J. Product. & Dev., 22(3): 781- 793 (2017)

INSIGHT INTO THE EFFECT OF CHITOSAN ON GROWTH AND FRUITING OF SUCCARY MANGO TREES

Hussein, H.M. Saied* and Radwan, E.M.A**
**Hort. Dept. Aswan Fac. of Agric. And Natural Resources Aswan Univ. Egypt*
*** Hort. Dept. New Valley Fac. of Agric. Assiut Univ., Egypt.*

ABSTRACT

This study was carried out during 2015 and 2016 seasons to examine the effect of spraying chitosan at 0.25 to 1.0% once, twice or thrice on growth, nutritional status of the trees, yield and fruit quality of Succary mango trees grown under Aswan climatic conditions.

Treating the trees once at growth start, twice at growth start and just after fruit setting or thrice at the same previous two dates and one month later with chitosan at 0.25 to 1.0% substantially improved all growth again aspects, chlorophylls a & b, total chlorophylls, total carotenoids, N, P, K, Mg, Zn, Fe, Mn, fruit retention %, yield and both physical and chemical characteristics of the fruits relative to the control. The promotion was related to the increase in concentrations and frequencies of application of chitosan. All the investigated parameters were unaffected with increasing concentrations from 0.5 to 1.0% and frequencies of applications from twice to thrice

***Conclusively,** the best results with regard to yield and fruit quality of Succary mango trees grown under Aswan climatic conditions were obtained due to treating the trees twice at growth start and again just after fruit setting with chitosan at 0.5%.*

Keywords: Chitosan, Succary mango, yield, fruit quality.

INTRODUCTION

One of the principle problems in mango orchards is abiotic stress, which blocked plant growth and fruiting. Application of chitosan is one of the approaches to overcome the negative effect of abiotic stress and increase yield and quality of fruit crops (Borkowski and Kowalczyk, 1999 and Barka*et al*, 2004). Chitosan has antiviral, antibacterial and antifungal properties and it considers one of the most common polymers found in the

nature (Wojdyla, 2001).It was be obtained by partial de acetylation of chitin (*Poly N-acetyl- D- glucosamine*) from crustacean shells (Vasconuelo*et al*., 2004). It is structurally related to cellulose and it consists of long chain of glucose. It is a natural antioxidant and application of it via soil or leaves effectively stimulated the resistance mechanism of plants besides having a direct effect on pathogenic organism (Feng *et al*., 2007). It can also induce a multitude of biological processes in plant tissues including the stimulation of chitinases, accumulation of phytoalexins, synthesis of proteinase inhibitors and increase signification (Wojdyla, 2001).

Previous studies showed that using chitosan pre and post harvesting was very effective in enhancing growth, yield and fruit quality parameters in different fruit crop species (Jiang and Li, 2001; Chien and Chou, 2006; No *et al*., 2007; Gornil*et al*., 2008; Amborabe*et al*., 2008; Marquez *et al*., 2009; Corradini*et al*., 2010; Ghasemnezhad*et al*., 2010; Ali *et al*., 2011; El-Miniawy*et al*., 2013; Hadwiger, 2013; Shao *et al*., 2015; Malerbe and Cerana, 2016 and Hossain and Iqbal, 2016) emphasized the beneficial effects of using chitosan on improving fruit quality of fruit crops.

Therefore, the target of this work was elucidating the effect of different concentrations and frequencies of application of chitosan on growth, yield and fruit quality of Succary mango trees grown under Aswan climatic conditions.

MATERIALS AND METHODS

This investigation was conducted during two consecutive seasons 2015 and 2016 on thirty 10- years old Succary mango trees onto seedling mango rootstock. The trees are grown in a private mango orchard located at KomEmboo district, Aswan Governorate. The uniform in vigour trees of Succary mango (30 trees) were planted at 7 x 7 meters apart. The soil texture of the tested orchard is silty clay well drained with a water table depth not less than two meters. Surface irrigation system was followed using Nile water.

The results of orchard soil analysis according to Wilde *et al*., (1985) are shown in Table 1**.**

The selected trees (30 trees) received the regular agricultural and horticultural practices which were followed in the orchard except the application of chitosan.

Table (1): Analysis of the tested soil

Particle size distribution:	**????**
Sand %	6.1
Silt %	56.7
Clay	37.2
Texture	Silty clay
pH(1:2.5 extract)	7.35
EC (1: 2.5 extract) (mmhos/Icm/25^{o}C)	0.59
O.M. %	2.39
$CaCO_3$ %	1.45
Total N %	0.18
Available P (ppm, Olsen)	9.0
Available K (ppm/ ammonium acetate)	5.01
Available Mg (ppm)	115.0
Available S (ppm)	7.11
Available EDTA extractable micronutrients (ppm)	
Zn	1.49
Fe	12.11
Mn	9.39

This study included the following ten treatments:

1. Control treatment.
2. Spraying chitosan at 0.25% (2.5 g/l) once at growth start (1st week of Mar.).
3. Spraying chitosan at 0.25% (2.5 g/l) twice at growth start (1st week of Mar.) and again just of fruit setting (2nd week of Apr)
4. Spraying chitosan at 0.25% (2.5 g/l) thrice at growth start, just after fruit setting and at one month later (2nd week of May.).
5. Spraying chitosan at 0.5% (0.5 g/l) once as previously mentioned.
6. Spraying chitosan at 0.5% (0.5 g/l) twice as previously mentioned.
7. Spraying chitosan at 0.5% (0.5 g/l) thrice as previously mentioned.
8. Spraying chitosan at 1.0% (10 g/l) once as previously mentioned.
9. Spraying chitosan at 1.0% (10 g/l) twice as previously mentioned.
10. Spraying chitosan at 1.0% (10 g/l) thrice as previously mentioned.

Each treatment was replicated three times, one tree per each. Triton B as a wetting agent was added at 0.1%. Few drops of 0.1 N NaOHwas added to the known weights of chitosan to facilitate the solubility. The control

trees received water containing Triton B and few drops of 0.1 N NaOH. Spraying was done till runoff.

Randomized complete block design (RCBD) was used for statistical analysis of the present study.

During both seasons, the following parameters were recorded:

1- Growth aspects namely shoot length (cm.), number of leaves/shoot and leaf area $(cm)^2$.(Ahmed and Morsy, 1999) in the Spring growth cycle (last week of May) during both seasons).
2- Leaf pigments namely chlorophylls a & b, total chlorophylls and total carotenoids (mg/100gF.W) (Hiscox and Isralstam, 1979).
3- Leaf contents ofof N, P, K, Mg (as %) and Zn, Fe and Mn (as ppm) (Summer, 1985 and Wilde *et al*., 1985).
4- Percentage of fruit retention.
5- Yield expressed in weight (kg.) and number of fruits/tree.
6- Physical and chemical characteristics of the fruits namely T.S.S.%, total and reducing sugars% (Lane and Eynon, 1965), ascorbic acid (as mg/100g pulp), total acidity as g citric acid/100g pulp, , and total fibre %(A.O.A.C, 2000).

The obtained data were tabulated and subjected to the proper statistical analysis and treatment means were compared using New L.S.D. test at 5% (Mead *et al*., 1993).

RESULTS AND DISCUSSION

1- Vegetative growth aspects:

It is clear from the obtained data in Table (2) that the three growth aspects namely shoot length, number of leaves/shoot and leaf area were significantly affected by varying concentrations and frequencies of application of chitosan. Treating the trees once, twice or thrice with chitosan at 0.25 to 1.0% had significant promotion on the three growth traits over the control treatment. There was a gradual promotion on these growth aspects with increasing concentrations and number of sprays chitosan. These growth traits were significantly unaffected with increasing concentrations than 0.5 to 1.0 % and frequencies of application from twice to thrice. The maximum values were recorded on the trees that received three sprays of chitosan at 1.0 %. The lowest values were recorded on untreated trees. These results were true during both seasons.

Table (2): Effect of different concentrations and frequencies of application of chitosan on some growth aspects in the spring growth cycle and leaf pigments of Succary mango trees during 2015 and 2016 seasons.

Treatment	Shoot length (cm)		No. of leaves /shoot		Leaf area $(cm)^2$		Chlorophyll a (mg/100gF.W)		Chlorophyll b (mg/100gF.W)		Total chlorophylls (mg/100g F.W)		Total carotenoids (mg/100g F.W)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	15.0	16.3	12.0	13.0	77.0	78.1	3.1	3.3	1.0	0.9	4.1	4.2	0.9	1.0
Chitosan at 0.25% once	16.1	17.4	14.0	15.0	79.0	80.2	4.0	4.1	1.4	1.3	5.4	5.4	1.2	1.4
Chitosan at 0.25% twice	17.6	18.6	16.0	17.0	81.3	82.5	4.9	5.1	1.8	1.9	6.7	7.0	1.5	1.7
Chitosan at 0.25% thrice	17.7	18.8	16.0	17.6	81.6	82.8	5.0	5.2	1.9	2.0	6.9	7.2	1.6	1.8
Chitosan at 0.50% once	19.0	20.0	18.0	19.0	84.9	86.0	6.1	6.8	2.2	2.4	8.3	9.2	2.0	2.2
Chitosan at 0.50% twice	20.2	21.9	19.0	21.0	88.0	89.1	7.3	7.9	2.7	2.8	10.0	10.7	2.4	2.6
Chitosan at 0.50% thrice	20.3	22.2	19.0	21.0	88.3	89.5	7.4	8.0	2.8	2.9	10.2	10.9	2.5	2.7
Chitosan at 1.0 % once	19.3	20.1	18.3	19.3	85.0	86.1	6.2	6.9	2.3	2.5	8.5	9.4	2.1	2.3
Chitosan at 1.0 % twice	20.6	22.0	19.3	21.3	88.3	89.4	7.4	8.0	2.8	2.9	10.2	10.9	2.5	2.7
Chitosan at 0.1 % thrice	20.8	22.3	19.4	21.6	88.6	89.7	7.5	8.1	2.9	3.0	10.4	11.1	2.6	2.8
New L.S.D at 5%	**1.0**	**0.8**	**1.0**	**1.0**	**1.0**	**1.1**	**0.4**	**0.6**	**0.2**	**0.3**	**0.5**	**0.4**	**0.2**	**0.3**

2- Leaf chemical components:

Data in Table (3) obviously reveal that leaf content of N, P, K, Mg, Zn, Fe and Mn was significantly enhanced in response to treating the trees once, twice or thrice with chitosan at 0.25 to 1% relative to the control treatment. There was a gradual promotion on these nutrients with increasing concentrations and frequencies of application of chitosan. Increasing concentrations of chitosan from 0.5 to 1.0% and frequencies of application from twice to thrice had no significant promotion on these nutrients. Treating the trees three times with chitosan at 1.0% gave the highest values. The untreated trees produced the minimum values.Similar trend was noticed during both seasons.

.

3- Percentages of fruit retention and yield per tree:

It is evident from the data in Table (4) that spraying Succary mango trees once, twice or thrice with chitosan at 0.25 to 1.0 % significantly was accompanied with improving the percentage of fruit retention as well as yield expressed in weight (kg.) and number of fruits/tree over the control treatment. Increasing concentrations of chitosan from 0.25 to 1.0% and frequencies of application from once to thrice caused a progressive promotion on these parameters.Percentage of fruit retention and yield were significantly unaffected by increasing concentration of chitosan from 0.5 to 1.0 % and frequencies of application from twice to thrice. Therefore, from economical point of view, it is preferable to use chitosan at 0.5% for producing an acceptable yield. Under such promised treatment, yield per tree reached 51.5 and 51.7 kg compared with the yield of the untreated trees that reached 30.8 and 31.5 kg during both seasons, respectively. The percentage of increment on the yield due to using the suggested treatment over the control treatment reached 67.2 and 64.1 % during both seasons, respectively. Similar trend was noticed during both seasons.

4- Physical and chemical characteristics of the fruits:

As shown in Tables (4 & 5), treating Succary mango trees once, twice or thrice with chitosan at 0.25 to 1.0 % significantly was very effective in improving fruit quality in terms of increasing fruit weight and dimensions (height & diameter), pulp %, edible to non- edible portions, T.S.S.%, total and reducing sugars % and vitamin C and decreasing total acidity % and total fibre % rather than the control treatment. The promotion was

Table (3): Effect of different concentrations and frequencies of application of chitosan on the leaf chemical composition of Succary mango trees during 2015 and 2016 seasons.

Treatment	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %		Leaf Mn (ppm)		Leaf Fe (ppm)		Leaf Zn (ppm)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	1.60	1.59	0.112	0.120	1.11	1.15	0.59	0.64	49.1	48.9	50.3	51.0	49.1	50.0
Chitosan at 0.25% once	1.68	1.70	0.152	0.160	1.17	1.21	0.64	0.71	51.0	50.9	51.9	52.6	51.1	52.0
Chitosan at 0.25% twice	1.78	1.81	0.194	0.202	1.23	1.28	0.69	0.76	52.7	53.0	54.5	55.3	53.2	54.1
Chitosan at 0.25% thrice	1.80	1.82	0.196	0.204	1.24	1.29	0.70	0.77	53.0	53.1	55.0	55.4	53.3	54.2
Chitosan at 0.50% once	1.91	1.95	0.241	0.250	1.33	1.41	0.76	0.81	55.0	55.9	58.0	58.7	56.0	57.0
Chitosan at 0.50% twice	2.01	2.04	0.280	0.289	1.41	1.50	0.81	0.86	57.1	58.0	60.0	61.0	58.3	59.4
Chitosan at 0.50% thrice	2.02	2.05	0.282	0.290	1.42	1.51	0.82	0.87	57.2	58.3	60.3	61.3	58.4	59.6
Chitosan at 1.0 % once	1.93	1.96	0.243	0.251	1.34	1.42	0.77	0.82	55.1	56.0	58.3	59.0	56.3	57.1
Chitosan at 1.0 %twice	2.03	2.05	0.281	0.290	1.42	1.51	0.82	0.87	57.2	58.1	60.3	61.2	58.4	59.5
Chitosan at 0.1 %thrice	2.04	2.06	0.283	0.292	1.44	1.53	0.83	0.88	57.3	58.6	60.4	61.4	58.8	59.7
New L.S.D at 5%	0.06	0.04	0.021	0.031	0.03	0.04	0.03	0.02	1.4	1.6	1.3	1.0	1.2	1.3

Table (4): Effect of different concentrations and frequencies of application of chitosan onthe percentages of fruit retention, yield and some physical characteristics of Succary mango trees during 2015 and 2016 seasons.

Treatment	Fruit retention %		No. of fruits/tree		Yield/tree (kg.)		Fruit weight (g.)		Fruit height (cm)		Fruit diameter (cm)		Pulp %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	0.8	0.9	199.0	201.0	30.8	31.5	155.0	156.9	7.6	7.7	5.6	5.5	61.9	62.1
Chitosan at 0.25% once	1.0	1.2	215.0	218.0	34.8	36.0	162.0	165.0	8.0	8.1	6.0	5.9	63.0	63.9
Chitosan at 0.25% twice	1.3	1.6	229.0	232.0	40.3	41.3	176.0	178.0	8.5	8.6	6.5	6.6	64.5	65.4
Chitosan at 0.25% thrice	1.4	1.7	230.0	233.0	40.8	41.9	177.6	180.0	8.6	8.7	6.6	6.7	64.7	65.8
Chitosan at 0.50% once	1.7	2.0	243.0	247.0	45.7	47.2	188.0	191.0	9.0	9.1	7.1	7.2	67.3	69.0
Chitosan at 0.50% twice	2.0	2.3	256.0	260.0	51.5	51.7	201.0	199.0	9.4	9.5	7.6	7.7	69.9	71.9
Chitosan at 0.50% thrice	2.1	2.4	257.0	261.0	51.9	52.2	202.0	200.0	9.5	9.6	7.7	7.8	70.2	72.0
Chitosan at 1.0 % once	1.8	2.1	244.0	248.0	46.1	47.5	189.0	191.5	9.1	9.2	7.2	7.3	67.4	69.0
Chitosan at 1.0 %twice	2.1	2.4	257.0	261.0	51.9	52.2	202.0	200.0	9.5	9.6	7.7	7.8	70.0	72.0
Chitosan at 0.1 %thrice	2.2	2.5	259.0	262.0	52.6	52.7	203.0	201.0	9.6	9.7	7.8	7.9	70.4	72.3
New L.S.D at 5%	**0.2**	**0.3**	**11.0**	**13.0**	**0.8**	**0.9**	**4.9**	**4.6**	**0.2**	**0.3**	**0.2**	**0.3**	**0.7**	**0.8**

Table (5): Effect of different concentrations and frequencies of application of chitosan onsome physical and chemical characteristics of the fruit of Succary mango trees during 2015 and 2016 seasons.

Treatment	Edible/non-edible portions of fruit		T.S.S. %		Total sugars %		Reducing sugars %		Total acidity %		Vitamin C (mg/100 g pulp)		Total fibre %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	1.62	1.64	14.8	15.0	8.9	9.0	3.0	2.9	0.390	0.385	41.3	42.0	0.95	1.00
Chitosan at 0.25% once	1.70	1.77	15.1	15.4	9.3	9.4	3.4	3.3	0.361	0.356	43.0	43.8	0.88	0.91
Chitosan at 0.25% twice	1.82	1.89	15.5	15.9	9.7	9.8	3.7	3.7	0.329	0.324	45.0	45.8	0.81	0.83
Chitosan at 0.25% thrice	1.83	1.92	15.6	16.0	9.8	9.9	3.8	3.8	0.328	0.322	45.3	46.1	0.80	0.80
Chitosan at 0.50% once	2.06	2.23	15.9	16.3	10.9	11.0	4.2	4.1	0.301	0.294	48.0	48.7	0.71	0.69
Chitosan at 0.50% twice	2.32	2.56	16.6	16.7	11.4	11.6	4.5	4.4	0.285	0.279	50.0	51.0	0.59	0.57
Chitosan at 0.50% thrice	2.36	2.57	16.7	16.8	11.5	11.7	4.6	4.5	0.283	0.277	50.3	51.3	0.57	0.55
Chitosan at 1.0 % once	2.07	2.26	16.0	16.4	11.0	11.0	4.3	4.2	0.299	0.293	48.1	49.0	0.70	0.68
Chitosan at 1.0 %twice	2.33	2.57	16.7	16.8	11.5	11.7	4.6	4.5	0.283	0.277	50.2	51.3	0.58	0.56
Chitosan at 0.1 %thrice	2.38	2.61	16.8	16.9	11.6	11.8	4.7	4.6	0.280	0.275	50.5	49.3	0.56	0.54
New L.S.D at 5%	0.08	0.06	0.2	0.3	0.2	0.2	0.2	0.2	0.014	0.014	1.1	1.2	0.03	0.04

associated with increasing concentration and frequencies of application of chitosan. Significant differences on quality parameters were detected among most concentrations and frequencies of application of chitosan except among the higher two concentrations (0.5 & 1.0%) and frequencies of application (twice or thrice). Therefore, from economical point of view, it is advisable to use chitosan twice at 0.5% for producing better fruit quality of Succary mango trees. Unfavourable effects on fruit quality were recorded on the control trees. These results were true during 2015 and 2016 seasons.

DISCUSSION:

The previous beneficial effects of chitosan on growth, nutritional status of the trees, yield and quality parameters are based on how this glucosamine polymer influences the biochemistry and molecularbiology of the plant cell. The cellular targets are the plasma membrane and nuclear chromatin. Subsequent changes occur in cell membrane, chromatin, DNA, Ca, MAP Kinase, oxidative burst, reactive oxygen species (ROS), callose pathogenesis- related genes and phytoalexius. It is used as an ecologically friendly biopesticide substance that boosts the innate ability of plants to defend themselves against fungal infections (Borkowski and Kowalczyk, 1999; Wogdyla, 2001; Barka*et al*, 2004;Vasconsuelo*et al*., 2004andFeng *et al*., 2007).

These results are in agreement with those obtained by Jiang and Li, (2001); Chien and Chou, (2006); No *et al*., (2007); Gornil*et al*., (2008); Amborabe*et al.*,(2008); Marquez *et al*., (2009); Corradini*et al*., (2010); Ghasemnezhad*et al*., (2010); Ali *et al*., (2011); El- Miniawy*et al*., (2013)Hadwiger, (2013); Shao *et al.,* (2015); Malerbe and Cerana, (2016) and Hossain and Iqbal, (2016).

Conclusively, the best results with regard to yield and fruit quality of Succary mango trees grown under Aswan climatic conditions were obtained due to treating the trees twice at growth start and again just after setting with chitosan at 0.5%.

REFERENCES:

Ahmed, F. F. and Morsy, M. H. (1999): A new method for measuring leaf area in different fruit crops. *Minia of Agric. Res. & Develop*.. Vol. (19) pp. 97-105.

Ali, A., Muhammad, M.T.M., Sijam, K. and Siddiqui, Y., (2011): Effect of chitosan coatings on the physicochemical characteristics of Eksotika II papaya (*Carica papaya* L.) fruit during cold storage. *Food Chemistry*, 124(2), pp.620-626.

Amborabé, B.E., Bonmort, J., Fleurat-Lessard, P. and Roblin, G., (2008): Early events induced by chitosan on plant cells. J. Exp. Bot., 59(9).2317-2324.

A.O.A.C.(2000): Association of Official Agricultural Chemists. *Official Methods of Analysis*. 12th Ed., Benjamin Franklin Station, Washington D.C., U.S.A.pp.490-510.

Barka, E. A., Eullaffroy, P., Clément, C., and Vernet, G. (2004): Chitosan improves development, and protects *Vitisvinifera* L. against Botrytis cinerea. *Plant Cel Rep*., *22*(8), 608-614.

Borkowski, J. and Kowalczyk, W. (1999). Influence of tytanit and chitosan sprays and other treatments on the tomato plant growth and the development of powdery mildew (*Oidiumlycopersicum*. *Bull. Polish Acad. Sci*. Biology Sci., 47 (2-4): 129-132.

Chien, P. J., and Chou, C. C. (2006): Antifungal activity of chitosan and its application to control post-harvest quality and fungal rotting of Tankan citrus fruit (*Citrus tankan Hayata*). *J. of the Sci. of Food and Agric.*, *86*(12), 1964-1969.

Corradini, E., De Moura, M. R., and Mattoso, L. H. C. (2010): A preliminary study of the incorporation of NPK fertilizer into chitosan nanoparticles. Express Polymer Letters, 4(8), 509-515.

El-Miniawy, S., Ragab, M., Youssef, S., and Metwally, A. (2013): Response of strawberry plants to foliar spraying of chitosan. *Res. J. Agric. Biol. Sci*, 9(6), 366-372.

Feng, T., Du, Y., Li, J., Wei, Y., and Yao, P. (2007): Antioxidant activity of half N-acetylated water-soluble chitosan in vitro. *Eur Food Res Technol*, 225 (1), 133-138.

Ghasemnezhad, M., M.A. Shiri and M. Sanavi. (2010). Effect of chitosan coatings on some quality indices of apricot (*Prunusarmeniaca* L.) during cold storage. *Caspian J. Environm. Sci*., 8(1):25-33.

Górnil, K., Grzesik, M., &Romanowska-Duda, B. (2008): The effect of chitosan on rooting of grapevine cuttings and on subsequent plant growth under drought and temperature stress. *J. of Fruit and Ornamental Plant Res.16*, 333-343.

Hadwiger, L. A. (2013): Multiple effects of chitosan on plant systems: solid science or hype. *Plant Sci.*, 208, 42–49.

Hiscox, A. and Isralstam, B. (1979): A method for the extraction of chlorophyll from leaf tissue without maceration. *Can. J. Bot.,* 57: 1332 – 1334.

Hossain, M. S., and Iqbal, A. (2016): Effect of shrimp chitosan coating on postharvest quality of banana (*Musa sapientum* L.) fruits. *Inter. Food Res. J.*, 23(1), 277-283.

Jiang, Y., and Li, Y. (2001). Effects of chitosan coating on postharvest life and quality of longan fruit. *Food Chem.*, 73(2), 139-143.

Lane, J. H. and Eynon, L. (1965): Determination of reducingsugars by means of Fehlings solution with methyleneblue as indicator A.O.AC. Washington D.C.U.S.A. pp.490-510.

Malerbe, M., and Cerana, R. (2016). Chitosan Effects on Plant Systems. *Inter. J. Mol. Sci.*, 17(7), 996.

Márquez, C.J.; Cartagena, J.; Pérez-Gago, M.B. (2009): Effect of edible coatings on Japanese loquat (*Eriobotryajaponica*T.) postharvest quality. *Vitae.*, 16(3):304-310.

Mead, R.; Currnow, R. N. and Harted, A. M. (1993): *Statistical Methods in Agricultural and Experimental Biology*. 2nd Ed. Chapman and Hall, London pp. 10-44.

No, H. K., Meyers, S. P., Prinyawiwatkul, W., and Xu, Z. (2007): Applications of chitosan for improvement of quality and shelf life of foods: a review. *J. of Food Sci., 72*(5), R87-R100.

Shao, X., Cao, B., Xu, F., Xie, S., Yu, D., & Wang, H. (2015): Effect of postharvest application of chitosan combined with clove oil against citrus green mold. *Postharvest Biol. Technol.*, 99, 37-43.

Summer, M.E. (1985): Diagnosis and Recommendation Integrated System (DRIS) as a Guide to orchard fertilization. Hort. Abst 55 (8):7502

Vasconsuelo, A., Marí, A., and Boland, R. (2004): Signal transduction events mediating chitosan stimulation of anthraquinone synthesis in Rubiatinctorum. *Plant Sci.166* (2): 405-413.

Wilde, S. A.; Corey, R. B.; Lyer, J.G. and Voigt, G.K. (1985): *Soils and Plant Analysis for Tree Culture*. 3rd Ed. Oxford, IBH, New Delhi. 1-218.

Wojdyla, A. T. (2001). Chitosan in the control of rose disease-6-year-trials. *Bull. Polish Academy. Sci. Biolog. Sci.*, 49 (3) 233-252.

نظرة علي تأثير الشيتوسان علي النمو والاثمار فى اشجار المانجو السكرى

حسين حمدان محمد سعيد *- عصام محمد عبد الظاهر رضوان**
*قسم البساتين –كلية الزراعة والموارد الطبيعية –جامعة أسوان- مصر
**قسم البساتين –كلية زراعةالوادى الجديد–جامعة أسيوط- مصر

أجريت هذه الدراسة خلال موسمى **2015**، **2016** لإختبار تاثير رش الشيتوسان بتركيز **0.25** إلي **1**% عند رشه مرة، مرتين أو ثلاث مرات علي النمو، الحالة الغذائية للأشجار، كمية المحصول، وخصائص الجودة للثمار فى أشجار المانجو السكرى تحت الظروف المناخية لأسوان.

إن معاملة الأشجار مرة فى بداية النمو الخضرى، مرتين فى بداية النمو الخضرى وبعد مرحلة عقد الثمار مباشرة أو ثلاث مرات فى نفس الموعدين السابقين وبعد مرحلة عقد الثمار بشهر بالشيتوسان بتركيز **0.25** إلي **1**% يكون فعالا فى تحسين صفات النمو الخضرى، كلوروفيل أ، ب، الكلوروفيل والكاروتين الكلى والنيتروجين والفوسفور والبوتاسيوم والماغنسيوم والزنك والمنجنيز والحديد والنسبة المئوية للثمار الباقية علي الشجرة وكمية المحصول وخصائص الجودة الطبيعية والكيميائية للثمار وذلك مقارنة بمعاملة الكونترول وكان التحسن متوافقا مع الزيادة فى التركيز وعدد مرات الرش المستخدمة. وام تتأثر جميع الصفات تحت الدراسة برفع التركيز من **0.5** إلي **1**% ولا عدد مرات الرش من اثنين إلي ثلاث مرات.

التوصية: أمكن الحصول علي أفضل النتائج بخصوص كمية المحصول وخصائص الجودة للثمار فى أشجار المانجو السكرى تحت ظروف مطقة أسوان عند رش الأشجار مرتين فى بداية النمو الخضرى وبعد عقد الثمار مباشرة بالشيتوسان بتركيز **0.5**%.

الكلمات الدالة: الشيتوسان- المانجو السكرى– كمية المحصول – خصائص الجودة للثمار.