

Report of the Control Strategies Subgroup meeting on 13 May 2015: Discussion and agreements reached

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Initially members of the *Alternaria* Subgroup attended a joint meeting with the Control Strategies Subgroup to allow aspects of *Alternaria* fungicide ratings to be fully discussed.

1. ALTERNARIA BLIGHT

1.1 Protocol for fungicide efficacy trials to provide ratings for *Alternaria* fungicides

There will be three field trials with *A. solani* in 2015; in Germany, Denmark and The Netherlands. Hans Hausladen presented the following updated outline of the protocol.

Treatments will override label restrictions in relation to number of applications

EPPO guidelines (EPPO 1/263(1)) will be adhered to

A susceptible variety will be used

The experimental design will be a randomised complete block

An untreated is to be included, either as plots or as spreader rows

Natural infection by *A. solani* is preferred but artificial inoculation is to be allowed provided the method used is the cereal grain one.

Misting of the trial is allowed but not preferred

The reference fungicide treatments are mancozeb @ 7-day intervals (reference for late blight fungicides with activity against early blight) and mancozeb @ 14-day intervals (reference for early blight specific fungicides)

The first application of the test fungicides is to be made at 6 to 8 weeks after crop emergence and definitely no later than the first appearance of symptoms

The severity (%) of early blight will be assessed every 7 days

The results of six trials with good results are required for a rating to be awarded to a test fungicide.

The first ratings are anticipated in 2017.

Fungicide products can have 7- and 14-day ratings

The ratings for the two mancozeb standards, and the ratings scale have not been finalised yet.

1.2 Changes to the early blight fungicide table

Prior to the Brasov workshop Belchim requested that the EuroBlight fungicide experts give an early blight rating for difenoconazole (Narita) based on the experts' experience with this product and also information provided by Belchim. Prior to the workshop a rating of +++ was agreed, with the table footnote that in some trials there were indications that the rating was +++(+). This rating was agreed at the subgroup meeting in Brasov.

Proposal: A footnote to the early blight table is required stating that the number of applications of test fungicides in the trials does not necessarily comply with the product label (Agreed).

Proposal: The dose rates of fungicide products should be added to the early blight table (Agreed).

Proposal: Comments on insensitivity risk for fungicides should be included in the early blight table (Not agreed). The consensus was that this needs to be considered further because the situation is not clear cut.

Proposal: Include information on the curative activity of fungicides against *Alternaria* (Not agreed). The subgroup's view was that it was too early to include information other than early blight leaf protection ratings.

2. CONTROL STRATEGIES SUBGROUP ALONE, LATE BLIGHT

2.1 Late blight fungicide table changes, as agreed at the 2013 workshop in Limassol

The A and B tables that existed previously have been combined.

The dates of first registration in Europe of the listed fungicide products have been added.

Fungicide products that are no longer marketed have been removed from the table.

A disclaimer covering fluazinam insensitivity in relation to genotype 33_A2 is now in place.

The table now has links to the early blight table and the FRAC website.

Proposal: The accuracy of some first registration dates should be checked (Agreed). The appropriate company should inform Huub Schepers of any necessary amendments.

Proposal: The link to the early blight table should be clearer (Agreed).

2.2 Ratings

The following ratings, based on trial results, were awarded and the table modified accordingly:

Fungicide	Leaf blight control ratings
benalaxyl-M + mancozeb	3.0
dimethomorph + fluazinam	3.7
mandipropamid + cymoxanil	4.4
(zoxamide + cymoxanil) + fluazinam	4.3

There were no changes to tuber blight control ratings or new ratings based on trials.

Qualitative ratings (0 to +++) were modified for dimethomorph + fluazinam after consideration by the EuroBlight fungicide experts of the information submitted by Adama.

If a company has information supporting revised qualitative ratings the agreed procedure is for the company to approach Huub Schepers.

Proposal: Phosphonates and host resistance elicitors should be considered for inclusion in the ratings table (Not agreed). It was stated that product registration is a prerequisite for inclusion. Companies with such registered products should approach EuroBlight to have products considered for trial evaluation.

Proposal: The decimal rating for a fungicide product needs to be confirmed (through an additional three EuroBlight trials) 7 years after the rating was conferred (Not agreed). Where there is suspicion of a discrepancy between a fungicide's rating and its current efficacy advisors need to report this to EuroBlight with supporting evidence (Agreed).

2.3 New initiatives and developments

Proposal: Information on the events of other blight networks, e.g. Latin Blight, USBlight and Asiablight, are to be placed on the EuroBlight website and in newsletters (Agreed).

Proposal: Links on the EuroBlight website to these other networks are required (Agreed).

Proposal: The experimental protocols on the EuroBlight website should be shared across the different blight networks (Agreed).

Proposal: FTA card samples should be submitted from Romania so that the country is included in the 2015 Monitoring of *P. infestans* in Europe programme (Agreed).

3. RECORD OF FUNGICIDE TABLES

The most up to date versions of the late blight and *Alternaria* fungicide tables should be accessed via the EuroBlight website. The fungicides tables in this paper are a record of the tables as at September 2015.

GENERAL COMMENTS ABOUT THE RATINGS TABLE FOR LATE BLIGHT FUNGICIDES

Ratings for leaf blight are based on results from EuroBlight field trials, and only compounds included in these trials are rated for leaf blight. The scale for leaf blight is a 2-5 scale (see technical report: Fungicide evaluation to rate efficacy to control leaf late blight for the EuroBlight table. Results 2006 – 2013).

Ratings for tuber blight are also based on results from EuroBlight field trials and only compounds included in these trials are rated for tuber blight. The scale for tuber blight is a 0-5 scale (see technical report: Fungicide evaluation to rate efficacy to control tuber blight for the EuroBlight table. Results 2009-2011). All other ratings are on a 0 to +++ scale.

There are few products with decimal ratings for tuber blight control compared with earlier subjective ratings. The 0 to +++ ratings can be obtained from the previous workshop proceedings.

The scores for individual products are not additive for mixtures of active ingredients. The dose rates in brackets are those used in the EuroBlight field trials to determine the leaf blight and tuber blight ratings. Ratings will be lower where fungicide insensitive strains are present.

The ratings given are for late blight fungicides currently registered in several EU countries and are for commercially available products containing one active ingredient, or two active ingredients as a co-formulated mixture, or tank mix on the product label. The ratings are NOT for the active ingredients themselves. 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 those for leaf and tuber blight control, are based on non-EuroBlight field experiments and experience of the performance of products when used in commercial conditions. Ratings for leaf blight and tuber blight control were each calculated from the results of a minimum of six EuroBlight field trials. Ratings, other than leaf and tuber blight control ones, are intended as a guide only and will be amended in future if new information becomes available.

DEFINITIONS (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.

NEW GROWTH

The ratings for the protection of the new growing point (new growth) indicate the protection of new foliage due to 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.

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

See section above on phenylamide resistance

Isolates of *P. infestans* have been found in The Netherlands resulting in lower field efficacy of fluazinam.

As stated earlier in this paper the fungicide insensitivity status of the European population of *Alternaria* species is currently not clear. Where resistant strains are present in high frequencies within populations the scores for the various attributes will be reduced.

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.

It is essential 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.

Late Blight Fungicide Table The effectiveness of fungicide products and label mixtures for the control of *P. infestans* based on the highest dose rate registered in Europe (as at September 2015)

Product [Dose rate (l or kg/ha)]	Effectiveness				Mode of Action		Rainfastness	Mobility in the plant	Year	
	Leaf Blight ³	New growth	Stem blight	Tuber blight ⁴	Protectant	Curative				Anti-sporulant
copper			+		+(+)	0	0	+	contact	1900
dithiocarbamates (2.0) ¹	2.0		+	0.0	++	0	0	+(+)	contact	1961
chlorothalonil			(+)		++	0	0	++(+)	contact	1964
cyazofamid (0.5)	3.8	++	+	3.8	+++	0	0	+++	contact	2001
fluazinam (0.4)	2.9		+		+++	0	0	++(+)	contact	1992
zoxamide+mancozeb (1.8)	2.8		+ ⁵		+++	0	0	++(+)	contact+contact	2001
amisulbrom+mancozeb (0.5+2.0)	4.5		+	3.7	++(+)	0	?	+++	contact+contact	2007
ametocradin+mancozeb (2.5)	3.7	? ⁸	? ⁸		++(+)	0	0	+++	contact+contact	2011
famoxadone+cymoxanil			+(+)		++	++	+	++(+)	contact+translaminar	1996
mandipropamid (0.6)	4.0	++	+(+)		+++	+ ⁶	+(+)	+++	translaminar+contact	2005
mandipropamid+difenoconazole (0.6)	4.0	++	+(+)		+++	+ ⁶	+(+)	+++	translaminar+contact	2005
benthiavalicarb+mancozeb (2.0)	3.7		+(+) ⁵		+++	+(+)	+	++(+)	translaminar+contact	2003
cymoxanil+mancozeb			+(+)		++	++	+	++	translaminar+contact	1976
cymoxanil+metiram			+(+)		++	++	+	++	translaminar+contact	1976
cymoxanil+copper			+(+)		++	++	+	++	translaminar+contact	1976
dimethomorph+mancozeb (2.4)	3.0		+(+)		++(+)	+	++	++(+)	translaminar+contact	1988
dimethomorph+fluazinam (1.0)	3.7	+	+	3.3	++(+)	+	++	++(+)	translaminar+contact	2012
fenamidone+mancozeb (1.5)	2.6		+(+) ⁵		++(+)	0	+(+) ⁵	++	translaminar+contact	1998
(zoxamide+cymoxanil)+fluazinam (0.45 + 0.4)	4.3								translaminar+contact	2013

Product [Dose rate (l or kg/ha)]	Effectiveness				Mode of Action		Rainfastness	Mobility in the plant	Year	
	Leaf Blight ³	New growth	Stem blight	Tuber blight ⁴	Protectant	Curative				Anti-sporulant
mandipropamid+cymoxanil (0.6)	4.4							translaminar+translaminar	2013	
benalaxyl-M+mancozeb ²	3.0	++	++		++(+)	++(+)	++(+)	+++	systemic+contact	1981
metalaxyl-M+mancozeb ²		++	++		++(+)	++(+)	++(+)	+++	systemic+contact	1977
metalaxyl-M+fluazinam ²		++	++		++(+)	++(+)	++(+)		systemic+contact	
(propamocarb+cymoxanil) + cyazofamid ((2.0)+0.5)				4.6					systemic+translaminar+contact	2012
propamocarb+cymoxanil (2.0)					+(+)	++(+) ⁷	++(+)		systemic+translaminar	2011
propamocarb+fenamidone (2.0)	2.5	+(+)	++		++(+)	++	++	+++	systemic+translaminar	1998
propamocarb+fluopicolide (1.6)	3.8	++	++	3.9	+++	++	++(+)	++(+)	systemic+translaminar	2006

Footnotes to Late Blight Fungicide Table

See caveats listed in the section entitled 'General comments about the ratings tables'

¹ Includes maneb, mancozeb, propineb and metiram. ² See text for comments on phenylamide resistance. ³ Based on EuroBlight field trials in 2006-2012.

⁴ Based on EuroBlight field trials 2009-2012 ⁵ Based on limited data. ⁶ In some trials there were indications that the rating was ++(+).

⁷ In some trials the curative activity was +++ ⁸ Observations from some trials indicated that both new growth and stem blight efficacy were ++

Key to ratings : 0 = no effect ; + = reasonable effect ; ++ = good effect ; +++ = very good effect ; Blank = no rating

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

The scale for tuber blight is 0 (no effect) to 5 (complete control).

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

Early Blight Fungicide Table Efficacy of fungicides for the control of early blight caused by *Alternaria solani* and *Alternaria alternata* (as at September 2015)

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

Key to ratings : 0 = no effect ; + = some effect; ++ =reasonable effect ; +++ = good effect ; ++++ very good effect

¹This 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*. ²In some trials there were indications that the rating was ++(+).

³In some trials there were indications that the rating was +++(+). Ratings will be lower where fungicide insensitive strains are present.

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