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SECTION 23. Agriculture. Agronomy. The technique.

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EFFECT OF SPARING WITH KELPAK, HLETAB AND GROFALCS ON STORABILITY CHARACTERS OF FRUITS OF SOURS ORANGE (CITRUS AURANTIUM L.)

Abstract: *This study was carried out in a private orchard at AL-Abbasyia, Najaf Governorate during the growing of season 2014 on the local sours orange fruit. The trees were sprayed at 1 / 10 / and 1 / 11 / 2014 with three concentrations of Kelpak and Hletab (1, 2 and 3) % for each other and Grofalcs at concerted (200,300 and 400 mg/L) and stored three months from 1/12 /2014 to 1/3/ 2015 in 5C0 and 80- 85 R.H . Results showed that fruit which treated with above mentioned treatments had significant effect in terms of redaction weight loss percentage, physiological decay (RS+SERB), fungi decay and total decay and increase percentage of peel, peel thickness, weigh of peel, humidity of peel, percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration at the end of storage period. The treatment of Grofalcs 400 mg/L gave the best results of studied characteristics.*

Key words: *storability of fruits, sours, orange, cold storage.*

Language: *English*

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Introduction

Sours orange trees are evergreen fruits , belong to genus " **Citrus** " , which is follows to the Family "Rutaceae " , **Citrus fruits are among the most important fruit crops in the subtropical regions . The initial citrus variety is thought to have originated in the Assam region or adjacent areas in south east Asia . The cultivation of citrus trees is widespread in those tropical and subtropical regions that have a suitable climate (latitude 41N to 34S)(** Salvatava, 2010) .Physioiogical disorders significantly influence the quality of citrus fruits in markets and postharvest factors after the occurrence of physioiogical disorders of fruits (Mitra, 1997) . Abo – Zaid (2000) mentioned that , spraying of extract of alga Oligo-x which containing hight percentage of salicylic acid and hormones at conc. of (1 and 2 %) on mango trees in Egypt has increased the total soluble sold (T.S.S), **acidity and vitamin C** . Basak (2008) mentioned that , spraying apple tress in the end of full bloom period with extract of alga Eckonia (Kelpak) at conc. of (0.5 , 1 and 2 %) caused a significant increased the , content of leaves from total chlorophyll , hormones , IAA , GA_3 , quality of fruits and its resistant to physiological and fungi decay throw storage compared to control treatment . Dell (2013) showed that , sea weed and extract of alga's contenting high percentage of Salicylic acid , cytokinin , Fume acid ,GA^3 and auxins that led to delay of senescence of fruits .Bondok, et al.(2013) found that spraying grape fruit trees with extract of alga's (Acadian , Goemar and BM86) at conc. of (0.5 , 1 and 2 %) caused increase **percentage of peel, peel thickness, weigh of peel, humidity of peel and reducing percentage of total soluble sold , acidity , vitamin C** in the vegetative growth and fruits quality with increase of concentration of extract of alga's . Bund and Norrie (2011) observed that cherry trees when applied at (0.5,1 and 2) Kg/ H seaweed **increased** length ,diameter of fruit ,total yield of trees , total soluble solids , total sugar , vitamin C and anthocyanine pigment in fruit compared with control treatment . AL- Rahem (2012) noticed that , spraying local tress of orange with **Grofalcs** at conc. (100 ,

150 mg / L) **caused inceease percentage of peel, peel thickness, weigh of peel, humidity of peel and reducing percentage of total soluble sold , acidity and vitamin C** of fruits compared to control treatment . The main objective of this investigation is to study of the effect of spraying with Hletab , kelpak and **Grofalcs on reducing** percentage of weight loss **and improve storability of fruits of sours orange that stored 3 months at 5C and 80-85 R.H** .

Materials and methods:

The present study was conducted out during 2014 growing season on 10 years old of the local sours orange trees grown in an orchard located at El-Abbasiya / Najaf governorate. The trees were planted at (5 x 5) m apart and received the same horticultural management. Thirty trees similar size and growth were selected and divided into 10 treatments with three replicates . It is a doped according to Randomized Complete Block Design (RCBD) , and the results were statistically analyzed according to LSD test at the probability level of 5% (Al-Rawi and Khalf Allah , 2000) . Trees spraying with kelpak ,Hletab, at percentage of(1,2 and 3)% each other and **Grofalcs** at conc. Of (200, 300 and 400) mg/L at 1/10/ and 1 /11 /2014 . Hletab, it was extract of alga Fucox that containing fucoxant pigment 70 mg/L , growth stimulator (methyl puntosan, 20 mg/L ,fucodan, 23 mg/L , mantol 15mg/L , riboflavin 30mg/L , olego scoris 90mg/L), IAA 20mg/L ,CKs 35mg/L , Vit.C 9mg/L ,amino acid 6% ,organic nitrogen 3% , phosphor 2% , potassium 3% , magnesium 2% , Iron 2% , Zinc 2% , organic matter 16% , Algonac acid 50% . Kelpak , it was natural extract of alga Eckonia that containing IAA 11mg/L ,CKs 31mg/L , amino acid 3% ,organic nitrogen 2% , phosphor 3% , potassium 2% , Magnesium 2% , Iron 2% , Zinc 2% , organic matter 12% (Oyoo et al., 2010) . **Grofalcs** , (it were discs of GA3 50% from the production of Green river company. India). Hletab , kelpak and **Grofalcs** in (It were from the production of Green river company. India). Spraying was done early morning until wetness was full addendum . Tween 20 was added at conc. of $1cm^3/L$ as spreader material . The experiment involved the following 10 treatments :

1- Control treatment (sprayed with tap water).
2- Kelpak as foliar sprays at concentration of 1% .
3- Kelpak as foliar sprays at concentration of 2% .
4- Kelpak as foliar sprays at concentration of 3% .
5- Hletab as foliar sprays at concentration of 1% .
6- Hletab as foliar sprays at concentration of 2% .
7- Hletab as foliar sprays at concentration of 3% .
8- **Grofalcs** as foliar sprays at concentration of 200 mg / L .
9- **Grofalcs** as foliar sprays at concentration of 300 mg / L .
10- Grofalcs as foliar sprays at concentration of 400 mg / L .

In 1 /12 / 2014 harvested 90 Kg fruits similar in size and color without dieses and mechanical injures from trees of experiment . This fruits were treated with Benlate at conc. of 1 gm / L to improve from postharvest pathology . Fruits were divided into 10 treatments weight 9 Kg for each treatment. The fruits of each previous treatments were divided into 3 replicates and each part weight was 3 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 $5C^0$ temperature and relative humidity 80-85 % for three months starting in 1 / 12 /2014 . The design for this treatment was similar to that of the field experiment . In 1 / 3 /2015 fruits were taken out and traits were measured . The % weight loss , % physiological decay Stem End Rind Breakdown (SERB) , % physiological decay Rind Stem (RS) , % fungi decay (*Penicillium italicum* , *Penicillium digitatum*, *Alternaria citri*) , % Total decay , percentage of peel , peel thickness mm , Weigh of peel gm, % humidity of peel , Acidity , . Vitamin C mg /100 ml Juice , % juice and Respiration rate mgCO2/ Kg /hr according to (A.O.A.C , 1985) . The total soluble solids were determined by hand refract meter. Antioxidant capacity was determined to previous work (Crisosto and Crisosto, 2001)

1-Weight loss percentage: Data in Table (1) shows that , spraying trees of local sours orange with kelpak , Hletab and Grofalcs led to significantly decreased the percentage of weight loss after storage fruits 3 months that gave the lowest percentage 2.13% in the treatment Grofalcs 400 mg /L in comparison to the highest percentage 4.42% in the control treatment .The reason of decreasing the percentage of weight loss of fruits lead to influence these materials in some physiological changes in the fruit peel .This process leads to increase the poly amines which it used to enhance the stability of cell membranes .The poly amines are in content to nucleic acids in structure of membranes and this leads to make the peel thick and firmness and decrease the moisture loss .The result is decreasing the rate of respiration which decrease the loss in weight (Jundi , 2003, and Spinelli, et al. 2009) .

2-The percentage of physiological decay Stem End Rind Breakdown (SERB), Rind Stem (RS), fungi decay and Total decay .

Data in Table (1) indicate that, all treatments significantly decreased the percentage of physiological decay (SERB) , (RS) , fungi decay and Total decay compared to control treatment .The highest values in the control treatment it was (1.33 % , 2.39 % , 1.93% and 5.65%) , while the lowest percentages (1.07 % , 1.40 % , o.48 % and 2.95 % in the treatment Grofalcs 400 mg /L . The decrease in different type of decay in fruits as a result of kelpak , Hletab and Grofalcs led to its role in making new balance in fruits and around between O_2 , CO_2 and ethylene . The increase of water content in fruits leads to decrease the percentage of decays (Roy, 2008) . Abo – Zaid (2000) mentioned that , the extracts of sea alga's have salycine that protected fruits from some biological dieses are which caused by fungi and Bacteria so, the salycine had positive role in decreasing the percentage of decay .

3- The percentage of peel, peel thickness, Weigh of peel and percentage humidity of peel .

Results indicated in table (1 and 2) that, treating trees with kelpak , Hletab and Grofalcs led to a significant increase in the percentage of peel, peel thickness, weigh of peel and percentage humidity of peel of fruits which reached to the maximum values of (35.81 %, 4.00mm, 51.79 gm and 87.49 %) with the treatment of Grofalcs 400 mg/L in comparison to the lowest values (27.75 %, 2.92mm, 46.21 gm and 85.96%) in control treatment, respectively . The spraying with kelpak, Hletab and Grofalcs led to decrease the rate of fruits respiration because of its role as resistance ethylene functions . These materials change the structure of cells wall which effected the quantity of respiration and transpiration in positive direction. The fruits preserve their peels (Dell, 2013). The materials have another role in increasing the fruits cells growth and the growth of peel and its development (Lisa and Kader, 2003).

4- The chemical constant of fruits juice .

Data in Table (2) shows that, spraying kelpak , Hletab and Grofalcs led to a significant increased in the content of fruits from the percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration compared to control treatment at the end of storage. The highest significance result were recorded in treatment of Grofalcs 400 mg /L, that gave the highest percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration of fruits , they were (13.95 % , 2.83%, 49.53 mg / 100 ml Juice, 2.14 (mmol TE/g FW) and 19.98 mgCO2/ Kg /hr) comparison with (11.73 % , 1.97% ,48.11 mg / 100 ml Juice , 1.66 (mmol TE/g FW) and 31.56 mgCO2/ Kg /hr) in control treatment) respectively . The increase in chemical companied of fruit juice because of fruits treated with such materials led to reducing the loss in weight , increase in firmness peel of fruits and reduction the respiration rate (Al-Shamery, 2014).

Conclusion

It could be concluded from this experiment that the cv. local sours orange fruit which treated with concentrations of Kelpak , Hletab and Grofalcs and stored three months had significant effect in terms of redaction weigh loss percentage , physiological and fungi decay (RS+SERB) total decay and increase percentage of peel ,peel thickness, weigh of peel, humidity of peel , percentage of total soluble sold , acidity , vitamin C , Antioxidant capacity and rate of respiration. The treatment of Grofalcs 400 mg /L gave the best results of studied characteristics at the end of storage period.

Table 1

Effect of spraying with Kelpak , Hletab and Grofalcs on storability characters of fruits of sours orange (Citrus aurantium L.) for three months .

Treatments	% weigh loss	% physiological decay **SERB**	% physiological decay SR	% fungi decay	**%** Total Decay	% of peel	peel thickness mm
Control	4.42	1.33	2.39	1.93	5.65	27.75	2.92
Kelpak 1%	4.10	1.13	1.80	1.57	4.50	30.66	3.05
Kelpak 2%	3.25	1.09	1.61	1.17	3.87	31.00	3.62
Kelpak 3%	3.09	0.80	1.20	0.78	2.78	33.12	3.75
Hletab1%	3.90	1.15	1.65	1.53	4.33	29.90	3.11

Hletab2%	3.55	1.13	1.45	1.46	4.06	32.28	3.32
Hletab3%	2.97	0.50	0.98	0.77	2.25	33.47	3.68
Grofalcs 200 mg / L	2.78	1.21	1.29	1.50	4.00	29.90	3.75
Grofalcs 300 mg / L	2.34	1.16	1.68	0.75	3.59	33.25	3.88
Grofalcs 400 mg / L	2.13	1.07	1.40	0.48	2.95	35.81	4.00
L . S. D. 0.05	1.13	0.30	0.11	0.22	1.10	1.60	0.08

Table 2

Effect of spraying with Kelpak , Hletab and Grofalcs on storability characters of fruits of sours orange (Citrus aurantium L.) for three months.

Treatments	Weigh of peel gm	% humidity of peel	% Total soluble sold	%Acidity	Vitamin C mg / 100 ml Juice	Antioxidant capacity (mmol TE/g FW)	Respiration rate mgCO2/ Kg /hr
Control	46.21	85.96	11.73	1.97	48.11	1.66	31.56
Kelpak 1%	47.54	86.78	12.78	2.01	48.48	1.99	27.32
Kelpak 2%	47.98	86.96	12.22	2.19	48.59	2.13	27.00
Kelpak 3%	48.76	87.23	12.76	2.28	49.00	2.25	26.16
Hletab1%	47.18	86.49	13.71	2.46	48.42	2.19	26.78
Hletab2%	48.85	86.74	13.60	2.59	48.90	2.20	25.46
Hletab3%	49.67	86.95	13.82	2.71	49.18	2.12	23.45
Grofalcs 200 mg / L	48.50	86.87	13.50	2.68	49.08	2.28	25.49
Grofalcs 300 mg / L	50.28	87.20	13.73	2.78	4929	2.35	22.85
Grofalcs 400 mg / L	51.79	87.49	13.95	2.83	49.53	2.41	19.98
L . S. D. 0.05	0.83	0.96	0.18	0.04	0.21	0.18	0.28

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