

RESEARCH ARTICLE

(Open Access)**The behavior of some peach and nectarine cultivars to Leaf curl peach (*Taphrina deformans* (berk.) tul. in Albania.**

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Abstract

The susceptibility/ resistance ratio to diseases is not considered as a key-criterion in peach breeding programs. Even if the turn-over of peach cultivars is important, suitability for organic and low-input systems remains unknown for most of the cultivars. Leaf curl of peach and nectarine, caused by *Taphrina deformans* (Berk.) Tul, is a difficult disease to control throughout Albania. Heavily infected fruit trees are poorly nourished, develop fewer flower buds, and are more easily damaged from freezing in winter. In this research, the **behavior** (susceptibility/resistance) of 2 peach and 2 nectarine varieties to leaf curl disease was investigated in ecological conditions of Tirane, Albania province in 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. From the observation data we can see that in the method where we use PMB to protect the peach from leaf curl (*Taphrina deformans*), index of this disease (Imc-ja in%) varies from 2% in Royal Black cultivar to 3.33% in cultivar Black and with control ranging from 38% in Roajal Black cultivar and up to 48 667% in cultivar Venus. Results are truly alluring and method in biological treatments where infection levels (Imc-in%) ranged from 12 667% in Royal Black cultivar until 20:33% in Red Star cultivars.

Keywords: Peach, organic, cultivar, quality, *Taphrina deformans***1. 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 [1]. 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. Although one well-timed spray in early spring can control the disease completely, in practice even several sprays from leaf fall until early blossom may not completely prevent leaf curl in all terminal shoots. [2] *Taphrina* diseases probably occur all over the world.

Taphrina causes defoliation of peach trees, which may lead to small fruit or fruit drop. In plum, 50% or more of the fruit may be affected and lost in years when the disease is severe. In both peach and plum, buds and twigs may also be affected, thus reducing the vitality of the tree significantly. In peach and nectarine, parts of or entire infected leaves are

thickened, distorted, and curled downward and inward. Affected leaves at first appear reddish or purplish, but later, when the fungus produces its spores on these areas, they appear reddish yellow or powdery gray, turn yellow to brown, and drop [3]. Blossoms, young fruit, and the current year's twigs may also be attacked. Infected blossoms and fruit generally fall early in the season.

The infected twigs are swollen and stunted and die during the summer. In plum, the disease first appears on the fruit as small white blisters that enlarge rapidly as the fruit develops and soon involve the entire fruit. [4]. The fruit increases abnormally in size and is distorted, with the flesh becoming spongy. The seed ceases to develop, turns brown, and withers, leaving a hollow cavity. The fruit appears reddish at first, but later becomes gray and covered with a grayish powder. Leaves and twigs may also be affected, as in peach.[5]. *Taphrina* diseases are controlled easily by a single fungicide spray, preferably in late fall after the leaves have fallen or in

early spring before leaf buds swell. The fungicides used most commonly are the Bordeaux mixture and chlorothalonil; the latter controls the disease if applied twice, in late fall and in early spring..

2. Material and Methods

2.1. 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.

2.2. 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.

2.3. 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 Leaf curl of nectarine and peach, caused by *Taphrina deformans* (Berk.) Tul., has been based on SADs (standard area diagrams) the percent of covered leaves and fruits surface occupied by the disease.[6].

Severity and diffusion of infection were obtained by resorting to the McKinney index [7] (modified from [8]). 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

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

<i>Infection class</i>	<i>Leaf curl damaged leaves (%)</i>	<i>IT*</i>
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%.

Statistical Date Analysis: The statistical data analysis: all data processing for this study period, averages, variance and standard deviation are calculated with statistical program Assistat 2016, Version 7.7 [7] and for comparison of averages of the

disease severity index is performed with Tukey-Kramer test and additional comparison of levels with control tree's is performed with Dunnett's test by using the statistical program SAS 2009 University edition [9].

3. Results and Discussion

Data on the initial results achieved on the

disease index to Leaf curl peach (*Taphrina deformans*) over three treatments and four cultivars in the study are shown in Figure . 1.

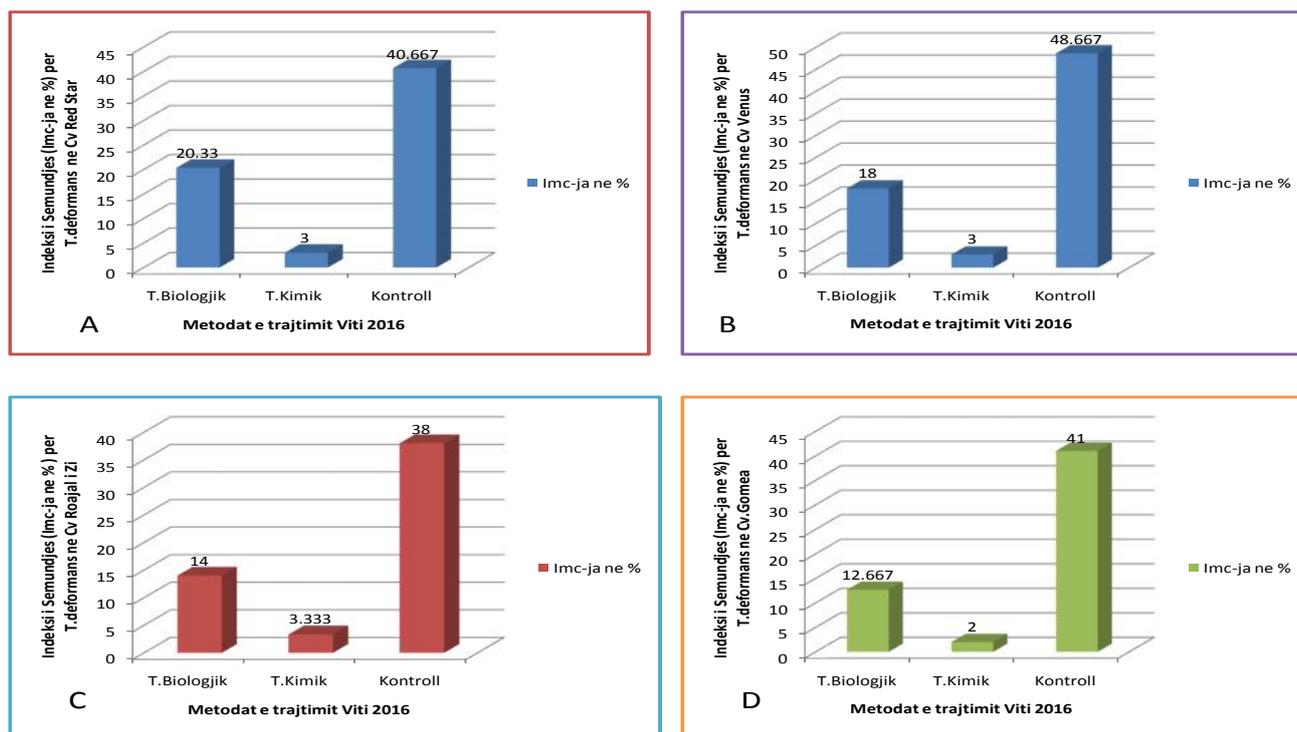


Figure 1. Disease Index (Imc in %) for Leaf curl peach (*Taphrina deformans*) 2016 for the three treatment methods in four cultivars under study. A. (Red Star) B. (Venus) C. (Roajal I i Zi) D. (Gomea)

The data analysis shows that the weather was suitable for the development of Leaf Curl Disease by mid-March, it can be seen from physiological stages of peach plant which has come to three years of study for stages of her treatment at the time of swelling buds, at different times.

From the results obtained in graphic 1 and 2 we conclude that the disease index (Imc in%) during the year 2016 of study ranged from 4.22% in cultivar Gomea and amounts to 8.22% in cultivar Red Star in the chemical treatment method, compared it with high level of infection control, which ranges from 40.66% in cultivar Royal Black and up to 43.66% in cultivar Gomea. This indicates that chemical treatment manages to control Leaf Curl the best peach. The results observed in the biological treatment method, where the disease index ranges from 15.4% in Gomea and 23.33% to cultivar Venus shows that bio

preparations can control Leaf Curl of peaches at a good level.

From the experimental data we are studying table 2 , we conclude that the effects of 2 factors in the study as Factor A = Cultivars with 4 levels (cultivars = Red Star, Venus, Royal Black and Gomea) and Factor B = 3 levels of treatment methods (treatment Biological, Chemical treatment and Control) showed significant differences statistically higher level of truth ($p = 99\%$). They are well protected compared to control.

Effects of interaction Interaction A x B are proven statistically to higher level of truth ($p = 99\%$), this indicates that environmental factors (especially temperature and humidity) influenced the rate of disease development the peaches but we brought cultivars to these diseases.

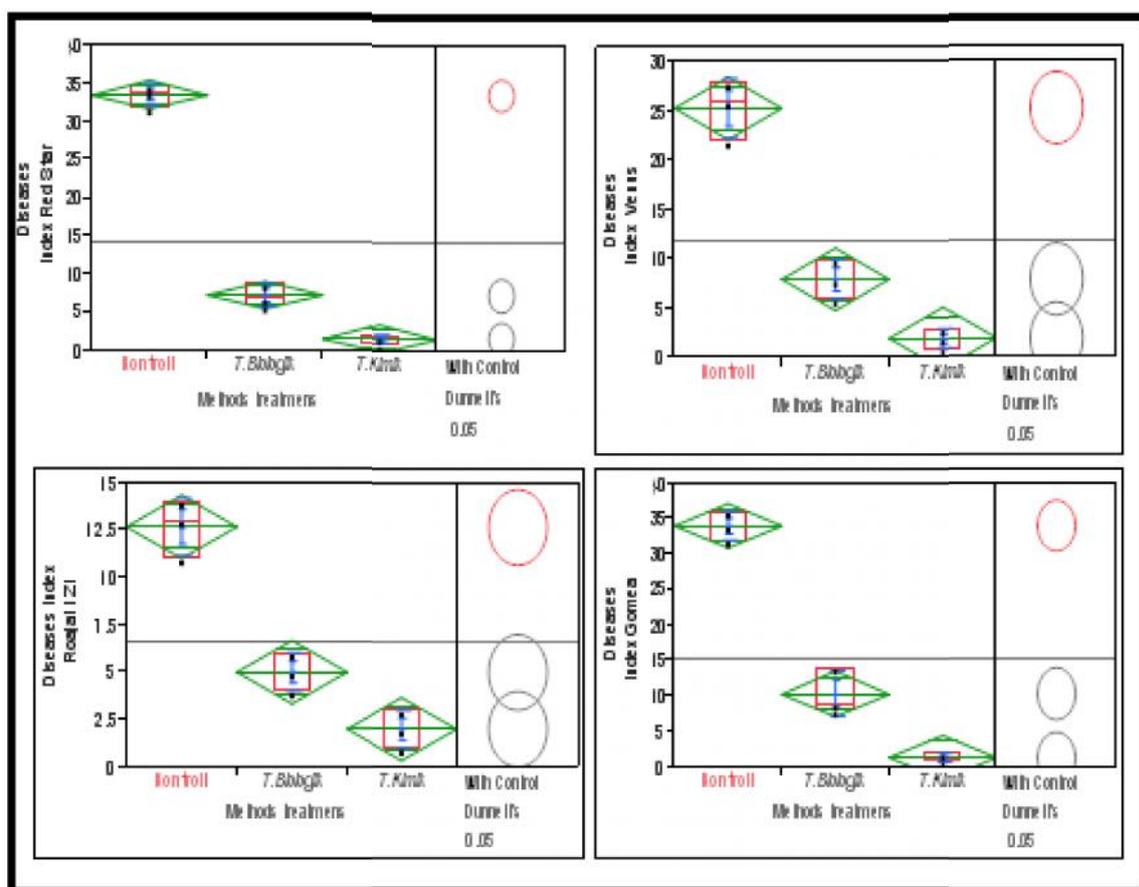


Figure . 2. Disease Index (Imc in %) for Leaf curl peach (*Taphrina deformans*) 2016 for the three treatment methods in four cultivars under study. A. (Red Star) B. (Venus) C. (Roajal I i Zi) D. (Gomea).

4. Conclusions

The analysis of the data noted that the weather was suitable for the development of leaf curl (*Taphrina deformans*), disease by mid-March and grace in May is seen and physiological stages of peach plant which has come to three years of study stages of her treatment at the time of swelling buds, at different times

For the disease index: (*Taphrina deformans*), We see that the disease index (Imc in%) during the three years of study ranges from 4:22% in cultivar rubber and arrives at 8:22% in cultivar Red Star in the chemical treatment method, compared it with the very high level of infection control which ranges from 40.66% in cultivar Roajal Black and up to 43.66% in cultivar rubber., satisfactory results were observed in the biological treatment method where the disease index ranges

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