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IBI (India) = 4.260
OAJI (USA) = 0.350

SOI: [1.1/TAS](https://doi.org/10.1/TAS) DOI: [10.15863/TAS](https://doi.org/10.15863/TAS)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2022 Issue: 01 Volume: 105

Published: 11.01.2022 <http://T-Science.org>

QR – Issue



QR – Article



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INFLUENCE OF PEELS ROOT BERBERS EXTRACT, CuSO_4 AND IRRIGATION, ON IMPROVE STORABILITY FRUITS OF FIG CV. IRANIAN

Abstract: An experiment was conducted on private orchard at Al- Abbasyia / AL-Najaf Governorate on fig cv. Iranian that brought from one of the mountains that located about 25 Km northeast country Mayame in Mashhad Governorate in Iran on 15 January 2016. After 5 years trees were spraying with peels root Berbers extract 30% , CuSO_4 at concentrate 350 mg/L and treated with 3 periods of irrigation in single way or in combination at 15 March and 15 May in 2021. Results indicated that, trees treated with peels root Berbers extract CuSO_4 and periods of irrigation and their interactions caused a significant decrease percentage of weight loss, total decay , percentage of brown coloring of the area around the ostiole, respiration rate and increase vitamin C, total soluble solids ,total sugar , Anthocyanine pigment in fruit peel, fruit firmness, Antioxidant capacity and degree of taste after 8 days of the storage on 5C^0 and relative humidity 80-85 % compared to control treatment . There were a significant effect between treatment. Treatment of spraying (peels root Berbers extract + Cu SO_4 + Irrigation after 15 days) gave the highest rate of parameters studied.

Key words: peels root Berbers extract, CuSO_4 , Irrigation, Fig Iranian.

Language: English

Citation: Al-Hameedawi, A. M. S., & AL-Malikshah, Z. R. J. (2022). Influence of peels root Berbers extract, CuSO_4 and irrigation, on improve storability fruits of fig cv. Iranian. *ISJ Theoretical & Applied Science*, 01 (105), 180-187.

Soi: <http://s-o-i.org/1.1/TAS-01-105-9> **Doi:**  <https://dx.doi.org/10.15863/TAS.2022.01.105.9>

Scopus ASCC: 1100.

Introduction

Turkey, Egypt, Algeria, and Morocco account for 65% of the world production. Turkey is the leading Country with 27% of world fresh figs and 53% of dry figs, accounting for 51% of fig fruit world exports (Yilmaz et al., 2017). Fig trees (*Ficus carica* L.) are deciduous fruits, belong to genus " Ficus " , which is follows to the Family " Moraceae " , where it believed that its origin is Arabian peninsula and Spread to the subtropical regions and native to western Asia and has been cultivated and consumed in the Mediterranean Basin since the earliest stages of the agricultural

civilization (Stover et al., 2007). The variety of fig cv. Iranian was found in one of the mountains that located about 25 KM northeast country Mayame in Mashhad Governorate in Iran and resisting to cold temperatures and dryness. This fig had the best result characteristics in the percentage of total soluble solids, vitamin C, titratable acidity, total sugar, antioxidant capacity, firmness of fruits and length of fruit / diameter of fruit (fruit shape). Also it was gave the lowest rats of leaf aria, petiole length and ostiolum diameter of fruits compared with three fig cultivars were Aswod DIALA, Waziri and Kadota that grown in a private orchard in

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Abbasyia, Najaf Governorate. The Iranian fig are belongs to normal fig group *Ficus carica* var. *hortensis* (AL - Hameedawi and AL- Sharea, 2020). The type and degree of skin damage varied among cultivars. For 'Brown Turkey', 'Kadota' and 'Sierra', slight skin-damage and coloring of the area around the ostiole prior to cold storage increased decay and reduced postharvest life with reduced irrigation 55% (Kong et al., 2013). AL- Malikshah (2017) mentioned that, the fruits of figs are among the fruits of rapid perishability, and storing them is a re-organization of marketing and prolonging the period of displaying the fruits in the market. The best storage period for fig fruits ranges from 7 to 10 days at a temperature of 5 C⁰ and a relative humidity of 80-85%, and most of the diseases that occur during storage are disease of *Aspergillus Niger*, *Alternaria tenuis*, *Penicillium* explosion Sourcing, *Alternaria Fiji*, *Fusarium solani*, *Ulocladium atrum*. Muhammad and Kamel (2019) noticed that the peels of Root Berbers containing isoquinoline alkaloids 2-3%, the most important of which are: berberine, berbamin, berbaminun, magnoflorine, and Jatrorrhizin. In addition to containing materials Afsih resin and organic pigments. Studies in different regions of the world were found that, some nutrients, such as Cupper has an important to increasing content of leaves from growth hormones, total chlorophyll, length and number of branches, firmness of fruits and production of fig trees and also led to decrease the percentage of dropping and cracking of fruits. The decline element Cupper in fig trees led to injury with deses rusty leaves, leaves pot, (Exanthema or die back) of branches and internal breakdown, senescent scald of fruits (George, 2019). AL- Hameedawi .et. al. (2021) noticed that, spraying with Willow inflorescence extracts at concentration (30 and 40%), CuSO₄ 300 mg/L and hemorrhage cane vine local cv. Das alanze

at (40 and 50%) on the local fig cv. White Adriatic in single way or in combination caused a significant increase in carotene pigment in fruit peel, percentage of total acidity (TA), percentage of total soluble sold (T.S.S), T.S.S/ TA, vitamin C, firmness and peel thickness and reduced percentage of souring, total cracking at maturity stage. Leonel and Tecchio (2010) studied the effect of different irrigation levels on fig trees in the region of Ilha Solteira, São Paulo State, and concluded that the applied levels promoted positive effects on the yield of ripe fruits, total yield, branch length, and length and diameter of ripe fruits, recommending the application of 75% of Class A pan evaporation. when evaluating the pruning effect, either in the presence or absence of irrigation, from July to October, concluded that the irrigation practice promoted higher harvest numbers and expansion of the production cycle. AL- Hameedawi and AL- Noumani (2014) found that, the spraying fig cv. Kadota with paclbutrazol at conc. Of 200 mg/L, Zinc sulphate at conc. Of 3000 mg/L and 3 periods of irrigation on 1/5/ at 2011 and 2012 respectively before 6 weeks fruit harvest in single way or combination cased a significantly increased the total soluble solids, total sugar, vitamin C, percentage of carbohydrate and firmness for the two growing seasons, respectively. AL - Hameedawi (2019) found that spraying with seaweed extract 3%, CaCl₂ at concentrate 1% and 2 periods of irrigation, in single way or combination on the fig cv. Aswod Diala for season 2017 was increased the firmness of fruit, calcium pectate and anthocyanine pigment in fruit peel at maturity stage of fruits compared to control treatment. The main objective of this investigation is to study the effect of spraying with peels root Berbers extract, CuSO₄ and irrigation, on reducing percentage of weight loss, total decay, and improve storability of fruits of fig cv. Iranian that stored 8 days at 5 C⁰ and 80- 85 R.H.



Figure (1)



Figure (2)

Figure (1 and 2) : Fig trees cv. Iranian in one mountain of country Mayame in Mashhad Governorate in Iran in 15 January 2016.

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Materials and methods

The small seedlings of fig cv. Iranian brought from one of the mountains that located about 25 Km northeast country Mayame in Mashhad Governorate in Iran on 15 January 2016 (Figure 1 and 2).

The trees were planted creeping morphology form at rise 60 cm, The trees were preservation of leaves and fruits despite on lowering temperatures which reached to 3C⁰ in October month and the temperatures of summer to go pass 40C⁰ and lower humidity and no rains during months (June, July and August). The texture of the soil of mountains of this aria is Sand Silt Clay. The fig trees founded in mountains which rise about 300-600 m from level of valley (Figure 3 ,4,5 and 6). Most of plants of this aria prickly alhagi and favash which planted in bottom of valley. There were no spring near from this shrubs. The small seedlings were planted on 20 January in a private orchard at Abbasyia, Najaf Governorate. For the 2021 season, 48 at same size and growth trees were selected with 5 years of age, that planted on (5 x 5 m.), they watered every five days, and fertilized by Nitrogenous and phosphates in two periods in March and May of each year at a rate of 300 g. per tree, as well as by manure for the two years. The experiment included 16 treatments with three replicates. It is adopted according to Randomized Complete Block Design (RCBD), and the results were statistically analyzed according to Duncan test at the probability level of 5% (Snedecor, and Cochran, 1990). Treatments were adopted at 15 March and 15 May in 2021, spraying was done early morning until wetness was full addendum. Tween 20 was added at concentration of 1cm³/ L. as spreader material. Treatments were as follows :

- Control . -1
- Peel root Berbers extract (Prbe) conc. of 30% . it was natural extract of peels root Berbers (Berberis vulgaris L.) .It was brought from the city of Quinn , south Khorasan .
- CuSO₄ 5H₂O (Cu) at conc. of 350 mg / L . -3
 - Irrigation after 5 days . -4
 - Irrigation after 10 days . -5
 - Irrigation after 15 days . -6
 - Prbe +Cu . -7

- Prbe + Irrigation after 5 days . -8
- Prbe + Irrigation after 10 days . -9
- Prbe + Irrigation after 15 days . -10
- Cu + Irrigation after 5 days . -11
- Cu + Irrigation after 10 days . -12
- Cu + Irrigation after 15 days . -13
- Prbe + Cu + Irrigation after 5 days . -14
- Prbe + Cu + Irrigation after 10 days . -15
- Prbe+ Cu + Irrigation after 15 days . -16

In 1-10 -20121 harvested 96 Kg fruits similar in size and color without dieses and mechanical injures from trees of experiment. Fruits were divided into 16 treatments weight 6 Kg for each treatment. The fruits of each previous treatments were divided into 3 replicates and each part weight was 2 Kg . These parts were placed in polyethylene bags with 22 holes for each bags and the diameter of the hole were 0.5 cm. The fruits were stored under 5C⁰ temperature and relative humidity 80-85 % for 8 days starting in 1 / 10 /2021. The design for this treatment was similar to that of the field experiment. In 8 / 10 /2021 fruits were taken out and traits were measured. The percentage of weight loss according to (Lisa and Kader 2003). percentage total decay that includes (disease of Alternaria tenuis, Alternaria fici, Penicillium expausum, Aspergillus niger and Souring according to (Crisosto and Kader ,2004). Ten normal fruits were taken at random in the end of storage from each treatment for quality determination. Acidity percentage, Vitamin C mg /100 ml Juice, % Total sugar and anthocyanin pigment in fruit peel according to (A.O.A.C, 2019). The percentage of total soluble solids were determined by hand refract meter. Firmness Kg/cm² was measured on two sides of each fruit with an Effegi penetro meter (Model NI, McCormick Fruit Tech ,Yakima ,WA) Fitted with an 0.5 cm tip.). Antioxidant capacity (mmol TE/g FW) was determined to previous work (Crisosto and Crisosto, 2001). Respiration rate mg CO₂ / Kg /hr according to (Ibrahim, 2010). In estimating the quality of the taste of the fruits at the end of storage, it was based on the taste of the participants in the examination. Examination forms were dictated by them on a scale (1-4), where given 1 = bad, 2 = acceptable, 3 = good, 4 = very good .

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Figure 3



Figure 4



Figure 5

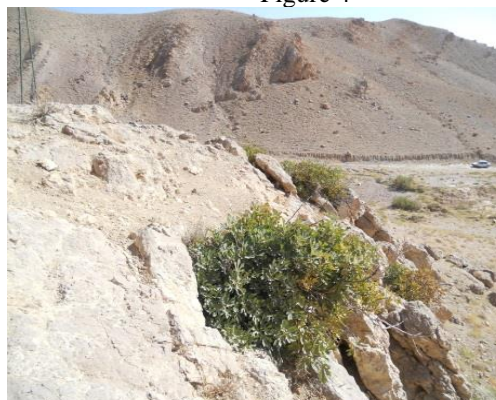


Figure 6

Figure(3,4,5 and 6) : Fig trees cv. Iranian in one mountain of country Mayame in Mashhad Governorate in Iran in 25 October 2018, the maximum temperatures was 11°C and minimum temperatures 3°C.

Results and discussion

1-Weight loss percentage.

Data in Table (1) shows that, spraying trees of fig cv. Iranian with peels root Berbers extract 30%, CuSO_4 at concentrate 350 mg/L and treated with 3 periods of irrigation in single way or in combination led to significantly decreased the percentage of weight loss after 8 days of storage that gave the lowest percentage 3.33 % in the treatment (Prbe+ Cu + Irrigation after 15 days) in comparison to the highest percentage 5.20% in the control treatment . The reason for the decrease in the percentage of weight loss may be due to the effect of the sprayed materials on the trees, in addition to the irrigation periods in causing some physiological changes in the fruit peel and decrease respiration and transpiration of water through peel tissue and changed in structure of

membranes and this leads to make the peel thick and firmness and decrease the moisture loss (Nabifarkhni et al., 2015). As well as to a decrease in the rate of respiration of the treated fruits, an increase in their nutritional content and an increase in their hardness table (1 and 2).

2- The percentage total decay and percentage of brown coloring of the area around the ostiole.

Results indicated in table (1) shows that, treating trees of fig cv. Iranian with peels root Berbers extract 30%, CuSO_4 at concentrate 350 mg/L and treated with 3 periods of irrigation led to decreased in the percentage of total decay and percentage of brown coloring of the area around the ostiole significantly compared to control treatment, The treatment (Prbe+ Cu + Irrigation after 15 days) gave the lowest values

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in percentage of total decay it was 4.59% and 2.05% in comparison to the highest rates 9.76% and 3.95% in control treatment in the end of storage. The increase in the content of the fruits of carbohydrates, in addition to the inhibiting effects on the growth of fungi, bacteria and some physiological diseases, made the fruits of trees treated with copper sulfate more resistant to diseases that occur during storage compared to the control fruits (Devlin and Witham, 2001). The bark of the roots of Berbers is contains a high percentage of berberine, which is from the amino acid tyrosine group, which follows isoquinoline alkaloids, which have an important role in inhibiting the growth of bacteria and fungi that infect fruits (Tadeusz, 2011).

3- Acidity, total soluble solids, Vitamin C, anthocyanine pigment in fruit peel and antioxidant capacity.

Concerning the results in table (1 and 2) shows that percentage of acidity was not significant with the single way or in combination treatment spraying to fig trees compared with untreated trees. Vitamin C, total soluble solids ,total sugar in juice ,anthocyanine pigment in fruit peel and antioxidant capacity were increased significantly when trees sprayed with peels root Berbers extract 30% , CuSO₄ at concentrate 350 mg/L and treated with 3 periods of irrigation in single way or combination. The highest significance result were recorded in treatment (Prbe+ Cu + Irrigation after 15 days) that, gave the highest percentages of percentage of Vitamin C, total soluble solids ,total sugar in juice, anthocyanine pigment in fruit peel and Antioxidant capacity, they were (7.28 mg / 100 ml Juice, 17.60%, 19.21% ,401.28mg/100g peel and 3.15 mmol TE/g FW) comparison with lest rates of percentages (6.09 mg / 100 ml Juice, 15.20%, 17.25%, 237.70 mg/100g peel and 2.21 mmol TE/g FW) in the control treatment respectively at the end of storage. The increase in chemical companied of fruit juice because of fruits treated with such materials led to decreasing the loss in weight, increase in firmness peel of fruits and reduction the respiration rate (Hounsoume, et.al, 2008). Increasing fruits from Vitamin C, total soluble solids, total sugar in juice and anthocyanine pigment in fruit pee which results through spraying with peels root Berbers extract and CuSO₄ in single way or in combination with 3 periods of irrigation due to the fact that this compound increase vegetative growth and thus encourages the accumulation of carbohydrate materials in fruits leading to increased content of these materials (Matsuhira, et.al, 2006). Some plant extracts containing alkaloid compounds have been used as environmentally friendly biological fertilizers that improve plant growth and increase production, and the qualitative and quantitative characteristics of the fruits (Naguib, 2011).

4- Firmness of fruits .

Data presented in Table (2) shows that, spraying peels root Berbers extract, CuSO₄ and irrigation period alone or combination treatments led to increased fruit firmness that gave the highest rates 0.410 kg/cm² in the treatment (Prbe+ Cu + Irrigation after 15 days) in comparison to the lowest values 0.300 kg/cm² in control treatment. The reason of increasing the fruit firmness as a result of the experiment treatments. Above mentioned treatments led to the root system in absorption the nutrients elements in which some of them are parts of chlorophyll which led to increase its quantity in comparison control treatment. This process increases photosynthesis an activate plant growth which led to enhance hormones synthesis (Lambers, and Oliveira, 2019).

4- Rate of respiration of fig fruits.

Concerning the results in Table (2) that, the rate of respiration was decreased in the all treatments compared to control treatment. The respiration of fig fruits were significantly affected by all treatments. It is cleared when spraying peels root Berbers extract, CuSO₄ and irrigation period alone or combination to the fig trees decreased compared with control treatment. In addition, spraying this material in combination gave the lowest parameters it was (16.80 mg CO₂ / Kg /hr). On the other hand, the fruits of untreated trees gave the highest value rat (38.73 mg CO₂ / Kg /hr). Using peels root Berbers extract, CuSO₄ and their combination caused increase in epidermis and cortex thickness of fruits and this reusing led to decreasing rate of respiration of fruits (Allegra et. al., 2017).

5- The degree taste of fruits.

Data in Table (2) shows that the degree of taste in fruits was increased significantly when trees sprayed with peels root Berbers extract, CuSO₄ and irrigation period in single way or combination compared to control treatment. The highest significance result were recorded in treatment (Prbe+ Cu + Irrigation after 15 days) that gave the highest degree of taste, it was 4.00 comparison with lest rates 2.01 in the control treatment at the end of storage. The increase in degree of taste because of fruits treated with such materials led to decreasing the loss in weight, increase in firmness peel of fruits and reduction the respiration rate table (1 and 2).

11-George, M. (2019). Fruit Sciences & Postharvest Group, Agricultural Sciences, Biotechnology and Food Science (ABF) at the Cyprus University of Technology (CUT), based in Lemesos, Anexartias 57, Pareas Building PO Box 50329, 3603 Lemesos Cyprus.

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Conclusion

Generally it could be concluded that trees fig cv. Iranian treated with peels root Berbers extract 30%, CuSO₄ at concentrate 350 mg/L and 3 periods of irrigation at 15 March and 15 May in 2021 in single way or in combination caused a significant decrease percentage of weight loss, total decay, percentage

respiration rate and increase vitamin C, total soluble solids, total sugar, Anthocyanine pigment in fruit pee, fruit firmness, Antioxidant capacity and degree of taste after 8 days of the storage under 5C⁰ and relative humidity 80-85 % compared to control treatment with significant differences between treatments.

Table 1 . Effect of spraying of peels root Berbers extract, CuSO₄ and irrigation, on percentage of weight loss, total decay and chemical characterize of fig fruits cv. Iranian after 8 days from storage at 5 C⁰ and 80-85% R.H. for season for season 2021

Treatments	weight % loss	% Total Decay	brown % coloring around ostiole	Acidity%	Vitamin C mg / 100 ml Juice	Total % soluble sold
Control	5.20 a	9.76 a	3.95 a	0.320 a	6.09 k	15.20 i
Prbe	5.06 ab	9.45ab	2.80 c	0.316 a	6.16 j	15.35 ghi
Cu	5.11 abc	9.50 ab	2.66 c	0.317 a	6.23 ij	15.39 fghi
Irrigation after 5 days	4.90 abc	9.11 c	3.70 b	0.312 a	6.41 f	15.41 efgh
Irrigation after 10 days	4.82 abc	8.60 d	3.45 bc	0.313 a	6.30 ij	15.46 efg
Irrigation after 15 days	4.75 bcd	8.36 de	3.28 bc	0.310 a	6.74 e	15.52 efg
prbe +Cu	4.85 cde	8.63 d	2.49 cd	0.311 a	6.85 cd	15.75ef
Prbe + Irrigation after 5 days	4.65 def	8.05 ef	2.75 c	0.306 a	6.78 de	15.88 de
Prbe + Irrigation after 10 days	4.50 def	7.70 fg	2.41cd	0.309 a	6.27 ij	15.95 cde
prbe + Irrigation after 15 days	4.48 efg	7.10 g	2.20 d	0.309 a	6.30 hi	16.20cd
Cu + Irrigation after 5 days	4.35 fgh	6.85 gh	2.70 c	0.305 a	6.38 hg	16.47 bc
Cu + Irrigation after 10 days	4.20 ghi	6.43 hi	2.53 cd	0.302 a	6.42 g	16.53 bc
Cu + Irrigation after 15 days	3.98 hi	5.91 hij	2.17 de	0.307 a	6.92 c	16.71 ab
prbe +Cu + Irrigation after 5 days	3.75 ij	5.71ij	2.15 ef	0.299 a	6.90 c	16.73 ab
Prbe +Cu + Irrigation after 10 days	3.61 j	5.60 jk	2.11 ef	0.294 a	7.09 b	17.16 b
prbe +Cu + Irrigation after 15 days	3.33 k	4.59 l	2.05 efg	0.295 a	7.28 a	17.60 a

Means followed by the same letters are not significantly different.

Table 2 . Effect of spraying of peels root Berbers extract, CuSO₄ and irrigation, on physical and chemical characterize of fig fruits cv. Iranian after 8 days from storage at 5 C⁰ and 80-85% R.H. for season for season 2021

Treatments	Total % sugar	Anthocyanin e in fruit peel mg / 100g pe	Antioxidant capacity (mmol TE/g FW)	Fruit firmness Kg/cm2	Respiration rate mgCO ₂ / Kg /hr	degree of taste
Control	17.25 j	237.70 i	2.21 fg	0.300 i	38.73a	2.01 j
Prbe	17.53 hij	337.60 fgh	2.33def	0.325 fgh	36.91b	2.17 ij
Cu	17.50 hij	340.75 fg	2.37 fgh	0.327 efg	36.20 b	2.19 hij
Irrigation after 5 days	17.66 ghi	345.19 efg	2.35efg	0.328 efg	34.54 c	2.15 ghi
Irrigation after 10 days	17.85 fgh	347.21efg	2.31 efg	0.323efgh	36.70 b	2.29 fgh

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Irrigation after 15 days	17.81 efg	354.62 def	2.26 efg	0.335 defg	34.88 bc	2.35 fg
Prbe +Cu	17.70 efg	351.73 def	2.33 def	0.340 cde	32.60 d	2.66 efg
Prbe + Irrigation after 5 days	17.95 def	355.35 def	2.35def	0.343 def	33.40 bcd	2.90 ef
Prbe + Irrigation after 10 days	18.18 de	360.69 cde	2.40 de	0.352 cd	31.54 cd	3.03 def
Prbe + Irrigation after 15 days	18.20 cde	362.69 abc	2.45de	0.349 cde	30.40 cd	3.25 de
Cu + Irrigation after 5 days	18.35 cd	365.57 cde	2.59 cd	0.355 cd	29.61 cde	3.66 bc
Cu + Irrigation after 10 days	18.49cd b	569.87 bcd	2.75 bc	0.360 cd	25.17 ef	3.48 cd
Cu + Irrigation after 15 days	18.42 bcd	370.42 bc	3.02a	0.369 cd	24.44 fg	3.72 bc
Prbe +Cu + Irrigation after 5 days	18.65 bc	380.25 abc	2.90ab	0.380 bc	22.51 gh	3.84 abc
Prbe +Cu + Irrigation after 10 days	18.90 ab	392.45ab	3.00 ab	0.395 bc	19.90 hi	3.91 ab
Prbe +Cu + Irrigation after 15 days	19.21 a	401.28 a	3.15 a	0.410 a	16.80 j	4.00 a

Means followed by the same letters are not significantly different.

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