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The application of difference covers for controlling of *Ectomyelois ceratoniae* Zeller (Lepidoptera: Pyralidae)

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Abstract

Pomegranate (*Punicagranatum*L.) is an important fruit crop in Iran. Carob moth is the most important reason of pomegranate qualitative and quantitative reduction all over country. So this study was carried out in order to determine effect of using difference covers, including cover with 20×20 mesh (Harir), cover with 30×30 mesh (Behdashti), cover with 40×40 mesh (Metghal),for controlling of Ectomyelois Ceratoniae Zeller (Lepidoptera: Pyralidae). Furthermore, effects of different treatments on quality of fruit such as cracking, sunburn, total acidity, PH and total soluble solids were also determined. Results showed that in the studied orchard application of covers could reduce about 50% of total infection, in comparison with control treatment. There was no significant difference between the cover treatments in this case. Applications of Metghal cover was the best method for preventing sunburn in pomegranate fruits while that increased total acidity and decreased total soluble solids. Finally, we can propose using of cover for prevention and reduction of carob moth damaging and where sunburn is the important problem of pomegranate fruits, farmers can use the Metghal cover.

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Introduction

Pomegranate (*Punicagranatum*L.) is an important fruit crop of many tropical and subtropical regions of the world, grown especially in the moderate climates of Mediterranean countries (Kader *et al*,1984). It is native to Iran and grown extensively in arid and semi-arid regions worldwide (Sarkhosh *et al*,2006). Pomegranate (*Punicagranatum*) is a fruit bearing shrub or small tree growing to between five and eight meters tall (Bilderback. L, 2007) , cultivated extensively in Iran, India and some parts in the Physical and chemical properties of pomegranate U.S.A (California), China, Japan and Russia (Nagy *et al*,1990).

Pomegranate fruits are important for human health because of their high antioxidant capacity and a high polyphenols and anthocyanins content (Gilm *et al*, 2000) as pomegranate juice contains about 8.00 mg ascorbic acid/100 ml of juice and is a good source of vitamin B (panthotenic acid), minerals; Na, K, Fe, Cr and Cu and polyphenols such as tannins and flavonoids (Heyn, 1990).

Iran ranks the first producer and exporter of pomegranate in the world. In Iran, pomegranate as one of the most important commercial fruits is eaten fresh and also processed for jams, jellies, syrups, pomegranate juice products and is used for medical purposes (Aarabi *et al*, 2008).

Carob moth, (Lepidoptera: Pyralidae) has also been recognized as an important pest of pomegranate in Iran. Carob moth is the most important reason of pomegranate qualitative and quantitative reduction all over country. This pest is polyphage and attacks to fig-tree and pistachio too. This pest eats internal tissues of fruits and makes entrance of fungi and bacteria easier that will follow by fruit decaying (Hashemifesharakia *et al*, 2011). Insect can enter easier and lay its eggs inside the fruit. It is of concern to growers because few insecticides are available for its control (Vetter *et al.,* 1997).

Due to biology of the pest, the application of pesticide has not beenconsidered practical and the losses to this product are more than 30 percent of the yield (Zolfagharieh *et al*, 1996 and Shakeri, 2001). Several different methods including collecting and burning of infected fruits and biological control have been examined to control the pest, but none of them was effective (Sheikhali,2009). Pomegranate growers in Turkey use methods, such as covering the fruits with newspaper pieces and bags, which are developed by themselves (Yazycy and Kaynak, 2005). Probably, use of cover prevented of infection with moth and pest generations.

It is a known fact thatsome fruits crack during the latter period of growth.Cracking causes a major fruits loss, which is a serious commercial loss to farmers. Fruit cracking, seems to be a problem that lessens the marketability to a greatextent (EL-Khawaga, 2007). Researcher showed that use of pinoline (Vapor Guard) treatments reduced the percentage of splitting cracking (Basha and Ibrahim, 1979). Sunburn is another damaging on fruits (Yazycy and Kaynak, 2005). Study of Glenn *et al* (2002) that provided 18 % Shade by use of covering material on apple fruits, showed reduction of sunburn from 35% to 18% on Gala varieties and from 68% to 29% on Braeburn varieties.

This study was conducted on Shahreza, which is the most important pomegranate fruit cultivar produced and exported from this region. In this study, we aimed to investigate the repellency of different covering material (That have different mesh) on Carob moth and its effect on prevention of rotten pomegranates in the orchards of Shahreza city.

Material and methods

Regain for experimental application

The present study was carried out during July to November 2013 on 10 years old pomegranate trees grown in an orchard located at Shahreza city that is one of the cities of Isfahan province in the south west part of Iran The trees were planted at 4x4 m apart and received the same horticultural management.

Choose the treatments

48 trees similar age and vigor were selected and divided into four different treatments including the control, the experiment involved the following four treatments:

1. Control treatment (without any cover).
2. Using Harir cover (with 20×20 mesh).
3. Using Behdashty cover (with 30×30 mesh).
4. Using Metghal cover (with 40×40 mesh).

Design of experiment

The experiment was designed as a completely randomized block design (CRD) with four replicates and each replicates was replicates by three trees. In cover treatments, the randomly selected 30 fruits per tree and covers fasten on the pomegranate. All treatments were carried out in the first week of July.

Determinations

After then, from the first to end of experiment, weekly the damaged pomegranates with Carob moth were collected and the percentage of damage pomegranate calculated.

At the harvest time the 30 number of fruits per trees, that covered in each treatment (in control treatment randomly 30 number of fruits per trees selected), was counted and also the number of splitting and sunburn fruits was recorded. Then the percentage of cracked and sunburn fruits was calculated.

A normal fruit was taken from each tree for chemical determination. The pH of the juice was determined by using a digital pH meter (CRISON Instrument Ltd, Spain). Before estimating the pH of the sample, pH meter was standardized with standard buffers of 4, 7 and 9. TSS of samples was measured by Erma brand hand refractometer and results were expressed as °Brix. Total acidity (TA) by titration to pH 8.2 with 0.1 N NaOH and expressed as citric acid content (g/100 mL).

Statistical analysis

The effects of treatments were evaluated by analysis of variance and the means compared using the Least Significant Difference Test (LSD) at 0.05, using the Statistics 8 software.

Results and discussion

The total infection analyze

The results of the analysis showed that there was significant difference between the treatments. The highest level of infection was observed in control treatment with 62.12%. There was a significant difference between control and other treatment (Fig 1). Although using of behdashti cover decreased about 22% of total infection, but no significant difference between three cover treatments in this study (Fig 1).

Table 4. The mean of TA, PH and TSS for all treatments.

Treatments	TA(g/100ml)	PH	TSS (°Brix)
Control	1.4560 AB*	3.3950 A^{ns}	18.333 A**
Harir	1.1040 B	3.3525 A	18.375 A
Behdashti	1.2544 AB	3.4100 A	18.625 A
Metghal	1.5125 A	3.3250 A	17.250 B

NS, *and** :No Significant, 5% and 1% 0,1 are significant in alpha level, respectively.

Taki *et al* (2014) studied the some mechanical methods including net cover, steam elimination and net cover with steam elimination to behavior manipulation of the carob moth, in pomegranate orchards. They reported that the treatment of net cover can decrease the infection to 50%, in comparison of control treatment. Also they showed that steam elimination treatment increased the number of other insects in steam of pomegranate so this method couldn't an effective way and only can increase the final expenditure of pomegranate production but using the net cover in best time can be

suitable more than others. A similar research studied the effect of cover kinds of pomegranate fruits including complete covering by fabric net, crown covering with a plastic cap and crown covering with a cap by fabric net for the damage reduction of pomegranate fruit moth. The results showed crown covering could reduce fruit infection by 78 %(Rafie *et al*, 2011). Sheikhali *et al* (2009) studied the effect of stamens elimination methods on reducing damages of pomegranate fruit moth, the results showed that the mean infection rates were 22 and 10% for control and stamens elimination methods, respectively. Moths mate and lay on anthers, filaments and at times on the sepals. First instar larvae hatches out from the eggs and stays in the crown of pomegranate (Farzaneh, 1987). Probably, use of cover prevented of infection with moth and pest generations.

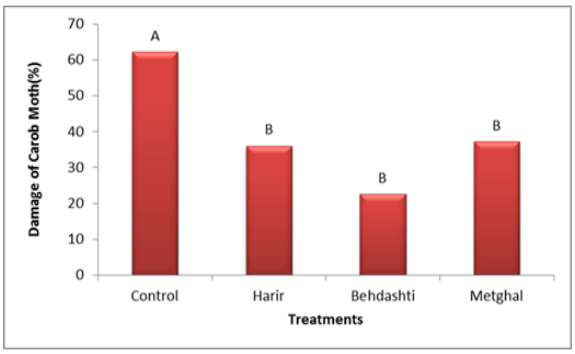

Fig. 1. Percentage of infection in all treatments.

Percentage of cracked fruits analyze

The results of the analysis showed that, there was no significant difference between the treatments for the percentage of cracked fruits (fig2).

It is a known fact that some fruits crack during the latter period of growth. Fruit cracking as a preharvest disorder which may result from the fluctuation of soil moisture and relative humidity, dry wind, rain or heavy irrigation following a dry spell and states that the potential to develop crack resistant varieties still exit. Cracking causes a major fruits loss, which is a serious commercial loss to farmers. Fruit cracking, seems to be a problem that lessens the marketability to a great extent (Nagy *et al*, 1990).

Basha and Ibrahim (1979), showed that, pin line (Vapor Guard) treatments reduced the percentage of splitting cracking. Results of this research are in harmony with those obtained by Taki *et al* (2014) that showed the difference of percentage of cracking in steam elimination, net cover, net cover with steam elimination and check treatments weren't significant. Sheikhali *et al* (2009) reported that cracking in customary steam elimination, steam elimination with hand-operating machine and control were 17.22%, 20.07% and 24.58%. Those showed that steam elimination decrease the cracking.

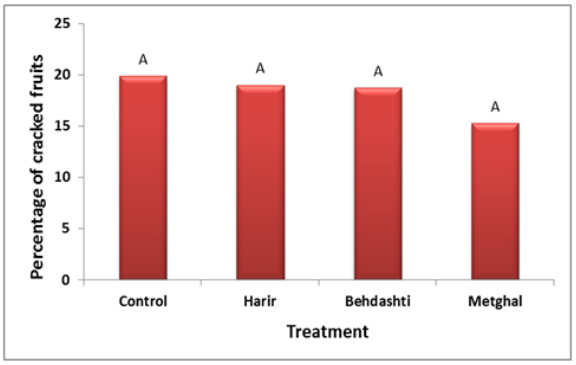

Fig. 2. Percentage of Cracked fruits in all treatments.

Sunburn analyze

Sunburn ratio of fruits on experiment treatments is presented in fig3. Data analysis indicated that different cover applications were significant on sunburn. Metghal cover applications led to considerable lower sunburn damage on fruit (9.5%), after that Hari and Behdashti cover showed the lowest sunburn, 16.26 and 12.92% respectively (fig3). Pomegranate damage due to sunburn is discoloration or burning of fruit surfaces exposed to direct sun. Furthermore, water content depletion and drying occurs in fruit and this leads to less appeal in marketing and economic losses (Yazycyand Kaynak, 2005). Study of Yazycy and

Kaynak (2005) that used shading treatments on sunburn on fruit determined that Shading treatments decreased sunburn damage on pomegranate fruits compared to control. Similar results were also provided with 18 % Shade by use of covering material on apple fruits and damage showed reduction from 35% to 18% on Gala varieties and from 68% to 29% on Braeburn varieties (Glenn *et al*, 2002). Also results of present study that showed metghal cover have minimum of sunburn damaging, due to this cover

treatment have little mesh that caused highest shading.

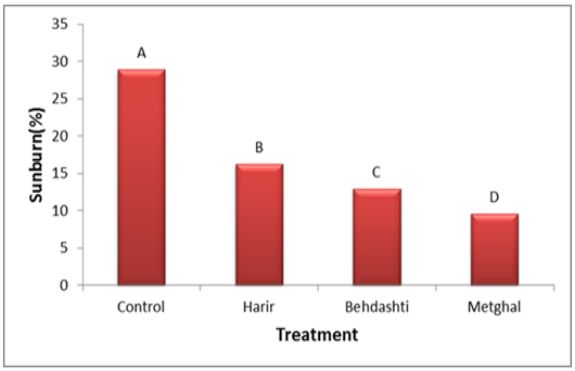

Fig. 3. Percentage of Sunburn in all treatments.

Acidity, pH and Total soluble solids analyze

The results of the analysis of acidity showed that there was significant difference between the treatments (Table, 4). Data on total acidity (as citric acid) indicated that highest level was found to be 1.5% in Metghal cover treatment and lowest (1.1%) at Harir cover. Table (4) showed that, the pH was not affected significantly by all treatments compared with the control, although pH was lowest in Metghal cover.

The results of the analysis of total soluble solids (TSS) showed that there was significant difference between the treatments (Table, 4). TSS of fruits was found to be significantly minimum in metghal cover (17.25), while other treatments comparison with control treatment showed no significantly difference.

Yazycy and Kaynak (2005) studied effects of shading treatments on quality criteria a's on fruit of Hicaznar cultivar of pomegranate. They reported that there was no significant effect of shading application on acidity. Our findings agree with Taki *et al* (2014) that used net cover, found this treatment was no significantly effect on pH. According to Barzegar *et al* (2004) , that study 15 cultivar of pomegranate that cultivated in Agriculture Researches Center of Yazd (in Iran), mean of total acidity, pH and TSS were 0.42-2.05%, 3.05-4.08 and 12.1-18.3 °Brix, respectively. In another study different covering material was also tested that these materials were effective in decreasing fruit temperature (Yuri *et al*, 2002). Perhaps metghal cover in present research with reducing of sun ray (as shading effect) caused highest acidity and lowest TSS, finally caused sour taste.

Conclusions

Considering the results of this study, cover treatments showed low infection to carob moth, in comparison with control treatment which was because that control treatment haven't any preventer such as covering material so this fruits is appropriate place for more generations of this pest. Plus that, sunburn was the lowest in Metghal cover treatment. But caused more total acidity and less TSS, finally fruits with this cover become sour. Among the characteristics of the fruit, for cracking no specific trend was observed at any treatments. So we can propose using of cover for prevention and reduction of carob moth damaging. Between covers that used in this study, Behdashty cover was better than other covers, because this cover could decrease infection of fruits with carob moth, plus that TSS and TA of fruits showed no specific trend with this cover, too where sunburn is the important problem of pomegranate fruits, farmers can use the Metghal cover.

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