

Harpin protein (006477) Fact Sheet

Summary

Harpin is one of a class of proteins produced in nature by certain bacterial plant pathogens. It acts by eliciting a complex natural defense mechanism in plants, analogous to a broad spectrum immune response in animals. While most pesticides act directly on the target pest, Harpin, by contrast, elicits a protective response in the plant that makes it resistant to a wide range of fungal, bacterial, and viral diseases. Because Harpin does not interact directly with disease pests, these organisms are not expected to develop resistance to it. Harpin protein can be used on a broad range of crops, including traditional field crops, minor use crops, turf and ornamentals. With no expected adverse effects to human health or the environment, use of Harpin protein has the potential to substantially reduce use of more toxic pesticides, especially fungicides and certain soil fumigants, such as methyl bromide.

I. Description of the Active Ingredient

Source and Manufacture

In nature, Harpin is produced by *Erwinia amylovora*, a bacterium that causes the disease fire blight in apples and pears. A weakened strain of *Escherichia coli* was modified to produce Harpin on a commercial scale. Commercially produced Harpin protein is identical to the protein that occurs in nature. *E. coli* K-12 is considered to be a non-pathogenic, nutritionally deficient bacterium which is unable to grow in the environment. Harpin is concentrated from the growth medium of the genetically modified *E. coli*, and the bacterial cells are killed and removed from the marketed product.

Mode of Action

Harpin does not act directly on the disease organism, nor does it alter the DNA of treated plants, but instead activates a natural defense mechanism in the host plant, referred to as systemic acquired resistance (SAR). This new active ingredient is currently the only broad-spectrum, proteinaceous elicitor of SAR commercially available. Harpin is effective against certain viral diseases for which there are no other controls or resistant plant varieties. It also protects against soil-borne pathogens and pests, such as certain nematodes and fungal diseases, which have few effective controls except for methyl bromide, which has adverse human health and environmental impacts.

In addition to its ability to protect plants against diseases, Harpin protein also reduces infestations of selected insects and enhances plant growth, general vigor, and yield of many crops, including vegetables, traditional agronomic crops and ornamentals.

Risk Reduction and Resistance Management Tool

Harpin exhibits no direct inhibitory or toxic effect on plant pathogens, and thus cannot exert the selection pressure that would promote the development of resistance in pest populations. By decreasing the use of conventional pesticides, Harpin is expected to be

an important tool in resistance management programs.

Because of the low use rates and lack of demonstrated toxicity to humans and non-target organisms, it is also expected to be an excellent alternative to more toxic conventional fungicides. As an example, Harpin has been used effectively in tomato Integrated Pest Management (IPM) programs, decreasing usage of conventional fungicides and insecticides by an average of 70%, while controlling diseases as well or better than conventional fungicides.

Trade and other names: MESSENGER®

II. Use Sites, Target Pests, and Application Methods

1. **Use Sites:** All food commodities; trees, turf, and ornamentals
2. **Target Pests:** Effective in controlling a wide variety of fungal, bacterial and viral plant pathogens. Also reduces infestation of selected insect pests.
3. **Application Method:** The end use product may be applied as a pre-plant or foliar spray with conventional ground or aerial spray equipment, or by conventional irrigation/chemigation systems. In addition, it may be used as a seed treatment, or in greenhouses as a soil drench. Use rates are very low, generally 2-11.5 grams of active ingredient per acre to be applied at 14-day intervals.

III. Assessing Risks to Human Health

Whether or not a substance poses a risk to humans or other organisms depends on two factors: how toxic the substance is, and how much of it an organism is exposed to. Therefore, the EPA considers toxicity data and exposure data in determining whether to approve a pesticide for use.

Human health risks posed by Harpin are expected to be minimal to nonexistent. It is applied at low rates, and degrades rapidly in the field, thus resulting in no expected residues on treated crops. Risks to pesticide applicators and workers are also expected to be very low, as reflected by the minimum level of personal protective equipment (PPE) that is required (viz., long-sleeved shirt and long pants; shoes and socks; and dust mask). Because of the potential for Harpin to reduce reliance on conventional fungicides, which are generally more toxic, it has the potential to be an important human health and environmental risk reduction tool.

IV. Assessing Risks to the Environment

Harpin is not expected to cause any harm to the environment. Because Harpin is applied at low rates, and degrades rapidly after application, it poses little or no concern as a ground or surface water contaminant. In addition, it has no demonstrable adverse effects on birds, fish, aquatic invertebrates, honeybees, non-target plants and algae. Therefore risks to wildlife and beneficial insects are expected to be minimal to nonexistent.

V. Regulatory Information

Harpin protein was originally registered as a pesticide active ingredient on 4/19/2000 for a period of two years. During that time, the registrant was required to submit additional studies designed to assess possible risks to aquatic invertebrates, and further define and support their procedures for quality control during the manufacturing process. The Agency has reviewed these studies and has found them acceptable. Therefore, the product was granted a full, non-expiring registration on April 11, 2002.

As of the 3/31/02, MESSENGER® is the only registered pesticide product containing harpin protein as an active ingredient.

VI. Producer Information

Plant Health Care, Inc.
440 William Pitt Way
Pittsburgh, PA 15238
1-800-421-9051

VII. Additional Contact Information:

[Ombudsman, Biopesticides and Pollution Prevention Division](#) (7511P)
Office of Pesticide Programs
Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460