Scientific Papers. Series B, Horticulture. Vol. LVII, 2013
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

PEACH CROP PROTECTION IN SUSTAINABLE AGRICULTURE CONDITIONS IN SMALL AND MEDIUM FARMS

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Abstract

Scientific work aims to promote disease management systems of fruit trees stone group (peach), using chemical treatment methods with low impact on the environment and human health, which contribute to increase crop quality and quantity. Research has been conducted on peach species cultivated in Research and Development Station for Fruit Tree Growing-Baneasa, Bucharest, in the climatic conditions of the year 2012. Stigmina carpophila was the pathogen for which measures have been taken for its prevention and control. Treatments against pathogen were applied at warning, depending on the biological reserve of the vegetation period and the climate evolution in that year. Among the five fungicides used, the best results were obtained with the products Score 250 EC and Systhane C PU.

Key words: *peach orchard, disease control, ARM software.*

INTRODUCTION

Prunus persica L. culture has a high economic value on national as well as on international level. Production and fruits marketing is the goal of an intense modern trade. Annually, the trees suffer from attacks of various pathogens causing crop diseases which develop dependent to the climate conditions of the year and to the cultivated variety (Ivascu, 2002; Delian, 2006). Long term use of pesticides in pomiculture and ignoring its side effects, have had negative consequences towards the environment (Hoza et al., 2000; Burzo et al., 2005). Nowdays, the more severe requirements regarding the environment protection and health orchards led to the development of ecological selective methods (Toncea, 2001) specifically for the crops pest control (Jinga et al., 2008). The treatments applied during the vegetation period determine the improvement of the yield's quality and quantity (Delian et al., 2012).

MATERIALS AND METHODS

The evaluation of several plant protection products efficacy against the main studied pathogens for the peach culture was developed during several visits at the Research and Development Station for Fruit Tree Growing-Baneasa. There were taken biological samples (plants with pathogen attack symptoms) from this orchard and there were isolated the main pathogen agents. The isolated pathogens were used in laboratory experiments for testing these new plant protection products proposed in the technology. After the laboratory trials, there were also performed field treatments, during the spring season, in the vegetation period, with fungicides, followed by establishing the efficacy of the tested products. In the *Prunus persica* L. orchard there were carried out treatments in order to prevent and control the attack of the main fruit's pathogens. The attack rate was calculated with the formulas RA%= F*I/100, F%-frequency of the attacked organs, I – intensity of the organ' attack. The tested peach variety was Victoria, which is a sensitive one. During the laboratory trials was tested the biological action of the following products: Dithane M45, Bravo Folicur Solo 250EW, Score 250 EC and Systhane C PU. It was used a method based on the inclusion of the tested fungicide into the PDA medium, in 5 different concentrations. The medium was poured in

Petri dishes, the pathogenic fungi were placed on the medium, and it was observed the growth of the colonies compared to control fungi, growth on medium without fungicide (Baicu et al., 1996; Severin et al., 2001). For each fungicide concentration was calculated the inhibition percent of the mycelium growth (Alexandri, 1982; Geamanu, 2006).

The field trials of the fungicides selected after the laboratory tests were made in the 2012 spring season. There were used the following variants:

V1 = untreated control
V2 = Dithane M45 0.2% concentration
V3 = Bravo 500 SC 0.15% concentration
V4 = Folicur Solo 250 EW 0.1% conc
V5 = Systhane C PU 0.1% concentration
V6 = Score 250 EC 0.02% concentration

Weather conditions during application:

Table 1. 1st treatment 04-04-2012

Temperature of air	19.2°C
Relative humidity	54%
Wind speed	0.8
Wind direction	N
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0.4 mm
Rainfall with 2 weeks after spraying	0 mm
First rainfall after spraying and its amount	15-05-2012

Table 2. 2nd treatment 06-05-2012

Temperature of air	13.9°C
Relative humidity	72%
Wind speed	0.5
Wind direction	NE
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0.4 mm
Rainfall with 2 weeks after spraying	3.4 mm
First rainfall after spraying and its amount	19-05-2012

Table 3. 3rd treatment 09-06-2012

Temperature of air	19.6°C
Relative humidity	64%
Wind speed	0.7
Wind direction	N
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0 mm
Rainfall with 2 weeks after spraying	0 mm
First rainfall after spraying and its amount	24-06-2012

There were applied 3 treatments on the 4th April, 6th May and 9th June, in accordance with the meteorological conditions, and the observations took place 8 days after each treatment, taking into account the frequency (PESING) and the intensity (PESSEV) of the attack. The observations targeted the *Stigmina carpophila* pathogen which produces the shot hole disease (Figure 1).

The treatments were carried out using the SOLO atomizer pump (Figure 2).

Studies regarding the experimental models of the proposed technology took place in an 8 years *Prunus persica* L. orchard, at Research and Development Station for Fruit Tree Growing-Baneasa, in order to establish the rate of infectious load from this area.

It was used the classical testing method which consist in 6 variants in 4 replications with 5 trees per each variant in random disposal.

Figure 1. Shot hole and fruit stain produced by Stigmina carpophila

Figure 2. Treatments in vegetation period

RESULTS AND DISCUSSIONS

The biological action of some fungicides on the development of *Stigmina carpophila* fungus colonies on leaves and fruits is presented in Table 4.

Table 4. Biological action of some fungicides on the development of fungus colonies Stigmina carpophila

Product	Colony diameter (mm) at conc.%					Inhibition percent at conc.%				
	0,2	0,1	0,05	0,025	0,015	0,2	0,1	0,05	0,025	0,015
Dithane M 45	0	7	10	16	20	98,6	70,0	65,0	37,1	11,5
Bravo 500 SC	0	8	20	25	41	100	80,5	70,5	20,0	14,8
Folicur Solo 250 EW	0	0	8	10,5	15	100	91,4	88,6	75,0	50,1
Systhane CPU	0	0	8	19	31	100	100	78,5	58,6	42,5
Score 250 EC	0	0	0	0	0	100	100	100	87,1	51,5
Control	70 mm									

Based on the data presented in Table 4 were selected the products and their optimal concentration which will further be used during the field trials in order to control the fungus *Stigmina carpophila*.

The products with very good biological action were: Folicur Solo 250 EW in 0.1% concentration, Systhane C PU in 0.05% concentration, Score 250 EC in 0.02% concentration, Bravo 500 SC in 0.2% concentration, Dithane M 45 in 0.2% concentration.

During the experiments there were taking into account the 100% fungi inhibition in accordance with the various factors acting towards plants.

The results obtained in field during the vegetation period are presented in Tables 5 and 6.

Table 5. The frequency and intensity of the Stigmina carpophila attack

Treatment product name		PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
Variant 1	R 1	27.0	12.0	39.0	12.0	52.0	16.0
	R 2	19.0	10.0	27.0	16.0	43.0	20.0
	R 3	28.0	9.0	34.0	14.0	48.0	23.0
	R 4	31.0	12.0	31.0	16.0	51.0	20.0
	Average	26.3	10.8	32.8	14.5	48.5	19.8
Variant 2	R 1	16.0	6.0	20.0	11.0	21.0	13.0
	R 2	12.0	4.0	18.0	12.0	31.0	21.0
	R 3	17.0	5.0	15.0	6.0	24.0	14.0
	R 4	14.0	4.0	21.0	10.0	28.0	12.0
	Average	14.8	4.8	18.5	9.8	26.0	15.0
Variant 3	R 1	17.0	5.0	17.0	15.0	20.0	9.0

	R 2	11.0	4.0	15.0	7.0	22.0	10.0
	R 3	16.0	4.0	16.0	5.0	17.0	8.0
	R 4	9.0	5.0	12.0	8.0	21.0	10.0
	Average	13.3	4.5	15.0	8.8	20.0	9.3
Variant 4	R 1	10.0	3.0	16.0	7.0	17.0	6.0
	R 2	12.0	5.0	10.0	4.0	19.0	7.0
	R 3	9.0	4.0	12.0	6.0	21.0	8.0
	R 4	11.0	6.0	14.0	3.0	14.0	7.0
	Average	10.5	4.5	13.0	5.0	17.8	7.0
Treatment product name		PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
Variant 5	R 1	14.0	7.0	11.0	4.0	11.0	7.0
	R 2	12.0	4.0	12.0	6.0	16.0	5.0
	R 3	16.0	4.0	14.0	5.0	14.0	8.0
	R 4	10.0	5.0	13.0	6.0	16.0	4.0
	Average	13.0	5.0	12.5	5.3	14.3	6.0
Variant 6	R 1	10.0	5.0	7.0	5.0	11.0	6.0
	R 2	12.0	4.0	10.0	4.0	12.0	5.0
	R 3	9.0	4.0	12.0	3.0	9.0	4.0
	R 4	8.0	3.0	11.0	3.0	10.0	3.0
	Average	9.8	4.0	10.0	3.8	10.5	4.5

Table 6. Processing of data from the three treatments applied in the vegetation period

Variant	Treatment Product Name	PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
1	Variant 1	26.3 a	10.8 b	32.8 a	14.5 a	48.5 a	19.8 a
2	Variant 2	14.8 b	4.8 b	18.5 b	9.8 b	26.0 b	15.0 b
3	Variant 3	13.3 b	4.5 b	15.0 bc	8.8 b	20.0 c	9.3 c
4	Variant 4	10.5 b	4.5 b	13.0 c	5.0 bc	17.8 c	7.0 cd
5	Variant 5	13.0 b	5.0 b	12.5 c	5.3 bc	14.3 cd	6.0 cd
6	Variant 6	9.8 b	4.0 b	10.0 c	3.8 c	10.5 d	4.5 d
LSD (P=.05)		4.56	1.59	4.32	3.57	4.85	3.41
Standard Deviation		3.02	1.05	2.87	2.37	3.22	2.27
CV		20.74	18.88	16.91	30.27	14.09	22.1
Bartlett's X2		6.773	3.184	5.618	8.991	4.713	10.298
P (Bartlett's X2)		0.238	0.672	0.345	0.109	0.452	0.067
Replicate F		1.270	2.050	1.114	1.166	0.462	1.136
Replicate Prob (F)		0.3204	0.1501	0.3746	0.3555	0.7131	0.3662
Treatment F		15.787	23.460	33.049	11.431	71.803	27.351
Treatment Prob (F)		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

*Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls)
Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

The data processed using ARM 8 software (ARM is a recognized and respected standard throughout the plant production, used by thousands of researchers around the world), concludes, that after the first treatment (April 4) all 5 fungicides showed significant effects (b) in fungus control. After the 2nd treatment (May 9) the results are significant (b) in variants 2 and 3 and significant distinct (bc) in variants 4 and 5 and very significant in variant 6. The results obtained after the 3rd treatment (June 12) are from distinct significant in variants 3 and 5 up to very significant in variant 6.

It results that the following contact fungicides Bravo 500 SC and Dithane M 45 (V2 and V3) have a good efficacy, and the systemic ones (V3-V6) present a high efficacy. The best results were obtained with V6, the fungicide Score 250 EC.

CONCLUSIONS

During the laboratory trials there were selected the products with the best biological activity against the development of the studied fungi. The products with the highest biological activity against the development of fungus colonies of *Stigmina carpophila* were: Folicur Solo 250 EW in 0.1% concentration, Systhane C PU in 0.05% concentration, Score 250 EC in 0.02% concentration, Bravo 500 SC in 0.2% concentration, Dithane M 45 in 0.2% concentration. Laboratory results enable the selection of fungicides showing high inhibition percentage in order to establish a treatment chart for the vegetation period, regarding the control of the major diseases specific to the peach.

The phytosanitary treatments will be made at warning, according to the evolution of environmental conditions and pathogenic organisms, pursuant to the proposed technology.

It results that the following contact fungicides Bravo 500 SC and Dithane M 45 (V2 and V3) have a good efficacy, and the systemic ones (V3-V6) present a high efficacy. The best results were obtained with V6, the fungicide Score 250 EC.

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