Impact of spraying chitosan and turmeric extract on fruiting of Flame seedless grapevines

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SUMMARY

During 2020 and 2021 seasons, Flame seedless grapevines were sprayed three times at growth start, just, after berry setting and one month later with chitosan at 0.025, 0.05 and 0.1% and turmeric extract at 0.1, 0.2 and 0.3% as single or combined application examining the effect of these treatments on growth, vine nutritional status, berry setting %, yield as well as berry colouration and quality. Single and combined applications of chitosan and turmeric extract had an obvious promotion on some growth aspects, vine nutritional status, berry setting, yield, berry colouration % and quality of the berry relative to the control treatment. Combined applications were superior than using each material alone.

Using chitosan was considerably favourable than using turmeric extract in improving some growth, vine nutritional status, berry setting, yield, berry colouration and berry quality. A slight promotion on these characteristics was observed among the higher two concentrations of chitosan namely 0.05 to 0.1% and turmeric extract namely 0.2 to 0.3. Carrying out spraying of a mixture chitosan at 0.05 % and turmeric extract at 0.2% at growth start, just after berry setting and one month later was responsible for improving yield and berry quality of Flame seedless grapevines grown under Minia region conditions

Keywords: Flame seedless grapevines, chitosan, turmeric extract, berry setting, berry colouration, yield.

INTRODUCTION

Abiotic stress caused by higher temporarily on Flame seedless grapevines grown under El- Minia environmental conditions resulted in poor yield and berry colourations. Many efforts were done for findings out the recent and non- traditional horticultural practices that are responsible for solving these defects. Out of these practices was the application of chitosan and turmeric extract an essential antioxidant required for the trees grown under unfavourable environmental conditions. Chitosan (acetyl glucosamine) is a natural biopolymer combined derived.

Therefore, the idea of using chitosan as a promising and new natural compound for overcoming of these problems was raised. Chitosan is considered a biopolymer produced from chitin and is very safe for human being. It has bioactivity and bio compatibility (Dias *et al*., 2013).

Using it in plants resulted in improving the yield and reducing transpiration (Mondal *et al*., 2012).

It is an important antioxidant and using it was accompanied with blocking oxygen species (ROS) and protecting the vines from their damages (Parl *et al*., 2004).

The plants subjected to chitosan are less prone of all biotic and abiotic stresses (Jabeen and Ahmad, 2013 and Pongrayoon *et al*., 2013).

It contains 2% of chitosan (Poly- Dgklucsamien) which is one of the most common polymers found in nature (Wojdyla, 2001).

Chitosan is structurally related to cellulose, which consists of long chain of glucose molecules linked to each other. In chitosan, the building block of the chain is slightly modified from of glucose (Wojdyla, 2001).

Moreover, plants treated with chitosan may be less prone to stress evoked by unfavourable conditions such as drought, salinity, low or high temperature (Lin *et al*., 2005; Liu et al., 2007; Xu *et al*., 2007 and Shao *et al*., 2015).

Turmeric is the dried rhizome of the plant curcuma Longa L. It is used in various industrial purposes, medicine, religious functions and as biopesticide. The genus curcuma belongs to the family Zingiberaceae and contains 49 genera and 1400 species. Turmeric is an erect perennial herb, grown as an annual crop. The above ground of the plant is an erect pseudostem bearing leaves and inflorescences (Govinarajan, 1980).

Turmwric is valued mainly for its principel a coloyuring pigments, curcumin which imparts the yellow colour to turmeric, besides nutritive contituents like potassium.

Curcumindemethocycucrumin, methone and bis-demethoxycurcumin together make the colouring pigments in the turmeric rhizomes (Peter, 1999).

The goal of this study as elucidating the effect of chitosan and/ or turmeric extract on growth aspects, vine nutritional status, berry setting %, yield, berry colouration % and quality of Flame seedlings grapes.

MATERIALS AND METHODS

This study was carried out during the two consecutive seasons of 2020 and 2021 on sixteen uniform in vigour own rooted 14 years old of grapevines cvs Flame seedless, grown in a private vineyard, situated at Talla village , Minia district, Minia Governorate, Egypt, where the texture of the soil is clay. Well drained and water table not less than two meters deep. All the selected vines are planted at 1.5 x 3.0 meters apart (888 vines/ fed.). The chosen vines were pruned during the last week of December in both seasons using sour pruning method. Vine load was 72 eyes for all the selected vines on the basis of (12 fruiting spurs x 5 eyes plus six replacement spurs x two eyes) using Gable supporting method. Surface irrigation system was followed using Nile water containing 160 ppm salinity.

Mechanical, physical and chemical analysis of the tested soil were carried out at the start of the experiment according to the procedures of Wilde *et al*., (1985) and the results are shown in the Table (1).

Table (1): Analysis of the tested vineyard soil

Parameters	Values	Parameters	Values
Particle size distribution		**Macronutrients**	
Sand %	8.5	Total N%	0.09
Silt %	14.0	P (ppm)	4.11
Clay %	77.5	K (ppm)	420
Texture grade	Clay	Mg (ppm)	6.15
pH (1:2.5 extract)	7.58	EDTA extractable micronutrients	
EC (1: 2.5 extract) mmhos/ 1 cm 25^{o}C	0.79	Fe (ppm)	1.15
M.O.%	2.11	Zn(ppm)	0.81
$CaCO_3$%	2.4	Mn (ppm)	1.99

Except these dealing with the present treatments (chitosan and turmeric extract), all the selected vines (60 vines) received the usual horticultural practices which are commonly used in the vineyard. This study included the following ten treatments from chitosan and turmeric extract.

1- Control.
2- Spraying chitosan at 0.025 % (1/4 g / L.)
3- Spraying chitosan at 0.05 % (1/2 g / L.)
4- Spraying chitosan at 0.1 % (1 g / L.)
5- Spraying turmeric extract at 0.1 % (1 g / L.)
6- Spraying turmeric extract at 0.2 % (2 g / L.)
7- Spraying turmeric extract at 0.3 % (3 g / L.)
8- Spraying chitosan at 0.025 % + turmeric extract at 0.1%.
9- Spraying chitosan at 0.05 % + turmeric extract at 0.2%.
10-Spraying chitosan at 0.1 % + turmeric extract at 0.2%.

Each treatment was replicated three times, two vines per each. The total vines selected for achieving this experiment was 60 vines. Chitosan and turmeric extract were sprayed three times at growth start (first week of March), just after berry setting (first week of Apr.) and at one month later (first week of May). Chitosan was sprayed amounts was dissolved in few drops of 0.1 N NaOH for facilitating the solubility. Triton B was added to 0.1% few drops of 0.1 N NaOHwas added to the known weights of chitosan to facilitate the solubility. Spraying was done till run off.

Randomized complete block design (RCBD) was followed.

Table (2): Chemical composition of turmeric extract (according to Shiyouet al., 2011)

Compounds	Values/ 100 g. D.W.	Compounds	Values 100 g. D.W.
β- Bisabolene %	1.3	α-Pinene %	0.1
1/8 – cineol %	2.4	Terpinolene %	0.3
P- cymene %	3.0	Tr- turmerone %	31.1
P- cymen-8- ol %	0.3	Turmerone %	10.0
Tr- curcumin %	6.3	Ascorbic acid (mg)	50.0
Curlone %	10.6	ASH (g)	6.8
Dehydrocucumin %	2.2	Calcium (g)	0.2
Myrcene %	0.1	Carbohydrate (g)	69.9
α-Phellandrene %	0.1	Fat (g)	8.9

During the two seasons, the following measurements were recorded:

- Shoot length (cm), number of leaves/ shoot (leaf) and leaf area $(cm)^2$ was calculated as a result of measuring the diameter of twenty mature laves from those apposite to the basal clusters on the main shoots according to Ahmed and Morsy, (1999).
- Leaf pigments namely chlorophyll a, chlorophyll b, total chlorophylls and total carotenoids (mg/ 1.0 g F.W.) according to Von- Wettstein, (1957).
- Percentages of N, P and K in the leaves (summer, 1985 and Chapman and Pratt, (1987).
- Berry setting %: It was calculated by caging five clusters per vine in perforated white peper bags

before blooming stage. At the end of berry setting stage. The bags were removed for counting the following : a-The number of attached berries , (b) The number of dropped berries (c) The number of dropped flowers , (d) the number of total flowers (a + b + c) per cluster. yield expressed in number of clusters per vine and weight (kg.) vine, cluster weight (g.) berry weight (g.) and dimensions (length and diameter in cm)

- Berry colouration %.
- Chemical characteristics of the berry namely T.S.S. % , total sugars % Lane and Eynon, (1965) and total acidity % as a tartaric acid /100 ml juice A.O.A.C., (2000). Also, TSS/ acid ratio was calculated.

Statistical analysis was done (according to Mead *et al*., 1993) treatment means were compared using new L.S.D. at 5%.

RESULTS AND DISCUSSION

Vegetative growth:

It is clear from obtained data Table (3) that treating the vines three times with chitosan and/ or turmeric extract significantly enhanced three shootlength, number of leaves per shoot and leaf area relative to the control. The promotion was associated with increasing concentrations of chitosan from 0.025 to 0.1% and turmeric extract from 0.1 to 0.3% combined applications of chitosan and turmeric extract significantly increased these growth aspects than using each material alone. Using chitosan was significantly superior than using turmeric extract in stimulating these growth traits. Increasing concentrations of chitosan from 0.05 to 0.1% and turmeric extract from 0.2 to 0.3% had no significant promotion on these growth traits.

The maximum values of shoot length (124.5, 125.0 cm) number of leaves/ shoot (27.0 , 28.0) and leaf area (127.2 , 127.8 cm^2) were recorded on the vines that received three sprays of a mixture of chitosan at 0.1% and turmeric extract at 0.3% during both seasons, respectively.

The untreated vines produced the minimum values of shoot length (112.0, 113.0 cm), number of leaves per shoot (17.0, 17.0 leaf) and leaf area (113.5, 114.0 cm^2) during both seasons, respectively.

These results were true during both seasons. The beneficial effect of chitosan on enhancing hormones the resistance to diseases, enzyme, antioxidants and microorganisms, levels of ABA which plays a key role in the regulation of water use due to the closure of stomata availability and uptake of water and essential nutrients through adjusting osmotic pressure in plant cells and in descending order water loss transpiration the accumulation of harmful free ridicules (Hadwiger *et al*., 2002) could explain the present results.

The results of chitosan are harmony with these found by (Hadwiger *et al*., 2002, Ewise *et al*., (2006) on sugar beet;Xu *et al*.,(2007);Hadwiger(2013); Saied and Radwan, (2017) on Succary mango trees and Khalil, (2021) on Flame seedless grapevines.

The essential roles of turmeric extracts on stimulating cell division, the biosynthesis of organic foods and the resistance of plants to all stresses (Singh *et al*., 2001).

Table (3): Effect of single and combined application of chitosan and turmeric extract on some vegetative growth characters as well as chlorophyll a and chlorophyll b of Flame seedless grapevines during 2020 and 2021 seasons

Treatment	Shoot length (cm.)		No. of leaves/ shoot		Leaf area $(cm)^2$		Chlorophyll a (mg/ 1.0 g F.W.)		Chlorophyll b (mg/ 1.0 g F.W.)	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Control	112.0	113.0	17.0	17.0	113.5	114.0	1.77	1.81	1.11	1.13
Spraying chitosan at 0.025 %	118.5	119.0	21.0	21.0	118.2	119.0	1.95	1.98	1.21	1.22
Spraying chitosan at 0.05 %	121.0	122.2	22.5	23.0	122.0	122.2	2.01	2.03	1.29	1.30
Spraying chitosan at 0.1 %	121.5	123.0	23.5	24.0	122.7	123.0	2.03	2.05	1.31	1.31
Spraying turmeric extract at 0.1%	114.0	114.0	18.0	19.0	115.0	115.5	1.83	1.88	1.14	1.16
Spraying turmeric extract at 0.2%	117.0	117.5	20.0	20.5	117.5	118.0	1.92	1.95	1.19	1.20
Spraying turmeric extract at 0.3%	118.2	119.0	20.5	21.0	118.2	118.8	1.96	1.99	1.22	1.23
Spraying chitosan at 0.025 %+ turmeric extract at 0.1%.	121.0	121.3	23.0	24.0	122.0	123.2	2.01	2.04	1.29	1.29
Spraying chitosan at 0.05% + turmeric extract at 0.2%.	123.2	124.0	26.5	27.0	126.4	127.0	2.13	2.16	1.36	1.37
Spraying chitosan at 0.1% + turmeric extract at 0.3%	124.5	125.0	27.0	28.0	127.2	127.8	2.15	2.18	1.38	1.39
New L.S.D. at 5%	1.1	1.0	1.1	1.1	1.2	1.1	0.06	0.05	0.03	0.02

Leaf chemical composition:

Data in Tables (3,4) obviously reveal that varying chitosan and turmeric treatments significantly altered the leaf chemical composition namely chlorophyll a, chlorophyll b, total chlorophylls, total carotenoids, N, P and K in the leaves rather single and combined applications

significantly were responsible for enhancing these leaf chemical composition relative to the control was a gradual promotion on leaf chemical composition with increasing concentrations of chitosan from 0.025 to 0.1% and turmeric extract from 0.1 to 0.3%. Using turmeric extract was significantly preferable than using chitosan in enhancing these leaf chemical composition. Using both materials together significantly increased these leaf pigments and nutrients combined to using material alone in enhancing these leaf chemical composition.

Table (4): Effect of single and combined application of chitosan and turmeric extract on total chlorophylls, total carotenoids and percentages of N, P, and K in the leaves of Flame seedless grapevines during 2020 and 2021 seasons

Treatment	Total chlorophylls (mg/ 1.0 g F.W.)		Total carotenoids (mg/ 1.0 g F.W.)		Leaf N %		Leaf P %		Leaf K %	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Control	2.88	2.94	1.20	1.21	1.66	1.67	0.16	0.17	1.16	1.17
Spraying chitosan at 0.025 %	3.16	3.20	1.29	1.30	1.75	1.75	0.25	0.26	1.25	1.26
Spraying chitosan at 0.05 %	3.30	3.33	1.36	1.37	1.79	1.82	0.33	0.34	1.31	1.33
Spraying chitosan at 0.1 %	3.34	3.36	1.38	1.39	1.81	1.85	0.36	0.37	1.33	1.34
Spraying turmeric extract at 0.1%	2.97	3.04	1.22	1.23	1.68	1.69	0.19	0.19	1.19	1.21
Spraying turmeric extract at 0.2%	3.17	3.15	1.27	1.28	1.73	1.74	0.23	0.24	1.23	1.25
Spraying turmeric extract at 0.3%	3.18	3.22	1.29	1.30	1.75	1.76	0.24	0.26	1.25	1.26
Spraying chitosan at 0.025 %+ turmeric extract at 0.1%.	3.30	3.33	1.28	1.39	1.82	1.86	0.35	0.37	1.33	1.35
Spraying chitosan at 0.05% + turmeric extract at 0.2%.	3.49	3.52	1.44	1.45	1.92	1.95	0.41	0.42	1.39	1.41
Spraying chitosan at 0.1% + turmeric extract at 0.3%	3.53	3.57	1.46	1.47	1.94	1.98	0.41	0.43	1.40	1.42
New L.S.D. at 5%	0.07	0.06	0.04	0.03	0.07	0.06	0.02	0.03	0.05	0.06

No significant differences were observed on these leaf chemical composition among the higher two concentrations of chitosan namely 0.05 and 0.1% and turmeric extract from 0.2 and 0.3 %. Treating the vines with chitosan at 0.1 % and turmeric extract at 0.3% gave the maximum values of chlorophyll a (2.15, 2.18 mg/ 1.0 g F.W.), chlorophyll b (1.38 , 1.39 mg/ 1.0 g F.W.), total chlorophylls (3.53, 3.57 mg/ 1.0 g F.W.), total carotenoids (1.46 , 1.47 mg/ 1.0 g F.W.,N (1.94, 1.98%), P (0.41, 0.43%) and K (1.40, 1.42 %) during both seasons respectively. The lowest values were recorded on untreated vines.

Table (5): Effect of single and combined application of chitosan and turmeric extract on the percentages of berry setting, yield as well as cluster weight of Flame seedless grapevines during 2020 and 2021 seasons

Treatment	Berry setting %		No. of clusters / vine		Cluster weight (g.)		Yield per vine (kg.)	
	2020	2021	2020	2021	2020	2021	2020	2021
Control	9.3	9.4	25.0	25.0	345.0	348.0	8.6	8.7
Spraying chitosan at 0.025 %	10.6	10.6	26.0	28.0	375.0	378.0	9.8	10.6
Spraying chitosan at 0.05 %	11.0	11.1	26.0	29.0	390.0	395.0	10.1	11.4
Spraying chitosan at 0.1 %	11.2	11.3	26.0	30.0	395.0	400.0	10.3	12.0
Spraying turmeric extract at 0.1%	9.9	10.0	26.0	26.0	350.0	355.0	9.1	9.3
Spraying turmeric extract at 0.2%	10.4	10.5	26.0	27.0	368.0	370.0	9.6	9.9
Spraying turmeric extract at 0.3%	10.6	10.7	27.0	28.0	372.0	375.0	10.0	10.5
Spraying chitosan at 0.025%+ turmeric extract at 0.1%.	11.2	11.4	26.0	30.0	390.0	395.0	10.1	11.8
Spraying chitosan at 0.05% + turmeric extract at 0.2% .	12.6	12.7	26.0	32.0	405.0	408.0	10.5	13.0
Spraying chitosan at 0.1% + turmeric extract at 0.3%	12.9	13.0	26.0	33.0	408.0	410.0	10.6	13.4
New L.S.D. at 5%	0.4	0.3	NS	1.0	8.7	8.5	0.3	0.6

Similar results were announced during 2020 and 2021 seasons. The enhancing effect of chitosan on uptake of water and different nutrients surely reflected on enhancing the biosynthesis of plant

pigments and nutrients (Hadwiger *et al*., 2002). The promotion effect of chitosan on leaf chemical composition was supported by (Hadwiger *et al*., (2002); Ewaise, *et al*., (2006) on sugar beet; Xu *et al*., (2007); Hadwiger, (2013); Saied and Radwan, (2017)on Succary mango treesand Khalil, (2021) on Flame seedless grapevines.

The higher content of these plant extracts from nutrients could explain the present results (Giovanni *et al*., 2012). Also, these results are in harmony with these obtained by Abdelaal and Aly (2013) on Ruby seedless grapevines, Abada, (2014) on Thompson seedless grapevines; Osman, (2014) on Superior grapevines and Uwakiem, (2014) on Thompson seedless grapevines.

The percentage of berry setting, yield and cluster weight:

Data concerning the effect of single and combined applications of chitosan and turmeric extract on the percentage of berry setting, yield and cluster weight of Flame seedless grapevines during 2020 and 2021 seasons are shown in Table (5). The evident from the obtained data that supplying the vines with chitosan at 0.025 to 0.1% and/ or turmeric extract at 0.1 to 0.3% significantly was followed by improving berry setting %, yield expressed in weight (kg.) and number of cluster per vine and cluster weight relative to the control treatment.

There was a progressive promotion on these parameters with increasing concentrations of each material. Significant differences on these parameters were observed between all concentrations and materials except among the higher two concentrations of each material, therefore from economical point of view it is necessary to use the material (Chitosan and Turmeric extract). Combined were favourable than using each material alone in this respect. Using chitosan significantly preferable than using turmeric extract in improving berry setting % yield and cluster weight.

From economical point of view using chitosan at 0.05 % and turmeric extract at 0.2% resulted in the highest yield. Under such promised treatment yield per vine reached 10.6, 13.4 kg during both seasons, respectively. The untreated vine gave the lowest yield reached (8.6 and 8.7 kg) during both seasons, respectively.

The percentage of increment on the yield due to application of the previous treatment over the check treatment reached 23.3 and 54.0 %during both seasons, respectively. These results were nearly the same during both seasons. The promoting effect of chitosan on berry setting, yield and cluster weight was emphasized by Ab-delaal *et al.,* 2012and Khalil, (2021) on Flame seedless grapevines.

The percentage of berry colouration:

Table (6) show the effect of single and combined applications of chitosan and turmeric extract on the percentage of berry colouration of Flame seedless grapevines during 2020 and 2021 seasons.

It is revealed from the obtained data that subjecting Flame seedless grapevines to chitosan at 0.025 to 0.1% and/ or turmeric extract at 0.1 to 0.3% significantly enhanced berry colouration relative to the control treatment.

Table (6): Effect of single and combined application of chitosan and turmeric extract on the percentages of berry colouration and some physical characteristics of the berry of Flame seedless grapevines during 2020 and 2021 seasons

Treatment	Berry colouration %		Av. Berry weight (g.)		Av. Berry length (cm)		Av. Berry diameter	
	2020	2021	2020	2021	2020	2021	2020	2021
Control	70.0	70.8	3.32	3.35	2.14	2.15	1.89	1.90
Spraying chitosan at 0.025 %	77.1	78.0	3.55	3.60	2.23	2.24	2.02	2.04
Spraying chitosan at 0.05 %	80.2	81.9	3.71	3.74	2.31	2.32	2.08	2.09
Spraying chitosan at 0.1 %	82.2	82.8	3.76	3.77	2.33	2.34	2.09	2.10
Spraying turmeric extract at 0.1%	73.2	74.0	3.40	3.41	2.16	2.17	1.92	1.93
Spraying turmeric extract at 0.2%	76.5	77.0	3.52	3.55	2.21	2.22	1.99	1.99
Spraying turmeric extract at 0.3%	77.0	78.2	3.56	3.58	2.22	2.24	2.02	2.03
Spraying chitosan at 0.025 %+ turmeric extract at 0.1%.	83.0	83.5	3.75	3.76	2.33	2.34	2.09	2.09
Spraying chitosan at 0.05% + turmeric extract at 0.2%.	90.0	91.2	3.84	3.85	2.37	2.38	2.13	2.14
Spraying chitosan at 0.1% + turmeric extract at 0.3%	92.0	93.1	3.88	3.90	2.38	2.40	2.14	2.15
New L.S.D. at 5%	0.8	0.9	0.04	0.05	0.05	0.06	0.03	0.04

Using chitosan was significantly superior than using turmeric in enhancing berry colouration.A mixture of chitosan and turmeric extract was significantly preferable in enhancing berry colouration than using material alone. Meaningless

promotion on berry colouration was observed among the higher two concentrations of each material.

A progressive promotion was noticed with increasing concentrations of each material. The berry coloration reached the highest values (92.0, 93.1 %) in the vines that received both materials together at the higher concentration. The lowest berry colouration (70.0, 70.8%) was occurred on the untreated vines during both seasons, respectively. These results were true during both seasons.

The results of berry colouration are in the same line with the present results concerning the effect of chitosan on enhancing berry colouration (Hadwigeret al., 2002, Ewaise *et al*., (2006) on sugar beet ;Xu *et al*., 2007 and Khalil, (2021) on Flame grapevines.

The higher control of these plant extracts from nutrients, vitamins, hormones and amino acids in balanced rate (Kamra *et al*., 2012).

These results are in accordance with those obtained by (Abdelaal and Aly, (2013) and Gad El- Kareem and Abd El- Rahman, (2013) On Ruby seedless grapevines

Some physical and chemical characteristics of the berry:

Data in Tables (6, 7) show the effect of single and combined applications of chitosan and turmeric extract on berry weight and dimensions (length and diameter), TSS %, total sugars %, total acidity % and TSS/ acid ratio in the berry of Flame seedless grapevines during 2020 and 2021 seasons.

Table (7): Effect of single and combined application of chitosan and turmeric extract on some chemical characteristics of berry of Flame seedless grapevines during 2020 and 2021 seasons

Treatment	T.S.S. %		Total sugars %		Total acidity %		T.S.S. / acid ratio	
	2020	2021	2020	2021	2020	2021	2020	2021
Control	18.2	18.4	16.1	16.5	0.690	0.690	26.3	26.7
Spraying chitosan at 0.025 %	19.2	19.4	17.2	17.5	0.650	0.650	29.5	29.8
Spraying chitosan at 0.05 %	20.2	20.5	18.1	18.6	0.625	0.620	32.3	33.1
Spraying chitosan at 0.1 %	20.6	20.7	18.5	18.7	0.615	0.610	33.5	33.9
Spraying turmeric extract at 0.1%	18.4	18.5	16.5	16.4	0.680	0.678	27.1	27.3
Spraying turmeric extract at 0.2%	18.8	18.9	16.9	16.9	0.660	0.655	28.5	28.9
Spraying turmeric extract at 0.3%	19.3	19.4	17.4	17.3	0.655	0.650	29.5	29.8
Spraying chitosan at 0.025 %+ turmeric extract at 0.1%.	20.6	20.7	18.5	18.6	0.620	0.615	33.2	33.7
Spraying chitosan at 0.05% + turmeric extract at 0.2%.	21.0	21.2	19.0	19.1	0.590	0.585	35.6	36.2
Spraying chitosan at 0.1% + turmeric extract at 0.3%	21.2	21.3	19.1	19.2	0.585	0.580	36.2	36.7
New L.S.D. at 5%	0.3	0.4	0.3	0.3	0.015	0.016	0.9	0.9

It is clear from the obtained data that treating Flame seedless grapevines three times with chitosan at 0.025, 0.05 and 0.1% and / or turmeric extract at 0.1, 0.2 and 0.3% significantly was favourable than the control treatment in improving quality of the berry in terms of increasing weight, length and diameter of berry, TSS%, total sugars % and TSS/ acid ratio and decreasing total acidity % relative to the check treatment. The promotion on quality of the berry was related to the increase in concentrations of chitosan and turmeric extract without significant promotion among the higher two concentrations of chitosan and turmeric extract. Using chitosan significantly was preferable than using turmeric extract in enhancing physical and chemical properties of the berry .These results regarding the promoting effect of chitosan on berry quality are in harmony with those obtained by (Hadwiger *et al*., 2002; Ewaise *et al*., (2006); Xu *et al*., 2007; Hadwiger, 2013; Saied and Radean, (2017) on Succary mangoand Khalil, (2021) on Flame seedless grapevines.

The beneficial effects of these plant extracts on advancing maturity explained these results. This effect was attributed to the higher content of these plant extracts on sugars, boron, magnesium, sulphur and essential amino acids (Dhekney, 2016).

These results are in concordance with those obtained by (Abdelaal and Aly, 2013 and Gad El-Kareem;Abd El- Rahman, (2013) on Ruby grapevines;Abada(2014) on Thompson seedless grapevines and Ahmed *et al*., 2016) on Superior grapevines.

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الملخص العربى

تأثير رش الشيتوزان ومستخلص الكركم عى الاثمار فى العنب الفليم سيدلس

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خلال موسمى ٢٠٢٠و ٢٠٢١ تم رش كرمات العنب الفليم سيدلس ثلاثة مرات فى بداية النمو وبعد العقد مباشرا وبعد العقد بشهر بكلا من الشيتوزان بتركيز ٠.٠٢٥ ، ٠.٠٥ و ٠.١% مع أو بدون مستخلص الكركم بتركيز ٠.١ و ٠.٢ و ٠.٣% وكان الهدف هو دراسة تاثير هذه المعاملات على بعض صفات النمو والحالة الغذائية للكرمات ونسبة العقد وكمية المحصول وكذلك نسبة تلوين الحبات وجودة الحبات.

وكان الاستخدام الفردى والمشترك للشيتوزان بتركيز من ٠.٠٢٥ الى ٠.١% ومستخلص الكركم بتركيز من ٠.١ الى ٠.٣% أدى الى تحسين بعض الصفات الخضرية والحالة الغذائية لكرمات ونسبة عقد الحبات وكمية المحصول ونسبة تلوين وجودة الحبات وذلك مقارنة بمعاملة الكونترول.

الاستخدام المشترك من المادتين كان أفضل من الاستخدام الفردى للمادة الواحدة فى هذا الصدد.

استخدام الشيتوزان بتركيز من ٠.٢٥ الى ٠.١% أفضل الى حد كبير من استخدام مستخلص الكركم بتركيز من ٠.١ الى ٠.٣% فى تحسين بعض صفات النمو والحالة الغذائية للكرمات ونسبة العقد وجودة الحبات .

لوحظ فروق طفيفة وغير معنوية على هذه الصفات بين التركيزين الاعلى من الشيتوزان وهى ٠.٠٥% و ٠.١% ومستخلص الكركم بين ٠.٢ و ٠.٣%.

لأجل تحسين كمية المحصول وخصائص جودة الحبات فى كرمات العنب الفليم سيدلس النامية تحت ظروف منطقة المنيا فانه ينصح برش الكرمات ثلاثة مرات بمخلوط من الشيتوزان بتركيز ٠.٠٥ % ومستخلص الكركم بتركيز ٠.٢% فى بداية النمو وبعد عقد الحبات مباشرة وبعد عقد الحبات بشهر.

الكلمات الدالة: العنب الفليم سيدلس- الشيتوزان – مستخلص الكركم- عقد الحبات -الحبات الملونة- المحصول.