Foliar Spray: Use 1-8 oz of Armory in 50-100 gallons of water per acre. Apply to all areas of foliage and plant to wet just prior to run off. Reapply every 7-14 days depending need.

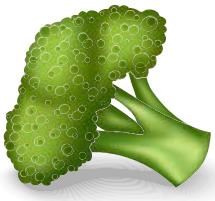
Hydroponics Systems: Use 1-4 tsp per gallon. Reapply each time nutrient solution is changed.

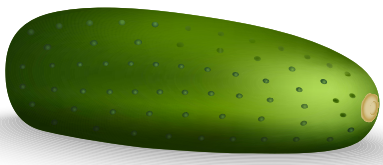
Features & Benefits

- Solubilizes phosphorus
- Makes iron and manganese more readily available
- Breaks down cellulose & lignin
- Increases nutrient cycling
- Not phytotoxic and no residue
- 100% water soluble - no clogging

For Use On:

Fruits & Fruiting Vegetables
Green Leafy Plants
Spices, Herbs & Medicinal Herbs
Tree Fruit & Nuts
Turf & Ornamentals
Cotton, Rice, Soy,
Wheat, Corn
& More





REGISTERED cdfa ORGANIC INPUT MATERIAL

OMRI LISTED
For Organic Use

MEGAPHOS™ SP

Phosphorus Solubilizing Microbe

MegaPhos SP Packaging
12.5 lb pail (4/case)
16 oz bag (12/case)
2 oz bag (12/case)

The Problem
Phosphorous is notoriuous for binding in the soil and, thus, being unavailable to plants. This in turn leads to either phosphorus deficiency or over application of phosphorus fertilizers.

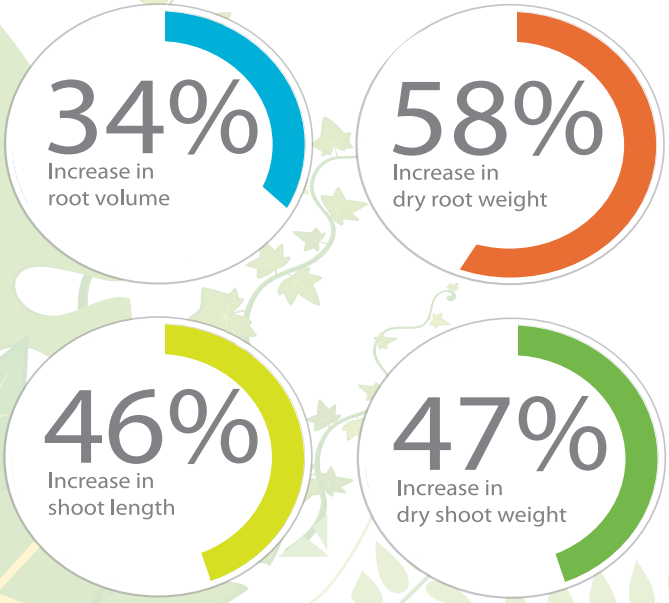
The Solution:
MegaPhos SP is a high concentration of a select bacterial strain that aids in transformation of soil phosphorus into an assumable form for plants. The active ingredient in MegaPhos SP, *Bacillus megaterium* HM87, produces enzymes and other secondary metabolites that solubilize and mineralize normally unavailable phosphorous.

Results
MegaPhos greenhouse trials (fig. 1) demonstrate its ability to release normally unavailable phosphoris to plants. As an end result, plants aslo see and increase of vigot, root growth and overall plant health.

Benefits

* Contains high concentration of a unique beneficial strain of *Bacillus*
* Solubilizes phosphorus normally unavailable to the plant
* Can help cure phosphorus deficiency
* Increases crop yield and production
* Perfect rotational or tank mix partner
* OMRI listed and CDFA organic certified

Figure 1: Glasshouse trials using MegaPhos SP



TECHNOLOGY SPECS

Active Ingredient: *Bacillus megaterium* HM87, A gram positive, rod shaped, endospore forming bacteria.

Purpose:
Solubilizes phosphorus and makes it available to plants even in high calcium soils. Produces metabolites beneficial to plant growth, yield & root production

Secondary Metabolites Produced:
Lactic acid, gluconic acid, citric acid succinic acid, propionic acid and enzymes that help solubilize the fixed phosphorus into an exchangeable form that is usable by plants. These organic acids, through their hydroxyl and carboxyl groups, chelate the cations (mainly calcium) bound to phosphate converting them into the soluble forms.

Plant Interaction:
Able to colonize the rhizosphere

Additional Benefits:

- Increases crop yield
- Creates more developed root & top growth
- Enhances plant vigor

Formulation:
Water-soluble powder

Carrier:
Proprietary blend of natural microbial enhancers to promote biofertility properties

Application:
Soil incorporation, seed treatment, soil application or foliar spray

REGISTERED cdfa ORGANIC INPUT MATERIAL

OMRI LISTED
For Organic Use

Tenet BioFungicide

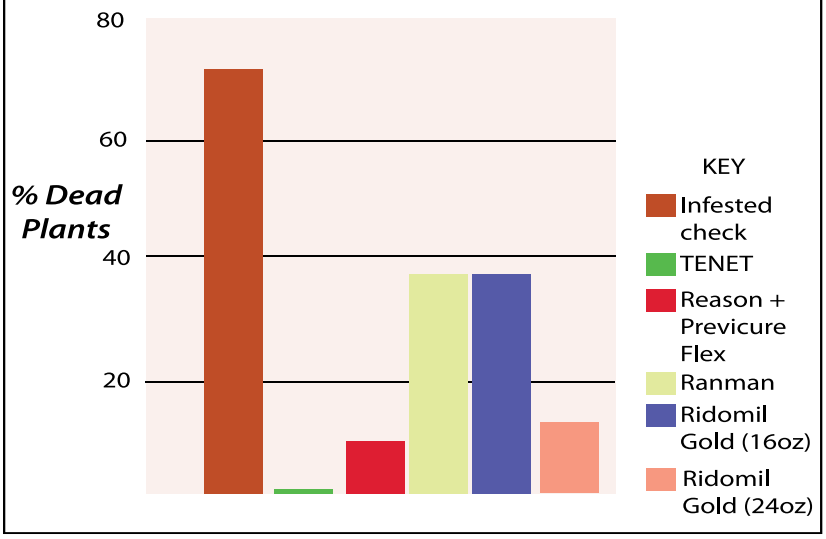
Tenet WP Packaging
1 lb bag (12/case)

New standard for soil-borne disease control.
TENET® WP is a second-generation biorational fungicide that contains two powerful species of beneficial Trichoderma fungi that effectively control or suppress soil-borne diseases. Tenet is highly effective against F*usarium spp., Phytophthora spp., Pythium spp., Rhizoctonia spp., Sclerotinia spp., Sclerotium rolfsii, Thielaviopsis basicola, Verticillium spp*., as well as *Armillaria sp* and *Rosellinia sp.*
When applied the active ingredients grow in the soil and around the plant's root system using multiple modes of action to suppress and destroy disease causing fungi.

The two unique beneficial fungi in Tenet work in complimentary temperature ranges: *T. gamsii* germinates at 44.6º F and *T. asperellum* at 53.6º F and both are most active between 75º and 86º F. With this broad range of activity, Tenet is perfect for both early season planting in cooler soil as well as late season applications.

Phytophthora capsici control on peppers

Dr. Mike Matheron (University Of Arizona)



Features & Benefits

- Effective against root rot diseases such as *Fusarium, Pythium, Phytophtora, Rhizoctonia, Sclerotinia* and other soil borne diseases
- Colonizes plants roots and lives symbiotically with the plant
- Compatible with mycorrhizal fungi, beneficial inoculants and other biologicals
- For use as a soil drench, soil spray, irrigation or in hydroponic systems
- Four (4) hour REI and Zero (0) day PHI
- Compatible with fertilizers and most fungicides
- Can be applied through conventional spray equipment and irrigation
- Can be applied through irrigation equipment and hydroponics systems

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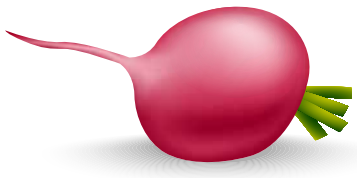
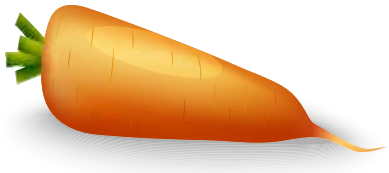




NOFLY™ WP
BIOLOGICAL INSECTICIDE

What is NoFly?

NoFly WP is a highly effective biological insecticide. It is a concentration of the active ingredient *Isaria fumosoroseus* strain FE 9901, a naturally occurring insecticidal microorganism. This aggressive fungus is a natural predator to select insect pests while non-pathogenic to beneficials. NoFly WP is also compatible with many chemicals making it an excellent tool for use in an Integrated Pest Management program. NoFly WP is effective against whiteflies, aphids, thrips, mealybugs and other insect pests.

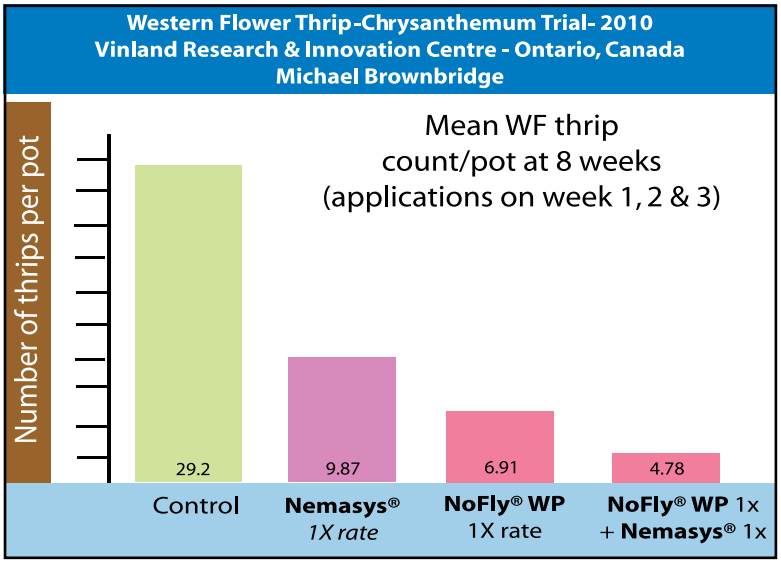
Packaging:
2 lb bag (12/case)

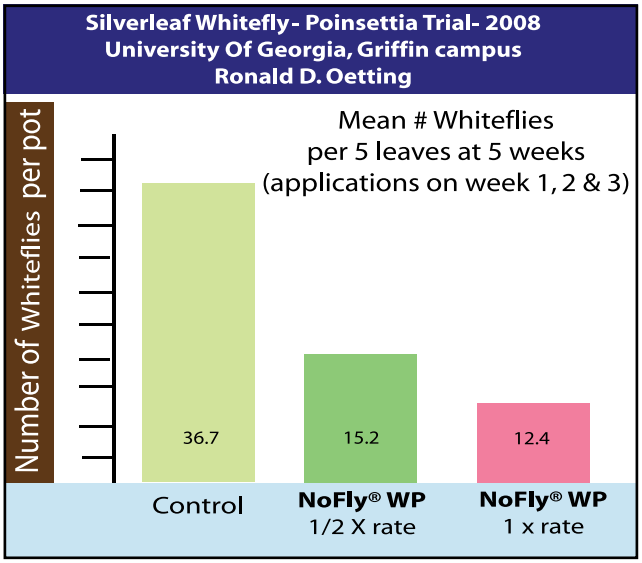
How it Works

When spores of NoFly WP come into contact with the insect pest they attach to the body and begin to grow almost immediately. Once the spore germ tube penetrates the host cuticle, fungal multiplication takes place through formation of hyphal bodies in the host hemocoel. The NoFly microbe mechanically disrupts the host's internal organs and initiates tissue necrosis. This leads to lack of feeding, inactivity and eventually death.

The end result? Insect pests sprayed with NoFly WP stop feeding in about 24 hours and are killed in about 2-5 days.

CROP	PEST	DOSES (lb/100 gal.)	APPLICATION DIRECTIONS
Greenhouse and indoor crops (food and ornamental)	Eggs and larvae of whiteflies, thrips, aphids and mealy bugs	1-2	Apply at first symptoms of pest attack. Minimum 3 applications at 5-7 day intervals or shorter in severe infestations





Directions For Use

NoFly WP consists of spores of an entomopathogenic fungus that are susceptible to high temperatures, dryness and ultraviolet radiation. Avoid these potential adverse effects by applying the product in late afternoon, in the early morning and at mid to high relative humidity (if practical, pre-watering of crop is strongly suggested). Use sufficient water to ensure thorough coverage of the foliage including the underside of leaves.

Features & Benefits

- Biological pesticide
- Attacks pests at all life stages from egg to adult
- Minimal residue issues
- Ideal for integrated pest management
- Safe for beneficial insects
- 6-month shelf life when refrigerated

NoFly WP Fogger Application

- NoFly WP can be used with a cold fogger (e.g. Dramm AutoFogger)
- Do not use with heat-generating foggers
- Maximum dilution of 10-oz/gal of water

Safe and Effective

Isaria fumosoroseus FE 9901 is not a plant pathogenic organism and does not produce significant detrimental effects on beneficial insects, including bees and bumblebees. The only residues derived from applications of NoFly WP are short lived spores that should not present any environmental persistence concerns in soil, water, or air. These characteristics make this product an idea tool for any Integrated Pest Management Program.

Technical Information

Organism (Active Ingredient):
Isaria fumosoroseus strain FE 9901

General Description:
Naturally-occurring fungus, geographically widespread, and common pathogen of insect pests

Pests Suppressed/Controlled:
Whiteflies (*Bemisia, Trialeurodes, Lecanoideus, Aleuroidicus*), aphids, thrips, mealy bugs and potentially other hosts

Origin:
Isolated from the carcass of a whitefly

Temperature Tolerance:
Optimal temperature for sporelation of *Isaria* spores is between 72-84^0 F (22-28^0 C).

Humidity:
Optimal humidity for growth of *I. fumosoroseus* FE 9901 is 50% or greater. If humidity is below 50%, schedule application of product immediately after general watering or irrigation.

PH Tolerance:
NoFly WP is unaffected by pH ranges from 4.0 - 9.0

Shelf Life:
NoFly WP will remain viable at room temperature for up to 6 months. Refrigeration will extend the shelf life to 18 months. It is recommended that this product be stored in a refrigeration unit or at temperatures below 41^0 F (5^0 C). Do not freeze for extended periods.

Chemical Compatibility:
NoFly WP is compatible with some synthetic and natural insecticides and fungicides. Contact Blacksmith BioScience for current list. Before mixing products **not** on this list, please call for technical advice.

UV Sensitivity:
The spores of NoFly WP are UV sensitive. Product should be sprayed in the early morning hours or evening to prevent degradation.

OMRI LISTED
For Organic Use

Blacksmith BioScience
Biological Products Quick Guide

PRODUCT	CLASS	USE
Armory SP	Soil Health & Plant Inoculant	*Soil application and/or foliar spray.*
Tenet WP	BioFungicide	*Targets soil born diseases. Use in irrigartion.*
Nitryx	BioFertility	*For Nitrogen use effeciency. Soil or seed applied*
MegaPhos	BioFertility	*For phosphorus defeciency or correction. Soil or seed applied.*
NoFly WP	BioInsecticide	*Contact insecticide for whitefly, aphid, thrip and more. Soil or foliar applied.*

BLACKSMITH
BIOSCIENCE

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