

# The Effects of “Thiabendazole, Sodium Bicarbonate, Hot Water Dip, Herbal Plants Extract” Treatments and Fruit Size on Valencia Orange Postharvest Quality and Quantity

Zeinab Nadimi, Mehrdad Jafarpour, Esmail Mahmoudi, Shahin Eghbalsaiied

*Khorasgan (Isfahan) Branch, Islamic Azad University, Isfahan, Iran*

## Abstract

Thiabendazole, sodium carbonate, hot water and Thyme extract are among the serious chemical compounds which seem to be used as treatments of the fruits in the warehouses. But the effects that each one has for this purpose is different. Moreover it seems that the size factor also influence the qualitative and quantitative characteristics of the fruits. In order to study the effects of these different treatments on longevity of Valencia orange storage a survey, in the form of entirely random districts with 19 treatments and two sizes of the fruit (5/5 to 6 cm and 6/5 to more than 7cm), is conducted. After making the treatments prepared and putting them in the plastic bags, fruits are kept in a usual warehouse with 20-28 c about 80 days. Base on the results, the most quantity of decay is observed through treatment control 2 for about 49/035 percent and the least quantity relates to treatment Sahed 1, hot water and Thyme extract. The fruits grouped as size 1 (5-6/5cm) showed the highest level of decay for about 36/62 percent. The highest quantity of losing weight was observed through treatment control 2 about 11 grams and the lowest showed by treatment control 1, hot water and Thyme extract. The fruits in size 1 had the highest quantity of losing weight about 7/75 grams. Treatment control 1 with 4/172 showed the highest level of PH for the extract of fruit. The fruits grouped as size 2 (6/5-7cm) had 3/86 pH. while they didn't have meaningful differences with other treatments, Thyme extract (1000) and rosemary extract (2048), hot water and rosemary extract (1024), hot water and rosemary extract (256) parts in million 1/034, 1/035, 1/035 kg/cm<sup>2</sup> respectively had the highest level of density. Considering this issue, the highest level of density belonged to fruits in size 1 (5-6/5cm) that was 1/037 kg/cm<sup>2</sup>. In conclusion, it is inferred from this study that treatments control 1 (free from treatment and unvaccinated) and hot water and thyme extract, in comparison with other treatments, were more successful base on the observed results. In addition, it can be concluded that as they have lower rate of decay, fruits with higher size have more resistance for storage in the warehouses. So with careful attention to environmental issues and producing organic products, it is recommended to use herbal treatments instead of chemical treatments.

**Keywords:** Thiabendazole, Sodium bi carbonate, hot water dip, herbal plants extract, size

## Introduction

Nowadays, agricultural products and their wastage through pathogenic factors and during the storage becomes a more noteworthy issue than foretime. During the recent years, the reduction of wastage during the harvest is one of the objects that most of international

organizations follow. It is believed that the cost of decreasing the rate of wastage would be lower than increasing the production level (Sincliar, 1984). Based on this assumption and just by considering the economical aspects, it is acceptable to seek the ways for reducing the wastage of agricultural products (Aboutalebi, 1381).

Among the healthy and safe ways for controlling the maladies after the harvest is the use of natural compounds such as natural extracts or vegetable oils. Plants extracts contain a vast range of second metabolites and in many cases have the anti microbial, Allupaty, Fungicidal, Antioxidants and environmental features. (Karimi et al., 1378, Asghari, 1387).

The physical treatments used for controlling the wastage and maladies includes thermal treatments such as hot water, hot and dry air, water stream, infrared with short wavelength. The use of thermal treatments for the easy use, being free from remained dangers and lucrative effects that they have on the fruits is of serious importance. (Rahimie.1382)

So based on the above mentioned points, nowadays, considering the importing and marketing of the fruit products free from the remained effects of Fungicides, preventing the environmental pollution and the Cancerous danger of different Fungicides for human caused the use of extracts, snaps and oils from herbal plants in addition to hot water and mineral compounds as a suitable and healthy way for reducing the mould decay resulting from green and blue moulds in the fruits.

The results of the study showed drowning the tangerine fruits in hot water with 52 degrees centigrade temperature for 2 minutes, 55 degrees centigrade for 1 minute and 60 degrees centigrade for 20 seconds, without any affective influence on the inner quality but as an effective feature in the outlet, would increasingly improve the apparent quality of the fruit. These plant extracts contains substances can be used against microorganisms, the effects of which is proved for Bacteria, yeasts and moulds (Tavaloli et al., 1386).

Karimi and Rahimi (1378) studied the effect of thyme on the decay of Valencia orange blue mould in the liquid form of ethyl alcohol 25% with densities of 0/1,0/3,0/5 and the results showed that the rate of decay was increasingly decreased.

Also HadiZadeh et al. (2009) used thyme extract of 1500 and 2000 parts in million and respectively controlled the rate of decay by *Alternaria* to 74/7 and 68/5 percent.

It seems, in addition to the controlling effects of extracts on moulds, they have effective influences on stimulating the defensive reactions of the plants. As it was mentioned the Fungicidal reactions of extracts has been proved in different experiments but there is not enough studies. Today for the rise of human knowledge, the requests for healthy and organic foods have been increased. As a result the attention toward these kinds of studies has been risen for turns them to a good substitute for artificial chemical substances which have dangerous effects on human health.

## **Materials and methods**

This study is conducted in the form of entirely random districts with 19 treatments and two sizes of the fruit (5/5-6 cm and 6/5-7cm). For this purpose and after transferring from the garden, Valencia oranges were washed and disinfect the surface form with ethyl alcohol 70%. Before using treatments, the fruit skin was scratched in two parts with a sterile knife and each vertical one with 2 millimetre depth. Then the suspension liquid ( $1 \times 10^5$ ) in each millilitre of green mould spoor was sprinkled on fruits, and it was given a 48 hours time till the spoor infiltrate in the scratch. After sprinkling spoor, the use of treatments was done. For each repetition of the study 5 fruits were chosen and then the treated fruits were transferred into a usual store with 22-30 degrees centigrade temperature. They were kept there for 80 days. At the end of the study the rate of decay and losing weight, the PH of extract and the density of the fruits were measured. In the end, the obtained results were analyzed through SAS software and the average of the results was compared by LSD test.

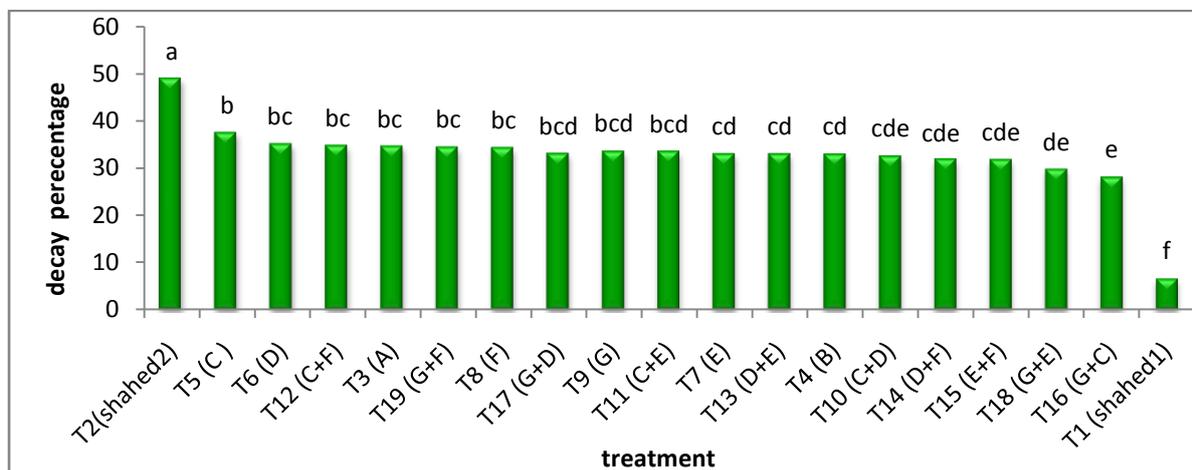
## **Results**

### **1.1 The effects of treatments on the rate of decay**

The results of the study are shown in the graph 1-1. From the presented results it can be inferred that the highest quantity of decay has happened with treatment control 2 (T2 49.035%) as there were a meaningful difference in comparison with other treatments. In addition, the lowest quantity relates to control 1 (T1 6/66%). After treatment control 2, hot water and Thyme extract treatment with 1000 parts in million density 29.815% (T18) showed to be more appropriate.

The reason of high rate of decay with treatment Shahed2 can be resulted from the hidden infection that exists in the surface of growing fruits. Moulds can cause decay through the scratches happening during the picking up the fruits. In addition, if the cuticle epiderm damaged or through keeping the fruits in unfavourable situation weakened it would enable the moulds, for spoor budding and colony to obtained food and humidity from fresh scratches. The obtained results of the study show congruence with what Tavalalieet al. (1386) and what Aboutalebi and Janparvar (1389) reported.

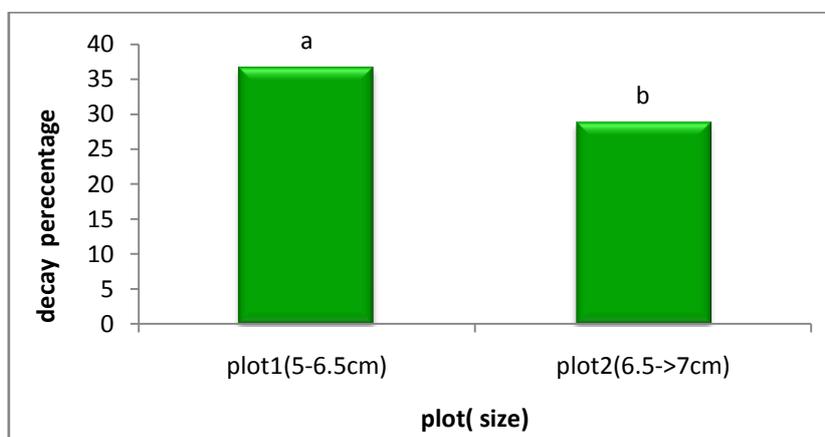
### 1.1. The quantity of decay



### 2.1 The effects of treatments on fruits size

According to the graph (2-1), the highest level of decay is observed about 36/62% in the first Platt of fruit with size of 5-6/5 cm which have a meaningful difference of 5% with what was obtained through the second Platt with size of 6/5-7cm and about 28/79% decay. The first Platt had smaller fruits so their rate of water loss in comparison with bigger ones is higher and this is for the lower Surface to volume ratio which causes more Breathing, Evaporation and Transpiration. So their rate of decay per unit time in comparison with fruits with bigger size is higher.

#### 2.1. The effects of treatments on the size of the fruits

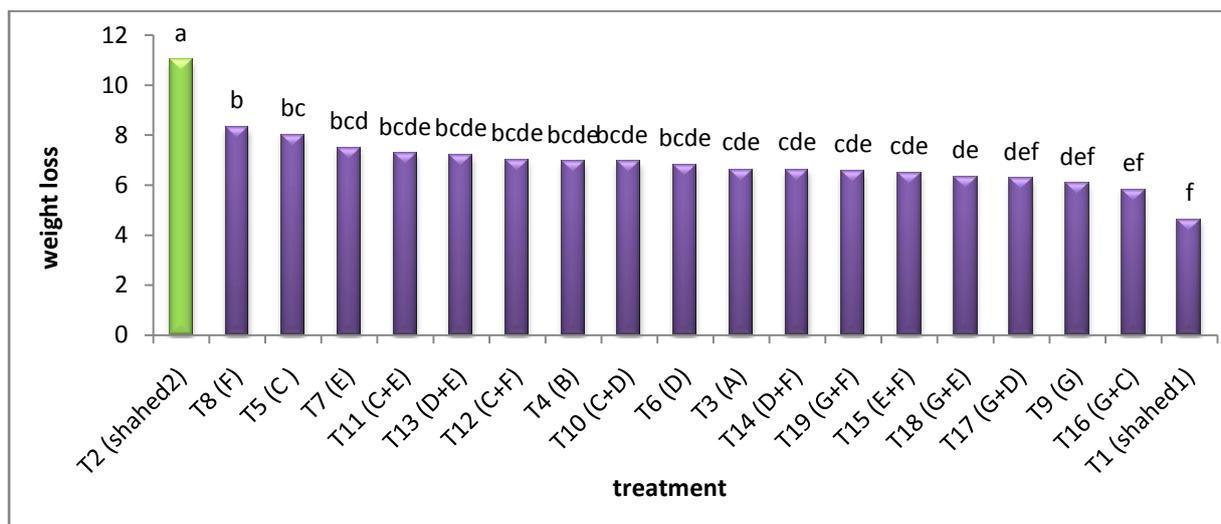


### 3.1 The effects of treatments on the weight loss of the fruits

As the graph (3-1) shows the highest level of losing weight is observed with treatment control2 (T2) which is 11 grams, the reason of which can be for the green moulds activities, none use of treatment and the enhancement of the breathing rate and Transpiration from the skin of the fruits.

After treatment Sahed1, the compound treatment of hot water and thyme extract 1000 parts in million and hot water and rosemary extract 1024 parts in million were more successful than the others while there is not meaningful differences among their obtained results. It seems that the effects of thermal treatments for controlling the loss of weights are because of the effects that they have on the skin of the fruits. The hot water treatments lessen the rate of water exudation. These findings are in accordance with what Ghasemiet al. (1388) have reported.

#### 3.1. Treatments and the losing weight



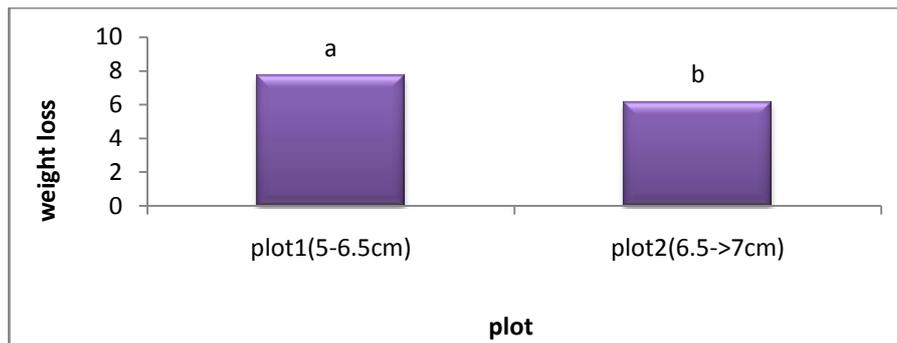
### 4.1 The effect the fruitsize on weight loss

As it can be inferred from graph (4-1) comparing the averages of Platt sizes shows the level of weight loss in Platt 1 (5-6/5 cm) is about 7/75 gram which have a meaningful difference with the what is observed from Platt 2 (6/5-7cm) and about 6/177 gram.

The reason for the obtained results of these two plats is that the fruits in the platt1 had smaller size in comparison with Platt 2; in addition the lower proportion of surface to the mass of the fruits caused more Transpiration and breathing. Fruits with smaller sizes are more disposable

to decay and polluted faster, so the rate of their water exudation, breathing and weightloss is higher than the others.

#### 4.1. The fruit size and weight loss

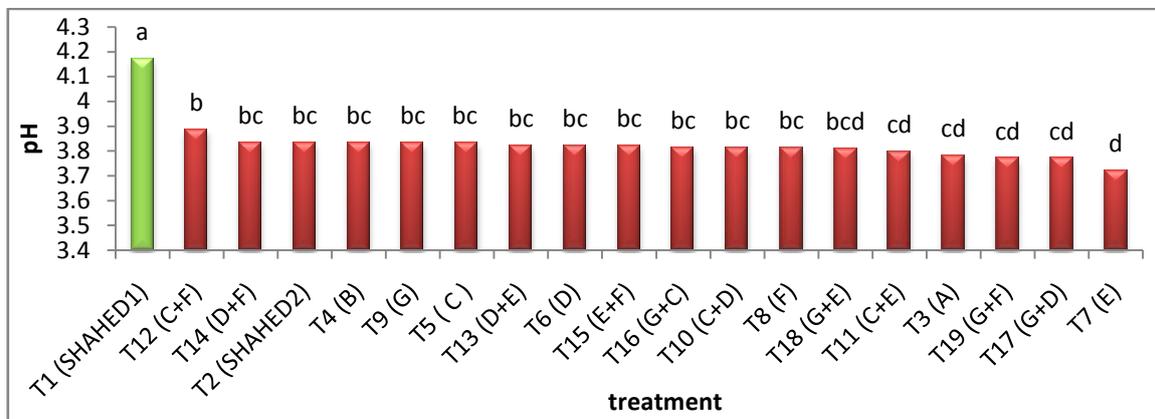


#### 5.1 The effect of the treatments on juice pH rate

As the comparison of the averages on the graph (5-1) shows the treatment control 1 (T1) have the highest pH level of fruits extract, about 4.172 and meaningful in comparison with other treatments. The lowest level is observed through rosemary treatment with 2048 parts in million (T19) about 3.77, which doesn't show a meaningful with Thiabendazole with 1500 parts in millions density (T3) and 3.78 density, thyme extract with 100 parts in million density, rosemary extract with 256 parts in million (T11) and 3.79 density and hot water and rosemary extract with 256 parts in million density (T18).

Base on the studies it can be inferred that the high rate of pH of fruit extract after a period of storage in the warehouse is for keeping the qualities of fruits. In treatment Sahed1 for the lower rate of decay and keeping the qualitative characteristics of fruits the rate of pH increased, the result of which was the increase of the liquid solid substances. The reason of this increase can be because of unknown reasons which make the participation acidic compounds in the metabolic processes of the cells (Aziziet al. 1388).

### 5.1. Treatments and the pH rate



### 6.1 The effect of fruit size on the pH rate

The comparisons of averages in graph (6-1) shows that the fruit extracts rate of pH in plot2 (6.5-7 cm) in its highestlevel is about 3.86 and in Plot 1 (5-6.5cm) it is about 3.79 in the lowest level. The difference between them is meaningful. According the studies on the both plots is discovered that the fruits in plot 2 have the higher rate of pH because of keeping the qualitative features of the fruits in comparison with fruits in plot 1.

### 6.1. Fruit size and the pH rate

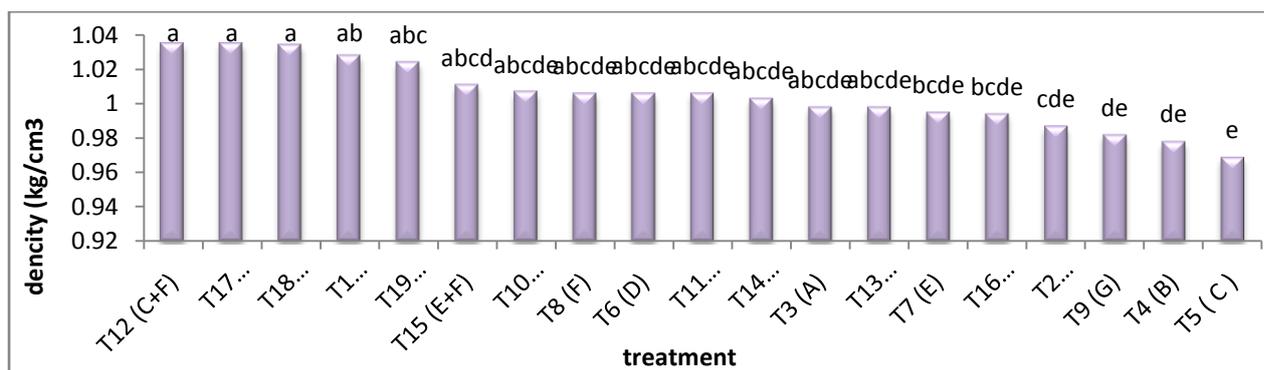


### 7.1 The effect of treatments on fruits density rate

The graph (7-1) shows the comparison of averages between the treatments of the study. The treatments of thyme extract with 100 parts in million density and rosemary extract with 2048 parts in millions density (T12) with 1.035 kg/cm and hot water and rosemary extract, 1024 parts in million (T17) with 1.034 kg/cm have the highest level of density but they don't show so meaningful difference with the other treatments. The lowest level of density belongs to thyme extract treatment 1000 parts in million (T5) with 0.969 kg/cm. according to the findings of this study the highest level of density through hot water and extracts can be

explained base on this reason that thermal treatments by decreasing the decay level of fruits not only cause the reduction of water, also prevent the loss of fruits weight, so the result would be the enhancement of the fruits density. So the effects of hot water and extracts treatments can be on the keeping and controlling the qualitative features of fruits and reduction of decay rate which turns to the increase of the fruits density.

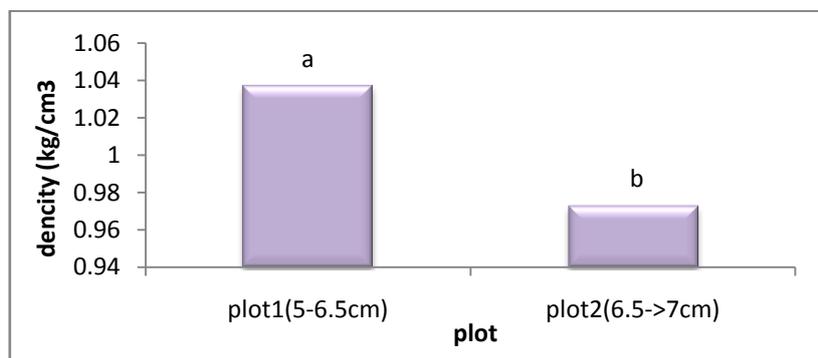
### 7.1. Treatments and the density rate of the fruits



### 8.1 The effect of fruits size on fruit density

As it can be inferred from graph (8-1) the highest level of fruit density is observed in platt1 with 1.037kg/cm and the lowest in platt2 with 0.973 kg/cm. these two data show a meaningful difference the reason of which can be the ratio of weight to mass of the fruits. The lessen the ratio of this proportion the result would be the more density rate.

### 8.1. Fruit size and the fruit density



## 9.1 Conclusion

Concluding the obtained results, generally it can be said that qualitative and quantitative characteristics of Valencia orange can be influenced with the nature of treatments. Through the general findings of the study, it suggests that herbal extracts, hot water and the double influence of hot water and extracts can be applicable in order to control and retain the qualitative and quantitative characteristics of Valencia orange in the usual stores. They are effective regarding the fruit lifespan after the time they have been picked up, especially about Valencia orange. They can control the rate of decay in comparison with the chemical ones.

## References

- [1] Aboutalebi A & F. Janparvar. 1389. *Effect of Mint and Eucalyptus extracts on Washington Navel Orange reducing decay at postharvest*. Jahrom Islamic Azad University
- [2] Azizi, Sarikhani & Dashti. 1388. The effects of Salicylic Acid and packing way on the shelf life and some qualitative features of three types of greenhouse pepper (*Capsicum annum* L). The sixth congress of agricultural science in Iran. Gillan University. P. 795-796.
- [3] Hadizadeh I, Peivastegan B, Hamzehzarghani H. 2009. Antifungal activity oils from some medicinal plants of Iran against *Alternaria alternata*. *American Journal of Applied Sciences*, 6: 857-861.
- [4] Inkha S, Boonyakita D, Srichuwong S. 2009. Effect of treatment on green infection in tangerine fruit cv. Sainumpung. *Cmu Journal Natural Science*. Available from: <http://cmuj.chiangai.ac.th/cmujvo181/90%20Journal%202009%20v8-1.Pdf>. [Accessed 12 February 2009].
- [5] Karimi. Z & Rahimie. M. 1378. *Comparing the effects of the oils extracts of thyme, clove and fungicide emazalil on decay of Penicillium Italicum for orange fruits in cold stores*. Scientific and technical journal of agriculture and natural resources. The twelfth edition. 45: 19-24
- [6] Plotto A, Roberts R G, Roberts D D. 2003. Evaluation of plant essential oils natural postharvest disease control of tomato (*Lycopersicon esculentum* L.). *Acta Horticulture Science*. 628: 737-745.
- [7] Rahimie .M. 1382. *Physiology after harvesting (an introduction to physiology and fruits, vegetables and plants transmission)*. Shiraz University publication, third edition, p. 438
- [8] Tavalalie. V, Rahimie. M & Karimi. Z. 1386. *Studying the effects of oil extracts of thyme and ginger on decay of Penicillium Italicum on the orange in the store*. The fifth congress of gardening science. Shiraz University. P.418

[9] Zhang H, Wang L, Zheng X, Dong Y. 2007. Effect of yeast in antagonist in combination with heat treatment on postharvest blue mold decay and rhizopus decay of peaches. *International Journal of Food Microbiology*. 115: 53-58.