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Response Of "Ewaise" Mango Trees To Foliar Spraying With Certain Anti-Transpirants In Aswan, Egypt

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Abstract

The present investigation was conducted for evaluating the impact of certain anti-transpirants, namely salicylic acid 100 ppm, chitosan 0.1 %, and green miracle 3cm^3/l as well as their combinations on the blooming characteristics, growth aspects, pigment contents, and mineral composition 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 the growth aspects including shoot length, shoot thickness , leaves number/shoot, and leaf area compared to the control in the studied seasons. The different chemical composition including N, P, K, Mg, Fe, and Mn, as well as pigment contents were also improved due to apply different anti-transpirants comparing to the control. The higher increment in the different tested 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, growth and chemical composition measurements.

Key words: *"*Ewaise" mango trees, anti-transpirants, salicylic acid, chitosan, green miracle, growth, chemical composition.

1.Introduction

The productivity of different fruits and the world food security will be impacted by severe

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droughts, climatic change and other abiotic stresses. Reduction of the plant transpiration with the different anti-transpirants agents may have a vital role in mitigating drought and other stresses. Under a climate change, a high temperature, a water deficit stress and a frequent drought predicted for the future, reducing water loss through transpiration is required to increase plant growth and productivity. **[1]** revealed that anti-transpirants agents are various materials that are applied on the plant leaves to reduce transpiration and thus increase the water potential of the plant**.** In addition **[2]** pointed out that drought stresses produce dehydration of the plant tissue and cells, a deficiency in the nutritional intake, and a decreasing in assimilation of carbon dioxide because of stomatal closure, and thus causing starvation. **[3]** reported that dehydration stress leads to disruption of the physiological processes, including all plant transitions, leaves development, gas exchange, carbon fixation, and then the result is reducing plant growth and yield.

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 **[5].** It has shown many functions, acts as an anti-transpirants and promotes plant growth **[6].** Enhances chemical composition, 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 thickness of shoots, leaf area index, and leaf chlorophylls 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 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-transpirants 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 growth 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 **[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, pigments, characteristics and chemical composition 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, this study was conducted to evaluate the possibility of inducing blooming characteristics, growth aspects, photosynthetic pigments and nutritional status in "Ewaise" mango trees by spraying 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 some anti-transpirants on the growth, pigment contents, and chemical composition 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, Egypt. 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	$NaHCO_3$-extractable P (mg/kg)	5.10
Clay (%)	11.75	NH_4AOC-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
$CaCO_3$ (%)	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 two seasons the following measurements were recorded:

1- Vegetative growth characteristics are shoot length (cm), number of leaves /shoots, leaf area (cm^2), and shoot thickness (cm) **[20].**
2- Leaf chemical components, namely chlorophylls a, b, total chlorophylls, and total carotenoids (mg/g F.W.) **[21]** N, P, K, and Mg (as %), Zn, Fe, and Mn (as ppm) in the leaves **[22] .**

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 **[23].**

3. Results and discussion:

3.1. Growth aspects:

It is evident from the results in Table 2 that growth characteristics i.e. shoots length, shoots thickness, leaves number/ shoot and leaf area index were significantly increased with spraying trees with any treatment of the different anti-transpirants used comparing with untreated ones. Significant differences on the tested characteristics were noticed between the different treatments. The increment in the tested traits was significantly related to applying 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 shoot

length (23.8 & 23.6 cm), shoot thickness (0.89 & 0.91 cm), leaves number/shoot (16.70 & 16.80), and leaf area (92.47 & 92.30 cm^2) were recorded during the 2022 and 2023seasons, respectively when the trees received four sprays of SA 100 ppm + Chit 0.1% + GM 3cm^3/l. The minimum values of these traits were registered with untreated trees. The obtained results regarding the effect of green miracle as anti-transpiration on the yield go in line with the results of **[10] .** Also, **[24]** reported that green miracle foliar spray at 150 ppm on peach trees increased different growth characteristics. Moreover, **[25]** pointed out that the applying "Succary" mango trees with chitosan improved the different growth aspects of the trees. The positive effects of salicylic acid on the growth traits of mango trees were previously reported by **[18]** who reclaimed that spraying "Fagri Kalan" mango trees with salicylic acid has significant promotion on the growth characteristics.

Table 2. Effect of some anti-transpirants treatments on shoot length (cm), shoot thickness (cm), leaves number/shoot and leaf area (cm^2) of "Ewaise" mango trees during the two seasons of 2022 and 2023

Treatments	Shoot length (cm)		Shoot thickness (cm)		No. of leaves/shoot		Leaf area (cm^2)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	15.8	16.2	0.59	0.61	10.0	10.3	78.37	78.57
T2 = spraying SA 100 ppm	17.2	17.3	0.62	0.63	11.0	11.0	79.40	79.60
T3= spraying Chit 0.1%	18.1	18.3	0.69	0.68	12.4	12.7	80.63	80.70
T4= spraying GM 3cm^3/l	19.5	19.6	0.71	0.70	13.2	13.4	83.40	83.90
T5=spraying SA 100 ppm + Chit 0.1%.	20.4	20.6	0.73	0.72	13.9	13.8	85.27	85.27
T6=spraying SA 100 ppm + GM 3cm^3/l	21.5	21.8	0.77	0.78	14.8	14.6	87.57	87.93
T7=spraying Chit 0.1% + GM 3cm^3/l	22.3	22.6	0.84	0.86	15.2	15.0	90.17	90.43
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	**23.8**	**23.6**	**0.89**	**0.91**	**16.7**	**16.8**	**92.47**	**92.30**
L.S.D. at 5%	0.9	1.0	0.03	0.03	1.0	1.0	0.45	0.80

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

3.2. Mineral and pigment contents:

Data in Tables 3 & 4 & 5 clearly revealed that applying any treatment of the different anti-transpirants was significantly effective in improving N, P, K, Mg, Fe, Mn, Zn and contents as well as improving total chlorophylls and carotenoids of the "Ewaise" mango trees during the two studied seasons. Differing anti-transpirants significantly varied all tested characteristics of "Ewaise" mango trees. The higher promotion in these traits 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 N (1.97 & 2.00 %), P (0.335 and 0.340 %), K (1.827 and 1.853 %), Mg (0.767 and 0.787 %), Fe (124.67 & 126.33 ppm), Mn (90.33 & 92.00 ppm),Zn (107.8 &108.4), total chlorophylls (11.05 & 11.05 mg/g FW), and carotenoids (3.6 & 3.8 mg/g FW) were recorded during

the 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 mineral and photosynthetic **[18].** Also, **[25]** revealed that the chemical composition of "Succary" mango trees was improved by applying of chitosan relative to the untreated trees. However, 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, **[24]** reported that green miracle foliar spray at 150 ppm on peach trees increased their chemical composition. Spraying green miracle at 4 cm/l resulted in the highest chemical composition 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 pigments and mineral contents as compared with un-treated trees **[9].** The beneficial effects of salicylic acid were explained by different researchers. Results of **[18]** suggested that applying salicylic acid improved chemical composition of "Fagri Kalan" mango trees.

Table 3. Effect of some anti-transpirants treatments on some leaf pigments of "Ewaise" mango trees during seasons of 2022 and 2023.

Treatments	Chlorophyll a (mg/ 1.0 g FW.)		Chlorophyll b (mg/ 1.0 g FW.)		Total chlorophyll (mg/ 1.0 g FW.)		Total carotenoids (mg/ 1.0 g F.W.)	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	4.00	3.80	1.60	1.40	5.60	5.20	1.10	1.00
T2 = spraying SA 100 ppm	4.40	4.50	1.90	1.80	6.30	6.30	1.70	1.50
T3= spraying Chit 0.1%	4.90	5.00	2.20	2.10	7.10	7.10	1.90	1.80
T4= spraying GM 3cm^3/l	5.40	5.60	2.50	2.70	7.90	8.30	2.00	2.20
T5=spraying SA 100 ppm + Chit 0.1%.	5.90	6.10	2.90	3.00	8.80	9.10	2.40	2.50
T6=spraying SA 100 ppm + GM 3cm^3/l	6.60	6.70	3.40	3.50	10.00	10.20	2.80	2.90
T7=spraying Chit 0.1% + GM 3cm^3/l	6.90	7.20	3.70	3.60	10.60	10.80	3.20	3.30
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	7.60	7.50	3.90	4.00	11.50	11.50	3.60	3.80
L.S.D. at 5%	0.3	0.3	0.2	0.2	0.5	0.6	0.2	0.2

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

Table 4. Effect of some anti-transpirants treatments on N, P, K and Mg percentages in leaves of "Ewaise" mango trees during the two seasons of 2022 and 2023

Treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2022	2023	2022	2023	2022	2023	2022	2023
T1= control	1.49	1.52	0.132	0.137	1.263	1.317	0.457	0.463
T2 = spraying SA 100 ppm	1.56	1.58	0.162	0.166	1.360	1.377	0.483	0.510

T3= spraying Chit 0.1%	1.67	1.68	0.183	0.187	1.410	1.443	0.540	0.560
T4= spraying GM 3cm^3/l	1.70	1.73	0.215	0.220	1.460	1.470	0.590	0.620
T5=spraying SA 100 ppm + Chit 0.1%.	1.75	1.78	0.245	0.250	1.497	1.530	0.650	0.670
T6=spraying SA 100 ppm + GM 3cm^3/l	1.82	1.85	0.275	0.280	1.627	1.680	0.690	0.700
T7=spraying Chit 0.1% + GM 3cm^3/l	1.91	1.93	0.295	0.305	1.693	1.763	0.717	0.737
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	1.97	2.00	0.335	0.340	1.827	1.853	0.767	0.787
L.S.D. at 5%	0.05	0.04	0.02	0.02	0.046	0.030	0.019	0.017

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

Table 5. Effect of some anti-transpirants treatments on Fe, Mn, and Zn contents (ppm) in leaves of "Ewaise" mango trees during the two seasons of 2022 and 2023.

Treatments	Fe (ppm)		Mn (ppm)		Zn (ppm)	
	2022	2023	2022	2023	2022	2023
T1= control	91.00	94.00	61.00	63.00	85.3	84.2
T2 = spraying SA 100 ppm	95.00	96.00	68.00	68.00	87.5	88.1
T3= spraying Chit 0.1%	98.00	99.67	73.00	75.33	90.6	90.2
T4= spraying GM 3cm^3/l	104.00	106.00	77.00	77.67	95.4	96.0
T5=spraying SA 100 ppm + Chit 0.1%.	109.00	110.00	80.00	81.33	97.0	97.6
T6=spraying SA 100 ppm + GM 3cm^3/l	115.00	116.33	84.00	86.33	101.2	101.0
T7=spraying Chit 0.1% + GM 3cm^3/l	120.33	121.67	87.33	89.00	103.5	103.8
T8= spraying SA 100 ppm + Chit 0.1% + GM 3cm^3/l	124.67	126.33	90.33	92.00	107.8	108.4
L.S.D. at 5%	2.19	2.66	2.30	3.14	2.08	2.15

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 growth aspects, pigments content, and mineral composition of "Ewaise" mango compared to untreated ones. The most pronounced effects were due to spray with the mixture of salicylic acid 100 ppm + chitosan 0.1% + green miracle 3cm^3/l.

References

[1] Del Amor, F.M., P., Cuadra-Crespo, D.J. Walker, J.M. Cámara and R. Madrid. Effect of foliar application of antitranspirant on photosynthesis and water relations of pepper plants under different levels of CO_2 and water stress. J. Plant Physiol. 2010, 167, 1232–1238.

[2] Karimi, S., A. Yadollahi, K. Arzani, A. Imani and M. Aghaalikhani. Gas-exchange response of almond genotypes to water stress. Photosynthetica. 2015, 53(1):29-34.

[3] Chaves, M.M. and M.M. Oliveira. Mechanisms underlying plant resilience to water deficits: prospects for water-saving agriculture, Journal of Experimental Botany. 2004, 55(407): 2365-2384.

[4] Wang, W., Q. Meng, Q. Li, J. Liu, M. Zhou, Z. Jin and K. Zhao. Chitosan derivatives and their application in biomedicine. Int. J.Mol. Sci. 2020, 21, 487. [CrossRef].

[5] Abo Elsoud, M.M. and E. El Kady. Current trends in fungal biosynthesis of chitin and chitosan. Bull. Nat. Res. Cent. 2019, 43, 1–12. [CrossRef].

[6] Malerba, M. and R. Cerana. Chitosan effects on plant systems. Int. J. Mol. Sci. 2016, 17, 996. [CrossRef] [PubMed].

[7] Chamnanmanoontham, N., W. Pongprayoon, R. Pichayangkura, S. Roytrakul and S. Chadchawan. Chitosan enhances rice seedling growth via gene expression network between nucleus and chloroplast. Plant Growth Regul. 2015, 75, 101–114. [CrossRef].

[8] Almutairi, K.F., K. Górnik, A. Ayoub, H.S. Abada, W.F.A. Mosa. Performance of mango trees under the spraying of some biostimulants. Sustainability. 2023, 15, https://doi.org/10.3390/ 15543. su152115543.

[9] Gad, M.M., M.A. Abdel-Mohsen and O.A. Zagzog. Improving the yield and fruiting characteristics of Ewaise Mango Cultivar by spraying with Nano-chitosan and Nano-potassium silicate. Scientific Journal of Agricultural Sciences 2021, 3 (2): 68-77.

[10] EL-Gioushy, S.F., M.H.M. Baiea, M.A. Abdel Gawad-Nehad and O.A. Amin. Influence of $CaCO_3$ and green miracle foliar application on preventing sunburn injury and quality improvement of Keitt mango fruits. Middle East Journal of Agriculture, 2017, 6: 1098-1110.

[11] Abdel-Aziz M.A. and R.H.M. Geeth. Effect of spraying by some substances on low temperature stress for growth and productivity in late peas (*Pisum sativum* L.) planting under the Middle Egypt Region conditions. J. Plant Production, Mansoura Univ., 2017, 8 (8): 859-867.

[12] Fahmy, F.E. Effect of mepiquat chloride and some anti-transpiration agents on growth and productivity of Flame seedless grapevine under heat stress conditions. Egyptian J. Desert Res., 2023, 73 (2): 655-677.

[13] Reddy, S.V.R., R.R. Sharma, M. Srivastava and C. Kaur. Effect of pre-harvest application of salicylic acid on the postharvest behavior of 'Amrapali' mango fruits during storage. Indian J. Hortic. 2016, 73, 405-409. [CrossRef]

[14] Hadian-Deljou, M., M. Esna-Ashari and H. Sarikhani. Effect of pre-and post-harvest salicylic acid treatments on quality and antioxidant properties of 'Red Delicious' apples during cold storage. Adv. Hortic. Sci. 2017, 31, 31-38. [CrossRef].

[15] Ezzat, A., A. Ammar, Z. Szabó and I. Holb. Salicylic acid treatment saves quality and

enhances antioxidant properties of apricot fruit. Hortic. Sci. 2017, 44, 73–81. [CrossRef].

[16] Chen, L., X. Zhao, J.E. Wu, Y. He and H. Yang. Metabolic analysis of salicylic acid-induced chilling tolerance of banana using NMR. Food Res. Int. 2020, 128, 108796. [CrossRef].

[17] Supapvanich, S., R. Polpakdee and P. Wongsuwan. Chilling injury alleviation and quality maintenance of lemon basil by preharvest salicylic acid treatment. Emir. J. Food Agric. 2015, 27, 801–807. [CrossRef].

[18] El-Hosieny, Hanan A.M.R. Effect of ascorbic and salicylic acid on leaf area, N,P, K content as well as yield and its components of mango (*Mangifera indica* l.) trees. Plant Production, Mansoura Univ., 2015, 6 (10): 1619-1629.

[19] Black, C.A. Methods of Soil Analysis, part 1. Physical and Mineralogicol properties. ASA Madison. 1965, Wiss, USA.

[20] Ahmed, F.F. and M.H. Morsy. A new method for measuring leaf area in different fruit species. Minia J. Agric. Res. Dev.1999, 19: 97-105.

[21] Von Wettstein, D. Chlorophyll-letale und der submikroskopische Formwechsel der Plastiden.. Experimental Cell Research. 1957, 12, (3): 427-506.

[22] Summer, M.E. Diagnosis and recommendation integrated system (DRIS) as a guide to orchard fertilization. Hort. Abst. 1985, 55, 7502.

[23] Ott, R.L. and M.T. Longnecker. An introduction to statistical methods and data analysis. Cengage Learning, Boston 2015.

[24] Zaen El-Daen, E.M.A. Effect of irrigation levels and spraying mepiquat chloride on growth and productivity of peach trees. Future J. Agric., 2019, 3: 9-19.

[25] Saied, H.H.M. and E.M.A. Radwan. Insight into the effect of chitosan on growth and fruiting of succary mango trees. J. Product. & Dev. 2017, 22(3): 781-793.

الملخص العربى

استجابة أشجار المانجو "العويس" للرش الورقي ببعض مضادات النتح في أسوان، مصر

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 النمو الخضري والحالة الغذائية لاشجار المانجو العويس والنامية تحت ظروف منطقة اسوان.

الاستخدام الفردي و المشترك للثلاثة مواد كان فعّالاً جداً في تحسين مساحة الورقة و الحالة الغذائية 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.

ولأجل تحسين النمو والحالة الغذائية لاشجار المانجو العويس والنامية تحت ظروف منطقة اسوان فإنه ينصح برش الاشجار اربع مرات بمخلوط يتكون من ثلاثة مواد وهى حمض السيلسيلك والشيتوزان والجرين ميريكل

الكلمات المفتاحية : المانجو العويس ، مضادات النتح ، حمض السلسيلك ، الشيتوزان ،جرين مريكل، الحالة الغذائية