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Non-Correlation of Flower and Fruit Resistance to Brown Rot (*Monilinia fructicola* (Wint.) Honey) Among 27 Peach Cultivars and Selections

AM`ERICO WAGNER JR.[1], MARIA DO CARMO BASSOLS RASEIRA[2], JOEL FIGUEIREDO FORTES[2], CARLOS ROBERTO PIEROBOM[3], AND JOÃO BAPTISTA DA SILVA[4]

Abstract

The fungus *Monilinia fructicola* (Wint.) Honey, can infect twigs, flowers and fruits. Blossom blight in peach flowers and brown rot in fruits are among the most important disease for the peach industry in southern Brazil. Correlation of disease resistance among different organs of the tree could contribute to a more complete selection in a breeding program and benefit the industry. The objective of this study was to examine possible correlation between the resistance or tolerance in flowers and fruits of the peach cultivars 'Bolinha', 'Magno', 'Eldorado', 'Maciel', 'Linda', 'Leonense' and selection Conserva 672, and 24 F_1 seedlings of the following crosses: Conserva 672 x 'Maciel' Conserva 672 x A. 334, Conserva 672 x 'Leonense', Conserva 672 x 'Eldorado' and 'Leonense' x 'Bolinha'. We did not find a correlation between percentage of infected flowers and the average percentage of fruit surface area infected by *M. fructicola,* or between percentages of infected flowers and fruit. We suggest that different genes control the resistance in flowers and in fruits.

Introduction

Economic loss due to brown rot in peaches starts in the bloom period and increases during the pre- and post-harvest period, in the orchard as well as during transport and storage (2).

The use of resistant cultivars could complement cultural and sanitary practices. Since the fungus *M. fructicola* can attack different plant organs, it is interesting to know if there is a correlation between the resistance or tolerance in flowers and fruits of peach genotypes. If confirmed, a correlation of disease resistance among different development stages or different tree organs could contribute to a more complete selection in a breeding program. It would also allow screening for resistance in one organ with the assumption that the other is also resistant, thus decreasing the screening costs.

The present work had the objective of determining if there is a correlation between the resistance or susceptibility to *M. fructicola* in peach flowers and fruits.

Materials and Methods

The experiment was conducted at Embrapa Clima Temperado (CPACT), Pelotas-RS,

[1]Agr. Eng. Master from Federal University of Pelotas. Doctor student, Federal University of Viçosa. Department of Plant Science. Viçosa – MG. CEP 36571-000. Brazil. Scholarship program of Capes. e-mail: americowagner@ibest.com.br.
[2]Agr. Eng. PhD., Empresa Brasileira de Pesquisa Agropecuária/Centro Nacional de Pesquisa de Clima Temperado. (Embrapa/CPACT). Bolsista CNPq. Br 392, Km 78, Caixa Postal 403. Pelotas – RS. Brazil. CEP 96001-970. e-mail: bassols@cpact.embrapa.br.
[3]Agr. Eng. PhD., Department of Phytopathology, Campus Universitário, s/nº, Federal University of Pelotas, CEP 96001-900, Pelotas, RS – BRAZIL.
[4]Bolsista CNPq, Department of Physic e Mathematics, Campus Universitário, s/nº, Federal University of Pelotas, Caixa Postal 354, CEP 96010-900, Pelotas, RS – BRAZIL.

Brazil, in the years of 2001 and 2002. Six cultivars Bolinha, Magno, Eldorado, Maciel, Linda, Leonense, one selection Conserva 672, and 24 F_1 seedlings of the following crosses: Conserva 672 x 'Maciel', Conserva 672 x A334, Conserva 672 x 'Leonense', Conserva 672 x 'Eldorado' and 'Leonense' x 'Bolinha' were inoculated.

The routine cultural practices were realized during the experiment period except for fungicide application.

Six to eight twigs per plant were collected at random around the plant canopy. The fully opened flowers were discarded and the twigs surface sterilized with 0.125% active chlorine solution for one minute and then washed three times in distilled water. The twigs then were kept at 5° ± 1°C for 5 to 7 days and for 24 hours at room temperature (24° ± 2°C) in order to get more uniform developmental stage of the flower buds.

The unopened blossoms in pink stage were inoculated with 0.1 ml of a 5 x 10^4 spores/ml of a conidia suspension of *M. fructicola*, using a hand atomizer De Villbiss. The number of flowers inoculated varied between 10 and 97 by genotype, depending on availability. The detached twigs were placed in water and covered with a perforated transparent plastic bag that was sprayed inside with distilled water to create high humidity. The baskets containing the twigs were taken to a phytotron at 24°±2°C, high relative humidity (>90%), and 12 hour photoperiod. The percentage of flowers with necrotic spots on the petals was recorded 72 hours after inoculation.

Fruits were selected to avoid any visible damage or cracks, using stereomicroscopy and tested at firm maturity (harvest time) and full ripe stages. Then, the fruits were sterilized with 10% active chlorine solution for one minute and washed three times in distilled water.

The number of fruits inoculated was 10 for cultivars and it varied between 5 and 28 per seedling. Fruits were individually inoculated with 0.2 ml with a 1.0 x 10^5 spores/ml of a conidia suspension of *M. fructicola*. The inoculation was made with a De Vilbiss atomizer, on a two cm diameter circle of epidermis.

After the inoculated fruits were put in plastic boxes closed (24.0 x 23.0 x 10.0 cm) (with smalls lateral holes), on damp towel paper and PVC rings. The boxes were stored under controlled environment, at 24°±2°C, high relative humidity (75-85%), and a 12 hour photoperiod. The percentages of infected fruit and fruit surface area infected were evaluated 120 hours after inoculation. The infected surface area was estimated subjectively through division of fruit in 4 parts.

The studies on correlation coefficients involved the percentage of infected flower and the severity of infection in fruits and, the percentages of infected flowers and fruit. The correlation coefficient and the corresponding significance test were calculated according to Ferreira (3).

Results and Discussion

There was no significant correlation between the percentage of infected flowers and the severity of infection in fruits ($r = 0.012$) (Figure 1). Neither was there a significant correlation between the percentages of infected flowers and fruit ($r = -0.02$) (Figure 2). Thus, they appear to vary independently, and selection for blossom blight resistance does not mean that the genotype will be resistant to brown rot in fruits.

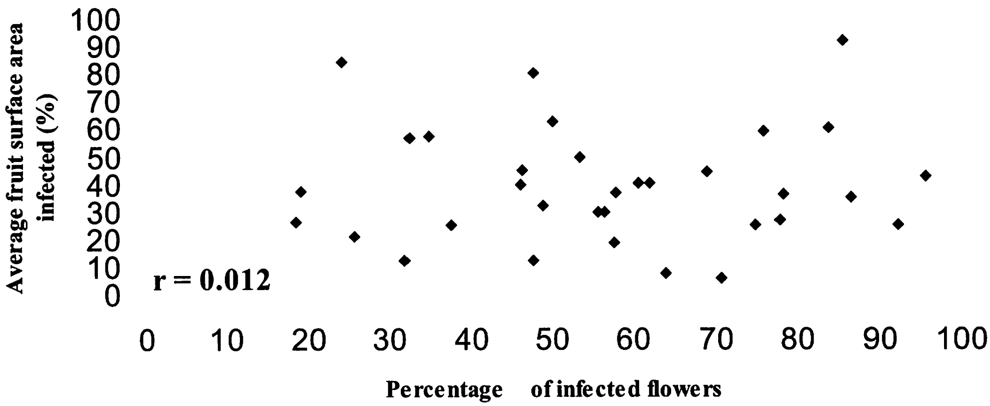

Figure 1. Relationship between brown rot incidence in peach flowers and the severity of infection in fruits.

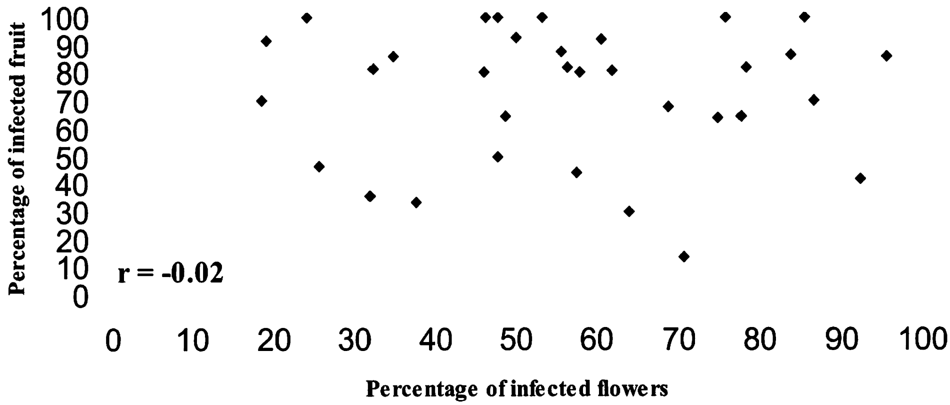

Figure 2. Relationship between brown rot incidence in peach flowers and the percentage of fruit infected.

Table 1. Percentage of infected flowers and average fruit surface with *M. fructicola* lesion in peach genotypes. (Embrapa Clima Temperado, Pelotas/RS, Brazil).

Genotype	Plant	Year	Flowers infected (%)	% fruit surface area infected	Fruit infected (%)
Conserva 672	-	2001	85.5 ± 14.5	91.7 ± 12.9	100.0 ± 0
Leonense	-	2001	34.8 ± 26.0	57.1 ± 34.5	85.7 ± 37.8
Magno	-	2001	47.6 ± 20.5	80.0 ± 20.9	100.0 ± 0
Cons. 672 x A. 334	84	2001	24.0	84.4 ± 22.9	100.0 ± 0
Cons. 672 x Leonense	69	2001	32.3	56.8 ± 37.2	81.2 ± 40.5
Cons. 672 x Eldorado	39	2001	95.7	42.9 ± 23.8	85.7 ± 37.8
Cons. 672 x Eldorado	04	2001	55.6	30.0 ± 27.4	87.5 ± 44.7
Bolinha	-	2002	74.9 ± 17.3	25.0 ± 25.0	63.6 ± 50.5
Conserva 672	-	2002	77.7 ± 4.96	26.8 ± 26.8	64.3 ± 49.7
Eldorado	-	2002	86.6 ± 16.6	35.0 ± 37.6	70.0 ± 48.3
Leonense	-	2002	57.7 ± 12.0	36.7 ± 26.5	80.0 ± 41.4
Linda	-	2002	61.9 ± 17.3	40.5 ± 29.0	80.9 ± 40.2
Maciel	-	2002	60.5 ± 24.2	40.4 ± 24.1	92.3 ± 26.9
Magno	-	2002	19.1 ± 9.9	37.5 ± 19.9	91.7 ± 28.9
Cons. 672 x Maciel	01	2002	53.3	50.0 ± 27.4	100.0 ± 0
Cons. 672 x Maciel	16	2002	46.2	45.0 ± 15.8	100.0 ± 0
Cons. 672 x Maciel	18	2002	56.3	29.6 ± 24.5	81.8 ± 40.5
Cons. 672 x Maciel	75	2002	92.3	25.0 ± 33.7	41.7 ± 51.5
Cons. 672 x Maciel	86	2002	31.8	12.5 ± 21.4	35.7 ± 49.7
Cons. 672 x Maciel	110	2002	46.0	40.0 ± 33.7	80 ± 42.2
Cons. 672 x Maciel	113	2002	25.5	21.2 ± 26.7	46.2 ± 51.9
Cons. 672 x A. 334	39	2002	75.8	59.1 ± 28.0	100.0 ± 0
Cons. 672 x A. 334	45	2002	50.0	62.5 ± 33.6	92.9 ± 26.7
Cons. 672 x A. 334	66	2002	78.3	36.4 ± 30.3	81.8 ± 40.5
Cons. 672 x A. 334	78	2002	83.7	60.0 ± 36.4	86.7 ± 35.2
Cons. 672 x A. 334	89	2002	18.5	26.5 ± 29.9	70.0 ± 48.3
Cons. 672 x A. 334	94	2002	70.7	5.7 ± 15.3	13.6 ± 35.1
Cons. 672 x A. 334	107	2002	57.5	19.0 ± 24.2	44.0 ± 50.7
Cons. 672 x Leonense	18	2002	68.8	44.6 ± 41.0	67.9 ± 47.6
Cons. 672 x Leonense	22	2002	48.7	32.1 ± 34.6	64.3 ± 49.7
Leonense x Bolinha	18	2002	37.5	25.0 ± 41.3	33.3 ± 49.2
Leonense x Bolinha	27	2002	47.6	12.5 ± 13.0	50 ± 51.9
Leonense x Bolinha	36	2002	63.9	7.5 ± 12.1	30.0 ± 48.3

In research studies, resistance is generally evaluated in one tree organ or another and a cultivar, such as 'Bolinha' with fruit resistance to brown rot, is mistaken as also having resistance to brown rot infection of flowers (1). In his experiments on cultivar resistance in peaches, Fortes (Pathologist, Embrapa Temperate Climate – personal communication), observed susceptibility in flowers 72 hours after inoculation with a conidia suspension of 1.0×10^5 spores/ml. We confirmed this observation in the present work even using a lower inoculum concentration (5×10^4 spores/ml).

It was observed that some genotypes showed a very low infection rate in the fruits but the flowers were susceptible. The opposite case, higher infection of fruits but more resistant flowers, was noticed in some genotypes such as in cultivar Magno (Table 1).

Conclusion

For selection of resistant genotypes, screening for brown rot resistance must be done in both flowers and fruits.

Literature Cited

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