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THE EFFECTS OF THE PARENTS' GENOTYPE ON SUSCEPTIBILITY TO LEAF CURL (*Taphrina deformans* (BERK.) TUL) OF VINEYARD PEACH HYBRID SEEDLINGS

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Leaf curl is one of the peach diseases with the most economically important impact, because very strong infection can cause total defoliation. Susceptibility to a leaf curl was examined from the period 1994-1998 in a collection of selected vineyard peach genotypes and newly peach and nectarine cultivars. Selected low susceptible genotypes (vineyard peach GR/65/87 and processing peach Villa Ada) were used in cross-pollination with differently susceptible genotypes. The process produced more than 250 seedlings of F_1 progeny from few combinations of the parents. Susceptibility of hybrid seedlings to the leaf curl pathogen was investigated several years in the open field, without application of pesticide. More types of inheritance of examined characteristic were determinate in the progenies from different combinations of the parents. The results agree with polygenic inheritance.

Key word: peach, leaf curl, inheritance

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INTRODUCTION

Cropping at an early age, high yields and long period of consumption as stone fruit (May-October) make peach very often choice of the growers. MIŠIĆ (2002) refers that the production of the peach worldwide is on the eight place (11.655.660 *t,* 1991-2001 average), while production in Serbia and Montenegro is on the six place (46.366 *t*, 1992-2001 average).

Taphrina deformans is one of the most dangerous peach pathogens (JOSIFOVIĆ, 1964, IVANOVIĆ, 1992). Rainy and warm weather in the beginning of budding creates optimal conditions for the spreading of the disease. Symptoms are visible on the young leaves at the beginning of the growth (NINKOVSKI, 1988). Infected peach leaves are deforming (curling), dying and falling of in June. Very infected infected trees can totally defoliate. Damages can be great for crop in the current and next year.

Peach breeding worldwide is very intensive. More than 6000 cultivars were created (OGNJANOV et.al., 1993). PEJKIĆ (1980) and MIŠIĆ (2002) cite that the lower susceptibility to leaf curl is one of the goals of the peach breeding.

Goals of this study were an investigation of the inheritance's mechanisms and a creation of hybrid seedlings with a low susceptibility to the leaf curl pathogen.

MATERIAL AND METHODS

For several years, the peach and nectarine cultivars and the vineyard peach selections were evaluated in the open field without pesticide application on the Jajinci and Padinska Skela localities. The genotypes with a low susceptibility to the leaf curl pathogen were selected and used as parents in cross-pollination. As parents were included also the genotypes investigated by the other authors. TODOROVIĆ and MIŠIĆ (1982) establised that, in an investigation of 11 peach cultivars, cv Cresthaven is a cultivar with the lowest susceptibility. MIŠIĆ (2002) cites that cv Creshaven and cv Villa Ada have low susceptibility or tolerancy to the leaf curl pathogen. ZEC *et al*. (1997) also empasize selection of a vineyard peach GR/65/87 as a very low susceptible.

For cross-pollination folowed parents's genotypes were used: processing peach cv Villa Ada (very low susceptibility - 1), selection of vineyard peach GR/65/87 (very low susceptibility - 1), cv Cresthaven - low susceptibility (3), cv Vesna – medium susceptibility (5) cv Autumn Glo and selection of flat peach – very high susceptability (7). Few combinations of the parents produced more than 250 seedlings of F_1 progeny. The progeny was evaluated in the open field, without application of pesticides, during 2005 and 2006. All progeny were in the same field with high density. Weather conditions during the investigation period on locality of hybrid seedlings field (Padinska Skela) were optimal for infection. The leaves of genotypes susceptible to leaf curl pathogen had very strong infection. Susceptibility of genotypes was evaluated on the basis of International Peach

Descriptor (BELLINI *et al.*, 1984). The data were statistically processed by t-test (HADŽIVUKOVIĆ, 1991).

RESULTS AND DISCUSSION

Parent's combination Villa Ada x Vesna and Creshaven x flat peach gave progeny (Table 1) with domination of genotypes with low susceptibility to the leaf curl (Figure 1). Crossing Cresthaven x flat peach gave 48 seedlings. Among them 36 were evaluated as low susceptible (mark 3) and 12 seedlings were evaluated as medium susceptible (mark 5). Results of t-test showed that for this parent combination low susceptibility inherit as mother domination type.

Table 1. Type of inheritance of susceptibility to leaf curl pathogen (according to t-test)

Parents combination	Susceptibility of mother	Susceptibility of father	Average susceptibility of F_1 progeny	Type of inheritance
GR/65/87 x Villa Ada	1.33	1.20	4.00	Negative heterosis
GR/65/87 x Vesna	1.33	4.20	3.93	Father domination
GR/65/87 x Autumn Glo	1.33	7.50	5.42	Partial father domination
Villa Ada x GR/65/87	1.20	1.33	2.69	Negative heterosis
Villa Ada x Vesna	1.20	4.20	1.57	Mother domination
Villa Ada x Autumn Glo	1.20	7.50	3.00	Parcial mother domination
Vesna x Villa Ada	4.20	1.20	3.00	Intermediate
Autumn Go x Villa Ada	7.50	1.20	8.33	Negative heterosis
Autumn Glo x GR/65/87	7.50	1.33	4.81	IIntermediate
Cresthaven x flat peach	3.00	7.00	3.50	Mother domination

Parent's combinations GR/65/87 x Villa Ada, Villa Ada x GR/65/87 and Autumn Glo x Villa Ada gave progeny with a domination of the genotypes with higher susceptibility than both parents. Results of t-test showed that for this parent combinations low susceptibility inherit as negative heterosis type. Parent's combination Autumn Glo x Villa Ada gave very high susceptible progeny (average mark 8.33; figure 2).

Parent's combination GR/65/87 x Vesna gave progeny with susceptibility very similar to one in the father. Results of t-test confirmed that for this parents' combination inheritance of susceptibility had father domination type.

Figure 1. Hybrid seedling from crossing Villa Ada x Vesna with very low susceptibility to the leaf curl pathogen

In the cross pollination Vesna x Villa Ada and Autumn Glo x GR/65/87 expression of susceptibility show intermediate type of inheritance.

The results showed that low susceptibility to the peach leaf curl pathogen agree with polygenic inheritance. The conclusion was coherent with the results of MONET (1985).

Figure 2. Hybrid seedling from crossing Autumn Glo x Villa Ada with very high susceptibility to the leaf curl pathogen

ZEC *et al*. (1997) established significant variability of investigated vineyard peach genotypes, peach and nectarine cultivars on susceptibility to the leaf curl, which points to the polygenic inheritance.

CONCLUSION

On the basis of the investigation of the hybrid seedlings on susceptibility to the peach leaf curl pathogen conclusions are:

- Very low susceptible parents (Villa Ada and GR/65/87) don't transmit that characteristic into progeny as father.
- Cultivars Villa Ada and Cresthaven as mother transmit low susceptibility into F_1 progeny, until vineyard peach selection GR/65/87 don't.
- Variability of hybrid seedlings susceptibility expression, so as different types of inheritance point to polygenic inheritance of examined characteristic.
- Low susceptible seedlings which also have some qualitative characteristics will be use as raw material to obtain quality peach genotypes, low susceptible to leaf curl pathogen.

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REFERENCES

ANDERSON H.W. (1956): Diseases of fruit Crops, McGraw- Hill Book Co.Inc., New York

BELLINI E., R. WATKINS, and E.POMARICI (1984): Descriptor list for Peach. IBPGR Secretariat, Rome, CES Secretariat, Brussels.

HADŽIVUKOVIĆ S (1991): Statistički metodi sa primenom u poljoprivrednim i biološkim istraživanjima. Institut za ekonomiku poljoprivrede i sociologiju sela, Novi Sad.

PEJKIĆ B. (1980): Oplemenjivanja voćaka i vinove loze. Naučna knjiga, Beograd, 367.

MIŠIĆ P. D. (2002): Oplemenjivanje breskve. Specijalno oplemenjivanje voćaka. Partenon, Beograd, 145-176.

MONET R. (1985): Heredity of resistance to leaf curl (*Taphrina deformans*) and green aphid (*Myzus Persicae*) in the peach. Acta Hort. 173: 21-24.

IVANOVIĆ M. (1992): Mikoze biljaka. Nauka, Beograd.

JOSIFOVIĆ M. (1964): Poljoprivredna fitopatologija. Naučna knjiga , Beograd.

OGNJANOV V., P. MIŠIĆ, D. OGAŠANOVIĆ, A. OBRADOVIĆ, and R. TODOROVIĆ (1993): Novi Jugoslovenski sortiment breskve. Jugoslovensko voćarstvo, 21, 101-102: 55-68.

ZEC G. (1997): Proučavanje odabranih genotipova iz populacije vinogradske breskve. Magistarska teza, Beograd, 18-23.

TAVDUMADŽE K. T. (1971): Resistance of Peach varieties to Leaf curl, Plant Breeding Abstracrs 41.

TODOROVIĆ R., and P. D. MIŠIĆ (1982): Osetljivost sorti i sejanaca breskve i nektarine prema *Taphrina deformans (Berk.)Tul.* Jugoslovensko voćarstvo,16,59-60: 97-102.

ZEC G., R.TODOROVIĆ, and P. D. MIŠIĆ (1997): Osetljivost vinogradske breskve prema *Taphrina deformans (Berk.)Tul.* Jugoslovensko voćarstvo,31,119-120:227-230.

NINKOVSKI I. (1988):Breskva i nektarina. Nolit, Beograd, 219-220.

UTICAJ GENOTIPA RODITELJA NA OSETLJIVOST HIBRIDNIH SEJANACA BRESKVE PREMA PROUZROKOVAČU KOVRDŽAVOSTI LISTA *Taphrina deformans (BERK.) TUL.*

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I z v o d

Kovrdžavost lista je jedna od ekonomski najznačajnijih bolesti breskve. Veoma jaka zaraza može prouzrokovati potpun gubitak lišća. U kolekciji odabranih genotipova vinogradske breskve i novijih sorti breskve i nektarine tokom perioda 1994-1998. ispitana je osetljivost prema prouzrokovaču kovrdžavosti lišća (*Taphrina deformans* (Berk.) Tul). Izdvojeni su genotipovi male osetljivosti (vinogradska breskva GR/65/87 i industrijska breskva Villa Ada) koji su korišćeni za hibridizaciju sa genotipovima različite osetljivosti. Iz više roditeljskih kombinacija dobijeno je preko 250 sejanaca F1 generacije. Osetljivost hibridnih sejanaca prema prouzrokovaču kovrdžavosti je više godina ispitivana u poljskim uslovima bez hemijske zaštite. U potomstvu iz različitih roditeljskih kombinacija utvrđeno je više tipova nasleđivanja ispitivanog svojstva. Dobijeni rezultati ukazuju na poligensko nasleđivanje.

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