

Assessments of the Disease Index of Some Peach and Nectarine Cultivars to Powdery Mildew (*Sphaerotheca Pannosa*) In Albania

Hajredin Toca¹; Hekuran Vrapit^{2*}; Thanas Ruci².

1* (PhD Candidate), Department of Plant Protection, Faculty of Agriculture and Environment, Agricultural University of Tirana, Kodër Kamëz, Tirana, Albania

2. Department of Plant Protection, Faculty of Agriculture and Environment, Agricultural University of Tirana, Kodër Kamëz, Tirana, Albania,

Abstract: Peach and Nectarine are of the most important fruit crops in Albania. Tirana grown fruits, especially peaches, are known for their quality. The causal fungus, *Sphaerotheca pannosa* attacks young shoots, leaves, and fruit of woody ornamentals including peach and other stone fruits and can cause serious economic loss due to collage of infected fruit. In this research, susceptibility of 2 peach and 2 nectarine varieties to leaf curl disease was investigated in ecological conditions of Tirane, Albania province in 2014 and 2016. Disease severity was calculated by the 0-5 scale when typical symptoms of leaf curl were evaluated on peach and nectarine leaves in naturally infected orchards. The conditions of natural infection allowed grouping the biological material in 4 classes (plant growth stages) and 6 groups of resistance for *Sphaerotheca pannosa* disease severity. From the data we see that the of disease index (Imc-ja in%) during the three years of study varies from 4.22% in cultivar tire and reaches 22.8% in the Red Star cultivar we also comparisons this level too Control high infection which ranges from 40.66% in Roajal Black cultivar and up to 43.66% in Gomea cultivar.

I. Introduction

Peach is an important crop in many parts of the world. World production of peaches and nectarines stood at 21 million metric tons in 2013 (FAO, 2014). Peach and Nectarine are of the most important fruit crops in Albania. Tirana grown fruits, especially peaches, are known for their quality. Peach ranks first in local markets on Tirana. But the weather on Tirana is more moderate, with a temperature range below 2°C in winter and up to 35°C in summer. Temperature and relative humidity are important factors for creating the conditions for peaches and nectarines to be affected by the disease. Under optimum conditions, powdery mildew will be visible 48 hours after infections; new infections produce spores in about 5 days. The presence of young growth on the trees is important for infection (Kyryk M.M.; Belova, L.V. 1970). The causal fungus, *Sphaerotheca pannosa* attacks young shoots, leaves, and fruit of woody ornamentals including peach and other stone fruits and can cause serious economic loss due to collage of infected fruit. Many stone fruit crops including cherry, apricot, plum, nectarine and peach are susceptible to powdery mildew (Grove 1995; Reuveni et al. 2006; Vajna and Rozsnyay 2006). The disease is associated with infection by *Sphaerotheca pannosa* var. *persicae* (syn *Podosphaera pannosa* is a widely distributed pathogen in different parts of the world and one of the most important peach pathogens (Yarwood 1939; Weinhold 1961; Grove 1995; Adaskaveg et al. 2001; Reuveni 2001; Reuveni et al. 2006). Three powdery mildew species are known to infect stone fruits: cherry powdery mildew (*Podosphaera clandestina*), apple powdery mildew (*Podosphaera leucotricha*, causing peach rusty spot), and peach powdery mildew (*Sphaerotheca pannosa*, the cause of rose powdery mildew).

III. Materials And Methods

Locations of experimental scheme: The experiment was set up in conjunction with the organic farm (Hajdar Kuçi) in the her field Vorë, Albania (-41° 22' 09" N, -19° 37' 17" E).

Experimental scheme resulted in a randomized complete block, which was designed as two factorial scheme with three repetitions. Four cultivars, two peaches, two nectarines. A total of 288 trees. Variants with 9 trees were treated. While variants with 6 trees were not treated. The scheme is also surrounded by protective belt with peaches which has undergone normal cultivation treatments.

Plant material: The main factors in the study were: cultivars, total 4 cultivar. The main factor II was, ways of treatment. Treatments were applied at three levels: Level I with organic treatment, Level II with chemical treatment and Level III without treatment. Plant protection products (PPP's) that were used in the scheme for 2014: At level I (organic treatment) was used preparation Sulphur 800. At level II (chemical treatment) was used triazole with getter preparation difenoconazol * 250gr / L (23.58% p / p). Level III without treatment.

Disease assessments and times assessments: Disease assessments were made 12 days after treatment. For disease assessments, in each version with nine trees only three trees were evaluated. In variants with six trees were assessed two trees.

Visual estimation of disease severity from natural infection by *Podosphaera pannosa* (*syn.Sphaerotheca pannosa var. persicae*) (Wallr.: Fr.), has been based on SADs (standard area diagrams) the percent of covered leaves and fruits surface occupied by the disease. (Lebeda and Widrlechner, 2003).

Table 1: Severity classes for the assessment of powdery mildew symptoms observed on leaves (expressed in percentage of leaf damage in the whole crown)

Infection class	Powdery mildew damaged leaves (%)	IT*
0	0	I
1	0-5	VR
2	5.1-15	R
3	15.1-40	MR
4	40.1-60	MP
5	61-100	P

* IT = Types of infection I= Immune sustainability;), in% Imc-ja = 0; VR = Very Resistant: Imc-ja in% up to 5%; R = Resistant: Imc-ja in% ranges from 5.1% to 15%; MR = average Resistant: IMC-ja in ranges from 15.1% to 40%%; MP = Moderately susceptible: Imc-ja in going from 40.1%% to 60%; P = susceptible: Imc Y.% amounts to 60.1%.

Severity and diffusion of infection were obtained by resorting to the McKinney index (McKinney, 1923) (modified from Cooke, 2006). The McKinney index (Imc) was obtained by using the following formula: where: DI (Imc) % = the total degree of infection; n= infection class frequencies; v = the category of infection (0-4); N = total of observed plants; X = highest value of the evaluation scale.

Statistical Date Analysis: Processing of data for the period of study (cultivar x method of treatment for 2014-2016) for all areas of the test: averages, variance and standard deviation were made using analysis of variance (ANOVA) with the statistical program ASSISTATS (2016) Version 7.7 - Website <http://www.assistat.com> By Francisco de AS Silva DEAG-CTRN-UFC

IV. Results And Discussions

Rezultatet Mbi Indeksin E Semundjes Hirin E Pjeshkës (*Sphaerotheca Pannosa*) Gjate Tre Viteve Te Studimit 2014-2016

The initial data on the results achieved on the index of disease for the Grace of peaches (*Sphaerotheca pannosa*) with three methods of treatment (biological treatment, chemical treatment and control) and four cultivars in the study (Red Star, Venus, Roajal Black and rubber) for each year of study are given in tables in 2014-2016 table 2 and chart 1

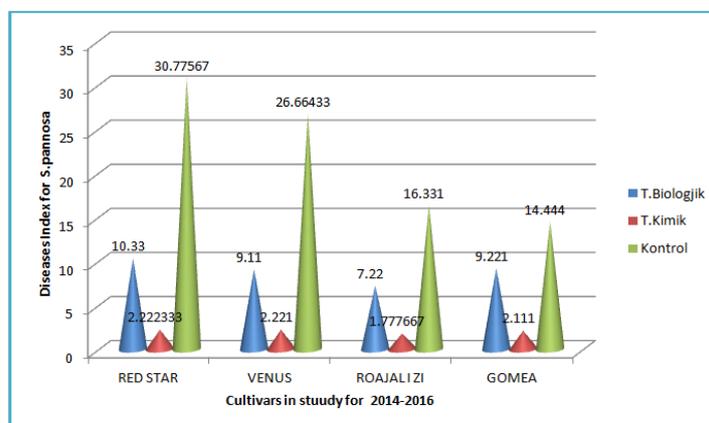


Chart 1 Disease index (Imc %) for powdery mildew (*Sphaerotheca pannosa*) during the three years of the study from 2014 to 2016

From the data of Table 2 and Chart 1 we see that the of disease index for powdery mildew (*Sphaerotheca pannosa*) (Imc-ja in%) during the three years of study varies from 2.11% in cultivar rubber and amounts to 2.22% in cultivar Red Star we also comparisons this level too Control high infection which ranges from 14.44% in cultivar rubber and up to 30.77% in the cultivar Red Star.

Really satisfactorily results and the method given biollogjike where infection (disease index) arrives by 7:22 Roajal% in cultivar Black and until 10:33% in cultivar Red Star. From the data of Table 2 and Chart 1 we see that the of of disease index for powdery mildew (*Sphaerotheca pannosa*) (Imc-ja in%) during the three years of study varies from 2.11% in cultivar tire and reaches 22.2% in the cultivar Red Star we also comparisons this level too Control high infection which ranges from 14:44 cultivar% in rubber and up to 30.77% in the cultivar Red Star

Really satisfactorily results and the method given biollogjike where infection (disease index) arrives by 7:22 Roajal% in cultivar Black and until 10:33% in cultivar Red Star. Table 3 bring three factorial analysis results using the Statistical Program assists (2016) to three factors taken into study as:

Table 2 Disease index (Imc %) for powdery mildew (*Sphaerotheca pannosa*) during the three years of the study from 2014 to 2016

Nr	Cultivars Factor (A)	Treatment Factor (B)	Disease Index (Imc) in %			Sum	Average	Classes according Tukey Test
			2014	2015	2016			
1	RED STAR	T.Organic	13.66	10	7.33	30.99	10.33	B
		T.Chemical	3	2	1.667	6.667	2.222333	A
		Control	30.33	28.33	33.667	92.327	30.77567	C
		Sum	46.99	40.33	42.664	129.984	-	
		Average	15.66333	13.44333	14.22133	-	14.44267	
Lsd			Lsd= 2.96880 për @ 0.05					
2	VENUS	T.Organic	12.33	7	8	21.66	7.22	B
		T.Chemical	2.33	2.333	2	2.221	2.221	A
		Control	32.33	22.33	25.333	26.66433	26.66433	C
		Sum	15.66333	10.55433	11.77767	12.66511	-	
		Average	15.66333	10.55433	11.77767	-	12.66511	
Lsd			Lsd= 2.96880 për @ 0.05					
3	ROAJAL I ZI	T.Organic	8.66	8	5	21.66	7.22	B
		T.Chemical	2	1.333	2	5.333	1.777667	A
		Control	23.66	12.666	12.667	48.993	16.331	C
		Sum	34.32	21.999	19.667	75.986	-	
		Average	11.44	7.333	6.555667	-	8.442889	
Lsd			Lsd= 2.96880 për @ 0.05					
4	GOMEA	T.Organic	7.33	10	10.333	27.663	9.221	B
		T.Chemical	3	2	1.333	6.333	2.111	A
		Control	28	34	34	96	32	C
		Sum	38.33	46	45.666	129.996	-	
		Average	12.77667	15.33333	15.222	-	14.444	
Lsd			Lsd= 2.96880 për @ 0.05					

*The Tukey Test at a level of 5% of probability was applied The averages followed by the same letter do not differ statistically between themselves

A factor levels in three years (three years of study in 2014, 2015, 2016).

- Factor B = 4 level varieties (cultivars = Red Star, Venus, Roajal Black and rubber).
- Factor C = 3 levels with treatment methods (biological treatment, chemical treatment and control) ..

Table 3: Analysis of variance MANOVA Two factorial for the disease Index for powdery mildew (*Sphaerotheca pannosa*) to three methods of treatment and four cultivars in the study; (Red Star). (Venus). (Roajal black). (Gomea)

Variation Source	Df*	Square Sum	Mean Square	F=Statistics of the test	Variation Source
				faktike	
Years (A)	2	105.5556	52.77778	13.2251 **	>0.050
Cultivars (B)	3	649	216.333	54.2088 **	>0.050
Methods of treatment C	2	11354.38	5677.194	1422.5916 **	<0.001
Int AxB	6	207.3333	34.55556	8.6589 **	>0.050
Int AxC	4	56.55556	14.13889	3.5429 *	<0.010
Int BxC	6	764.5	127.4167	31.9281 **	0.0298
Int AxBxC	12	302.3333	25.19444	6.3132 **	>0.050
Treatments	35	13439.66	25.19444	96.2204 **	<0.001
Error	72	287.3333	3.99074		
Total Variation	107	13727			

*Df= Degree of freedom **: E vertetuar per niveline propabilitetit 1%(p < 0.01) ; *: E vertetuar per niveline propabilitetit 5% (0.01 =< p < 0.05) ; NS: Pa vertetesi te propabilitetit (p >= 0.05). Sipas testit Tukey Kramer

The data of the experiment we are studying, learn that the effects of three factors A factor levels in three years (three years of study in 2014, 2015, 2016). Factor B = 4 level varieties (cultivars = Red Star, Venus, Roajal Black and rubber) and factor C = 3 levels with treatment methods (biological treatment, chemical treatment and control) .as and interactions between them are statistically proven to veracity high level ($p \leq 0.01$).

V. Conclusion

Analysis of variance (ANOVA) assessment of disease (IMC in%) for the four cultivars in the study for the years 2014- 2016 shows that the four cultivars Red Star, Venus, Roajal Black and Gomea have proven statistically changes to two levels of authentication $P = 0.05$ and 0.01 Powdery mildew of peach (*Sphaerotheca pannosa*) for the three years 2014- 2016 where variability and cultivars that have statistically the probability level $P = 0.05$ bracelets are blue, are cultivars Roajal Black and Red star Venus and Gomea under the general average = 26.44% for DMV = 3.06815 for $\alpha = 0.05$ by Tukey-Kramer test.

References

- [1]. **Food and Agriculture Organisation (FAO) of the United Nations. 2014.** Agricultural Statistics and Database. FAO Headquarters. Rome, Italy.
- [2]. **Agrios G.N. (2005).** Plant Pathology. Fifth Edition. Elsevier Academic . New York.
- [3]. **Hasani, M. (2005).** Sëmundjet e Pemëve frutore. Tiranë.
- [4]. **Kaltani, T e B.Celo, (1992).** “Fitopatologjia bujqësore”- Pjesa e përgjithshme dhe e veçantë.
- [5]. **Cooke, B. M. (2006).** Disease assessment and yield loss. In: *The Epidemiology of Plant Diseases.* B. M. Cooke, D. Gareth Jones and B. Kaye (Eds.) Second edition. The Netherlands: Springer.f.61.
- [6]. **Mckinney H.H. (1923).** Influence of soil temperature and moisture on infection of wheat seedlings by *Helminthosporium sativum*. Journal Agricultural Research, 26:195-217.
- [7]. **J. Phytopathol160:647–654 (2012)** Population Structure and Management of *Podosphaera pannosa* Associated with Peach Powdery Mildew in Oman. Abdullah M. Al-Sadi1, Ibtihal J. Al-Raisi 2, Masood Al-Azri2, Hamoud Al-Hasani2, Mohammed S. AlShukaili2, Saif M. Al-Shuraiqi 2, Khater O. Al-Fahdi2 and Mike L. Deadman.
- [8]. **Powdery mildews of stone fruit crops.(2010)** Ramesh Pokharel and Harold Larsen, Colorado State University, USA.
- [9]. **Programi statistikor ASSISTAT (2016) Version 7.7** -Website <http://www.assistat.com> By Francisco de A. S. e Silva DEAG-CTRN-UFC.