

# Protocol validation RIMpro-*Plasmopara* 2011

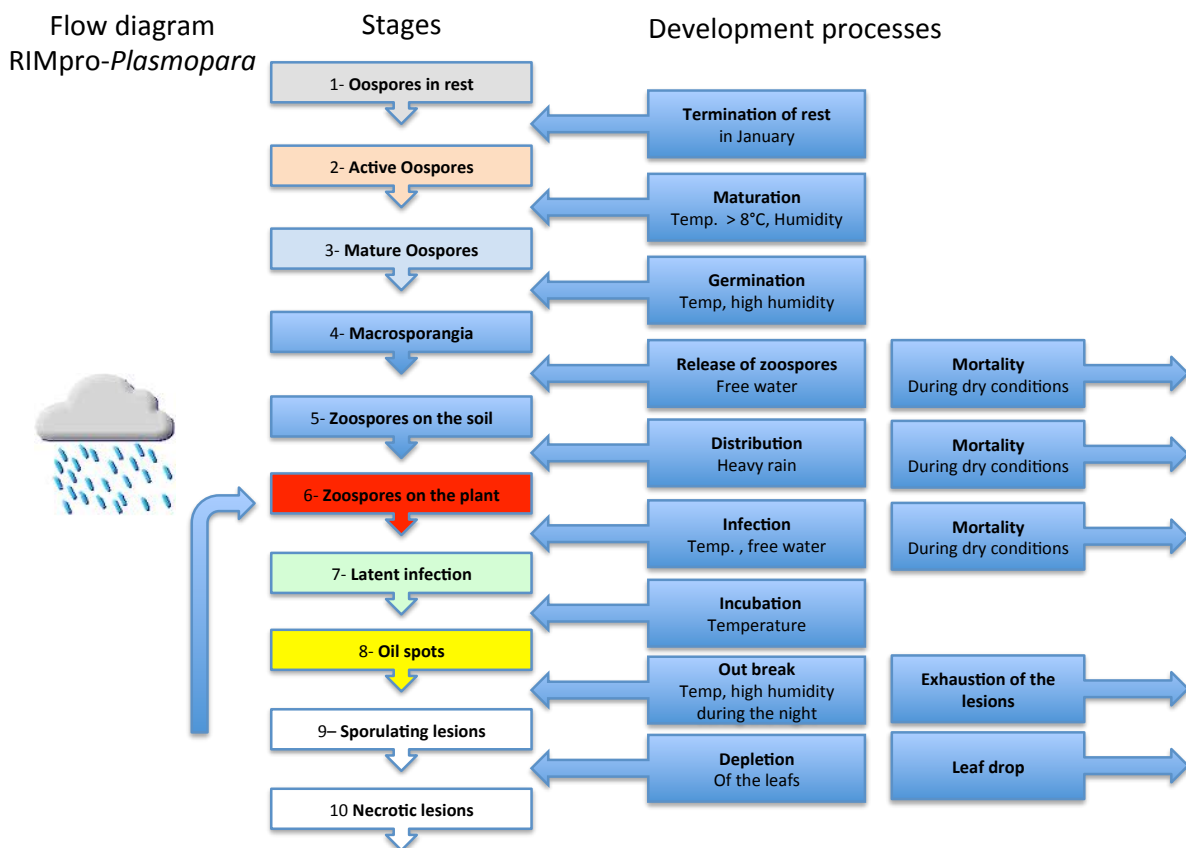
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## Introduction

The RIMpro-*Plasmopara* model is a decision support system (DSS) for management of Downy Mildew in grape production. The DSS is based on a dynamic simulation model that is quantifying the seasonal epidemiology of *Plasmopara viticola*. The model simulates both primary infections, and the subsequent growth of the disease population by secondary infection cycles. The structure and parameters of the sub-models describing the various steps in the infection biology of the fungus are based on published data, and expert knowledge and experience. Figure 1 presents the flow diagram of the simulation model.

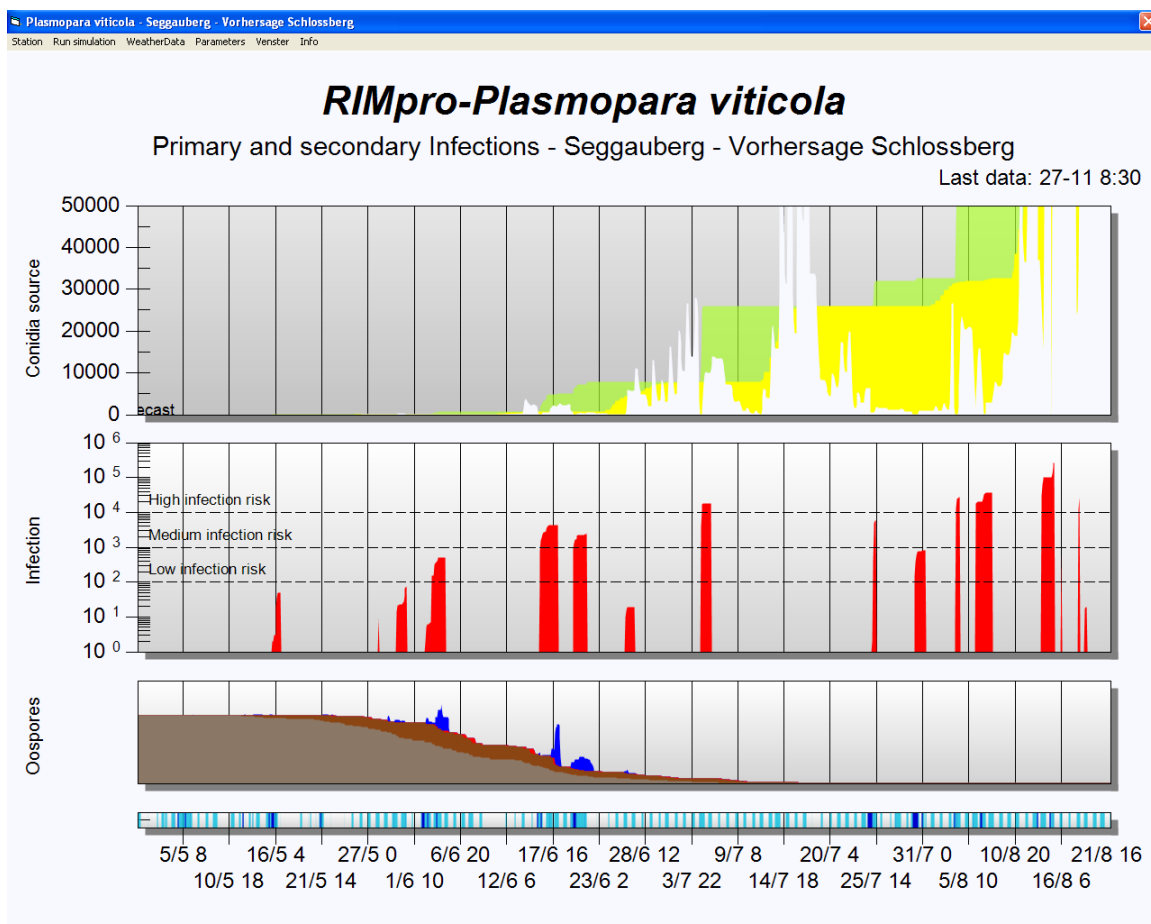
Development of the model has started in 2008. Validation so far has been based on field data from Italy, Austria and The Netherlands. The model is still experimental. On all levels of development: code logic, simulation algorithms, parameter settings, user interface, and practical interpretation of the results, improvements may be necessary. Our work in 2011 should lead to a validated version for practical use in 2012.



## User interface

Parameters for most sub-processes can be set by the user, but we strongly recommend to keep the default setting that we believe are most realistic. The program uses weather data from a local on-farm weather station representative for the vineyard. For practical use as decision support system RIMpro-*Plasmopara* also uses hourly local weather forecast to make predictions on infection events. The weather data file should be complete from February onward. Special care should be taken that RH and leaf wetness readings correspond with the situation in the vineyard, as these are vital parameters in the infection epidemiology of Downy Mildew. The output screen in its present layout consists of four graphs.

1. The lower graph represents the leaf wetness and precipitation readings.
2. The second graph represents the calculated development of oospores population on the soil surface from oospores in rest, over various steps, to free zoospores in the surface water (Blue). These zoospores can be launched into the plant by heavy rain.
3. The third graph represents the infection events. These can be caused by oospores, conidiospores, or both. We indicate some preliminary indications for the interpretation of the infection values
4. The upper graph represents the development of the epidemic in the crop. Green are latent infections, Yellow are the lesions visible as oilspots. White is the conidia production (and survival) by the oilspots.



## **Availability of RIMpro-Plasmopara**

When you are already using RIMpro for Apple Scab or Codling Moth you are familiar with the system, and we can supply you a RIMpro 2011 version that contains the experimental model for Downy Mildew.

Alternatively you could provide us a web location where your weather data are accessible for us (over FTP or HTTP), we can add a local weather forecast for you , and publish the graphs for your trial location on an internet page.

## **Informal cooperation**

As with the other RIMpro models, the development of RIMpro-*Plasmopara* is independent from formal projects, and carried by the voluntary work and enthusiasm of advisers, researchers and growers who cooperate. It is fine when you are able to fund your contribution to the development of RIMpro from local projects, but take care that the data you produce should be public, and your financiers will never be able to claim any rights on the software we develop. You are free to publish your own work. We aim to make all collected information available to anyone who is interested.

## **The aim of the work in 2011**

### 1-Validation

The aim of the work in 2011 is to collect as many data sets as possible that describe the epidemiology of Downy Mildew in 2011 under as many climatically different situations as possible, in combination with local recorded weather data.

The field observations will be used to evaluate the output of the RIMpro-*plasmopara* model using the local recorded weather data.

We will compare:

- Forecasted and observed moments of infection
- Forecasted and observed magnitude of the infection events
- Forecasted and observed disease progress during the growing season.

The results will be published, and used to optimize the model for practical use in 2012.

### 2- Interpretation

After having gained some experience and confidence in the model in 2009 and 2010, some users like to start trials where they base their decisions on the model output . Based on experience in 2009 and 2010 we proposed levels for low, intermediate and high infection risk, but most of our experience in this is on interspecific grape varieties that are partly resistant tot DM. An interesting trial format would be where you treat objects with a curative fungicide after different infection levels have been reached.

The plots would be:

- 1- Untreated
- 2- Common practice

- 3- Treated each infection event
- 4- Only treated when low infection risk is reached.
- 5- Only treated when medium infection risk is reached.
- 6- Only treated when high infection risk is reached.

## Methods

### Trial field

The observations on the epidemiology should be made in an untreated part of a vineyard. Preferably on a common grape variety.

As the incidence of the first primary infections may be as low as 1 lesion on 50-100 plants, for the first observations an untreated block of at least 100 plants is necessary. Later, when the epidemic develops 50 plants would be enough.

As soon as nearly 100% of the leaf has one or more lesions, further observations have no meaning, and you could apply fungicide treatments again to reduce the crop loss due to the trial.

### Observations:

The annex contains a proposed form for the registration of your observations.

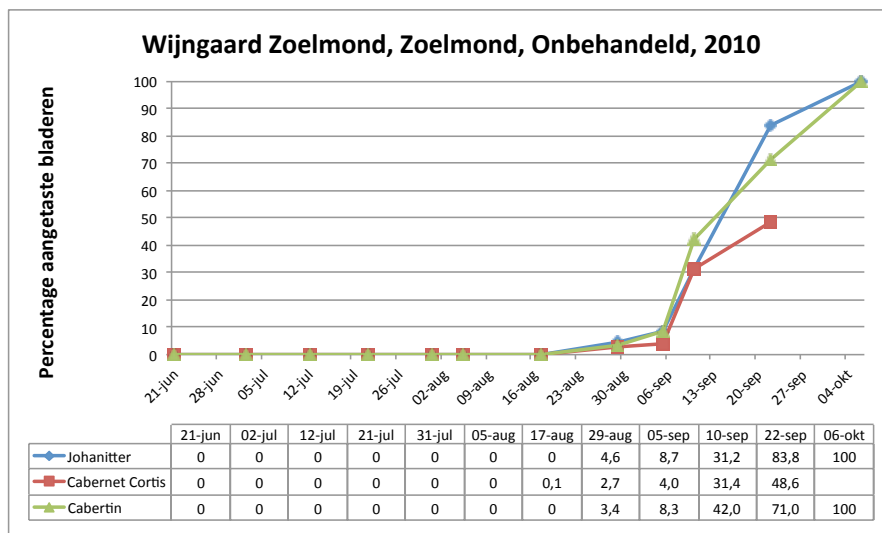
#### *1- Disease level*

Try to establish with 7 to 10 day interval the percentage Downy Mildew infected leaves. Focus on moments just before and just after you or RIMpro expects oil spots to become visible.

As long as no primary lesions have been found, check all plants in your trial plots carefully for symptoms, and note NONE as long as you find nothing.

From the moment on you find the first lesions, change the method to quantify the disease level. Check on 10 random spots in your trial field 100 leaves for Downy Mildew symptoms, and note the number of infected leaves in each series of 100 leaves. A convenient way to do this is to observe 100 leaves from lower, middle and upper part of the canopy, and count the number of infected leaves with a hand counter.

Results could look like these in a vineyard in The Netherlands in 2010.



## *2-Sporulation*

An essential driving factor for the secondary infections is the sporulation of oilspots. So to be successful RIMpro should simulate the sporulation well.

On each observation date note the level of sporulation of 30 random chosen leafs and note the magnitude of sporulation:

0= no sporulation

1= very limited spores present on the surface of the lesions

2= intermediate number of spores present on the lesions

3= strong sporulation

## *3- Situation notes*

In your trial-log, make notes that help to understand the situation better. E.g. on what leaf level are the fresh oilspots developing, that you see some fresh spots but suspect from what you see that many more will become visible the coming days, or that you still see only lesions on older leafs.

## *4- Crop phenology*

On each observation date note the phenological stage of the crop according the BBCH-scale for grapes. See attachment.

## **Communication**

If you have any questions please send me an e-mail or call : +31 6 53 176118  
Please let me know as soon as you find the first oilspots of *Plasmopara viticola*

Success!



Growth stage	Code	Description
0: Sprouting/Bud development	00	Dormancy
	01	Beginning of bud swelling: buds begin to expand inside the bud scales
	03	End of bud swelling: buds swollen, but not green
	05	“Wool stage”: brown wool clearly visible
	07	Beginning of bud burst: green shoot tips just visible
	09	Bud burst: green shoot tips clearly visible
1: Leaf development	11	First leaf unfolded and spread away from shoot
	12	2nd leaves unfolded
	13	3rd leaves unfolded
	1 .	Stages continuous till . . .
	19	9 or more leaves unfolded
5: Inflorescence emerge	53	Inflorescences clearly visible
	55	Inflorescences swelling, flowers closely pressed together
	57	Inflorescences fully developed; flowers separating
6: Flowering	60	First flowerhoods detached from the receptacle
	61	Beginning of flowering: 10% of flowerhoods fallen
	62	20% of flowerhoods fallen
	63	Early flowering: 30% of flowerhoods fallen
	64	40% of flowerhoods fallen
	65	Full flowering: 50% of flowerhoods fallen
	66	60% of flowerhoods fallen
	67	70% of flowerhoods fallen
	68	80% of flowerhoods fallen
	69	End of flowering
7: Development of fruits	71	Fruit set: young fruits begin to swell, remains of flowers lost
	73	Berries goat-sized, bunches begin to hang
	75	Berries pea-sized, bunches hang
	77	Berries beginning to touch
	79	Majority of berries touching
8: Ripening of berries	81	Beginning of ripening: berries begin to develop variety-specific colour
	83	Berries developing colour
	85	Softening of berries
	89	Berries ripe for harvest