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EXPERIENCE WITH SUSTAINABLE ALTERNATIVES IN THE PROTECTION OF VINEYARDS IN ARGENTINA

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ABSTRACT

Grapevine Powdery mildew *(Erisiphe necator*) is an important disease inside the wine-growing scene. Their integrated management implies a constant technical actualization about new tools. This challenge can be even more important if we consider all those parameters working into an organic production. The innovations in the field of the crop protection support sustainable alternatives for integrated control programs aiming at avoiding or reducing pesticides residues in the final product and providing valuable anti-resistance pest and disease management tools.

Studies realized in different Argentine vine-growing regions prove the high performance of control of powdery mildew by means of the use of Paraffinic oil, observing levels of efficacy between 73.1% and 80.6% for the commercial dose, whereas the severity of the disease did not overcome 4.5%.

Keywords: Powdery mildew, Paraffin oil, integrated management, Argentine vineyard.

RESUME

L'oïdium de la Vigne *(Erisiphe necator)* est une maladie particulièrement présente sur la scène viticole. Sa gestion intégrée implique une actualisation technique permanente de nouveaux outils. Ce défi peut être encore plus important si nous considérons ces paramètres dans le cadre de la production biologique. Les innovations dans le domaine de la défense des cultures soutiennent des alternatives durables orientées vers des programmes de contrôle intégré visant à réduire les résidus de pesticides dans le produit final et permettant de disposer d'outils anti-résistance pertinents dans la gestion des parasites et des maladies.

Les études réalisées dans différentes régions viticoles argentines prouvent la haute performance du contrôle de l'oïdium au moyen de l'utilisation d'huile paraffinique, montrant des niveaux d'efficacité de 73,1 % à 80,6 % pour la dose commerciale, avec une sévérité de la maladie n'ayant pas dépassé 4,5 %.

Mots-clés : Oïdium, Huile Paraffinique, gestion intégrée, vignoble argentin.

1) Introduction

The development of products of organic and / or biological characteristics and their strategies of use opens the possibility of an effective control without risk of compromising the innocuousness of the final product.

The aim of the realized studies was to verify the efficacy of Paraffin oil on powdery mildew control in the growing conditions of Mendoza, one of the most important wine regions in Argentina.

1.1) Powdery mildew description

Powdery mildew of the grapevine *Oïdium tuckeri* and its asexual form *Erisiphe necator* is a disease of great importance in the Argentine wine-growing areas. For treating itself about a fungus that develops and reproduces in conditions of average dampness, the sole occurrence of a small rain is enough to observe the ashen mycelia in leaves and in persistent conditions the fructifications of the fungus in fruits.

The associate damages go from slight fissures in berries that can be a door of entry to future problematic rottenness's, up to a severe defoliation that will involve the lack of sugar concentration of the production of the year and a strong decrease of the yields in the production of the next year; coming in ends to the fall of the berries. The early infections can be identified by the presence of green berries that remain in the bunch up to the crop. In Mendoza Powdery mildew is an endemic disease and for many producers. Depending on the climatic conditions of the season, infections can be observed from severe to slight and with major pressure in early or late phenological stages of the crop.

2) Materials and methods

Efficacy tests

The tests were carried out from 2007 until 2014 in different districts of Mendoza, Argentina. One of the tests was realized on Cabernet Sauvignon variety in Luján de Cuyo during the season 2007/08 that corresponds to a year with low pressure of disease. Another study was located in San Rafael on Chardonnay variety during the season 2009/10, which was particularly favorable to Powdery mildew.

The treatments were the following:

Table I: Description of the treatments
(Tableau I: Description des traitements)

Treatment	Product	Doses	Application timing
A	Paraffin oil	1%	1,2
B	Paraffin oil	2%	1,2
C	Sulphur / Quinoxyfen / Myclobutanil	3 Kg/ha 100 ml/ha 12ml/ha	1,2,3
D	Unsprayed		

The applications were done with a mixture equivalent to 1000L/ha.

Table II: Dates of application on Cabernet Sauvignon, campaign 2007/08, Luján de Cuyo, Mendoza
(Tableau II: Dates de traitement sur Cabernet Sauvignon, campagne 2007/08, Luján de Cuyo, Mendoza)

Application timing	Application date	Phenological stage
1	20/10/07	shoot growth 10-30 cm
2	9/11/07	Pre-flowering
3	19/12/07	Berries pepper corn size

Table III: Dates of application on Chardonnay, campaign 2009/10, San Rafael, Mendoza
(Tableau III: Dates de traitement sur Chardonnay, campagne 2009/10, San Rafael, Mendoza)

Application timing	Application date	Phenological stage
1	30/10/09	shoot growth 30-40 cm
2	6/11/09	Pre-flowering
3	23/12/09	Berries pea size

In the case of Luján de Cuyo, the crop is led in ladder with bilateral cord and the age of the crop is 17 years. In this device, 4 treatments were distributed at random with 4 repetitions. All the applications consisted of a volume of mixture equivalent to 1000 L/ha.

In case of the test in San Rafael, the vineyard is led in ladder with bilateral cord and the age of the crop is 9 years. In this device, 4 treatments were distributed at random with 3 repetitions. All the applications consisted of a volume of mixture equivalent to 1000 L/ha.

The evaluations were realized on 04/02/2008 for Luján and 22/01/2010 for San Rafael and they consisted of observing the central part of every repetition counting the total number of clusters, the quantity of these with symptoms of powdery mildew (measurement called "Incident") and later the percentage of the fruit compromised by the disease, considered "damaged" (measurement called "Severity").

Table IV: Evaluation according to degree of infection
(Tableau IV: Évaluation selon le degré d'infection)

Category	% of damaged bunches
C0	0
C1	1-20
C2	21-40
C3	41-60
C4	61-80
C5	81-100

With the obtained information, the infection severity index is calculated according to the formula:

S= (0 x C0 + 0, 2 x C1 + 0, 4 x C2 + 0, 6 x C3 + 0, 8 x C4 + 1 x C5) / N x 100

References:
S: Infection severity (%)
C0: Category 0
C1: Category 1…
C5: Category 5
N: Total number of damages
With the information obtained, it was proceeded to the analysis of the variance by means of Tuckey's test $\alpha \leq 0, 05$.

3) Results

Of the evaluations in the test carried out in Luján, we can observe that the treatments with Paraffin oil differ statistically from the unsprayed reference both in intensity and in severity. The efficiencies of control of the treatments A and B are 80.6% and 96.8% for the intensity and 90.1% and 97.8% for the severity, respectively. In addition, the behavior of Paraffin oil was equivalent to the commercial products used to control grapevine powdery mildew.

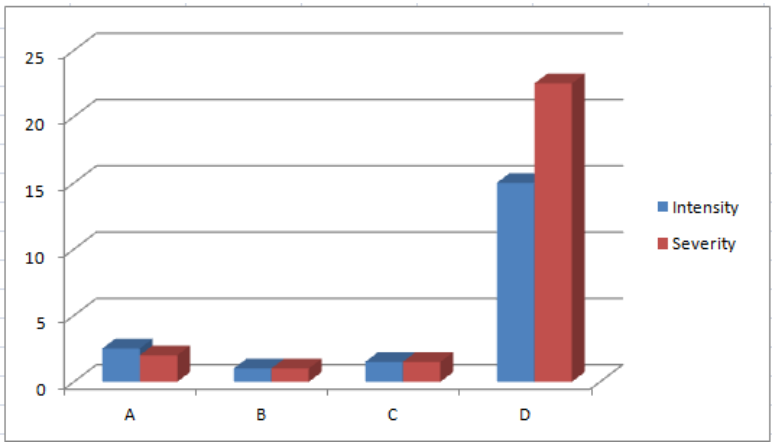

Figure 1: Intensity and severity of powdery mildew infections according to the treatments, campaign 2007/08, Luján de Cuyo, Mendoza

(Figure 1: Intensité et sévérité des attaques d'oïdium en fonction des traitements, campagne 2007/08, Luján de Cuyo, Mendoza)

In San's Rafael test, we can observe that the damage intensity of the treatment A differs significantly from the one obtained in the treatments C and D (Figures 2). The efficacies of control obtained were 73.4% for the severity of infections. The treatment B has an intermediate control that does not differ statistically. The treatments C and D reached levels of infection reaching approximately 40% of affected fruits.

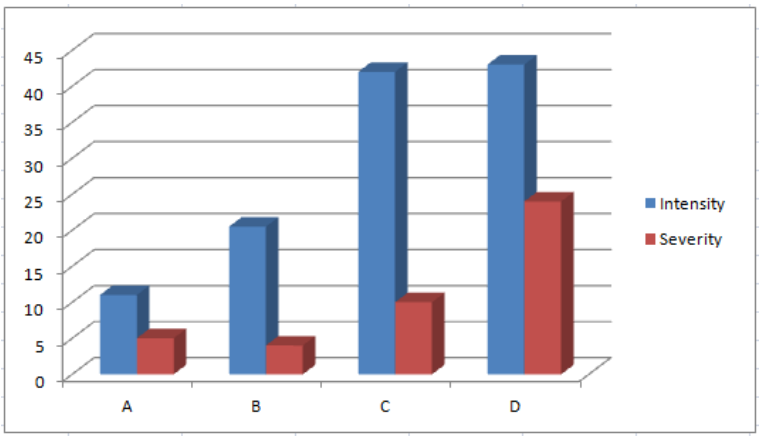

Figure 2: Intensity and severity of powdery mildew infections according to the treatments, campaign 2009/10, San Rafael, Mendoza
(Figure 2: Intensité et sévérité des attaques d'oïdium en fonction des traitements, campagne 2009/10, San Rafael, Mendoza)

4) Conclusion

The results obtained of the studies of Paraffin oil have consistently proved for 7 years efficiencies of control of powdery mildew similar to the commercial standards, at the dosage of 1%. Paraffin oil acting on a broad spectrum basis, occasional pests such as mites or scales can be also controlled at the same dosage.

Paraffin oil turns out to be an interesting alternative tool for the integrated management of powdery mildew in the Argentine vineyards.

Considering its original modes of action, Paraffin oil offers interesting benefits for the sustainable productions of grape and wine, among which the safety of use for operators and consumers, , the absence of toxic residues on the crops and the absence of risk of resistance development from pests and disease.

Reference

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