

Report of the fungicide sub-group meeting on 5 May 2010: Discussion of potato blight fungicides, their properties and ratings

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OBJECTIVES

The objectives of the sub-group meeting were:

- to discuss and approve new ratings for amisulbrom + mancozeb, initium + mancozeb and propamocarb + cymoxanil in the provisional table for late blight,
- to review the procedure for updating the fungicide tables with ratings calculated from trial results,
- to review the trial protocol for determining tuber blight ratings.

Before the discussion the following presentations were made to the subgroup.

Johnson SB	Post-Harvest Applications of Phosphorous Acid for Control of <i>Phytophthora infestans</i> on Potatoes
Edmonds J	Gowan and future developments with Zoxamide in Potato
Reimann S <i>et al.</i>	Initium - a new fungicide active ingredient for the control of Peronosporamycetes
Jilderda K, Reimann S & Tegge V	Initium based products for the control of <i>Phytophthora infestans</i>
Latorse M-P	Infinito: Protection of new growth from infection with <i>Phytophthora infestans</i>
Cooke LR & Little G	Evaluation of mandipropamid for the control of potato late blight in Northern Ireland
Desnoux J	The curative and eradicator activity of Proxanil
Schepers HTAM	Testing fungicides in the EuroBlight network

LATE BLIGHT

DISCUSSION AND AGREEMENTS REACHED

Approval of new ratings in the provisional table

The ratings proposed by the panel of experts in the seven countries for amisulbrom + mancozeb, iminitium + mancozeb and propamocarb + cymoxanil were agreed. The ratings are shown in Table 2 below.

Procedure for updating fungicide tables with ratings calculated from trial results

Products can be included for testing in the trials if they 1. don't already have a rating, in which case the rating is calculated from the results of six good trials or 2. already have a rating but the rating is re-calculated including the additional trial results.

Trial-based ratings in the main fungicide table on the Euroblight website will be updated after all of the sponsoring companies have approved the draft report covering that year's series of trials and the calculated ratings. It was agreed that comments on the draft report would be sought from the panel of experts in the seven countries at the same time as those from the sponsoring companies. Fungicide ratings based on trial results will therefore be updated in advance of Euroblight workshops except where there is a serious problem that requires the agreement of the Fungicide Subgroup. In this situation the problem will be resolved at the next meeting of the Fungicide Subgroup.

It was agreed, as an interim measure, that products would keep their calculated ratings for 7 years without the need for further trials. Seven years after a product was rated it will need to be included in three new trials. The seven-year period will be reconsidered at future meetings of the Fungicide Subgroup. If there is information that a fungicide has become, or is suspected of being, relatively less effective than its rating in the table due to changes in the *P. infestans* population, a statement to this effect will be included as a footnote to the fungicide table.

The procedures in 1.2 will from now on be included in the protocols for the leaf blight and tuber blight rating trials.

Changes to the plus ratings of fungicides can only be made at meetings of the Fungicide Subgroup.

Protocol for determining tuber blight ratings

In response to concerns that the incidence of tuber blight in all three trials in 2009 had been low, methods to encourage a higher incidence were discussed. It was agreed that blanket applications of fungicide could continue after the test fungicide treatments had started. These applications would dampen the foliar epidemic and therefore delay the separation of the disease progress curves for the test fungicides. Extending the use of the blanket fungicide could therefore allow more applications of the test fungicides, thereby extending the period of their application to later in the growing season when conditions are generally more favourable for zoospore release. In addition, an extended period of application for the test fungicides should result in more rainfall events to increase the number of tuber infection events.

The use of blanket sprays during the period that the test fungicides are applied will be left entirely to the discretion of the study director because he/she has the knowledge of prevailing local blight risk and experience of the variety used in the trial. Each week the study director will decide 1. whether to apply a blanket spray and 2. the dose rate.

After the subgroup meeting it was not sufficiently clear which fungicide(s) could be used for blanket applications. This was discussed further by those conducting tuber blight trials in 2010 and agreement reached that prior to the application of test fungicides the blanket spray can be either Dithane NT, or Curzate M where curative activity is required to prevent the foliar epidemic developing too quickly. However, only Dithane NT can be used from the time that the test fungicides applications are started. Also, the use of Curzate M as a blanket treatment should stop at least 7 days before the test treatments commence.

The timing and amount of irrigation will also be at the discretion of the study director.

Other agreements

It was agreed that at present trials to calculate ratings in the late blight fungicide tables should continue for leaf and tuber blight efficacy but should not be extended to include other characteristics of fungicides.

The subgroup agreed with the proposal made in Session 4 of the Arras workshop that Euroblight should prepare a common statement on the implementation of IPM within the EU with respect to control of late and early blight. It was agreed that a short (1 page), simple statement would be drafted and circulated among Euroblight members prior to submission to the EU.

There was agreement that the provisional late blight fungicide ratings table should be placed on the Euroblight website.

GENERAL COMMENTS ABOUT THE RATINGS TABLES FOR LATE BLIGHT FUNGICIDES (TABLES 1 AND 2)

The ratings given in Table 1 are for blight fungicides currently registered in several EU countries and are based on the label recommendations for commercially available products containing one or two active ingredients as a co-formulated mixture. The ratings are NOT for the active ingredients themselves. Table 1 lists the commercially available mixtures of active substances. The ratings given are for the highest dose rate registered for the control of *P. infestans* in Europe. Different dose rates may be approved in different countries.

The ratings given in all columns, except the one for leaf blight, are the opinion of the fungicides sub-group at the Arras blight workshop, 2010 and are based on field experiments and experience of the performance of products when used in commercial conditions. Ratings for leaf blight were calculated from the results of 13 Euroblight field trials during 2006-2009, and only compounds included in a minimum of six of these trials are rated for leaf blight. The scale for leaf blight is a 2-5 scale, to one decimal place. All other ratings are on a 0 to +++ scale, using (+) to indicate half marks. The ratings are intended as a guide only and will be amended in future if new information becomes available. Table 1 is available on the Euroblight website, www.euroblight.net/Fungicide/FungicideComparison.asp

Table 2 gives provisional ratings for recently introduced products and new fungicide formulations. The inclusion of a product in this table is not indicative of its registration status either in the EU or elsewhere in Europe. These ratings are the consensus view of the fungicide sub-group and are based on information from field experiments or minimal practical experience of a product and will be amended at future workshops, as new information becomes available and the body of experience in commercial use increases.

DEFINITIONS AND DISCLAIMER (REPRODUCED FROM THE TALLINN 2005 PROCEEDINGS)

PHENYLAMIDE RESISTANCE

The ratings assume a phenylamide-sensitive population. Strains of *P. infestans* resistant to phenylamide fungicides occur widely within Europe. Phenylamide fungicides are available only in co-formulation with protectant fungicides and the contribution that the phenylamide component makes to overall blight control depends on the proportion of resistant strains within the population. Where resistant strains are present in high frequencies within populations the scores for the various attributes will be reduced.

NEW GROWTH

The ratings for the protection of the new growing point (new growth) indicate the protection of new foliage due to the systemic or translaminar movement or the redistribution of a contact fungicide. New growth consists of growth and development of leaves present at the time of the last fungicide application and/or newly formed leaflets and leaves that were not present.

PROTECTANT ACTIVITY

Spores killed before or upon germination/penetration. The fungicide has to be present on/in the leaf/stem surface before spore germination/penetration occurs.

CURATIVE ACTIVITY

The fungicide is active against *P. infestans* during the immediate post infection period but before symptoms become visible, i.e. during the latent period.

ANTISPORULANT ACTIVITY

P. infestans lesions are affected by the fungicide decreasing sporangiophore formation and/or decreasing the viability of the sporangia formed.

STEM BLIGHT CONTROL

Effective for the control of stem infection either by direct contact or via systemic activity.

TUBER BLIGHT CONTROL

Activity against tuber infection as a result of fungicide application after infection of the haulm, during mid- to late-season i.e. where there is a direct effect on the tuber infection process. The effect of phenylamide fungicides on tuber blight control was therefore not considered relevant in the context of the table as these materials should not be applied to potato crops if there is blight on the haulm, according to FRAC guidelines. Only the direct (biological) effect of a particular fungicide on the tuber infection process was considered relevant and NOT the indirect effect as a result of manipulation or delay in the development of the foliar epidemic.

DISCLAIMER

Whilst every effort has been made to ensure that the information is accurate, no liability can be accepted for any error or omission in the content of the tables or for any loss, damage or other accident arising from the use of the fungicides listed herein. Omission of a fungicide does not necessarily mean that it is not approved for use within one or more EU countries.

The ratings are based on the label recommendation for a particular product. Where the disease pressure is low, intervals between spray applications may be extended and, in some countries, fungicide applications are made in response to nationally issued spray warnings and/or Decision Support Systems. It is essential therefore to follow the instructions given on the approved label of a particular blight fungicide appropriate to the country of use before handling, storing or using any blight fungicide or other crop protection product.

EARLY BLIGHT (*ALTERNARIA SOLANI* AND *ALTERNARIA ALTERNATA*)

There was agreement that the *Alternaria* fungicide tables should be placed on the Euroblight website. In the *Alternaria* tables one column to cover the efficacy of fungicides against both species was currently still appropriate.

At the very end of the subgroup meeting BASF requested that Signum (pyraclostrobin + boscalid) should be moved from the provisional *Alternaria* table to the main *Alternaria* table. This was not discussed at the Subgroup meeting. The panel of fungicide experts in the seven countries was consulted after the workshop on whether they could agree to Signum being moved from the provisional table to the main table. All agreed and it was therefore proposed to include Signum in the main table. This proposal was approved by the Fungicide Subgroup members (by e-mail).

Table 1. The effectiveness of fungicide products/co-formulations for the control of *P. infestans* based on the highest rate registered in Europe

Product ¹	Effectiveness			Mode of Action			Rainfastness	Mobility in the plant	
	Leaf blight ²	New growth	Stem blight	Tuber blight	Protectant	Curative			Anti-sporulant
copper		?	+	+	+(+)	0	0	+	contact
dithiocarbamates ³	2.0	?	+	0	++	0	0	+(+)	contact
chlorothalonil		?	(+)	0	++	0	0	++(+)	contact
cyazofamid	3.8	++	+	+++	+++	0	0	+++	contact
fluzinam	2.9	?	+	++(+)	+++	0	0	++(+)	contact
zoxamide+mancozeb	2.8	?	+ ³	++	+++	0	0	++(+)	contact+contact
famoxadone+cymoxanil		?	+(+)	N/A	++	++	+	++(+)	contact+translaminar
mandipropamid	4.0	++	+(+)	++ ⁵	+++	+ ⁶	+(+)	+++	translaminar+contact
benthiavalicarb+mancozeb	3.7	?	+(+) ⁵	+(+)	+++	+(+)	+	++(+)	translaminar+contact
cymoxanil+mancozeb		?	+(+)	0	++	++	+	++	translaminar+contact
cymoxanil+metiram		?	+(+)	0	++	++	+	++	translaminar+contact
cymoxanil+copper		?	+(+)	0	++	++	+	++	translaminar+contact
dimethomorph+mancozeb	3.0	?	+(+)	++	++(+)	+	++	++(+)	translaminar+contact
fenamidone+mancozeb	2.6	?	+(+) ⁵	++	++(+)	0	+(+) ⁵	++	translaminar+contact
benalaxyl+mancozeb ⁴		++	++	N/A	++(+)	++(+)	++(+)	+++	systemic+contact
metalaxyl-M+mancozeb ⁴		++	++	N/A	++(+)	++(+)	++(+)	+++	systemic+contact
metalaxyl-M+fluzinam ⁴		++	++	N/A	++(+)	++(+)	++(+)	+++	systemic+contact
propamocarb-HCl+mancozeb		+(+)	++	++	++(+)	++	++	+++	systemic+contact
propamocarb-HCl+chlorothalonil	3.4	+(+)	++	++	++(+)	++	++	+++	systemic+contact
propamocarb-HCl+fenamidone	2.5	+(+)	++	++	++(+)	++	++	+++	systemic+translaminar
propamocarb-HCl+flupicolide	3.8	++	++	+++	+++	++	++(+)	++(+)	systemic+translaminar

¹The scores of individual products are based on the label recommendation and are not additive for mixtures of active ingredients. Inclusion of a product in the list is not indicative of its registration status either in the EU or elsewhere in Europe. ²Based on Euroblight field trials in 2006-2009. ³Includes manebe, mancozeb, propineb and metiram. ⁴See text for comments on phenylamide resistance. ⁵Based on limited data. ⁶In some trials there were indications that the rating was ++(+).

Key to ratings: 0 = no effect; + = reasonable effect; ++ = good effect; +++ = very good effect; N/A = not recommended for control of tuber blight; ? = no experience in trials and/or field conditions.

The scale for leaf blight is a 2-5 scale (2 = least effective, 5 = most effective).

Disclaimer: this is given in the text of this paper.

able 2. Provisional ratings¹ for the effectiveness of new fungicide products for the control of *P. infestans* in Europe. These ratings are the opinion of the Fungicides Sub-Group at the Arras blight workshop, 2010 and are based on field experiments and not experience in commercial potato production.

Product	Effectiveness			Mode of Action			Rainfastness	Mobility in the plant
	Leaf blight	New growth	Stem blight	Tuber blight	Protectant	Curative		
amisulbrom + mancozeb	?	?	+	++(+) ²	++(+)	0	?	contact + contact
initium + mancozeb	3.6 ³	? ⁴	? ⁴	++	++(+)	0	0	contact + contact
propamocarb + cymoxanil	?	?	?	?	+(+)	++(+) ⁵	++(+)	systemic + translaminar

¹The ratings for individual products are based on the label recommendation and are NOT additive for mixtures of active ingredients. Inclusion of a product is NOT indicative of its registration status either in the EU or elsewhere in Europe. ²Based on limited data; an efficacy greater than ++(+)² was observed in some trials. ³Calculated from Euroblight trials ⁴Observations from some field trials indicated that both new growth and stem blight efficacy were ++. ⁵In some trials the curative activity was +++.

Key to ratings : 0 = no effect ; + = reasonable effect ; ++ = good effect ; +++ = very good effect ; ? = no experience in trials and/or commercial

