

Guidelines and recommendations for the evaluation of a bio solution at different scale.

Based on COPPEREPLACE project



One of the actions of COPPEREPLACE project was focus on the best way to evaluate alternatives products (such as biocontrol agent), that could be used to decrease the amount of copper brought in vineyard protection.

After 2 years of evaluation. This document gives guidelines and recommendations about how to evaluate a bio solution on downy mildew pathogen based on all the problem encountered and solve during the project.

To start with, it is important to evaluate with different scale of trials, to avoid misunderstanding of results by evaluate the product directly in field. 3 scales are recommended: laboratory, small and large trial in field.



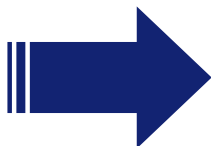
1. Screening products in Laboratory trial

First, lab trials are important to screen a lot of products and select the ones that seems to be the most efficient. Laboratory trials allow to control all the other parameters that cannot be controlled in field (weather, fungus attack, weakness, lack of nutriments etc..).

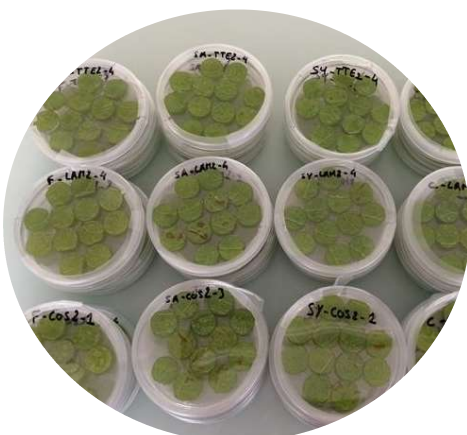
Precautions:

- Work on leaves disks that never receive any product and be sure that they are not infected by any pathogen (better to use potted plants and not leaves taken in field)
- Do minimum of 4 repetitions (4 petri dishes) with 10 disks each.
- Inoculate with a high concentration of inoculum (min 10^5)
- Do 2 assessments: the first one 5 or 7 days after the inoculation, the second one 10/12 days after.
- Do several trials until **you find homogeneous** results to conclude.

EVALUATION OF THE PRODUCT		
	ALONE	IN ASSOCIATION
OBJECTIVES	<ul style="list-style-type: none"> • Define the protocol based on the action of the alternative product (defense stimulation, direct action) • The action of the product will decide how to proceed to evaluate its efficiency (treat before/after the inoculation) 	<ul style="list-style-type: none"> • Reduce the dose of copper associated • Verify if there are any incompatibilities between the bio solution and copper



After the screening, select some modalities that have the best efficiency to evaluate in field.



2. Small trial evaluation

Small trial allows to evaluate several modalities in small plots, in field condition. Several objectives can be conducted in small plot:



Precautions:

- Minimum **4 repetitions** of 10 vines per modality (assessment will be done on each repetition)
- Add a modality with **untreated vines** all the season to validate the pressure.
- Before started to adapt the dose of alternative product, make sure that the full dose is efficient (all the season).
- If association with copper, lab trial will give recommendation if it is necessary to separate the application of the bio solution and the copper (avoid the mixture because incompatibilities for example). In small trial, chose if applications with copper are done separately or in alternance or in addition.
- To be sure to have result; use **artificial contamination** in field, and aspersion system to simulate rain
- Be careful to do the **artificial contamination after 2 treatments minimum**, at least for the defenses activator's product
- If association with copper product, make sure to **adapt the dose of copper** associated to the leaf wall area and the pressure: define each dose at each date of application.
- Example of device:

Experimental device :

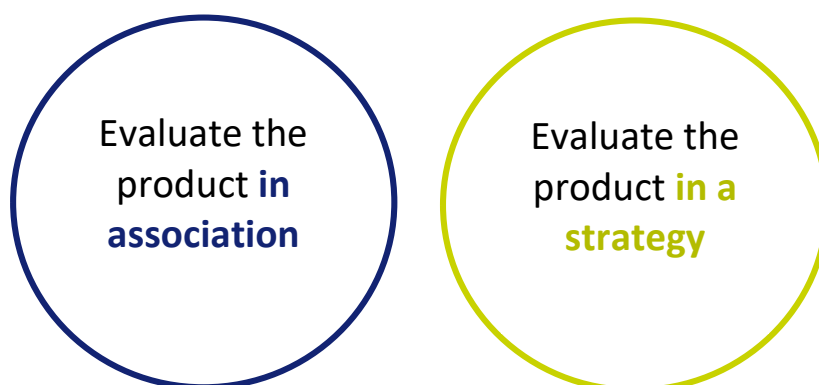
exemple :
1 case = 10 vines or more
n° = number of the modality tested
4 repetitions

	r1	r2	r3	r4
Bloc 1	1	2	3	4
Bloc 2	5	8	7	6
Bloc 3	4	7	5	1
Bloc 4	8	6	2	3
Bloc 5	3	1	4	2
Bloc 6	6	5	8	7
Bloc 7	2	3	6	8
Bloc 8	7	4	1	5

...

3. Large trial evaluation

Large trial allows to evaluate few modalities in bigger plots, in field condition, with viticultural spraying system. The objective is to find the results observed in lab/small trials and see if it is transferrable to a large scale. Several objectives can be conducted:



Precautions:

- Minimum **3 repetitions** of each modality in different zones in the parcel to take in consideration the potential **heterogeneity** of the pressure. The number of rows per repetition will depend on the sprayer (how many rows it can treat on 1 way)
- Add if it is possible some **untreated vines**, at least to follow the pressure of the year (on a border of the parcel to avoid any confusion for the vine grower who will treat the rest of the parcel). 20/25 vines could be enough.
- If association with copper, lab and small trial will give recommendation if it is necessary to separate the application of the bio solution and the copper (avoid the mixture because incompatibilities for example).
- If association with copper product, make sure to **adapt the dose of copper** associated to the leaf wall area and the pressure: define each dose at each date of application.
- For the assessment, evaluate several plots (3) per repetition. On a large scale it is important to anticipate any problem of protection in one area.
- Example of device:

