

BEHAVIOR OF THE PATHOGEN *P. LEUCOTRICHA* IN DIFFERENT METHODS AND FUNGICIDES

MUFAIL SALIHAIJ^{1*}, MYZEJEN HASANI²

¹ University of Prishtina, Kosovo.

² Agricultural University of Tirana.

*Author of correspondence; Email: mufailsalihaj@hotmail.com

Abstract

Apple Powdery Mildew caused by pathogen *Podosphaera leucotricha* is one of the most frequent diseases causing considerable quantitative and qualitative damage into the apple culture whose control is based mainly in the chemical method, even though this disease remains a matter of concern for the producers of this apple cultivar. For this reason, it is of paramount importance to identify a more effective fungicide for combating the apple powdery (*P. leucotricha*) as well as finding the right timing to carry these treatments. The study was carried during the 2010 – 2011 period in the District of Prishtina. The study was carried on Idared and Jonagold cultivars, which take a considerable part in the plantation structure and indicated higher rate of sensitivity to this disease as shown in the previous studies. During this study we have applied different types of fungicides for the sake of comparison of the data obtained when applying biologic and traditional methods, alternatively, in combating this disease. All these findings were presented in the diagrams and compared with the control parcel. Index of the infection was calculated in a periodic manner during the vegetation period (June – September), based on which findings we measured the efficiency scale of applied fungicides. The purpose of this study is to obtain concrete results from testing several fungicides, their type and dosage, in order to have a better and more realistic view over their effect, which in future would serve the local farmers in finding the best practices of combating the powdery mildew.

Key words: alternative, dosage, cultivar, fungicide, vegetation

1. Introduction

Following destruction left behind as a result of war in Kosovo, there is a steady increase of the surface planted with fruit cultures, 52% of which comprises of the apple cultivars.

The powdery mildew caused by *Podosphaera leucotricha*, can be commonly found in the apple cultivars throughout Kosovo. This disease is very dangerous and as such it causes a lot of damage to both quantity and quality of the apple production. The impact of the fungus causing this disease can be explained with its biologic characteristics, its ability to quickly reproduce and spread itself, which makes the protection against this disease more than necessary [2,6].

The purpose of this study is to see the efficiency of several types of fungicides in putting the powdery mildew under control, namely in the cultivars Idared and Jonagold in the region of Prishtina.

1.1 Objective of the study

Determination of intensity of affectedness in the apple cultivars in both treated and untreated parcels in order to evaluate resistance of the cultivars observed in this study. Determination of efficiency of several

active substances of tested fungicides, according to the study objectives by comparing the findings obtained with traditional and biologic method, respectively.

2. Material and methods

The experiment was carried during 2010 – 2011 in the District of Prishtina, around 28 km from the capital in Shtime Municipality, in the site called Mollopolc. Our experiment was focused mainly on the cultivars Idared and Jonagold (which are more sensitive towards *P. leucotricha* [10, 12]). In order to see the efficiency of their impact into the mildew four different types of fungicides were tested, namely Zato 50 WG (Trifloxystrobin 500g/kg), Falcon EC 460 (Tebukonazole 167g/l, Triadimenol 43g/l, Spiroxamine 250g/l), Karathane EC (Dinocap 350g/l), and Sabithane EC (Dinocap 325g/l, Myclobutanil 75g/l) against untreated control. In the biologic treatment, only Cumulus preparation with 80% sulfur was applied, while in the traditional treatment variant we applied the traditional recipe which is used by Kosovo farmers, without any modification with eight (8) interventions during vegetation. Treatment in all these cases was conducted after 16:00hrs, with a back

pump with a capacity of 10 liters. A total of four (4) treatments were carried out. Determination of index of infection from the mildew in the apple cultivars, caused by *Podosphaera leucotricha*, was done through two assessments, first of which was conducted in June and the second in the beginning of September [2, 5]. To this end, a total of 100 leaves from four trees of each apple cultivar were collected, i.e. in average 25 leaves from one apple tree from all sides of the crown, as well as from within, pursuing thus the spiral method of sampling, in order for the assessment of infection to be more reliable. Apple trees picked for analyses were selected at random for each cultivar, regardless of their extent of infection [4, 6]. The taken samples were sent to the laboratory for determination of infection scale. Assessment of infection was done as per category, in a scale from 0 to 5, whereas index of infection was calculated according to Townsend Heuborger formula [8, 9]:

$$P = \frac{n \times x}{5 \times N} \times 100$$

P = Amount of leaves infected as to category

N = Number of leaves per each category

x = Specific category

5 = Number of categories

N = Total number of leaves analyzed

Categories of leaves' infection are the following:

0 – No infection

1 – Light infection

2 – Less than half of leaf infected

3 – More than half of leaf infected

4 – Severe infection of leaf

5 – Leaves destroyed by infection

Also a two way ANOVA analysis was carried out, by XLSTAT program [1, 11].

3. Results and discussion

In order to determine the index of infection scale in apple cultivars, we compared the results of the last two assessments carried out during vegetation in 2010 and 2011, which were namely conducted in the first ten days of June and September, respectively. Results of this experiment are given in the table 1. Figures 1-2 show the behavior of the pathogen *P. leucotricha* when applying different types of fungicides, as average for two years under study.

Such graphic presentation of the data obtained during this two years' study shows that the powdery mildew is present in the apple cultivars with almost same index of infection from the very beginning of

vegetation until its end. High percentage of index of infection which is around 20% in average in both cultivars shows that in order to keep this disease under control, chemical treatment is required.

From three variants applied in this experiment, the best effect was achieved with application of the chemical treatment, with the best results achieved with the fungicide Zato 50 WG and Falcon EC, which managed to reduce the index of infection for 2.3% and 3.1%, respectively, compared to the assessment conducted in September 2010 in the cultivar Idared, when the affection scale was 21.8%. The same effect of these fungicides was observed in this two years' study also in two tested cultivars. In the biologic variant with sulfur, infection scale is reduced in average for around 50%, when compared to the examination during these two years of the study, which is quite encouraging when considering the low cost and other advantages of this biologic preparation.

The data obtained from the variant based on the traditional treatment are unsatisfying due to the percentage of the index of infection which is around 7.3% up to 9.2% and high number of treatments. Low efficiency of this variant is due to improper combination of applied fungicides.

From Two Way ANOVA analysis it was concluded that the effect of fungicides and cultivar are both significant, but not the interaction between them.

4. Conclusion

During this two years' study of the apple powdery mildew cause the pathogen *Podosphaera leucotricha* was present in the tested orchard.

The data on the index of infection in the cultivars Idared and Jonagold indicate that interventions with chemical treatments are required in order to keep this disease under control.

From the tested variants, higher efficiency was demonstrated by the fungicides Zato 50 WG and Falcon EC, where significant reduction of infection was observed when compared to the control.

Promising treatment was also the treatment with sulfur in the variant of biologic control, taking into consideration its economic advantage as well as advantage of its use (such treatment does not pollute the environment, it is not toxic either to humans or animals, it does not leave toxic residue in fruits, etc).

Results obtained from traditional treatments are unsatisfying due to high number of treatments which

cannot be justified by the infection scale. This is the reason that based on the data obtained from this experiment, to inform Kosovo farmers to give up

from using this traditional method and to choose one of the alternative variants which have emerged from this experiment.

Table 1: Behavior of the pathogen *P. leucotricha* when applying different types of fungicides in the cultivars Idared and Jonagold during 2010 - 2011, expressed in percentage.

Active substance	Idared				Jonagold			
	2010		2011		2010		2011	
	June	September	June	September	June	September	June	September
Plots.test	19.8	23.9	21.6	21.8	17.6	19.5	18.9	20.7
Treat.tred	7.8	7.9	8.6	8.2	7.3	7.4	7.9	9.2
Sulphur	9.2	10.9	10.3	7.9	8.4	8.1	9.5	9.7
Zato 50 WG 01	4.7	4.6	5.1	3.9	4.2	3.6	4.9	3.8
Zato 50 WG 015	2.7	3.3	3.9	2.3	2.9	2.6	3.7	2.9
falcon EC 460	3.6	3.7	4.2	3.1	3.1	2.4	3.9	3.1
Karathane EC	5.2	5.2	6.3	5.7	4.9	5.1	5.7	5.3
Sabithane EC	5.3	4.9	5.1	4.6	4.7	4.1	5.1	4.6

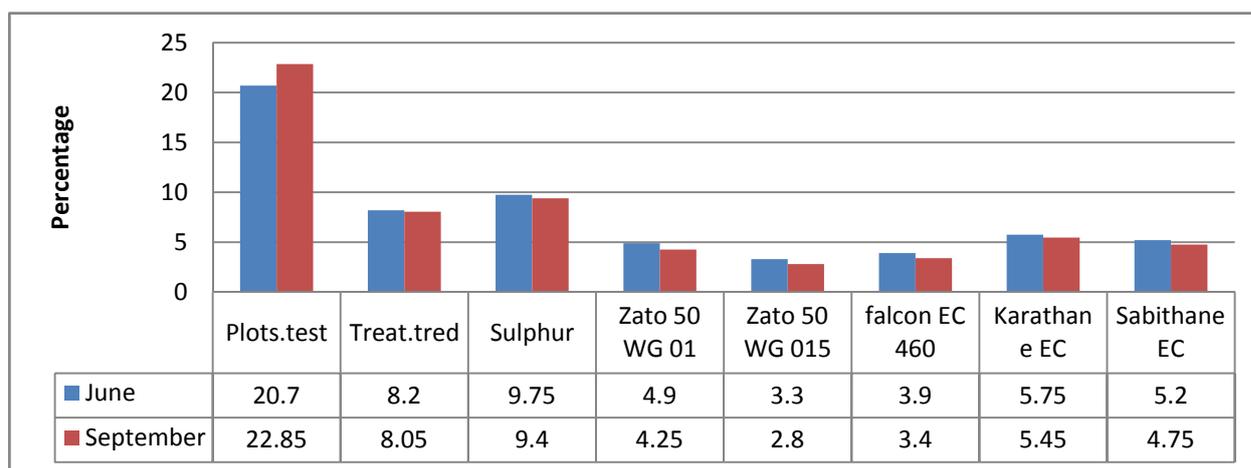


Figure 1: Behavior of the pathogen *P. leucotricha* when applying different types of fungicides in the cultivar Idared, as average of 2010 and 2011, expressed in percentage

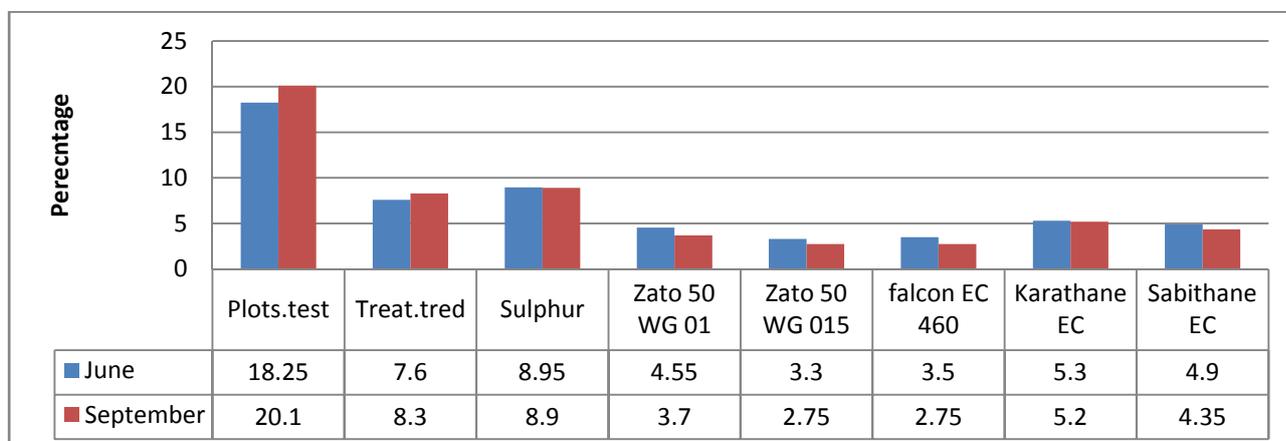


Figure 2: Behavior of the pathogen *P. leucotricha* when applying different types of fungicides in the cultivar Jonagold as average of 2010 and 2011, expressed in percentage

From the results obtained during our study it can be clearly seen that intervention with protective means is necessary and this can be proven by the high percentage of the infection scale in the tested parcel – untreated one in which the index of infection amounts from 17.6% until 23.9%.

Results from the traditional treatment are not satisfying in spite of eight (8) interventions undertaken during the vegetation period. Its percentage is around 7.3% until 9.2% and such high infection scale has occurred due to improper combination of the used pesticides.

Yet, we have obtained some encouraging results from the biologic treatment with sulfur, having in mind the number of treatments and their low cost. Index of infection was around 8.1% until 9.7%.

From the four fungicides which were put on trial, very good results were obtained by the fungicide Zato 50 WG and Falcon EC, which have reduced the infection scale to 2.3%.

The fungicides Karathane EC and Sabithane EC have provided approximately same results, i.e. from 4.1% to 6.3% which demonstrates less powerful effect in combating this pathogen when compared to the first two fungicides.

Just like in the previous studies, also in this case it emerged one more time that in order to properly monitor the mildew one should be very professional and careful during the entire vegetation period.

5. References:

1. Agresti A: **Categorical data analysis.**: Wiley Interscience,; 1990.
2. Agrios GN: **Plant Pathology.** 3rdEdn. 1988.
3. Covey RP: **Effect of extreme cold on the overwintering of Podosphaera leucotricha.** *Plant Dis Rep* 1969, **53**: 710-711.
4. Goidanich G, Casarini B, Ugolini A: **La difesa delle piante da frutto:** Edizione Agricole; 1990.
5. Govi G: **Patologia vegetale:** Edagricole; 1969.
6. Hasani M, Universiteti Bujqesor Tirane h8: **Patologjia e pemeve Frutore.** In: Agricultural University of Tirana, Albania; 2003: 8-11.
7. Matta A: **Fondamenti di Patologia vegetale.** In: *Patron editore, Bologna*; 1996: 348-349.
8. Molnar J: **Notes on the harmfulness of Apple mildew.** *Revof Plant Pathology* 1969: 4-6.
9. Odintsova OV: **Powdery mildew of Apple in the Krasnodar region along the Black Sea coast.** *Rev Plant Pathology* 1969: 337-339.
10. Salihaj M, Hasani M: **Determining intensity of Affectedness with Apple Powdery Mildew(Podosphaera leucotricha) in the Main Cultivars of Kosovo.** *Environmental Applicaion & Science* 2010, **5**: 156-166.
11. Saporta G: **Probability, Analyse de donnis et statistiques,**: Technip, Paris; 1991.
12. Susuri L: **Fitopatologjia.** Universiteti Bujqesor Prishtine, Kosove; 1995: 150-153.