Effect of bagging on Brown rot incidence in European Plum

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Abstract

Brown rot is the most important disease of stone fruits worldwide. In this study we evaluated the effect of bagging on prevention of the disease and on the fruit quality. The experiment was carried out with European plum 'Haganta'. Fruits were bagged with paraffin paper during 30 days before harvest. Brown rot was evaluated at harvest. Postharvest incidence was assessed after 7, 11, 14 days. Quality parameters were evaluated: Fruit size, Titratable acidity and Brix. Infections with Monilia *spp. before harvest were smaller in bagged fruit compared with unbagged. The development of the disease was little on the seventh day, especially in treatment with bagged fruit. Fruits were nearly completely infected by the disease at 14 days post-harvest. Bagging prevented infection by* Monilia *spp. almost completely. The quality parameters were better in bagged fruits compared to unbagged ones.*

Keywords: *Monilia* spp., *Prunus domestica*, fruit quality

Introduction

Brown rot is the most important disease of stone fruits (Bryde and Willetts, 1977). In Europe, it is mainly caused by *Monilia laxa* Honey and *Monilia frutigena* Honey (Aderhold and Ruhland) and can be also found in Asia, North and South America, South Africa and Australia (Barta, 1991). Fruits bagging is one of the practices used in organic production in China and Brazil to obtain the best quality fruits and free of pests and diseases, especially in pear, apple and peach, among others (Telles *et al*. 2004; Jia *et al*. 2005; Coelho *et al*. 2008, Keske *et al*., 2010, Chen *et al*. 2012). The aim of this study was to examine if the method of bagging helps to prevent the disease incidence in plums.

Material and Methods

The experiment was conducted in the experimental field of the Center for Life Sciences, Weihenstephan, Freising, Germany. The period of field experiment was July until October 2013. The trees were not treated againts diseases and pests during this period. The cultivar Haganta (*Prunus domestica*) was used. 130 fruits were bagged with crystal paper 30 days before harvest. The disease incidence was evaluated in the trees before harvest. Quality evaluation was performed on 30 non bagged fruits and 30 bagged ones. Fruit size was determined with a Digimatic Caliper Mitutoyo Digital Caliper 0-150 mm, Brix was measured with a Refractometer and titratable acid with the "Mettler Taredo" DL22 Food & Beverage Analyser.

Post-harvest monilia incidence was diagnosed 7, 11 and 14 days after harvest. The treatments were: 1) Fruits without bagging (treatment with distilled water); 2) Fruits without bagging inoculated with *Monilia* (concentration 10^6 per ml) and injured in four points; 3) Fruits with bagging (treatment with distilled water); 4) Fruits with bagging injured and

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inoculated as described above. The infection was classified according to the infected fruit surface area: no symtoms (1); < 1/8 surface infected (2); 1/8 (3); 4) 1/8 - 1/4 (4); 1/4 till 1/2 (5); 1/2 (6); nearly complete surface infected (7).

Results

Infections with *Monilia* spp. before harvest were higher in unbagged fruits (15.0 %) compared with bagged fruit (2.3 %) (Figure 1). Infections in bagged fruit were probably due to latent infections in fruits and branches prior to bagging.

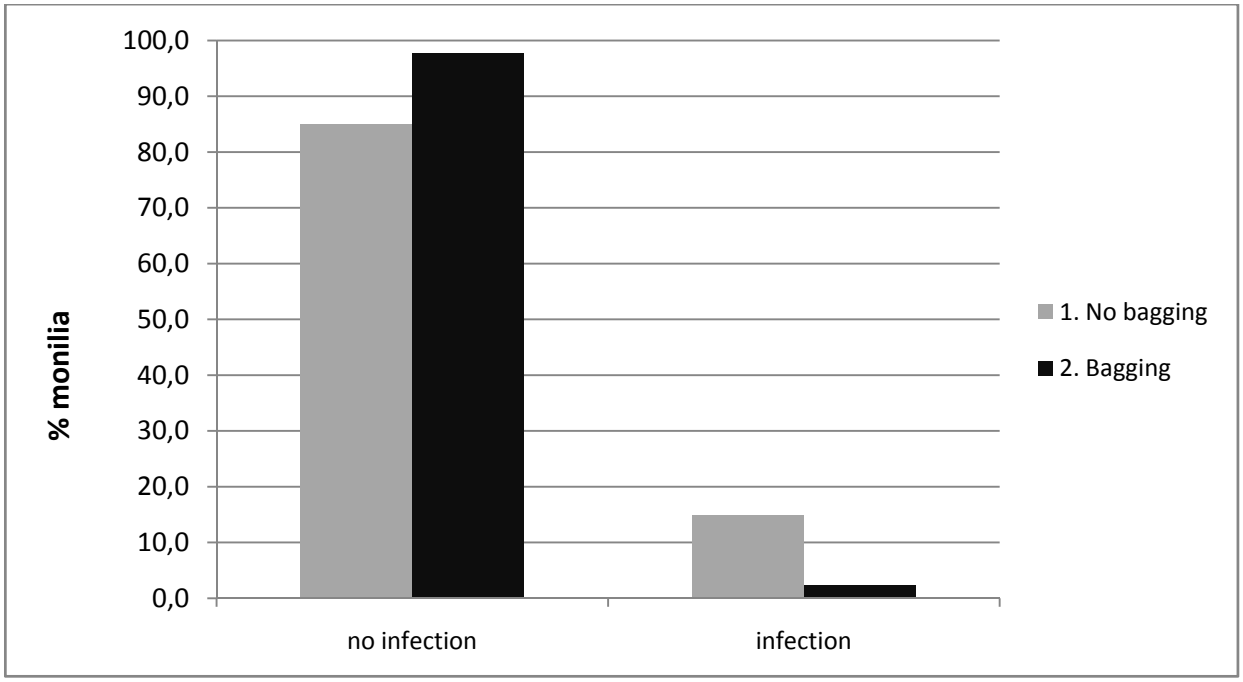

Figure 1: Infection with *Monilia* spp. before the harvest in fruits cv. ‘Haganta’ in the year 2013.

Regarding the development of the disease, it was observed that on the seventh day after harvest, the disease developed little, especially in bagged fruit (Table 1). After 11 days, the disease developed mainly in inoculated fruits showing little difference in relation to growth up to 14 days (Table 1). It was found that after 14 days, 61 % of unbagged fruits and no inoculated without symptoms of disease (Table 1). When inoculated, both unbagged and bagged fruits were nearly completely infected after 14 days. Bagged non-inoculated fruits were almost completely free of the infection (Table 2).

Regarding the fruit quality, it was found that the bagged fruits had higher mean length and diameter as compared to the unbagged ones, probably due to thinning performed before bagging (Table 2). Also, the Brix content was higher (19.23 %) than unbagged (18.23 %). Acidity was higher in unbagged fruits (14.07) compared to bagged ones (13.33) (Table 2).

Table 1: Infestation and disease growth with visible *Monilia* mycelium (%) on surface fruits after 7, 11 and 14 days of storage at room temperature in without bagging fruits, without bagging and inoculated fruits, bagging fruits and bagging and inoculated fruits.

Treatments	No symptoms	< 1/8	1/8	1/8 till 1/4	1/4 till 1/2	1/2	nearly total
Without bagging							
7 days after harvest	98	3	0	0	0	0	0
11 days after harvest	65	9	5	3	9	8	3
11 days after harvest	61	5	5	3	4	9	14
Without bagging+inoculated							
7 days after harvest	94	5	1	0	0	0	0
11 days after harvest	1	0	1	0	4	34	61
14 days after harvest	1	0	0	0	1	4	94
Bagging							
7 days after harvest	100	0	0	0	0	0	0
11 days after harvest	98	3	0	0	0	0	0
14 days after harvest	98	3	0	0	0	0	0
Bagging+inoculated							
7 days after harvest	98	3	0	0	0	0	0
11 days after harvest	3	3	0	0	0	23	73
14 days after harvest	3	0	0	0	3	3	93

Table 2: Comparison of quality parameters of fruits without bagging with bagging.

Treatments	Diameter (cm)	Length (cm)	Brix (%)	Acidy (g/l)
Without bagging	44.18	54.07	18.23	14.07
Bagging	47.03	63.1	19.23	13.33

Discussion

Infections with *Monilia* spp. before harvest were smaller in bagged fruits compared to unbagged ones. The same was observed by Keske *et al*. (2010) with incidences of brown rot ranging from 7.3 to 10.0 % in peaches bagged with different packaging. The development of the disease was little on the seventh day, especially in treatment with bagged fruit. Nearly all fruits were infected by the disease at 14 days post-harvest. Bagging fruit almost completely prevented infection by *Monilia* spp. on the tree. The quality parameters were better in bagged fruits compared to unbagged fruits. In studies with

apples, the total phenolic content was lower in bagged fruits compared to unbagged ones (Chen *et al*., 2012). For peaches, bagging improved sugar content (Telles, 2004; Keske *et al*., 2010) flavor and volatile aromatic compounds (Jia *et al*., 2005).

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