

# Metalaxyl-M & Resistance

## Possible effects on intensively grown vegetable crops (leafy)

Experience shows that some strains of fungus may develop resistance to the fungicide Metalaxyl-M and other phenylamides. APRON® XL (+/- MAXIM® 480FS) treated seeds in fields with a history of intensive use of phenylamides in foliar and drench applications can show severe emergence issues because of insufficient control of *Pythium* spp. by Metalaxyl-M.

This paper provides guidance on a resistance management strategy. It covers agronomic and use recommendations for phenylamides in order to limit resistance development. Its objective is to support the sustainable use of phenylamides (PA) and to manage resistance in relation to seed treatment with APRON XL. APRON XL is registered in several crops against the oomycete diseases caused by *Peronospora* spp. and *Pythium* spp.

## How can resistance against PA fungicides (phenylamides) develop?

### PA fungicides and seed treatment



PA fungicides as seed treatments are used only once in a growing season, as a preventative. This offers the lowest risk of soil-borne pathogens developing resistance



PA fungicides will only be available in low concentrations per soil volume. Therefore, only a small proportion of the soil-borne *Pythium* population will be exposed to the fungicide, also potentially restricting the number of individuals developing resistance



The pathogen will not be exposed to PA fungicides during most of its development cycle (mycelial growth and oospore

formation in soil) when used as a seed treatment



If PA resistance is detected in *Pythium* populations, the origin is far more likely to be associated with previous soil or foliage PA treatment, not seed treatment



If you use PA fungicides exclusively as a seed treatment you do not need anti-resistance strategies against soil-borne pathogens, such as *Pythium* spp.

**The likelihood of soil-borne *Pythium* developing resistance to PA fungicides used as a seed treatment is very low**

### PA fungicides and sprays



If you DO use additional PA treatments, such as a spray or drench against foliar or soil-borne pathogens, you MUST use strict anti-resistance strategies. The FRAC guidelines can be found here: <http://www.frac.info/expert-fora/phenylamides/general-use-recommendations>





## Recommendations for phenylamides

FRAC guidelines need to be followed strictly when using phenylamides.

### FRAC guidelines for phenylamides as Foliar or Drench Application



**Foliar Fungicide:** Where residual partners are used, use between  $\frac{3}{4}$  and a full recommended dose. The phenylamide dosage in the mixture depends on the intrinsic activity and is defined by the respective manufacturer



Use early in the season or period of active crop growth only, then switch to a non-phenylamide product



Limit foliar sprays to 2-4 consecutive applications per crop per year and use only pre-packed mixtures, including a mixing partner with a different mode of action



Do not use on seed potato crops or in nurseries



Do not exceed 14 day intervals



Do not use soil treatments to control foliar disease

### Agronomic recommendations in order to minimize development of Pythium resistance against PA fungicides



Optimal fertilization and irrigation on well-drained soils



Some leafy veges are extremely sensitive for early Pythium infections. Grow these in an agronomical acceptable crop rotation scheme (eg. Spinach once every four years); respect crop rotations to reduce build-up of inoculum

**Avoid too wet conditions after sowing and in young plant stage:**



- Avoid sowing when extensive rainfall is expected within a few days after sowing



- Prepare soil to sufficient depth to improve drainage. Pythium is most aggressive in wet conditions and most potent against seedlings and young plants



Minimize foliar and soil applications of phenylamide (e.g. Metalaxyl (M), benalaxyl (-M), Furalaxyl) applications in crop rotation crops



APRON XL (+/- MAXIM 480FS) treated seeds in fields with a history of intensive use of phenylamides (PA) in foliar and drench applications can show severe emergence issues because of insufficient control of Pythium spp. by Metalaxyl-M. **In this case, seek alternative control options.**

**Important:** Use seed treatment products safely. Always read the label and product information before use. The referenced products are registered for use in certain countries and national label instructions have to be read and followed; please check with your local regulatory authority for further information.

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