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The effect of application of different kinds of covers on the sunburn and internal qualities of pomegranate in Iran

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ABSTRACT: Pomegranate (*Punica granatum*) is one of the most important crops in Iran. Isfahan province has a lot of wide Pomegranate's orchards. However, there are some ways that can damage these crops. One of them is damages by sun that called sunburn. The purpose of this research was to compare the efficiency of some kinds of covering to prevent of sunburn dame in pomegranate orchard in Isfahan province of Iran. Three kinds of covering used in this research that called Methal, Harir and Behdashti. They have different meshes. Results showed that there is no significant difference between all treatments (Harir, Metghal and Behdashti about sunburn) bout all of them had a significant difference with check treatment. Harir and Methgal had a better performance when we want to compare all treatments about sunburn. In these treatments there weren't sunburn more than 50% and they decreased the percentage of sunburn between 10 to 50 and more than 50%.

Keywords: Pomegranate, Net covering, Sunburn, Isfahan Province

INTRODUCTION

Pomegranate (*Punica granatum L.*) belongs to the Punicaceae family. It is a shrub, usually with multiple stems, that commonly grows 6-15 ft. (1.8-4.6 m) tall. The slender branches start out upright then droop gracefully. This tree species is well adapted to marginal lands and arid soils. (Parashar and Ansari, 2012). It is native to the region extending from present day Iran to the Himalayas in northern India and has been cultivated since ancient times throughout the Mediterranean region of Asia, Africa and parts of Europe (Said *et al*., 2009).

Pomegranate is one of the oldest known edible fruits and was used in many ways as it is today and was featured in Egyptian mythology and art, praised in the Koran and Old Testament of the Bible, and desert caravans for the sake of its thirst-quenching juice carried it (Taki *et al,* 2014). It traveled to central and southern India from Iran about the first century A.D. and was reported growing in Indonesia in 1416. It has been widely cultivated throughout India and drier parts of Southeast Asia, Malaya, the East Indies and tropical Africa. The most important growing regions are Egypt, China, Afghanistan, Pakistan, Bangladesh, Iran, Iraq, India, Burma and Saudi Arabia (Hasni Sayyed *etal.,* 2012;Morton 1987) The main pomegranate cultivation centers of our country (Iran) considering cultivation area are provinces: Fars, Markazi, Isfahan, Khorasan, Yazd, Kerman, Semnan, Kermanshah, Tehran, Bakhtiari, Sistan and Baluchistan, Khouzestan, Lorestan, Mazandaran, Zanjan, Kohgilouyeh Boyerahmad, Azarbaijan Sharghi, Gilan, Hormozgan, Boushehr, Ilam, Azarbaijan Gharbi, Kurdistan. P omegranate is in third place (after apple and grape) in Isfahan province (Hashemifesharakia *et al*., 2011). Atmospheric conditions where pomegranate has grown have significant effects on its quality attributes.

With air temperatures in July and August normally above 38°C and mean of monthly total of sunshine hours during 1994-2005 337.1 and 352.5, Shahreza in Isfahan province is one of the main regions of pomegranate. Pomegranate fruits are especially sensitive to sun because they are terminal-bearing plants featuring few or no lateral branches on the lower half of the shoots (blind wood) and with most of the fruit buds being borne near the ends of the thin branches, which bend with the increase in fruit weight as the season progresses. This exposes fruit parts that had developed previously in the shade, and are extremely sensitive to sunburn. (Parashar and Ansari, 2012; Lawson *et al*., 1995)

In economic point of view High yield, make more income if products are marketable but sunburn damage in the form of large black spots on the fruit skin decrease marketability and income. Heat stress and sunburn caused from excessive temperatures and ultraviolet (UV) light can damage a pomegranate crop; significantly reducing marketable yield and cutting deep into a grower's profit.

High temperature stress in plants results in the production of reactive oxygen species (ROS) which cause oxidative stress (Ma *et al*., 2008; Fawole and Opara, 2013).

Plants protect themselves from the cytotoxic effects of the active oxygen species by antioxidant enzymes or metabolites such as glutathione, ascorbic acid and carotenoids which may scavenge reactive oxygen (Sairam *et al*., 2000; Ma *et al*., 2008). The effect of Kaolin and other covers on sunburn has been studied in some works (Glenn *et al*. 2002; Melagarejo *et al*. 2003; Faissal *et al*. 2013;Yazici and Kaynak, 2006), but there aren't some papers that focused on sunburn.

The main objective of this investigated is study the effect of applying cover treatments to pomegranate fruit on the degree of sunburn damage. In addition, the effect of sunburn on the internal antioxidant concentration of the juice was analyzed in Shahreza city, Isfahan province, Iran. Both factors are important in terms of fruit quality.

MATERIALS AND METHODS

A. Region

Forty-eight of pomegranate cultivars were selected as test plants. Test were conducted in year 2013 until July to November on orchard located within northern Shahreza limits at 32°06"E latitude, 51°85" longitude, at an elevation of 1845.2 m above sea level.

B. Treatment

Four northwest-southeast oriented rows contain similar trees in age; species and irrigation system were used to cover by three different meshes of fabrics. In our work three covering fabbric were trialled, one of which was18 holes per 1 square centimeter (Harir) second was 22 holes per 1 square centimeter (Metghal) and third was with very tiny holes (Behdashti).

In this trial, laid out as a completely randomized bock design, there were 4 replicates of 12 trees per treatment, but control treatment applied on the trees that every treatment applied on them. The pomegranate fruits were chosen as a pair regard to have same position to sun then one of them covered and another was control (Fig. 1).

C. Software uses for statistical analyze

For all the parameters measured, an analysis of variance (ANOVA) was performed and least significant differences (5%) calculated using the general analysis of variance procedure in SPSS statistical software (SPSS release version 16). In all cases data was checked for normality, transformed where required before analysis and back transformed for presentation (Weerakkody *et al*., 2010).

D. Experimental and computations part

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 0 Brix. Total acidity (TA) by titration to pH 8.2 with 0.1 N NaOH and expressed as citric acid content (g/100 mL). Anthocyanin and Taste index were calculated on the basis as cyanidin-3-O-glucoside and by dividing the TSS on TA respectively.

(a) Harir cover and control (b) Behdashti cover and control (c) Metghal cover and control.

Fig. 1.

RESULTS AND DISCUSSION

Table 1 shows the effect all treatments on some internal qualities of pomegranate in research area in Iran. At harvest for the covering treatment covered fruits and its control on the trees were harvested and rated for the level of external damage due to sunburn. Each fruit was visually rated into three groups depending on the area of the fruit surface that was damaged due to sunburn. The groups were <10% of the area affected by sunburn (minimum), 10–50% of the fruit surface area affected by sunburn (mild) and more than 50% of the fruit surface area affected by sunburn (severe). Distribution of damage of harvested fruits from covering treated trees is showed in Fig. 2. Figure 2, 3 and 4 represent mean of PH, moisture and anthocyanin respectively, it's visually clear that covers treatment didn't change moisture and PH but about anthocyanin we obtain Behdashti significantly reduced it than Harir. Because Harir had more pores and made fruit temperature lower than Behdashti.

According to Fig. 2, the Harir and Metghal treatments have a better protection in compare to the Behdashti but Harir with lower mesh than Metghal maybe is more suitable for fruit respiration.

Table.1. The effect of all treatments on some pomegranate internal qualities in Iran.

Treatment	Anthocyanin	PH	TSS	Moisture	Taste index
Behdashti	53.58	3.41	17.27	0.78	13.19
Harir	132.48	3.31	17.55	0.78	14.51
Metghal	118.92	3.89	17.97	0.78	13.39
Control	92.51	3.31	17.50	0.79	13.68

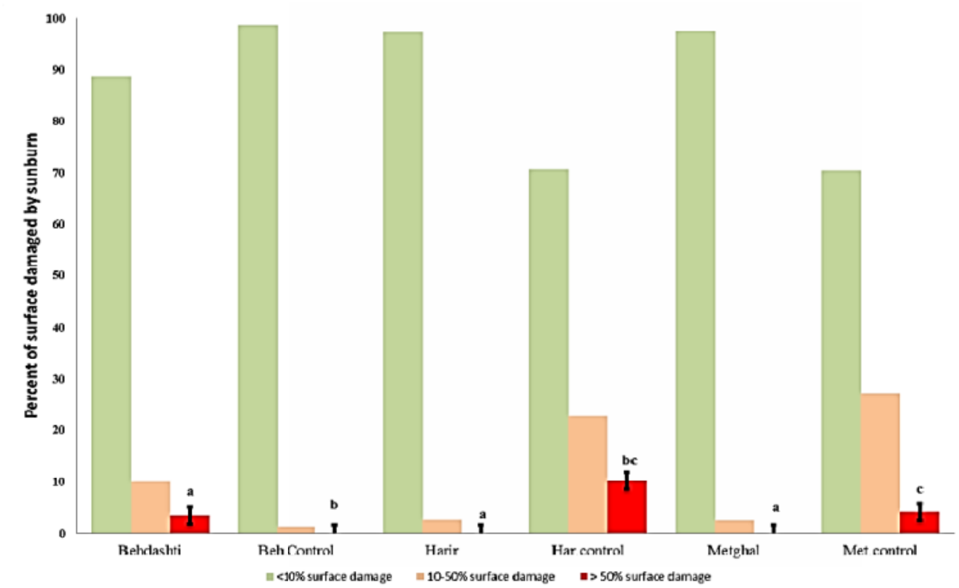

Fig. 2. Distribution of damage of harvested fruits from covering treated trees (vertical bars represent standard deviation) (p = 0.05, values followed by a different letter are significantly different).

In this research there wasn't any significant difference between PH, TSS and Anthocyanin with treatment. The results showed that there isn't significant difference between all treatments (between Harir, Metghal and Behdashti about sunburn) but all of them had a significant with their control treatment. Harir and Methgal had a better performance when we want to compare all treatments about sunburn. In these treatments there weren't sunburn more than 50% and they decreased the percentage of sunburn between 10 to 50 and more than 50%. Maybe this fact because of time that we start to do the experimental actions and sun could damage a big part of pomegranate orchards, so we definitely suggest to do this research for two years and show the best time for use some kinds of covers. Fig. 3 and Fig. 4 show the mean of PH and moisture in all treatments and Fig. 5 shows mean of anthocyanin in all treatment.

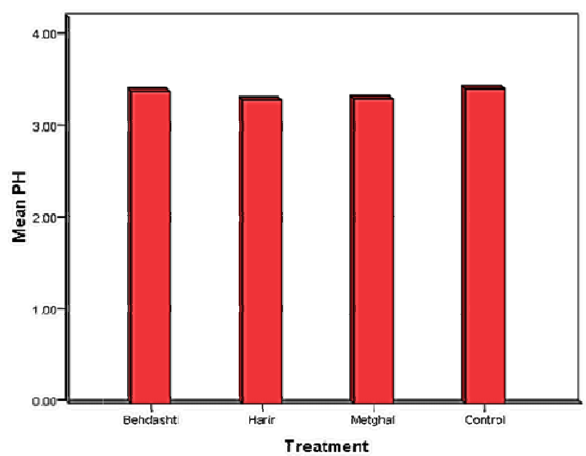

Fig. 3. Mean of PH in all tratment.

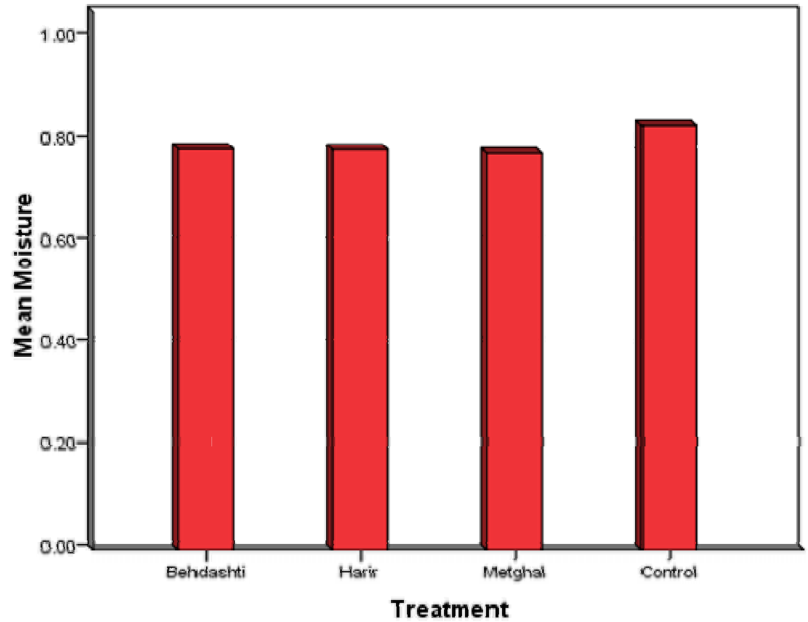

Fig. 4. Mean of Moisture in all tratment.

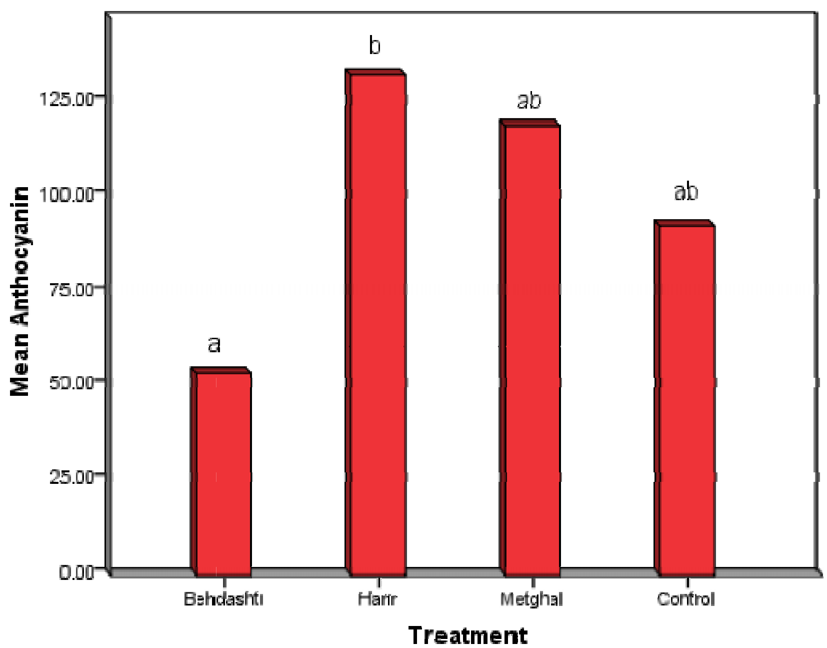

Fig. 5. Mean of Anthocyanin in all treatment (p = 0.05, values followed by a different letter aresignificantly different).

CONCLUSION

Pomegranate (Punicag ranatum) is one of the most important crops in Iran. Isfahan province has a lot of wide Pomegranate's orchards. However, there are some environmental effects that can damage these crops. One of them is sunburn and this option can decrease the customers and make some expenditures. To control it, three kinds of covers are used in Shahreza region. One of them was 18 holes per 1 square centimeter (Harir) second was 22 holes per 1 square centimeter (Metghal) and third was with very tiny holes (Behdashti). The purpose of this research was to compare the efficiency of these covers .To achieve this objective, some pomegranate orchards was chosen treatments. The results of research showed that there isn't significant difference between all treatments (between Harir, Metghal and Behdashti about sunburn) bout all of them had a significant with treatment. Reduction of sunburn was observed in all treatments in comparison to the check.

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REFERENCES

Hashemifesharaki S., Karimizadeh J., Jalalzand A.R., Besharatnejad M.H., Modaresi M. (2011). Studying on Damage of Carob Moth in Three Pomegranate Cultivars of Isfahan (Iran). *Procedia Environmental Sciences* **8**, 257 – 261.

Parashar A, Ansari A. (2012). A therapy to protect pomegranate (*Punica granatum L*) from sunburn. *International Journal of Comprehensive Pharmacy* **3**, 1-3.

Al-Said FA, Opara LU, Al-Yahyai RA. (2009). Physico-chemical and textural quality attributes of pomegranate cultivars (*Punica granatum L.*) grown in the Sultanate of Oman. *Journal of Food Engineering,* **90**, 129–134.

Hasni Sayyed HY, Patel MR, Patil JK. (2012). Pharmacognostical and phytochemical study of fruit peel of *Punica granatum* linn. *Journal of Pharmaceutical Sciences* **3**, 3047-3057.

Morton JF. 1987. Fruits of Warm Climates, Miami, FL, pp. 352–355.

Weerakkody P., Jobling J., Infante M.M.V., Rogers G. (2010). The effect of maturity, sunburn and the application of sunscreens on the internal and external qualities of pomegranate fruit grown in Australia. *Scientia Horticulturae.* 1-5. doi:10.1016/j.scienta.2009.12.003.

Lawson DM, HemmatM,Weeden NF. (1995). The Use of Molecular Markers to Analyze the Inheritance of Morphological and Developmental Traits in Apple. *Journal of the American Society for Horticultural Science* **120**(3), 532–537.

Taki M., G.R. Dabbagh, R. Torabi and M.R. Kavianpoor (2014). Some mechanicalmethods to behavior manipulation of the carob moth, Ectomyeloisceratoniae inpomegranate orchards. *International Journal of Biosciences*. **4**: 67.

Fawole OA, Opara LU. (2013). Changes in physical properties, chemical and elemental composition and antioxidant capacity of pomegranate (cv. Ruby) fruit at five maturity stages. *Scientia Horticulturae* **150**, 37–46.

Glenn, DM, Prado E, Erez A, McFerson J. and Puterka GJ. (2002). A reflective, processed-kaolin particle film affects fruit temperature, radiation reflection, and solar injury in apple. *Journal of American Society for Horticultural Science* **127**, 188-193.

Yazici K and Kaynak L. (2006). Effects of kaolin and shading treatment on sunburn on fruit of Hicnazar cultivar of pomegranate (*Punica granatum* L. cv. Hicnazar). *Acta Horticulturae* ***8*18**,167-174.

Ahmed FF; Abdel Aal AMK; El- Sayed MA and Sayed HR. (2013). Protecting Red Roomy Grapevines Growing Under Minia Region Conditions from Sunburn Damage. *Stem Cell* **4**(2), 15-20.

Sairam R.K., Srivastava G.C., Saxena DC. (2000). Increased antioxidant activity under elevated temperatures: a mechanism of heat stress tolerance in wheat genotypes. *Biol. Plant.* **43**, 245–251.