

## Report of the Fungicide Subgroup meeting on 11 & 12 October 2011: Discussion of potato blight fungicides, their properties and ratings

RUAIRIDH A. BAIN

SAC, John Niven Building, Auchincruive Estate,  
Ayr, Scotland KA6 5HW, UK

### CHAIRMAN: Huub Schepers

On Tuesday 11 October the following presentations were made to the subgroup.

Schirring A, Wannigen & Tafforeau	Infinito - tuber blight control experiences in the period 2006 -2010
Desnoux J, Testers J & Versmissen C	Another step forward in blight control with Ranman Top
Kiers E, Erven T, Tegge V	Recommendations and field performance of INITIUM® based products against <i>P. infestans</i> in potatoes
Bouwman J <i>et al.</i>	Revus Top – A new product for the control of <i>P. infestans</i> and <i>Alternaria</i> in potatoes in Europe
Leiminger J, Adolf B & Hausladen H	Sensitivity of German <i>A. solani</i> isolates against QoI fungicides

On Wednesday 12 October 34 delegates attended the discussion session of the Fungicide Subgroup meeting. The following areas were discussed.

- 1.1 Inclusion of tank mixes in the fungicide efficacy tables
- 1.2 Tuber blight efficacy ratings calculated from trial results
- 1.3 Contribution by EuroBlight experts to Country Specific Guidelines for Integrated Potato Protection in Europe
- 1.4 CropLife Foundation
- 1.5 Other

## 1.LATE BLIGHT

### DISCUSSION AND AGREEMENTS REACHED

#### 1.1 Inclusion of tank mixes in the fungicide efficacy tables

At the meeting of the Fungicide Subgroup in Arras in 2010 it was agreed that fungicide ratings based on trial results would be updated in advance of EuroBlight workshops except where there was a serious problem that required to be resolved by the Fungicide Subgroup. In this event the problem would be discussed and resolved at the next meeting of the Fungicide Subgroup. Such a situation arose with the possible inclusion of tank mixes in the efficacy tables, specifically with the test case of the Nufarm fungicide Canvas (Shinkon in the UK)(amisulbrom).

A rating for 0.5 l/ha Canvas + 2.0 kg/ha mancozeb product was included in the draft report of the EuroBlight leaf blight trials 2010. This was criticised mainly because the tank mix does not match the dose rates recommended in practice by Nufarm in Germany and the UK. In these countries the recommendation is 0.3 l/ha + 1.75 kg/ha. Canvas is registered at 0.5 l/ha in the UK and Germany without mention of a tank mix partner on the label. However, it was stated at the meeting that Canvas would soon be registered in Benelux at 0.5 l/ha and tank mixing with a partner fungicide will be mentioned on label.

The following points were discussed and decisions reached.

#### 1.1.1 Should a rating for a tank mix be included in the EuroBlight table or should ratings only be given to straight products and formulated mixtures?

It was agreed that tank mixes could be rated and included. However, certain conditions have to be met.

To be included in the EuroBlight table the tank mix has to be registered in at least one country in Europe, i.e. the tank mix is included on the product label. (AGREED)

The product label has to mention the specific tank mix partner. (AGREED) The label for Canvas only refers to a tank mix partner in general terms but Nufarm will only recommend mancozeb as the tank mix partner.

Tank mixes are to be included in the B Table (provisional) because of the lack of information on efficacy in commercial practice. (AGREED)

Tank mixes should be tested and rated only if there is no corresponding formulated product. (NOT AGREED)

The formulation of the tank mix partner needs to be specified on the product label. (NOT AGREED)

#### 1.1.2 Should a rating be included in the table for lower rates of the tank mix partners than those tested?

The highest label rates of tank mix partners should be tested because this is consistent with EuroBlight testing the highest label rates of formulated mixtures.(AGREED) Also, biological dossier data, in which the tank mix was tested at the highest rates, will back up data from the six EuroBlight trials. The tank mix of 0.5 l/ha Canvas + 2.0 kg/ha mancozeb product was tested in registration trials.

Tables should have dose rates included. (AGREED) This will clearly distinguish tank mixes from formulated products.

### **1.1.3 Should ratings for a straight product and/or a ready formulated product be included if there is a rating for the tank mix?**

The inclusion in the EuroBlight table of a rating for straight Canvas was discussed. Nufarm does not support this because the company does not recommend straight Canvas anymore.

The decision to test one partner of the tank mix alone, in this case amisulbrom, and/or the ready formulated product, in this case amisulbrom plus mancozeb, to generate EuroBlight ratings is a decision for the fungicide company alone. (AGREED)

### **1.2 Tuber blight efficacy ratings calculated from trial results**

The first combined report will include results from all 3 years of testing, 2009 to 2011, because of low incidences of tuber blight in some trials. The trials-based ratings will be released before the next EuroBlight meeting to be held in spring 2013.

It was agreed that all data from the dedicated trials are to be submitted to Bert Evenhuis by 28th February 2012 to allow earlier circulation of the combined report.

### **1.3 Contribution by EuroBlight experts to Country Specific Guidelines for Integrated Potato Protection in Europe**

Huub Schepers proposed that volunteer EuroBlight experts should contribute to harmonised Country Specific Guidelines for Integrated Potato Protection in Europe. National experts were requested to make EuroBlight information and expertise available to National Action Plan committees. Harmonisation was considered essential to ensure that Europe was co-ordinated.

Europe-wide harmonisation of *P. infestans* population monitoring was discussed. The discussion covered testing at a few centres only, genotyping, fungicide insensitivity testing, phenotyping and the inclusion of samples from the fungicide companies.

### **1.4 Crop Life Foundation**

It was agreed that there should be a link to the website of CropLife Foundation.

### **1.5 Other**

The table with provisional ratings for late blight fungicides (Table B) and the table with efficacy ratings for early blight (*Alternaria*) control need to be more easily accessible on the EuroBlight website.

BASF proposed harmonised varietal resistance testing, with a table to complement the fungicide efficacy tables.

## **GENERAL COMMENTS ABOUT THE RATINGS TABLES FOR LATE BLIGHT FUNGICIDES (LATE BLIGHT TABLES A AND B)**

The ratings given in Table A are for late 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 A 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, were endorsed by the Fungicides Subgroup at the St Petersburg workshop in 2011 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 19 EuroBlight field trials during 2006-2011, 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. Tables A and B are available on the EuroBlight website, [www.euroblight.net/Fungicide/FungicideComparison.asp](http://www.euroblight.net/Fungicide/FungicideComparison.asp) These tables on the website are updated more frequently.

Late Blight Table B 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 either calculated from dedicated trials (leaf blight efficacy only) or are the consensus view of the Fungicide Subgroup 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.

## 2. EARLY BLIGHT (*Alternaria solani* and *Alternaria alternata*)

At present there is only an A table for early blight fungicide efficacy because there are currently no products in the provisional category. It was stated at the St Petersburg meeting that there are two new candidates that could be considered for the B table, i.e. Revus Top (mandipropamid + difenoconazole) and also a new coded product from Gowan.

It was confirmed again at the meeting in St Petersburg that in the *Alternaria* table one column to cover the efficacy of fungicides against both *A. solani* and *A. alternata* was currently still appropriate because of insufficient information on fungicide activity against the individual species.

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

Product [Dose rate (l or kg/ha)] <sup>1</sup>	Effectiveness			Mode of Action			Rainfastness	Mobility in the plant
	Leaf Blight <sup>2</sup>	New growth	Stem blight	Tuber blight	Protectant	Curative		
copper	?	?	+	+	+(+)	0	0	contact
dithiocarbamates (2.0) <sup>3</sup>	2.0	?	+	0	++	0	0	contact
chlorothalonil	?	?	(+)	0	++	0	0	contact
cyazoflamid (0.2 + 0.15)	3.8	++	+	+++	+++	0	0	contact
flusiazam (0.4)	2.9	?	+	++(+)	+++	0	0	contact
zoxamide+mancozeb (1.8)	2.8	?	+5	++	+++	0	0	contact+translaminar
famoxadone+cymoxanil	?	?	+(+)	N/A	++	++	+	translaminar+contact
mandipropamid (0.6)	4.0	++	+(+)	++5	+++	+6	+(+)	translaminar+contact
benthiavalicarb+mancozeb (2.0)	3.7	?	+(+) <sup>5</sup>	+(+)	+++	+(+)	+	translaminar+contact
cymoxanil+mancozeb	?	?	+(+)	0	++	++	+	translaminar+contact
cymoxanil+metiram	?	?	+(+)	0	++	++	+	translaminar+contact
cymoxanil+copper	?	?	+(+)	0	++	++	+	translaminar+contact
dimethomorph+mancozeb (2.0)	3.0	?	+(+)	++	+++	+	++	translaminar+contact
fenamidone+mancozeb (1.5)	2.6	?	+(+) <sup>5</sup>	++	+++	0	+(+) <sup>5</sup>	translaminar+contact
benalaxyl+mancozeb <sup>4</sup>	++	++	++	N/A	+++	++(+)	+++	systemic+contact
metalaxyl-M+mancozeb <sup>4</sup>	++	++	++	N/A	+++	++(+)	+++	systemic+contact
metalaxyl-M+flusiazam <sup>4</sup>	++	++	++	N/A	+++	++(+)	+++	systemic+contact
propamocarb-HCl+mancozeb	+(+)	+(+)	++	++	+++	++	+++	systemic+contact
propamocarb-HCl+chlorothalonil (2.7)	3.4	+(+)	++	++	+++	++	+++	systemic+translaminar
propamocarb-HCl+fenamidone (2.0)	2.5	+(+)	++	++	+++	++	+++	systemic + translaminar
propamocarb-HCl+flupropidate (1.6)	3.8	++	++	+++	+++	++	+++	systemic + translaminar

<sup>1</sup>The 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. <sup>2</sup>Based on Euroblight field trials in 2006-2011. <sup>3</sup>Includes maneb, mancozeb, propineb and metiram. <sup>4</sup>See text for comments on phenylamide resistance. <sup>5</sup>Based on limited data. <sup>6</sup>In 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.

**Late Blight Table B.** Provisional ratings<sup>1</sup> 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 St Petersburg blight workshop, 2011 and are based on field experiments and not experience in commercial potato production.

Product [Dose rate (l or kg/ha)]	Effectiveness			Mode of Action			Rainfastness	Mobility in the plant contact + contact	
	Leaf blight <sup>3</sup>	New growth	Stem blight	Tuber blight	Protectant	Curative			Anti-sporulant
amisulbrom + mancozeb (0.5 + 2.0)	4.5	?	+	++(+) <sup>2</sup>	++(+)	0	?	+++	contact + contact
imintium + mancozeb (2.5)	3.6	?4	?4	++	++(+)	0	?	+++	contact + contact
propamocarb + cyromoxanil (2.0)	?	?	?	?	+(+)	++(+) <sup>3</sup>	?	?	systemic + translaminar

<sup>1</sup> The 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. <sup>2</sup> Based on limited data, an efficacy greater than ++(+)<sup>3</sup> was observed in some trials. <sup>3</sup> Calculated from Euroblight trials <sup>4</sup> Observations from some field trials indicated that both new growth and stem blight efficacy were ++, <sup>5</sup> In 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

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

**Early Blight Table A.** Efficacy of fungicides for the control of early blight caused by *Alternaria solani* and *Alternaria alternata*.

Product	Efficacy <sup>1</sup>
azoxystrobin	+++
fluazinam	(+)
metiram/mancozeb <sup>2</sup>	++
propineb	++
chlorothalonil	+(+)
famoxadone+cymoxanil	++
fenamidone+mancozeb	++
or propamocarb <sup>3</sup>	
zoxamide+mancozeb	++(+)
pyraclostrobin + boscalid	+++

<sup>1</sup> **Key to ratings :** 0 = no effect ; + = some effect; ++ =reasonable effect ; +++ = good effect ; ++++ very good effect

<sup>2</sup> This rating applies to products containing mancozeb when used at the highest dose rates (>1500g/ha). This rating may not be appropriate where the rate of mancozeb used is lower, particularly where the second active substance is not effective against *Alternaria*. <sup>3</sup> In some trials there were indications that the rating was ++(+).

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