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EFFECT OF SOME NATURAL STIMULATORS SPRAYING ON FRUIT SET, YIELD, QUALITY AND RIPENING OF PERSIMMON CULTIVAR 'VANILIA'

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ABSTRACT

Persimmon "Vanilia" trees in Beheira were treated by three biostimulators agents was tested to enhance vegetative growth and fruiting.

Humic acid ((0.5%). Codasting (0.03%)and activated Jasmine oil (a 0.025 %) in three time spraying (bud brust, fruit set and one month later) and 15 days before expected harvest date. two ripening agents were applied on treated and control trees, "Ethryl and Orange oil". Growth properties of fruits, the yield and quality parameters after one month in cold storage were evaluated. Humic acid and Jasmonic oil treated trees gave higher yields (averaging 30.92&48.92 kg/tree in both seasons under study) than Codasting treated ones and control. Both Humic acid and Jasmine oil treated trees resulted in fruits with higher weight (163.5 g) and size (178.4cm^3) than codasting or control (92.4 and110.6 cm^3).

Moreover, ethryl treated trees resulted in fruits which ripened after cold storage rapidly than fruits of Orange oil treatments or control, as shown by an increase in T.S.S% and acidity% decrease and a lower tannin content.

INTRODUCTION

Persimmon fruit tree has its origin in China, and was spread afterwards all over the world. In Egypt this fruit tree is cultivated in on area of approximately 7000 faddans with a moderate average production about of 4-6 tons/fadden.

This fruit appears in Egyptian markets during the period of October – December every year .The most important varieties in Egypt belong to the astringent fruit type like Costata, Tamuban, Hachia and Vanilia .Yield and fruit quality need to be improved to allow adequate gains for farmers and to satisfy market needs (El Zayat, *et al.*, 2004 and Kitagawa and Glucina, 1987).

Many vegetative growth and fruitfulness stimulators are used, mostly as foliar application, In order to increase fruit set. Decrease fruit drop. maintain quality and obtaining a high crop. Many growth stimulators and fruit setting agents are used actually in horticulture, either of organic or inorganic origin (Makhael and Wally; 2007 and Wally, 1998).

Codasting is a soluble liquid fertilizer containing 10% free amino acids, which are indispensable to vegetative growth and flowering period, and promoting higher fruit, caliber.

Another known effective material of promoting growth is Humic acid, which is used to encourage growth of trees .Zhu and Zhu (2000) reported that application of different concentrations of Opal HA-202 liquid fertilizer (consisting of humic acid, sodium humat. N.PK, Ca, Mg.S, Fe & microelements) on pears trees after petal fall for a total of 4 times at intervals of 10 days increased the fruit size by 21.8-29.2%.soluble solids content by 1.6-2.4% and yield by 21.6-28.6%.Guo *et al.* (2000) mentioned that, apple trees sprayed with different concentrations of Komix (an organic humic acid as liquid fertilizer) improved fruit quality and increased soluble solids content by 0.8%.

Jasmonic acid and methyl jasmonate are plant hormones that play an important role in stimulating plant immuring and defense against insects (Michael *et al* ., 1998) and in some cases they increase vegetative growth (Bradly *et al*., 1984, and Closes, 2004). Another experiment used n-propyl dihydrojasmonate (P D J) resulted in retarding physiological fruit drop of peaches and increased rate of fruit set (Taksucbi *et al* ., 1997).

These substances increase (in other cases) flowers and shelf life of fruits after harvest (Gast 2001 and El Zayat and Allam, 2006). Jasmonic oil is one of the sources of these two active and hormonal substances.

This research work aims to investigate the effect of the previously cited bio-stimulaters (Codasting. Humic acid and activated Jasmonic oil) on Kaki fruit set, yield and fruitfulness characters, in addition to.the fruit quality after ripening by Ethryl or a natural substance (Orange oil) to remove astringency El Zayat and Allam, 2006).

MATERIALS AND METHODS

The present study was conducted during two successive seasons (2006-2007) on 15 years old 'Vanilla' persimmon trees (*Diospyros kaki L*) grown on a farm at El-Bostan village, Al-Behira Governorate. Selected trees were grown in sandy soil at 5× 5m.apart, nearly similar in growth vigor and fruiting, free from any visual infection and receiving regularly the recommended horticultural due care.

Three natural substances, bio stimulators were applied on trees as a foliar spray, at three times per each season, i.e.-at bud burst, at fruit set and one month later .(those are for increasing yield and fruit quality. These bio stimulators and control were organized in four treatments, as follows:-

1- Humic acid in the commercial name "Actosol" liquid fertilizer, applied by a concentration of 5 cm/liter (0.5%).
2- Codasting, bio stimulators, applied by a concentration of 0.3 cm/liter (0.03 %).
3- Activated Jasmonic oil (as a source of methyl jasmonate and Jasmonic acid), used by concentration of a 0.025% (1cm/Liter of water).

4-Control: none treated trees.

Each treatment consists of 12 trees, and divided afterwards to three sub-treatments, as follows:-

A- Ethryl, used in a concentration of 200 p.p.m as a foliar application at 15 days before expected harvest date.
B- Natural orange oil as a source of ethylene (adjusted to pH 2.1) with concentration 0.05% as a foliar application on the tree, (El Zayat and Allam, 2006).
C- Water as a control.

That means that trees of each of the four principal treatments are divided into three parts, and subjected to ripening methods above cited, one part treated by Ethryl, second one by orange oil and third part by water (control).Therefore, every treatment consisted of 12 replicates, three replicates (three trees) for every sub treatment. These bio stimulators and control were organized in four treatments

Evaluation of yield parameters and physical properties:-

A) Fruit set percentage:-

Total number of flowers at blooming stage (March) was determined at 10 shoots randomly. Then after one month, number of fruit lets were computed and recorded to calculate fruit settings.

B) Yield:-

At harvest time (first October) the yield of selected trees were determined as kg\Tree for all treatments.

Fruit yield and weight were used in estimating crop monetary value considering a farm-gate price of L.E 1.75,1.50 and1.25 /kg for fruits weighing >150 g.,150-120g.and<120 g. respectively.

Moreover, Fruit physical properties i.e. fruit weight (g).fruit size (cm^3), fruit length (cm). diameter (cm), and color (as L%. b/a angle) were determined and recorded .Fruit color was determined by using Hunter colorimeter model DP 9000,colour was represented by a (green-red), b (blue –yellow)scale.b/a ratio and L were calculated to represent color .

2-Fruit quality parameters:-

Fruit Samples were taken from treated trees. Five kilograms or more of fruits were picked from each sub-treatment (5Kgx12 sub-treatments).These fruits were examined as follows:-

- A part of fruits were evaluated immediately after picking.
- The second part was stored for one month at 0°C and after removal of cold storage was evaluated. Quality parameters included:-
- **Weight loss percentage** calculated for each treatment was recorded in both seasons as follows:-
  Weight loss%=weight at time of sampling/ The initial weight of fruit ×100.
- **Total soluble solids:**-percentage in pulp was measured by a digital refractmeter.
- **Acidity percentage**:-in persimmon juice was estimated by titration with 0.1 N NaOH and calculated as malic acid according to A.O.A.C (1995).
- **Fruit color**:- Intensity of color was determined by Hunter colorimeter (DP9000) for each fruit, and color Hue angle was calculated as "tan^{-1} b/a". Color was rep-resented by a(green-red)and b(blue-yellow). The hue° was estimated as 0° =red-purple, 90° =yellow,180°=blush-green,270° =blue (McGuire,(1992).
- **Tannins** content was evaluated according to the method of Yeshajahu, and Clifton (1977).

Data were statistically analyzed according to the method of Snedecor and Cochran (1990)in each L.S.D at 5% level and Duncan multiple range test (Waller and Duncan 1969) were used for comparison between means of each treatment .

RESULTS AND DISCUSSION

1-Effect of treatments on fruit set and fruit drop of Persimmon.-

In both seasons, Jasmonic acid and Humic acid treated trees (Table 1) had recorded the highest fruit set (more than 80%for Jasmonic and about 63.7%-82% for Humic), followed by codasting treatment and the control came at last with a fruit set percentage in the range of 25.6%-29.6% in both years respectively. It can be assumed that Jasmonic acid activates the growth of leaves, as it lengthens the juvenility phase and helps in stimulating synthesis of chlorophyll and photosynthesis by Jasmonic acid which lead to a high percentage of fruit set. while Humic acid improves nutrients uptake and maximize absorption of these nutrients which lead to the same effect of stimulating more fruit set .Fruit drop was highest for the control(about 46.9%-47.3%)in both seasons .Jasmonic acid treated trees had the least fruit drop percentage (10% and 7.5 %at the two seasons consequently) and this can be attributed to its anti-ethylene effect (El Zayat and Allam, 2006)

Fruit drop of Humic acid treatment was less than codasting in both seasons respectively averaging (25%for humic and 33%for codasting). Humic acid treated trees gave the highest yield in both seasons .(31 kg 1st season and 48.9 kg 2^{nd} seasons) followed by Jasmonic oil treated trees (29kg 1st seasons and 35.6kg 2^{nd} season) Codasting treated trees yielded relatively less crop than Jasmine oil treated trees, but control trees crop was the smallest and was around 18.6-20.3 kg in both seasons. All the stimulating materials gave an expected higher yield than control, due to their effect in enhancing a higher fruit set and a good vegetative growth which has a more active photosynthetic process than control.

2-Effect of treatments on treatment cost/fed., yield/fedand yield monetary value of persimmon:

It is cleared that (Table 3) Humic acid gave the highest monetary value (L.E 21402.5&13027.5in the both seasons under

study) and less cost /fed L.E. 100 & 45 adding with Ethryl and Orange oil. Comparison with Jasmonic oil and Codasting (12661.0 & 15592.5 and 9885.0 & 14586.25 and the cost /fed was175&120 and 225&170 adding with Ethryl and Orange oil, respectively).

3- Effect of treatments on growth properties of fruits:-

As it is shown by Table (2) Humic acid treated trees yielded the highest fruit weight in both seasons (163.5-185.1 gm respecttively) followed by Jasmonic oil treated trees (152.0-159.5gm/fruit 1st and 2nd season consequently) while Codasting treated trees fruits recorded an average fruit weight of 150.0 gm for both seasons. Control trees had the least fruit weight (in the range of 92.4-113.5 g) in both seasons. Humic acid proved its superiority in stimulating growth and enhancing nutrients absorption by the tree (Atef *et al.*, 2005).Fruit size and fruit diameter follow the same trend, that means that humic acid yielded the biggest fruits (178 cm3 1st year and 200 cm3 2nd year) followed by Masonic oil which gave relatively better size of fruit and codasting came after words with fruit size ranged from 162.7 to 169.3 1st and 2nd seasons respectively, while, fruit size of control treatments was inferior and did not exceed 118.7cm3(2nd season)as shown in Table (2).

These results are in accordance with Alva *et al.*, 1998 for humic effect and Jasmonic oil positive effect on growth as cited by Martin *et al.*, 2004).

Table (1): Effect of some natural stimulators on fruit set, fruit drop and yield of 'Vanilia' persimmon trees (2006-2007)

Treatment	Fruit set	Fruit drop	Yield
	2006		
Jasmonic oil	82.05	10.03	28.94
Codastinge	58.12	34.6	26.36
Humic Acid	63.76	24.87	30.92
CONTROL	25.83	47.30	18.62
L.S.D	3.25	1.72	2.14
	2007		
Jasmonic oil	83.33	7.523	35.64
Codasting	72.90	32.62	33.34
Humic Acid	81.97	25.23	48.92
CONTROL	29.60	46.88	20.23
L.S.D	2.65	2.79	1.26

Table (2): Effect of some natural stimulators natural stimulators on physical characteristics of 'Vanilia' persimmon (2006-2007) seasons

Treatment	Fruit weight (g)	Fruit size (cm^3)	Fruit dia-meter (cm)	Fruit Length (cm)	Fruit weight (g)	Fruit size (cm^3	Fruit dia-meter (cm)	Fruit Length (cm)
	2006				2007			
Jasmonic oil	152.0	162.7	66.57	64.33	159.5	169.3	63.03	61.03
Codastinge	148.4	154.5	63.90	61.67	152.7	190.3	67.57	65.60
Humic acid	163.5	178.4	66.93	63.57	185.1	200.0	74.27	71.20
Control	92.43	110.6	54.53	60.23	113.5	118.7	62.67	62.37
L.S.D	5.22	9.40	5.06	4.61	5.85	6.49	1.34	0.77

Table (3): Effect of some natural stimulators on treatments cost /Fed..yild value/Fed. and yield /Fed. Of vanilia persimmon trees (2006-2007).

Field treatments	Ripen treat-ments	Treatments cost/Fed. (L.E)		Monetarur yield value (L.E)		Yield/Fadden (Ton)	
		2006	2007	2006	2007	2006	2007
Jasmonic	-	100	120	12661.25	15592.5	7.253	8.910
	Ethyrl	175	175				
	Orange oil	120	120				
Codasting	-	150	150	9885.0	14586.25	6.590	8.335
	Ethyrl	225	225				
	Orange oil	170	170				
Humic acid	-	25	25	13527.5	21402.5	7.730	12.230
	Ethyrl	100	100				
	Orange oil	45	45				
Control	Ethyrl	75	75	5818.75	6321.875	4.655	5.058
	Orange oil	20	20				

4-Effect of treatments on weight loss of fruit after cold storage:-

Results did not show a certain pattern, because of the inconsistency of the weight loss operation itself, affected by cold store conditions and position of the fruit in the cold store and in the package itself which may favor rapid water vapor loss from fruits than from others in case of their exposure to rapid cold air for example .Fruit of control without ripening agent registered the highest weight loss in the 2nd season (28%), followed by control fruits also, but treated trees with Ethryl which recorded also 20.3%of weight loss in the same year due to a rapid metabolism, higher respiration and transpiration rates.

5-Effect of treatments on total soluble solids percentage of fruit after cold storage:-

Total soluble solids content (T.SS. %) of persimmon changed a little bit in one month time of cold storage (and after being ripened by orange oil and Ethryl as mentioned). A small increase of T.S.S (0.5%-1.5% in most case) was observed after 1 month stay in cold storage may be as a result of fruit weight loss .while all T.S.S values clustered around the range of values from 19.17% to 22.17.

It can be seen that the biggest increase in T.S.S% content (1.8%) happened to fruits issued from trees treated by humic acid in the1st season and ripened by Ethryl. It seems that treatment by Ethryl caused a noticeable increase in T.S.S %of fruits after cold storage.

6-Effect of treatments on acidity percentage of fruit after cold storage:-

Acidity average value at picking (0.52%) declined in all cases after cold storage as shown in Table (6) and acidity decreased values were around 0.32%- 0.36% in the 1st season, regardless of the ripening method, while the same trend was repeated also in the second season, but Ethryl effect was more pronounced in decreasing acidity than Orange oil treatment (or without ripening agent) and gave the lowest acidity percentage with Jasmonic oil and codasting treated trees, recording 0.29%, while fruits of Humic acid treated trees recorded acidity of 0.3%and control gave 0.31%.

7-Effect of treatments on Persimmon color after cold storage:-

The decreasing number in Hue angle measurements, means a change in the color intensity far from green towards yellow and then towards pink and forwards to red (Yeshajahu *et al.*, 1977).

Results in Table (7) show that color peel turned towards more reddish pigmentation after fruits stored for one month of cold storage for all treatments. Hue angle as it represented the intensity of color has decreased in pronounced way in the second year,

even at the initial time (zero time)fruits were more colored than first year fruits at the beginning (on overall average of 87.5,1st year compared to the end at 2nd year).

8- Effect of treatments on tannins percentage after cold storage:-

Tannins decreased naturally after harvest (Table 8). Jasmine oil treated trees have recorded the highest percentage of tannins in their fruit immediately after harvest and without any ripening method (>3.9%) followed by Codasting and Humic acid treatments (around 3.5%) compared to control fruits (3.93% 1st year and 3.4%2nd year).Using orange oil as ripening agent (preharvest application) gave lower initial tannins by a small percentage (0.2%-0.1%)and ethryl showed the same effect; but by the end of storage period ethryl ripening effect was more pronounced in both years and tannins dropped quickly in1st year to attain a range of values (2.08%-1.98%)and (2.3%-1.4%) 2nd year.

Table (4): Effect of some natural stimulators on weight loss of "Vanilia "persimmon fruits after cold storage, during 2006/2007season

Treatment	2006						
	Without ripening		Orange oil		Ethryl		Average
	Initial*	End**	Initial*	End**	Initial*	End**	End**
Jasmonic oil	0.00	10.720	0.00	10.900	0.00	8.877	10.17
Codasting	0.00	9.387	0.00	7.420	0.00	9.633	8.81
Humic acid	0.00	6.930	0.00	7.527	0.00	9.587	8.02
Control	0.00	7.300	0.00	9.250	0.00	12.08	9.54
Average	0.00	8.58	0.00	8.77	0.00	10.04	
LSD 5% A=0.83 B=0.93 AB=1.62							
	2007						
Jasmonic oil	0.00	15.97	0.00	9.130	0.00	5.283	10.13
Codasting	0.00	9.637	0.00	7.950	0.00	6.190	7.93
Humic acid	0.00	3.730	0.00	9.83	0.00	8.780	7.45
Control	0.00	28.05	0.00	6.780	0.00	20.330	18.39
Average	0.00	14.35	0.00	8.42	0.00	12.41	
A=0.86 B=0.79 AB=1.38							

Table (5): Effect of some natural stimulators on T.S.S content of "Vanilia "persimmon fruits after cold storage, during 2006/2007seasons.

Treatment	2006							
	Without ripening		Orange oil		Ethryl		Average	
	Initial*	End**	Initial*	End**	Initial*	End**	Initial*	End**
Jasmonic oil	21.0	21.87	21.0	21.53	19.19	20.07	20.40	21.16
Codasting	21.47	22.10	21.17	22.17	19.83	20.77	20.82	21.68
Humic acid	21.0	22.0	21.10	20.00	19.17	21.97	20.42	21.32
Control	20.0	20.60	19.17	19.97	20.43	20.97	19.87	20.51
Average	20.93	21.64	20.61	20.92	19.66	20.95		
LSD5% (1) A=0.55 B=0.10 AB=0.18 LSD5% (2) A=0.32 B=0.15 AB=0.21								
	2007							
Jasmonic oil	21.13	21.83	20.37	21.07	19.20	19.93	20.23	20.94
Codasting	21.07	21.93	21.63	21.80	20.37	20.97	20.91	21.57
Humic acid	21.53	22.07	19.93	20.47	21.43	22.10	20.96	21.55
Control	19.97	20.77	19.63	20.20	21.60	22..03	20.65	21.27
Average	20.93	21.65	20.39	20.89	20.65	21.26		
A=0.25 B=0.44 AB=0.24 A=0.34 B=0.17 AB=0.30								

Ripening effect of orange oil was less clear by the end of cold storage (2.5% tannins for fruits resulted from Jasmonic oil and codasting treatments at 1st season and 2.25% 2nd season). And gave best results with fruits of humic acid treated trees at 1st year (2.18% tannins) after cold storage. Ethryl was more active as an ethylene releasing agent in lowering tannins of Persimmons in this certain experiment.

Table (6): Effect of some natural stimulators on acidity% content of "Vanilia "persimmon fruit after cold storage, during 2006/2007 seasons.

Treatment	2006							
	Without ripening		Orange oil		Ethryl		Average	
	Initial*	End**	Initial*	End**	Initial*	End**	Initial*	End**
Jasmonic oil	0.54	0.34	0.53	0.34	0.54	0.33	0.54	0.34
Codasting	0.54	0.33	0.54	0.34	0.53	0.34	0.54	0.34
Humic acid	0.54	0.33	0.55	0.34	0.54	0.34	0.54	0.34
Control	0.64	0.36	0.55	0.32	0.47	0.33	0.55	0.34
Average	0.57	0.34	0.53	0.34	0.52	0.34		
LSD5%(1)A=0.001 B=0.001 AB=0.001 LSD5%(2)A=0.001 B=0.001 AB=0.002								
	2007							
Jasmonic oil	0.51	0.33	0.53	0.32	0.50	0.29	0.53	0.33
Codasting	0.53	0.33	0.54	0.32	0.53	0.29	0.53	0.33
Humic acid	0.54	0.31	0.55	0.33	0.54	0.30	0.54	0.33
Control	0.58	0.35	0.49	0.33	0.49	0.31	0.52	0.33
Average	0.54	0.33	0.53	0.33	0.52	0.30		
A=0.001 B=0.001 AB=0.0017 A=0.0008 B=0.0009 AB=0.001								

Table (7): Effect of some natural stimulators on Hue angle color of "Vanillia" Persimmon fruits during 2006-2007 seasons (after cold storage)

Treatment	2006							
	Without ripening		Orange oil		Ethryl		Average	
	Initial*	End**	Initial*	End**	Initial*	End**	Initial*	End**
Jasmonic oil	87.98	64.70	79.93	63.43	87.03	62.93	84.98	63.69
Codasting	93.20	71.70	88.57	65.53	82.83	70.00	88.20	69.08
Humic acid	86.83	70.47	88.10	63.83	90.27	61.03	88.40	65.11
Control	85.47	65.83	88.00	63.67	85.97	56.20	86.48	61.90
Average	88.37	68.175	86.15	64.115	86.525	62.54		
LSD at 5% A= 7.10 B=3.72 AB=6.44 LSD at 5% A=5.96 B=3.71 AB=6.43								
	2007							
Jasmonic oil	80.33	64.80	65.83	54.43	65.13	53.00	70.43	57.41
Codasting	74.43	60.97	75.30	50.57	65.15	49.30	71.63	36.95
Humic acid	65.13	55.33	66.90	53.17	81.53	49.30	71.19	52.60
Control	79.30	60.67	80.67	57.73	61.20	54.10	73.72	57.50
Average	74.80	60.44	72.18	53.98	68.25	51.43		
A=3.72 B=1.41 AB=2.45 A=5.44 B=2.93 AB=5.08								

Table (8): Effect of some natural stimulators on Tannins% content of "Vanilia" Persimmon fruits after cold storage, during 2006/2007seasons.

Treatment	2006							
	Without ripening		Orange oil		Ethryl		Average	
	Initial*	End**	Initial*	End**	Initial*	End**	Initial*	End**
Jasmonic oil	3.97	2.25	3.70	2.50	3.50	1.98	3.72	2.24
Codasting	3.63	2.07	3.45	2.50	3.50	1.99	3.53	2.19
Humic acid	3.50	2.16	3.62	218	3.40	2.17	3.51	2.17
Control	3.93	2.50	3.50	2.50	3.40	2.08	3.61	2.36
Average	3.76	2.25	3.57	2.42	3.45	2.06		
LSD 5%(1)A=0.14 B=0.113 AB=0.19				LSD 5%(2)A=0.062 B=0.11 AB=0.19				
	2007							
Jasmonic oil	3.93	2.30	3.63	2.25	3.43	1.42	3.66	1.99
Codasting	3.50	2.39	3.43	2.36	3.37	1.32	3.43	2.02
Humic acid	3.40	1.19	3.33	2.29	3.28	1.69	3.34	1.72
Control	3.40	2.30	3.45	2.20	3.28	2.36	3.38	2.29
Average	3.55	2.04	3.46	2.27	3.34	1.7		
A=0.59 B=0.52 AB=0.912				A=0.001 B=0.001 AB=0.002				

CONCLUSION

Both biostimulators used on Persimmon trees;Humic acid and activated Jasmine oil gave better results as examined by yield and fruitsize, than Codasting treated trees .Persimmons stored for one month after harvest, ripened quickly when treated previously by ethryl than by Orange oil (as an ethylene releasing agent)but both of them gave same fruit quality.

Jasmine oil is recommended to be applied on Persimmon trees to enhance growth and fruiting as it is available and cheaper than other imported biostimulatos. Orange oil may be used in Persimmon ripening.

(The price of one liter of jasmine oil, is approximately100-120 L.E, and it is enough to treat 2-3 faddens of Persimmons.).

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تأثير الرش ببعض المواد المنشطات الطبيعية علي العقد والمحصول وجوده الثمار ومعاملات إنضاج ثمار الكاكي صنف فانيليا

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أجريت هذه الدراسة خلال موسمي ٢٠٠٦، ٢٠٠٧ على اشجار كاكي صنف فانيليا بثلاث مواد طبيعية بهدف زيادة العقد والمحصول وجوده الثمار بمزرعه خاصه بمنطقه البستان -محافظه البحيرة.

وتم رش الأشجار بحامض الهيوميك بتركيز ٥% وزيت الياسمين بتركيز ٠,٠٢٥%والكوداستنج بتركيز(٠,٠٣ %) في مرحله انتفاخ البراعم، في مرحله اكتمال العقد، وبعد المعامله الثانية بشهر.

ثم تمت معامله الآشجار بمعاملات الإنضاج رشا بزيت الموالح بتركيز ٠,٠٥%والاثيريل وقبل جمع المحصول ب١٥ يو م مع التخزين البارد لمده شهر. ppm بتركيز ٢٠٠ ولقد ظهرت النتائج الاتي:-

١- أعطي الهيوميك أعلي كميه محصول(٩ .٤٨ كجم للشجرة) يليه زيت الياسمين والكوداستنج عن الاشجار الغير معامله (٢٠,٢كجم/الشجرة).

٢- كذلك أعطي الهيوميك أعلي وزن(١٦٣,٥جم) وحجم للثمار(١٧٨,٤سم^{٣}) يليه زيت الياسمين والكوداستنج عن الآشجار الغير معامله(٩٢,٤ جم &١١٠,٦ سم^{٣}).

٣- بعد التخزين البارد أعطي الإثيريل نتيجة أفضل من زيت الموالح (وإن كانت متقاربة) من حيث زيادة نسبه المواد الصلبه الكليه،انخفاض الحموضة،التانينات وكذلك تحسين اللون.