

Twelfth EuroBlight workshop
Arras (France), 3-6 May 2010

Curative effect of fungicides against tomato late blight

R. BUGIANI, L. ANTONIACCI, I. TREVISAN

Servizio Fitosanitario -Regione Emilia-Romagna, Via Saliceto, 81, 40128 Bologna (Italy)

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AIMS

Late blight, caused by *Phytophthora infestans*, can lead to severe yield losses particularly during wet and warm seasons. Protection of outdoor tomato crop is based essentially on control strategies using preventive fungicide sprays throughout the growing season. However, situations when fungicides are applied after the infectious event are not rare. In Italy, experimental data related to curative effects of the most common fungicides used to control late blight on tomato, are very few. Therefore, this preliminary study aimed to evaluate the kick-back activity of the fungicides mostly applied in Italy on tomato to control late blight under experimental controlled conditions.

MATERIALS AND METHODS

The trial was carried out in greenhouse using tomato plants of the variety UC 82 B grown in pot. Plants were inoculated by spraying a *P. infestans* sporangial suspension at a concentration of 1800 spore/ml. Plants were placed inside a plastic bag and incubated for 24 hours at 18°C to provide the optimal conditions for infection. Fungicides were applied by a manual sprayer at 24, 48 and 72 hours from the inoculation. Plants were maintained at 18°C with a natural photoperiod. Two replicates, corresponding to a single plant, for each treatment were carried out. The properties of the tested formulations and the dosage are listed in table 1. Cyazofamid was evaluated using the formulation Mildicut (authorized on grapevine but not on solanaceous crops in Italy) instead of Ranman but at the same dosage of active ingredient of the latter. Such a choice was made because of the different toxicological properties of the two formulations. Infact, Ranman has the risk sentence R48 (risk for human health due to prolonged exposure) on its commercial label that makes it unsuitable to be included in the list of fungicides of the Italian Integrated Production Guidelines. The check was sprayed with water. Disease assessment was carried out after a week from the infection calculating the percentage of affected leaf area and the percentage of affected leaves. Data were statistically analyzed with ANOVA and using LSD test for $p \leq 0,05$ to evaluate the differences among the treatments.

Tab. 1 – Fungicide features

| Formulation | Active ingredient | A.I. in the formulation (% ml or g/l) | Formulation dosage (ml or g/ha) | Dosage tested (ml or g/ha) |
|----------------|-------------------------------------|---------------------------------------|---------------------------------|----------------------------|
| Pergado R* | mandipropamide + copper oxychloride | 2,5 + 13,95 | - | 500 |
| Ridomil Gold R | metalaxyl-m + copper oxychloride | 2,4 + 40 | 400 | 400 |
| Previcur | propamocarb | 722 | 150-300 | 225 |
| Volare | fluopikolide + propamocarb | 62,5 + 625 | 160 | 160 |
| Mildicut* | cyazofamid | 25 | 450 | 320 |
| Forum R | dimethomorph + copper oxychloride | 6 + 40 | 300-350 | 325 |
| Melody Compact | iprotiocarb + copper oxychloride | 4,2 + 20,3 | 300-400 | 350 |
| Curzate R | cymoxanil + copper oxychloride | 4,2 + 39,75 | 300 | 300 |

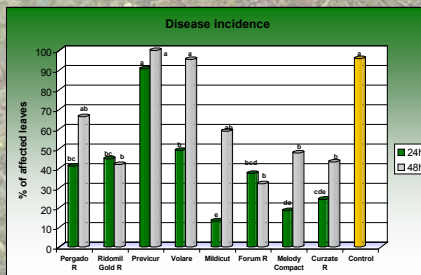
(*) Formulation not authorized



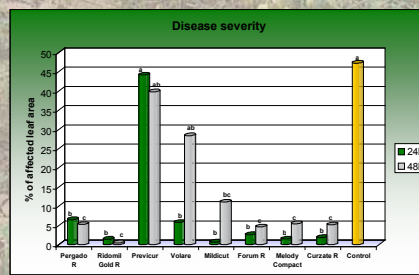
RESULTS

The present study showed different curative effects of the tested fungicides. Considering the high inoculum concentration applied, most of the fungicides showed a good kick-back activity at 24 hours from the infection. Apart Previcur, all the tested fungicide were statistically better than the unsprayed check. Regarding the disease incidence, Mildicut, Melody Compact and Curzate R provided the best results (Graphic 1). Results of the application at 48 hours from the inoculation showed more differences: Ridomil Gold R, Forum R, Melody Compact and Curzate R proved to be the most effective. Regarding the disease severity (Graphic 2), Pergado R and Mildicut also showed a good kick-back activity, while their disease incidence was not statistically different from the unsprayed check. Finally, Previcur showed no curative effect while Volare applied at 48 hours from the inoculation seems to lose its post-infection activity. At 72 hours from the inoculations no kick-back activity and no significant differences were observed among the treatments.

Graf. 1



Graf. 2



Treatments with the same letter are not statistically different for $p \leq 0,05$ (Test LSD)

CONCLUSIONS

The results of this preliminary study confirmed the good curative activity of Ridomil Gold R, still considered the best chemical reference in the field. However, good disease control was also obtained up to 48 hours from the infection, with Melody Compact and Forum R. Pergado R and Mildicut were applied at 48 hours were less effective. Unexpectedly, in spite of the results obtained in the field, Curzate R still showed a good curative effect. Volare seems to have a good curative effect when applied after 24 hours from the infection but not after 48 hours. Finally, Previcur failed to prove a satisfactory curative effect. However, more studies has to be carried out with this respect to draw final conclusions.