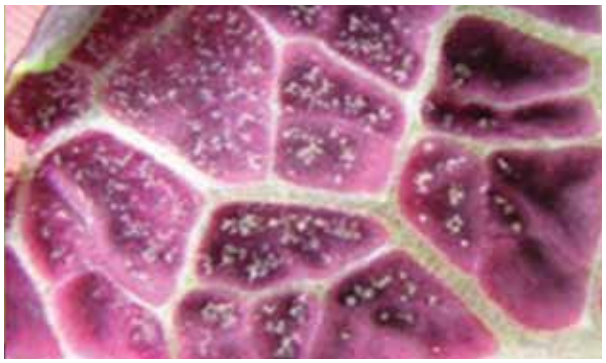
Micora Fungicide Technical Bulletin

Micora™ is a protectant fungicide for control of diseases caused by downy mildew fungi and *Phytophthora spp.* on ornamentals grown in greenhouse and outdoor production, including certain vegetable plants grown for resale. It is highly effective against spore germination, with secondary effects (prevention and reduction) on mycelial growth and sporulation.

Downy mildew on coleus
Photos by Dr. Mary Hausbeck

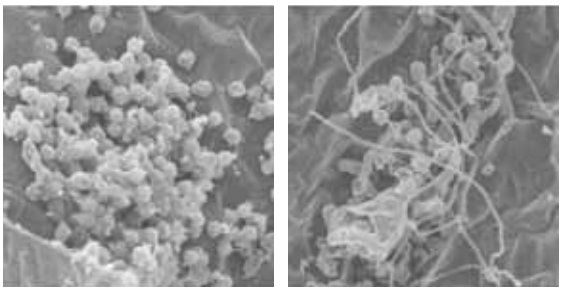


Sporulation on the underside of coleus leaves

Mode of Action

Micora belongs to the chemical family of Carboxylic Acid Amides (CAA, FRAC Group 40). While a definitive biochemical mode of action has not yet been determined, preliminary results indicate Micora inhibits steps in the biosynthesis of phospholipids. Micora offers protection and control through contact and translaminar activity.

Preventing Infection
Micora prevents germination of zoospores and sporangia, thereby inhibiting infections. Micora does not stop sporangia from releasing zoospores, but these zoospores fail to germinate. Micora also has some effect on mycelial growth and haustoria formation, which contribute to overall disease control.



Zoospores on a leaf TREATED with Micora

Zoospores on an UNTREATED leaf

Note: Germ tube growth on untreated leaf and lack of germ tubes on the treated leaf.
Source: J. M. Thompson—Queen's University of Belfast, 2008

Uptake and Translocation
Upon application, Micora bonds to the waxy layer of the plant surface, resulting in rainfastness as soon as spray deposits have dried. Micora is not rapidly degraded by photolysis. After it is bound to the wax layer of the plant, it continuously flows into the leaf over time, resulting in long residual control.

Through translaminar movement, Micora reaches the opposite leaf surface, where it also stops spores from germinating. These features enable Micora to provide long-lasting protection against diseases, even in variable weather conditions.

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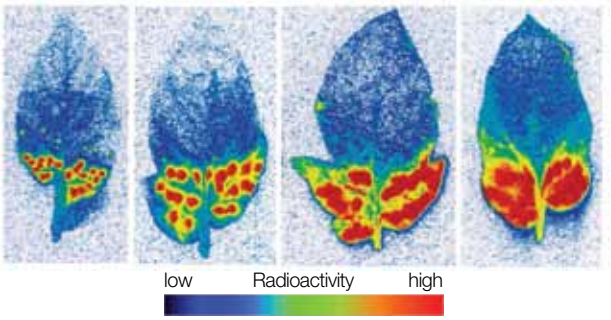
Factors that can affect translaminar movement include:

- Spray coverage and rate
- Thickness of the plant wax cuticle
- Rate of breakdown on the leaf surface (photolysis)
- Quality of formulation
- Solvents, additives and adjuvants

Notes: Autoradiographs demonstrate the significant local redistribution of Micora around the points of application. Uptake increased with longer exposure time; no significant acropetal or basipetal translocation occurred.



Spectrum of Activity

Micora controls fungi in the oomycete class. Excellent performance has been observed on foliar, stem and root diseases caused by *Phytophthora spp.* and many downy mildew diseases. Micora is not active on *Pythium spp.* or *Albugo spp.*

Disease	Crop	Application
Downy Mildew Diseases *Including: Peronospora belbahrii, Peronospora parasitica, Peronospora sparsa, Peronospora tabacina, Plasmopara viburni, Bremia lactucae*	Ornamentals	Foliar
Phytophthora Diseases *Including: Phytophthora ramorum, Phytophthora cryptogea, Phytophthora nicotianae, Phytophthora cinnamomi, Phytophthora tropicalis*	Ornamentals	Foliar & Drench
Downy Mildew Diseases *Including: Peronospora parasitica, Peronospora effusa (Blue Mold), Peronospora tabacina, Plasmopara umbelliferarum, Bremia lactucae*	Brassica Leafy Vegetables Fruiting Vegetables: *Peppers, Eggplant, Pepino, Groundcherry, Okra*	Foliar
Late Blight *Including: Phytophthora infestans*	Tomatoes	Foliar
Phytopthora Blight *Including: Phytophthora capsici*	Fruiting Vegetables: *Peppers, Eggplant, Pepino, Groundcherry, Okra*	Foliar

Application Methods and Use Recommendations

Application Methods

Micora may be applied as a foliar spray for control of diseases caused by downy mildew fungi and *Phytophthora spp.* and as a drench for control of root and stem diseases caused by *Phytophthora spp.* Micora may be applied with application equipment commonly used for greenhouse and nursery crop production, including certain irrigation systems (chemigation) and aerial applications (for roses only). Proper adjustments and calibration of spraying equipment to provide good canopy penetration and coverage are essential for good disease control. Always refer to the product label for crop-specific application directions.

Application Rate

Use rates for Micora are 4–8 fl. oz/100 gals of water for both foliar and drench applications to ornamentals.

Re-entry Interval

Micora has a four-hour re-entry interval (REI).

Adjuvants and Tank Mixing

For certain crops with waxy leaves, a spreading/penetrating-type adjuvant such as a non-ionic silicone-based or blend adjuvant can be used with Micora to help optimize the wetting and distribution of the spray on the plant surface. This may enhance uptake of Micora into plant tissue and improve performance.

Apply Micora prior to disease development as part of a disease management program. Micora is an excellent tank mix[1] partner with other plant protection products.

[1] Syngenta is unable to test all possible combinations of tank mix partners. Jar tests conducted by the grower/applicator are recommended.

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Resistance Management and Risk

The key to maintaining product efficacy is to follow a sound resistance management strategy. This may include rotating and/or tank mixing with products having different modes of action or limiting the total number of applications per season.

Micora belongs to FRAC group 40, the Carboxylic Acid Amides, which also includes dimethomorph, benthiavalicarb and iprovalicarb. The resistance risk is low to medium, but lower than other single-site inhibitors such as strobilurins or phenylamides. The risk of developing resistance in *Phytophthora spp.* is low; however, the resistance risk for other downy mildew species is moderate. Micora shows no cross-resistance to other classes of fungicides, including phenylamides and strobilurins.

Because resistance development cannot be predicted, use of Micora should conform to resistance management strategies that are established for the crop and use area. Consult local or state agriculture authorities for resistance management strategies that are complementary to those on the product label. Micora should not be alternated or tank mixed with any fungicide to which resistance has already developed. Adhering to the instructions contained on the product label and crop-specific best use guidelines will help to ensure its effectiveness in years to come.

Key Micora Resistance Management Practices

- Apply a maximum of four foliar and two drench applications during one crop cycle unless otherwise stated in the specific use directions.
- Apply no more than two sequential foliar applications before alternating to another effective non-group 40 fungicide.
- Use Micora according to label instructions in rotation or in a tank mix with an effective fungicide with a different mode of action that provides satisfactory disease control when used alone at the mixture rate.

Plant Tolerance

NOTICE TO USER: Plant tolerance to Micora fungicide has been found to be acceptable for many genera and species. Due to the large number of species and varieties of ornamentals and nursery plants, it is impossible to test every one for tolerance to Micora fungicide. The professional user should determine if Micora fungicide can be used safely prior to commercial use. In a small area, test the recommended rates on a small number of plants to test for phytotoxicity prior to widespread use.

Integrated Pest Management

Micora fits into successful Integrated Pest Management (IPM) programs because it can be adapted to fit predictive models that time fungicide applications without harming beneficials. IPM and sustainable production depend upon local, crop-specific disease management plans. Disease management is just one element among many within successful crop management programs.

Chemical and Physical Properties
Micora contains the active ingredient mandipropamid and is formulated as a 23.3% soluble concentrate (SC). Micora contains 2.08 lb ai/gal.

Chemical class:	Carboxylic Acid Amide (mandelamide)
Active ingredient:	Mandipropamid (NOA 446510, FRAC group 40)
Chemical name:	2-(4-chloro-phenyl)-N-[2-(3-methoxy-4-prop-2-ynyloxy-phenyl)-ethyl]-2-prop-2-ynyloxy-acetamide
Molecular formula:	C_{23} H_{22}CINO
Molecular weight:	411.9 g/mol
Appearance:	Light beige powder
Melting point:	96.4–97.3˚ C
Vapor pressure:	< 9.4 X 10^{-7} Pa at 25˚ C
Water solubility:	4.2 mg/L (at 25˚ C)
Partition coefficient:	log P_{OW} = 3.2 (at 25˚ C)

Mandipropamid and the Environment

Studies were performed to determine the fate of mandipropamid in the environment. The primary mode of degradation is photolysis, with half-lives of 0.63 to 1.1 days (aqueous) and 16 to 24 days (soil). It has a low vapor pressure (<9.4 x 10^{-7} Pa), so volatilization from water and soil is not significant. In lab studies, the aerobic soil half-life of mandipropamid ranged from approximately 26 to 103 days, and its aerobic aquatic half-life was about 18 days. Under anaerobic conditions, the rate of biodegradation is slower, with a half-life of 151 days.

Mandipropamid is expected to possess low to medium mobility in soils based upon KOC values ranging from 405 to 1,294 mL/g, measured in seven soils from the U.S. and Europe. Terrestrial field dissipation studies for mandipropamid were studied on bare plots in California (sandy loam soil), New York (loam sand soil) and Georgia (sandy loam soil). The average half-life of mandipropamid at the three sites was 86 days. No parent or metabolites were found below 12 inches, with nearly all of the samples remaining in the upper six inches.

Aerial Phytophthora infection on Vinca
Photos by Nancy Rechcigl

Soil Half-life	
DT_{50} lab:	Median 44 days
DT_{50} field:	86 days (range 75 to 101 days)
Hydrolysis in water:	Stable at pH 4 - 9
Photolysis in water:	DT_{50} -1.7 days at pH 7 and 25° C
Mobility in soil K_{OC}:	Mean 847 mL/g
Practically immobile in soil	

Ecotoxicology Profile	
LD_{50} duck	> 1,000 mg/kg (practically non-toxic to birds)
LD_{50} quail	> 2,250 mg/kg (practically non-toxic to birds)
LD_{50} bees (contact and oral)	> 200 µg/bee (practically non-toxic to bees)

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