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Effect Of Foliar Spraying With Certain Anti-Transpirants On Yield And Fruit Quality Of"Ewaise" Mango Trees Under Aswan Conditions

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Abstract

This investigation was carried out to determining the influence of certain anti-transpirants, namely salicylic acid 100 ppm, chitosan 0.1 %, and green miracle 3cm^3/l as well as their combinations on yield and its attributes of "Ewaise" mango trees grown in Aswan Governorate, Egypt. The experiment conducted during the two seasons of 2022 and 2023 on 10 years old orchard planted at a spacing of 7x7 m in sandy soil. The trees were sprayed four times monthly interval starting from 3rd week of February for both seasons. It is clear from the obtained results that spraying "Ewaise" mango trees with the different anti-transpirants used was significantly improved fruit length, diameter and volume, fruit weight, and fruit yield/tree. In addition, it resulted in reducing peel, seed percentages and improving pulp percentage. The different fruit quality including TSS %, reducing, non-reducing and total sugars, vitamin C content, and carotene were improved, while the total acidity were reduced as compared to the control treatment. The higher improvement in the yield and fruit traits was significantly coincided with applying salicylic acid 100 ppm + chitosan 0.1% + green miracle 3cm^3/l, followed by chitosan 0.1% + green miracle 3cm^3/l, and then salicylic acid 100 ppm + green miracle 3cm^3/l. From this study, it can be recommended that applying the mixture of salicylic acid 100 ppm + chitosan 0.1% + green miracle 3cm^3/l with four spraying had statistically the maximum productivity and quality measurements.

Key words: “Ewaise” mango, anti-transpirants, salicylic acid, chitosan, green miracle, yield, and fruit quality

1.Introduction

Future productivity of different fruits and crops as well as the world food security will be determined by severe droughts and other abiotic stresses, and decreasing plant transpiration with the different anti-transpirants may have a role in alleviating drought. Under a climate change, high temperature, water deficit stress and frequent drought predicted for the future, reducing water loss through transpiration is required to improve plant productivity. Anti-transpirants are various substances that are sprayed on plant leaves to decrease transpiration and thus improve the plant's water potential **[1].** However, drought stresses produce dehydration of the plant tissues and cells, a deficiency in the nutritional intake, and a decreasing in assimilation of carbon dioxide because of stomatal closure, and thus causing starvation **[2].** Dehydration stress leads to disruption of physiological processes, such as all plant transitions, leaves development, gas exchange, carbon

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fixation, and then the result is reducing plant growth and productivity **[3].**

Chitosan is an eco-friendly natural plant growth agent because it can induce plant growth and its tolerance to different stresses, improving fruit productivity and quality **[4].** It is also functions as a bio stimulant and is obtained from amino polysaccharides that are present in fungal cell walls, insect cuticles, and the shells of seafood **[5].** It has shown many functions, acts as an anti-transpirants and promotes plant growth **[6].** Enhances photosynthesis and stimulates biosynthesis of pigments in leaves as chlorophyll a, b, and carotenoids **[7].** The results of **[8]** suggested that the foliar spraying of 1500 mg/l of chitosan caused the highest increment in the length, number, and diameter of shoots, leaf area index, and leaf chlorophylls, as well as the fruit set, fruit yield, and the fruit's physical and chemical characteristics of mango cv. "Keitt" as compared to other treatments. In addition, application 50 or 100 ppm chitosan lead to improve leaves content of chlorophyll, zinc, and potassium, flowering, fruit set, yield, and fruiting characteristics of "Ewaise" mango cultivar **[9]**

Green miracle material is a new-generation of reflecting anti-transpirants. It is obtained from vegetable oil, but it is not edible **[10].** Also, green miracle is an anti-transpirant contains not less than 3 % total amino acids, 80% fatty alcohol, 10% other neutral alcohol, and 7% emulsifier and stabilizers 7%. Green miracle has a favorable effect on the plant growth under stress conditions **[11].** When the plant foliar is sprayed with this material, it makes a thin glassy film coat on the plant leaf which reflects the sun's rays' "visible light" to avoid thermic effects of light on the plant tissue. Foliar spraying with 3 cm/l green miracle improved the fruits number, fruit weight, fruit yield, and vitamin C of "Keitt" mango trees **[10].** Foliar spraying of green miracle at 4 cm/l produced the highest shoot length and leaves number/new shoots in Flame seedless grapevines as compared with the control treatment. It also produced the highest yield measurements, and improved cluster and berry quality **[12].**

Salicylic acid is an endogenous plant hormone, acts as an anti-transpirants, plays a crucial role in the plant growth, photosynthetic process, and pigment contents and has a vital role in physiological and biological activities in the normal and stressed plants. Salicylic acid application improves stress tolerance in different fruit tree species, including mango **[13],** apple **[14],** apricot **[15],** banana **[16]** and citrus **[17].** The vast majority of Salicylic acid applications have the goal to alleviate chilling injury to fruits. Foliar spraying with Salicylic acid treatments improved growth, yield and fruit quality including TSS and total sugars and reduced total acidity of mango trees cv "Fagri Kalan" **[18].**

Abiotic stress is considered one of the most important problems facing mango orchards, which greatly hinders the tree growth, productivity and fruit quality. Previous studies show the effective role of some anti-transpirants agents in overcoming such problems. Therefore, the target of this study was to examine the possibility of improving yield and its attributes in the fruits of "Ewaise" mango trees by applying certain anti-transpirants.

2. Materials and methods

The present investigation was conducted during the two successive seasons of 2022 and 2023 to study the different influences of certain anti-transpirants on flowering characteristics, yield and its attributes of "Ewaise" mango trees. Twenty four healthy and had nearly uniform vigor trees of 10-years-old were selected in a private orchard located within the Wady El-Nokra sector, Kom Ombo district, Aswan Governorate. The trees were budded on seedling rootstock and planted at 7 x 7 m spacing in sandy soil with a drip irrigation system. The physical chemical analysis of the tested soil was conducted out according to **[19]** method and presented in Table 1. The "Ewaise" mango trees received a basal recommended fertilization and subjected to followed annual agricultural practices. This experiment was arranged in a complete randomized block design with

three replicates, and one tree for each replicate.

Table 1. Physical and chemical properties of the tested soil

Soil property	Value	Soil property	Value
Sand (%)	72.25	Total N (%)	0.09
Silt (%)	16.00	NaHCO3-extractable P (mg/kg)	5.10
Clay (%)	11.75	NH4AOC-extractable K (mg/kg)	115.0
Texture	Sand	Available EDTA extractable micronutrients (ppm)	
pH (1:2.5 suspension)	8.10	Zn	1.31
EC (1:2.5 extract) (dS/cm)	4.20	Fe	2.10
O.M. (%)	0.90	Mn	2.20
CaCO3 (%)	1.28	Cu	0.70

The present study included the following eight treatments of anti-transpirants, namely salicylic acid (SA), chitosan (Chit), and green miracle (GM) arranged as follows:

T1= control.
T2 =spraying SA 100 ppm.
T3= spraying Chit 0.1%.
T4= spraying GM 3cm^3/l.
T5=spraying SA 100 ppm + Chit 0.1%.
T6=spraying SA 100 ppm + GM 3cm^3/l.
T7=spraying Chit 0.1% + GM 3cm^3/l.
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l.

The trees were sprayed four times monthly interval starting from 3rd week of February during the two studied seasons. All solutions, including salicylic acid, chitosan, and green miracle as well as their combinations were mixed with a wetting agent of 0.05% Triton B. Spraying was done until runoff using 10 l/ tree.

Measurements:

During the two seasons, the following measurements were recorded:

1- Percentages of initial fruit setting and fruit retention.

Ten shoots at one-year-old/ tree were randomly chosen and tagged for observations. The total flowers number/ panicle were counted at full bloom. Two weeks after full bloom stage, the fruitlets number/ panicle was counted to measure fruit set. The fruit set% was measured according the following formula:

$$\textbf{\textit{Fruit set \%}} = \frac{Number\ of\ fruitlets\ per\ panicle\ at\ fruit\ set}{Number\ of\ flowers\ per\ panicle\ at\ full\ bloom} \times 100$$

***Fruit retention %*:**

Fruit retention percentage was recorded for both seasons at the mature stage (a week before harvest) according the following formula:

$$\textbf{\textit{Fruit retention \%}} = \frac{Number\ of\ fruit\ retention}{Number\ of\ initial\ fruit\ set} \times 100$$

2-Yield and its attributes:

Harvest of "Ewaise" mango trees was done during the regular commercial harvesting time under Aswan governorate conditions at end of June for both seasons. The yield was determined in Kg/ tree. Ten fruits were randomly taken from the yield / tree to measure the following physical and chemical properties of the fruits.

2.1. Fruit Physical Characteristics:

The selected fruits were assessed for various physical characteristics including fruit weight (g), fruit diameter (cm), fruit length (cm), fruit volume (cm^3), peel (%), seed (%), and pulp (%).

2.2. Fruit Chemical Characteristics:

Total soluble solids percentage (TSS%): were determined using a handheld refractometer. Total acidity percentage: were determined by a calorimetric method relying on the estimation of citric acid was employed. This method involved taking five milliliters of the fruit juice and titrating it with a known normality of NaOH 0.1 N, using phenolphthalein as an indicator, following the procedure described in **[20].** The vitamin C content (mg/100 mL juice): was determined using 3% oxalic acid and 2,6-dichlorophenol indophenols, as described by **[21].** Total and reducing sugars (%): were estimated via calorimetric method involving phenol and sulfuric acid, utilizing 5 g of fresh pulp, following the method described by **[22].** Non-reducing sugars are the differences between total and reducing sugars. Fruit carotene content (mg/100g pulp) was measured according to the described method by **[23].**

Statistical analysis:

All the recorded data was statistically analyzed using MSTAT package, and then subjected to analysis of variance (ANOVA), and means of different treatments were compared using LSD test at 5% according to **[24].**

3. Results and discussion:

3.1.percent of initial fruit setting and fruit retention, and yield/tree,

It is clear from the results in Table 2 that spraying "Ewaise" mango trees four times with the different anti-transpirants used was significantly improved percent of initial fruit setting fruit retention, number of fruits/tree, and yield/tree, rather than the control treatment. There was a significant difference on all tested characters were detected among all anti-transpirants. The improvement was significantly coincide with applying SA 100 ppm + Chit 0.1% + GM 3cm^3/l, Chit 0.1% + GM 3cm^3/l, and SA 100 ppm + GM 3cm^3/l. Significant differences on percent of initial fruit setting and fruit retention were observed among all anti-transpirants. The maximum values of fruit set (6.40 &6.49 %), and fruit retention (2.70 & 2.81 %), and fruit yield/tree (61.67 & 62.07 kg) were produced in "Ewaise" mango trees that sprayed with SA 100 ppm + Chit 0.1% + GM 3cm^3/l in the 2022 and 2023seasons, respectively. Meanwhile, the least values were recorded with untreated trees in the two seasons. The obtained results were in accordance with that of **[8]** who showed that the foliar application of 1500 mg/l of Chit on mango cv. "Keitt" gave the highest increment for inducing percent of initial fruit setting and fruit retention of trees, number of fruits/tree, and yield/tree. However, **[25, 26]** revealed that some of anti-transpirants dried on the plant to form a clear glossy film, which retards the loss of normal moisture without interfering with the plant growth or normal respiration. In addition, salicylic acid and chitosan are considered coating substances prevent water loss and they allow gases to permeate but not liquids, which allow normal plant respiration but reduce transpiration up to 80%. Also, they responsible to decrease leaf temperature and increase leaf reflectance **[27, 28].** Chitosan serves multiple functions, acts as a carrier for nutrients, a water efficiency enhancer, and a remover of heavy metals **[29].** Also, **[30]** noted that chitosan containing amino groups, and can stimulate flowering characteristics. The foliar application of chitosan has been shown to improve stomatal conductance and water use efficiency by decreasing the transpiration rate **[31].** The beneficial effect of green miracle was reported by different researches. **[12]** found that applying green miracle at 4 cm/l improved productivity of Flame seedless grapevines.

Table 2. Effect of some anti-transpirants treatments on initial fruit setting, fruit retention, number of fruits/tree, and yield/tree of "Ewaise" mango trees during the two seasons of 2022 and 2023.

Treatments	Initial fruit setting %	Fruit retention	No. of fruits/tree	Yield/tree (kg)

			%					
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	4.07	4.10	1.55	1.60	214.0	218.0	43.43	43.20
T2 = spraying SA 100 ppm	4.27	4.27	1.80	1.76	222.0	225.0	44.53	44.33
T3= spraying Chit 0.1%	4.80	4.68	1.86	1.91	242.0	246.0	45.80	46.07
T4= spraying GM 3cm^3/l	5.08	5.16	2.05	2.08	255.0	260.0	48.80	49.27
T5=spraying SA 100 ppm + Chit 0.1%.	5.34	5.43	2.22	2.19	260.0	265.0	52.37	52.13
T6=spraying SA 100 ppm + GM 3cm^3/l	5.72	5.78	2.33	2.35	273.0	277.0	56.13	56.97
T7=spraying Chit 0.1% + GM 3cm^3/l	6.12	6.16	2.45	2.48	284.0	290.0	58.83	58.73
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	**6.40**	**6.49**	**2.70**	**2.81**	**296.0**	**300.0**	**61.67**	**62.07**
L.S.D. at 5%	0.09	0.14	0.07	0.12	10.0	11.0	0.77	0.87

Salicylic acid (SA), chitosan (Chit), green miracle (GM)

3.2. The effects on fruit physical characteristics:

It is clear from the results in Table 3 that spraying "Ewaise" mango trees four times with the different anti-transpirants used was significantly improved the different fruit physical characteristics namely, fruit weight, fruit length, fruit width, fruit thickness, and fruit weight rather than the control treatment. There was a significant difference on all tested characters were detected among all anti-transpirants. The improvement was significantly coincide with applying SA 100 ppm + Chit 0.1% + GM 3cm^3/l, Chit 0.1% + GM 3cm^3/l, and SA 100 ppm + GM 3cm^3/l. Significant differences on all quality characters were observed among all anti-transpirants. The maximum values of fruit length (9.90 & 10.20 cm), fruit width (8.40 & 7.60 cm), and fruit weight (208.40 & 208.70 g), were produced on "Ewaise" mango trees that sprayed with SA 100 ppm + Chit 0.1% + GM 3cm^3/l in the 2022 and 2023, respectively. Meanwhile, the least values were recorded with untreated trees in the two seasons. The obtained results were in accordance with that of **[8]** who showed that the foliar application of 1500 mg/l of Chit on mango cv. Keitt gave the highest increment for inducing, and the physical characteristics of fruits. However, **[25, 26]** revealed that some of anti-transpirants dried on the plant to form a clear glossy film, which retards the loss of normal moisture without interfering with the plant growth or normal respiration. In addition, salicylic acid and chitosan are considered coating substances prevent water loss and they allow gases to permeate but not liquids, which allow normal plant respiration but reduce transpiration up to 80%. Also, they responsible to decrease leaf temperature and increase leaf reflectance **[27].** Chitosan serves multiple functions, acts as a carrier for nutrients, a water efficiency enhancer, and a remover of heavy metals **[29].** Also, **[30]** noted that chitosan containing amino groups, and can stimulate plant growth and productivity. The foliar application of chitosan has been shown to improve stomatal conductance and water use efficiency by decreasing the transpiration rate **[31].** The beneficial effect of green miracle was reported by different researches. **[12]** found that applying green miracle at 4 cm/l produced the highest productivity and improving cluster and berry quality of Flame seedless grapevines. The obtained results regarding the effect of green miracle as anti-transpiration on the yield go in line with the results of **[10].** Also, **[32]** reported that green miracle foliar spray at 150 ppm on peach trees increased fruit weight, and flesh weight of mango fruits. Moreover, **[33]** pointed out that the applying fruit “Succary” mango trees with chitosan improved the different physical properties of their fruits. The positive effects of salicylic acid on the physical properties of mango trees were previously reported by **[18]** who reclaimed that spraying “Fagri Kalan” mango trees with salicylic acid has significant promotion on the fruit physical properties.

Table 3. Effect of some anti-transpirants treatments on some physical characteristics of "Ewaise" mango trees during the two seasons of 2022 and 2023.

Treatments	Av. Fruit weight (g)		Av. Fruit length (cm)		Av. Fruit width (cm)		Av. Fruit thickness (cm)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	186.17	186.47	7.5	7.7	6.2	6.3	5.20	5.30
T2 = spraying SA 100 ppm	188.17	187.87	8.6	8.4	6.9	6.8	5.40	5.50
T3= spraying Chit 0.1%	190.17	190.27	8.9	8.8	7.2	7.0	5.70	5.60
T4= spraying GM 3cm^3/l	192.30	192.00	9.2	9.0	7.4	7.5	5.90	6.00
T5=spraying SA 100 ppm + Chit 0.1%.	194.17	193.97	9.3	9.2	7.7	7.6	6.30	6.40
T6=spraying SA 100 ppm + GM 3cm^3/l	195.93	196.33	9.6	9.5	7.8	7.9	6.50	6.60
T7=spraying Chit 0.1% + GM 3cm^3/l	202.20	203.03	9.7	9.7	8.1	8.2	6.80	6.90
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	208.40	208.70	9.9	10.2	8.4	7.6	7.20	7.10
L.S.D. at 5%	1.44	1.31	0.2	0.2	0.2	0.2	0.2	0.2

Salicylic acid (SA), chitosan (Chit), green miracle (GM)

Data in Table 4 clearly revealed that applying any treatment of the different anti-transpirants was significantly effective in reducing seed percentages as well as improving pulp percentage of the "Ewaise" fruits during the two studied seasons. Differing anti-transpirants significantly varied all tested physical properties of the fruits. The higher promotion in physical properties was significantly associated with using SA 100 ppm + Chit 0.1% + GM 3cm^3/l > Chit 0.1% + GM 3cm^3/l > SA 100 ppm + GM 3cm^3/l. The maximum values of seed percentage (14.26 & 14.28 %), and pulp percentage (78.55 & 78.55%) were recorded during 2022 and 2023 seasons, respectively when the trees received four sprays of SA 100 ppm + Chit 0.1% + GM 3cm^3/l. Unfavorable effects on the tested traits were recorded with untreated trees. Spraying "Fagri Kalan" mango trees with salicylic acid has significant promotion on the fruit quality The same direction was recorded with the different characters of the fruit i.e. fruit weight, yield/tree kg and thickness, pulp %, edible to non- edible portions **[18].** Also, **[33]** revealed that the fruit retention %, and yield as well as physical and chemical characteristics of the fruits of "Succary" mango trees were improved by applying of chitosan relative to the untreated trees.

Table 4. Effect of some anti-transpirants treatments on some physical chemical characteristics of "Ewaise" mango trees during the two seasons of 2022 and 2023.

Treatments	Seed (%)		Pulp (%)		T.S.S (%)		Total sugars (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	14.26	14.28	71.99	72.02	15.80	15.90	12.35	12.30
T2 = spraying SA 100 ppm	14.11	14.10	73.24	73.2	16.30	16.25	12.70	12.65
T3= spraying Chit 0.1%	13.77	13.73	73.88	74.02	16.60	16.65	12.95	12.90
T4= spraying GM 3cm^3/l	13.31	13.29	74.54	74.62	16.85	16.84	13.25	13.35
T5=spraying SA 100 ppm + Chit 0.1%.	13.09	13.10	75.23	75.18	17.3	17.4	13.65	13.70
T6=spraying SA 100 ppm + GM 3cm^3/l	12.70	12.76	75.9	75.83	17.7	17.6	14.20	14.25
T7=spraying Chit 0.1% + GM 3cm^3/l	12.24	12.27	76.61	76.56	18.1	17.95	14.75	14.8
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	11.15	11.20	78.55	78.55	18.45	18.50	15.30	15.40
L.S.D. at 5%	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2

Salicylic acid (SA), chitosan (Chit), green miracle (GM)

3.3. The effects on chemical characteristics:

It is evident from Tables 4 & 5 that spraying "Ewaise" mango trees with the different anti-transpirants treatments either alone or in combination application significantly improved fruit quality. This resulted in an improve in TSS %, total sugars, and vitamin C content, and a reduction in total acidity, and total fibre (%)compared to the check treatment. Using 100 ppm salicylic acid, 0.1% chitosan, and 3cm^3/l green miracle, was essential in promoting fruit quality. Using a combination between the three substances, followed by combination of 0.1% chitosan with 3cm^3/l green miracle, and then combination of 0.1 % salicylic acid with 3cm^3/l green miracle is more effective in improving fruit quality than other treatments. Unfavorable effect on fruit quality of "Ewaise" mango was detected with the control. The obtained results regarding the effect of green miracle anti-transpiration on the yield and quality go in line with the results of **[10].** Also, **[32]** reported that green miracle foliar spray at 150 ppm on peach trees increased fruit TSS, and fruit quality as well as the lowest total fruit acidity of mango fruits. Spraying green miracle at 4 cm/l resulted in the highest productivity measurements and improving cluster and berry quality of Flame seedless grapevines **[12]**. On the other hand, spraying "Ewaise" Mango Cultivar with chitosan at 50 or 100 ppm was more effective in increasing panicle length yield and the best fruit characteristics as compared with un-treated trees **[9].**

The beneficial effects of salicylic acid were explained by different researchers. Results of **[18]** who suggested that spraying "Fagri Kalan" mango trees with salicylic acid improved productivity and enhanced their fruit quality.

Table 5. Effect of some anti-transpirants treatments on some chemical characteristics of "Ewaise" mango trees during the two seasons of 2022 and 2023.

Treatments	Reducing sugars (%)		Total acidity (%)		Vitamin C (mg/100 ml juice)		Total fibre (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	3.35	3.30	0.330	0.335	33.40	33.50	1.07	1.09
T2 = spraying SA 100 ppm	3.75	3.80	0.312	0.315	33.80	33.93	1.03	1.04
T3= spraying Chit 0.1%	3.90	3.95	0.297	0.302	34.47	34.57	1.00	0.99

T4= spraying GM 3cm^3/l	4.15	4.20	0.270	0.268	34.80	34.60	0.91	0.93
T5=spraying SA 100 ppm + Chit 0.1%.	4.45	4.40	0.254	0.253	35.67	35.77	0.88	0.89
T6=spraying SA 100 ppm + GM 3cm^3/l	4.55	4.60	0.235	0.236	36.33	36.50	0.86	0.85
T7=spraying Chit 0.1% + GM 3cm^3/l	4.75	4.80	0.215	0.218	39.60	39.57	0.82	0.81
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	**4.95**	**5.00**	**0.198**	**0.200**	**41.87**	**41.83**	**0.75**	**0.78**
L.S.D. at 5%	4.2	4.2	0.016	0.014	0.57	0.51	0.02	0.2

Salicylic acid (SA), chitosan (Chit), green miracle (GM)

Conclusion

From the present results, it can be concluded that using of salicylic acid 100 ppm, chitosan 0.1 % and green miracle 3 cm^3/l, whether as alone or mixed with four spraying improved the productivity and qualitative characteristics of "Ewaise" mango compared to untreated trees. The most pronounced effects were due to spray with the mixture of salicylic acid 100 ppm + chitosan 0.1% + green miracle 3cm^3/l.

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الملخص العربى

تأثير الرش الورقي ببعض مضادات النتح على محصول وجودة ثمار أشجار المانجو العويس تحت ظروف أسوان

أجريت هذه الدراسة خلال موسمي 2022 و 2023 لاختبار تأثير الاستخدام الفردي و المشترك لرش ثلاثة مواد وهى حمض السيلسيلك والشيتوزان والجرين ميريكل على بعض صفات التزهير والعقد والمحصو والصفات الطبيعية والكيميائية لاثمارأشجار المانجو العويس والنامية تحت ظروف منطقة اسوان.

الاستخدام الفردي و المشترك للثلاثة مواد كان فعّالاً جداُ في تحسين نسبة العقد النهائى و المحصول لاشجار المانجو و ذلك بالمقارنة بمعاملة الكنترول. و كان أفضـــل معاملة من المواد المســتخدمة هى الجرين ميريكل والشــيتوزان و احتل حمض السيلسيلك المرتبة الأخيرة في هذا الصدد. و كان الاستخدام المشترك أفضل من الاستخدام الفردي لهذه المواد في تحسين هذه الصفات.

لأجل تحسين المحصول وجودة ثمار اشجار المانجو العويس والنامية تحت ظروف منطقة اسوان فإنه ينصح برش الاشجاراربعة مرات بمخلوط يتكون من ثلاثة مواد وهى حمض السيلسيلك 100 جزءفى المليون والشيتوزان بتركيز 0.1 % والجرين ميريكل 3 سم لتر.

الكلمات المفتاحية : المانجو العويس ، مضادات النتح ، حمض السلسيلك ، الشيتوزان ،جرين مريكل، المحصول – الجودة .