The Future of Biology

FSA

Article

Impact of Applying Mixture of Plant Extract and Chitosan on Productivity and Quality of Early Sweet Grapevines

Mohamed Ahmed El-Sayed and Mahmoud Nageh Awni Abd El-Hady*

Hort. Dept., Fac. of Agric., Minia Univ., Egypt.

*Corresponding author: mahmoudnageh485@gmail.com

Abstract: Table grapes (*Vitis vinifera*) of the cultivar "Early Sweet", which was cultivated in a privet grapevine located at Al Sarririyyah Village, East Samalut, Minia Governorate, was sprayed with different concentration of mixture of plants extract and chitosan thrice, at the onset of growth, immediately after berry set, and one month later during 2023-2024. In an experimental conducted in a randomized block design, with 30 vines duplicated 3 times and contained concentrations of 0.05, 0.1 and 0.2% from mixture of plant extract (turmeric, garlic and green tea) and/or chitosan individually or in combination to become 12 treatments. Treated vines showed foliar application with chitosan was more superior than plant extract, while sprinkle with plants extract at 0.1%+chitosan at 0.1% registered the economical and highest values for studied parameters as cluster aspects, yield and berries physio-chemical quality under the same conditions.

Key words: Plant extract, turmeric, garlic, green tea, chitosan and Early sweet grapevines.

Future Science Association

Available online free at
www.futurejournals.org

Print ISSN: 2572-3006

Online ISSN: 2572-3111

DOI:
10.37229/fsa.fjb.2024.12.26

Received: 1 November 2024
Accepted: 15 December 2024
Published: 26 December 2024

Publisher's Note: FA stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

Grapes (*Vitis vinifera* L.) are fruiting berries produced by deciduous woody vines that belong to the family Vitaceae. Grapes occupy a significant position among perishable fruits due to their exceptional taste, nutritional value, and versatile use globally (**Ali *et al.*, 2021**). Various grape species are cultivated in numerous countries, albeit on a limited scale, playing a crucial role in the development of food products for human consumption. The rising food demand of the human population has prompted scientists to enhance grape yield productivity to address global food requirement challenges (**Babalık *et al.*, 2020**). Additionally, grapes are regarded as one of the most significant horticultural commodities for export. The quantity of this product is approximately 3% of the total horticultural export, while its export value is approximately 10%. The quantity of Egyptian grapes exported annually has reached approximately 131 thousand tons, and it is anticipated that this figure will rise in the future (**M.A.L.R., 2019**).

The marketing procedure of table grapes worldwide is significantly influenced by the quality of the berries. Mineral fertilizers

are frequently employed by producers to augment the size of the fruit, which has resulted in certain health issues. Nevertheless, some of them are still in use because of their significant contribution to the increase in fruit diameters, which in turn results in a higher yield. Consequently, it is imperative to pursue safer alternative agricultural practices in order to achieve this objective. One such approach is the application of bio-stimulants and natural plant extracts as supplements to enhance grape productivity and decrease the use of chemical fertilizers (**Yaseen *et al.*, 2020; Bedrech and Farroh, 2022; Masoud *et al.*, 2024**).

Plant-derived bio-stimulants improve photosynthesis, plant growth, quality, and tolerance to abiotic and biotic stresses, while enhancing resource use efficiency (fertilizers, nutrients, and water) through the modulation of biochemical, molecular, and physiological processes in plants (**Zulfiqar *et al.*, 2019; Rouphael and Colla, 2020**). Garlic is a widely utilized extract known for its stimulating and antifungal qualities. This extract is recognized for its excellent nutritional value, containing about 200 biological constituents, including antioxidants and vitamins (**Mohamed *et al.*, 2020**). Organosulfur compounds, including allicin, diallyl disulfide, and diallyl trisulfide, exhibit potent antioxidant properties (**Ali *et al.*, 2019**). Previous studies indicated that the application of plant extracts, particularly turmeric, enhanced the growth, yield, and quality of grapes. This effect is attributed to the presence of antioxidant phenolic compounds, volatile components, fats, proteins, nutrients, tannins, plant pigments and various organic compounds, (**Refaai and Silem, 2021; Abada *et al.*, 2023**). Green tea extract, which derived from the leaves of Camellia sinensis L. is a rich source of bioactive substances, including amino acids, vitamins, catechins, epicatechin, epigallocatechin, epigallocatechin gallate, lignans, saponins, polysaccharides, triterpenoid, and caffeine (**Lee *et al.*, 2014**). Additionally, it contains phenolic compounds, including flavonoids. These substances enhance the activity of plant cells and mitigate the effects of reactive oxygen species (**Grohar, 1992**). Additionally, the application of green tea extract to table grapes effectively enhanced the quality of the fruit by reducing total acidity, increasing total sugars, and reducing T.S.S. (**Abada, 2014). Ghasemifar and Saeidian (2014**) discovered that the stabilization and enhancement of anthocyanins can be achieved by incorporating catechins into red grape juice. Consequently, the anthocyanins may accumulate more readily and the green tea extract may be stabilized.

Chitosan is a naturally occurring compound that is commercially derived from seafood shells. This method has been employed to activate the defense mechanisms in both pre- and post-harvest fruits and vegetables against fungi, bacteria, viruses, and various abiotic stresses. Chitosan enhances the physiological properties of plants and extends the shelf life of post-harvest produce (**Sharif *et al.*, 2018**).

This study was undertaken to elucidate the advantageous effects of various plant extracts (turmeric, garlic, and green tea), particularly when utilized in conjunction with chitosan at different concentrations, on the vegetative growth, yield, and fruiting quality of Early Sweet grapevines in the context of Minia governorate.

2. Materials and Methods

2.1. Experimental site

An experiment was conduct across consecutive seasons in 2023 and 2024 on the "Early Sweet" cultivar, which was cultivated in a privet grapevine located at Al Sarririyyah Village, East Samalut, Minia Governorate. Planting grapevines at a distance of 2 x 3 meters. In a complete randomized block design, thirty standardized grapevines were chosen, which were healthy vines and near uniform in growth vigor. The grapevines were pruned using a cane training system, which involved 6 cane spurs X 10 bud plus 6 renewal spurs X 2 bud per vine. Consequently, the total number of buds remaining on each vine was 72.

The physical and chemical analysis of the tested soil is presented in Table A according to **Wilde *et al.* (1985),** with a water table depth of approximately 2m, alongside the implementation of a surface irrigation system using Nile water.

All vines underwent the usual agricultural techniques implemented in the vineyard, encompassing irrigation, fertilizer application, and management of pests and diseases over the two examined seasons.

Table (A). Examination of the analyzed soil

Soil characters		2023/2024
Particle size distribution (%)	Sand	32.47
	Silt	45.21
	Clay	22.32
	Texture class	Loamy
EC ppm (1:2.5 extract)		251
pH (1:2.5 extract)		8.11
Organic matter %		1.74
$CaCO_3$ %		2.10
Soil nutrients	Total N (%)	0.12
	Available P (ppm)	5.45
	Available K (ppm)	459.5
	Zn (ppm)	3.95
	Fe (ppm)	3.32
	Mn (ppm)	2.84
	Cu (ppm)	0.42

2.2. Experimental treatments

This study aimed to evaluate the impact of Early Sweet grapevines subjected to foliar application of varying concentrations of chitosan and a mixture of natural plant extracts, comprising ten treatments with three duplicates of chitosan and mixture of natural plant extract (turmeric, garlic and green tea extracts) either alone or in combination as following:

1. Control (spray with tap water).
2. Plant extract (0.05%).
3. Plant extract (0.1%).
4. Plant extract (0.2%).
5. Chitosan (0.05%).
6. Chitosan (0.1%).
7. Chitosan (0.2%).
8. Plant extract (0.05%)+chitosan (0.05%).
9. Plant extract (0.1%)+chitosan (0.1%).
10. Plant extract (0.2%)+chitosan (0.2%).

Both of the plant extracts namely (turmeric, garlic and green tea extracts) and chitosan were applied in three dosages: at the onset of growth, immediately following berry set, and one month thereafter.

Chitosan was diluted in a few drops of 0.1 N NaOH to enhance its solubility. Triton B was incorporated into 0.1%, and a few drops of 0.1 N NaOH were added to the measured quantities of chitosan to enhance solubility. Application was conducted until runoff occurred.

2.3. Preparation of studied extracts

Turmeric, garlic, and green tea were prepared by soaking 0.5, 1, or 2 g powder of each substance in one liter of distilled water for 24 hours at 25°C in a well-lit room. The resulting concentrations were

0.05, 0.1, and 0.2%. A cheesecloth was used to filter the solutions after soaking, and the filtrate was then collected to produce the final water extract. The designated vines were subjected to three sprays of each substance at the onset of growth (1st of March), immediately following berry setting (mid-April), and four weeks later (mid-May).

Table (B). Turmeric extract chemical analysis according to (Li *et al.*, 2011)

Compounds	Values /100 g . D.W.)	Compounds	Values /100 g . D.W.)
β- bisabalene %	1.3	α- pinene %	0.1
1, 8 – cineol %	2.4	Terpinolene %	0.3
p- cyemen %	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
Dehydrocurcumin %	2.2	Calcium (g)	0.2
Myrecen %	0.1	Carbohydrate (g)	69.9
α- phellanmdrene %	0.1	Fat (g)	8.9

Table (C). Garlic extract chemical analysis o according to (Dhekney, 2016)

Compounds	Values (mg/ 100 g D.W.)	Compounds	Values (mg/ 100 g D.W.)
Dipropyl disulfide	0.25	Bis- (1- propenyl)- sulfide	0.08
Diallyl disulfide	37.90	Diallyl sulfide	6.59
Dimethyl trisulfide	0.33	Dimethyl disfulide	0.15
Dimethyl thiophene	0.08	Allyl methyl tetrosulfide	1.07
Allyl methyl disulfide	3.69	Allyl propyl trisulfide	0.23
Methyl propyl disulfide	0.25	Diallyltusuflide	28.06
Methyl 1- propenyl disulfide	0.46	Eugenal	0.23
Allylpripyl sulfide	0.09		

Table (D). Green tea extract chemical analysis o according to (Lee *et al.*, 2014)

Constituent	Values /100 g . D.W.)	Constituent	Values /100 g . D.W.)
Total carbohydrates	11.0 g	Zn	41.0 ppm
Total fats	0.4 g	Fe	51.0 ppm
Favonoides	0.3 g	Mn	60.0 ppm
Tannins	2.9 g	Coneshin	0.7 g
Flour	20.0 mg	Thiamine	110.0 mg
N	1.19 g	Vitamin A	90.0 mg
P	0.24 g	Vitamin B	74.1 mg
K	1.0 g	Vitamin C	120.0 mg
Mg	0.5 g	Coffeic acid	315.0 mg

2.4. Measurements

Throughout both seasons of investigation, the following measurements were documented:

- Characteristics of clusters and yield: Four clusters /vine were harvested at the ripening stage to determine the following data: number of cluster/vine, cluster weight (g), length (cm), shoulder (cm), yield (kg)/vine was assessed in kg for each tree/replicate by multiply the cluster number and weight and berry setting (%) was computed as the following: Five flower clusters were packaged per vine in perforated paper bags prior to blooming, which are released during berry set, calculated as follows:

$$\text{Fruit berry Setting\%} = \frac{\text{Number of berries /cluster}}{\text{Total number of flower /cluster}}$$

- Physical characteristic of the berry: The shot berry proportion was calculated by dividing the percentage of berries in each cluster by the total number of berries in all clusters, then multiplying by 100, berry weight (g) and dimensions (longitudinal and equatorial).

- Chemical characteristics of berries according to (**A.O.A.C, 2000**): A hand refractometer used to measure TSS% in berry. Titrating 5 ml of berry juice against 0.1 N NaOH with phenolphthalein determined the titratable acidity percentage. TSS/acidity ratio of berry juice was calculated and total sugar%.

2.5. Statistical analysis

All collected data were organized into tables and statistically analyzed using the methodology of **Mead *et al.* (1993**), with treatment averages compared using the new LSD test at a significance level of 5%.

3. Results and Discussion

The Early Sweet grapevines were sprayed with a mixture of plant extract (turmeric, garlic, and green tea) and chitosan at varying rates (0.05, 0.1, and 0.2% for each). During the 2023 and 2024 seasons, examined specific aspects of physical and chemical state of berries, yield and cluster components.

3.1. Cluster aspects and yield

The effects of foliar spraying "Early Sweet" grapevines with plant extracts (green tea, turmeric, and garlic) and chitosan at various levels on cluster parameters and yield in 2023 and 2024 were compared to the untreated vines in terms of cluster number, cluster weight, yield (kg)/vine, berry setting%, length, and width are presented in Table (1).

The application of plant extracts and/or chitosan markedly enhanced the yield (kg/vine) compared to the control treatment (Table 1). Utilizing chitosan was markedly more advantageous than employing a blend of plant extracts in enhancing the yield and cluster aspects. Utilizing all materials collectively was superior to employing each group independently in this regard. The optimal outcomes were achieved on the vines subjected to combination treatments. Untreated vines yielded the lowest values. The examined treatments exhibited no impact at the two highest concentrations. From an economic perspective, the application of plant extracts at 0.1% combined with chitosan at 0.1% on Early Sweet grapevines yielded optimal results. With the promised treatment, the cluster number, cluster weight, yield (kg)/vine, berry setting%, length, and width were increased to (29.0-44.0), (507.1-512.6 g), (14.5-21.2 kg), (20.0-20.9%), (22.4-23.0 cm) and (16.0-16.1 cm), respectively. It could be noticed that yield in the second season, nearly doubling, and cluster number was in significant in the 1st season with a contestant number. Whereas untreated vines yielded (29.0-31.0), (450.0-455.0 g), (13.1-14.1 kg), (10.5-10.6 %), (17.2-17.4 cm) and (13.0-13.4 cm) in both seasons, respectively. The same trend was happened during two seasons.

The total yield per vine and the weight of clusters were positively impacted by chitosan. This is likely due to the fact that chitosan has the ability to reduce the loss of water from the outer membrane of berries. **Shiri *et al.* (2013)** reported that chitosan coatings assist in the regulation of respiration rate and ethylene production, which in turn reduces transpiration, controls weight loss, slows down maturation, and extends the shelf life. The increment in cluster aspects and yield associated with chitosan application as indicated by **Ali *et al.* (2023) and Masoud *et al.* (2024).**

The elevated levels of amino acids, vitamins, nutrients, and hormones in these plant extracts, as reported by **Kamra *et al.* (2012**), resulted in an increase in yield and its components. The increased concentration of limonene, eugenol, protocatechuic acid, caffeic acid, carotene, niacin, thiamin, turmerone, ascorbic acid, coumaric acid and curcumin as well as antioxidants such as zingiberene,

curdioen, bomeal, terpineol, cymene, riboflavin, and methoxy cinnamic acid in turmeric extract may explain its beneficial effect on Thompson seedless grapevine fruiting (**Ammon and Wehl, 1991**). The plant extracts from green tea, garlic cloves, and turmeric have a high concentration of nutrients, pigments, and antioxidants. This concentration encourages organic compound biosynthesis and cell division, which in turn increases the soil's mineral absorption, which in turn increases the mineral content of the leaves. The plant extracts have a favorable impact on nutrient status and tree growth, leading to the generation of more fruits (**Srimal, 1997 and Bruneton, 2001**). The application of garlic cloves extract to Earl Sweet grapevines has resulted in a substantial improvement in the quantitative characteristics of yield. This is likely due to the fact that the extract contains macro and micronutrients that enhance metabolic and vital activities, as well as numerous compounds such as carbohydrates, proteins, and vitamins that are transmitted to the fruits and contribute to their weight and size. Additionally, garlic clove extract secretes the auxin hormone, which promotes plant growth and cell division (**Pacurar and Krejci, 2010**). This results in an increase in the total chlorophyll content and leaf area. The findings of the current investigation regarding the influence of different plant extract on yield and cluster characteristics align with those of **El-Senosy *et al.* (2021); Refaai and Silem (2021) and Abd El-Hakim (2023)** using turmeric extract. Also, **Akl *et al.* (2017) and El-Senosy *et al.*, (2021)** using garlic extract. Moreover, **Abdel Aal *et al.* (2021) and El-Senosy *et al.* (2021**) using green tea.

Table (1). Early Sweet grape vines' cluster characteristics and yield (kg)/vine as affected by foliar spraying with some plant extract and chitosan across 2023 and 2024 seasons

Characteristics / Treatments	Cluster number/vine		Cluster weight (g)		Yield/vine (kg)		Berry setting %		Cluster length (cm)		Cluster width (cm)	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
Control	29.0	31.0	450.0	455.0	13.1	14.1	10.5	10.6	17.2	17.4	13.0	13.4
Plant extract (0.05%)	29.0	34.0	471.2	475.2	13.7	16.2	14.6	14.8	20.1	20.5	14.5	14.8
Plant extract (0.1%)	29.0	38.0	482.2	485.2	14.0	18.4	15.9	16.9	20.7	21.2	15.0	15.2
Plant extract (0.2%)	29.0	40.0	489.3	493.6	14.2	12.7	17.1	18.3	21.1	21.7	15.2	15.3
Chitosan (0.05%)	29.0	37.0	480.2	485.3	13.9	18.1	16.2	16.4	20.8	21.2	15.0	15.1
Chitosan (0.1%)	29.0	40.0	489.3	495.1	14.2	19.8	17.7	17.9	21.3	21.8	15.4	15.6
Chitosan (0.2%)	29.0	42.0	497.2	503.3	14.4	21.1	18.9	19.3	21.5	22.2	15.5	15.8
Plant extract (0.05%) + chitosan	29.0	39.0	490.2	495.6	14.2	19.3	17.5	18.0	21.4	21.8	15.4	15.5
Plant extract (0.1%) + chitosan	29.0	42.0	499.3	504.2	14.5	21.2	18.9	19.6	22.0	22.5	15.9	15.9
Plant extract (0.2%) + chitosan	29.0	44.0	507.1	512.6	14.7	22.5	20.0	20.9	22.4	23.0	16.0	16.1
New LSD $_{at\ 5\%}$	**N.S**	**2.5**	**8.0**	**8.5**	**0.3**	**1.4**	**1.3**	**1.5**	**0.5**	**0.6**	**0.3**	**0.3**

3.2. Berry physical characteristic

In 2023 and 2024, the morpho-physical parameters of the "Early Sweet" grapevine were compared to untreated controls through foliar applications of a mixture of plant extract (turmeric, garlic, and green tea) and chitosan at varying concentrations (0.05, 0.1, and 0.2%), as illustrated in Table 2. These metrics include the longitudinal and equatorial dimensions of berries, the average berry weight, and the shot berry.

The information shown in Table (2) demonstrated that the foliar application of plant extracts and chitosan at different concentrations significantly decreased the percentage of shot berries and increased

longitudinal and equatorial dimensions of berries, the average berry weight when compared to the control vines in both seasons. The increase in plant extract and chitosan concentrations led to a reduction in the percentage of shot berries and raise in longitudinal and equatorial dimensions of berries, the average berry weight, with no significant difference noted between the two highest concentrations. Chitosan exhibited a significantly lower mean value for the shot berries and lower mean of longitudinal and equatorial dimensions of berries, the average berry weight in comparison to the standard treatment. The application of 0.2% plant extract in conjunction with 0.2% chitosan resulted in the lowest values of shot berry and highest of longitudinal and equatorial dimensions of berries, the average berry weight, with measurements recorded at (4.3-5.1%), (4.87-4.91 g), (2.39-2.44 cm) and (2.31-2.36 cm). The untreated vines displayed the highest mean of values of shot berry and lowest of longitudinal and equatorial dimensions of berries, the average berry weight as (7.5-7.7%), (4.25-4.30 g), (2.10-2.13 cb) and (2.00-2.08 cm) over the two seasons, respectively. The remaining treatments demonstrated moderate values, and this trend continued across both seasons.

The impact of chitosan on the physical traits of berries in accordance with the results obtained by **Refaai and Silem (2021); El-Senosy (2022) and Ali *et al.* (2023)** they all found that foliar sprinkle with chitosan led to an increase in berry physicochemical parameters of superior grapevine as (berry setting%, berry weight and dimensions)

The positive impact on the fruiting of Early Sweet grapevines of the hormonal nature of mixture of studied plant extracts as the turmeric, garlic and green tea solution and the presence of substances that are similar in their effect on growth regulators (auxins) upon the physical characteristics and yield of the fruits may be the reason for the superiority of spraying with it (**Abd El–Hamied and El-Amary, 2015**), this results in increased cell division, side stretching, and elongation. El-Senosy *et al.* (2021); **Abd Al Sanad, (2022) and Masoud *et al.* (2024)** reported that foliar with turmeric extract increased berry quality (berry coloration, berry setting%, weight and dimensions). **Auda *et al.* (2023)** found that spray with garlic extracts at a concentration of 400 ml L^{-1} significantly the physical characteristics (fruit weight, diameter, length, and fleshy layer weight) of date palm. **El-Senosy *et al.* (2021)** demonstrated that green tea plant extract at 0.1% enhanced berry quality (berry coloration, berry weight, dimensions of Flame seedless.

Table (2). Early Sweet grape vines' average shot berries, berry weight (g), berry longitudinal and berry equatorial as affected by foliar spraying with some plant extract and chitosan across 2023 and 2024 seasons

Characteristics / Treatments	Shot berries %		Berry weight (g)		Berry longitudinal (cm)		Berry equatorial (cm)	
	2023	2024	2023	2024	2023	2024	2023	2024
Control	7.5	7.7	4.25	4.30	2.10	2.13	2.00	2.08
Plant extract (0.05%)	6.6	6.9	4.51	4.53	2.19	2.23	2.12	2.22
Plant extract (0.1%)	6.0	6.4	4.60	4.65	2.24	2.28	2.17	2.28
Plant extract (0.2%)	5.6	6.2	4.67	4.72	2.27	2.30	2.18	2.30
Chitosan (0.05%)	5.9	6.4	4.69	4.64	2.25	2.30	2.18	2.27
Chitosan (0.1%)	5.4	6.0	4.79	4.74	2.27	2.35	2.23	2.30
Chitosan (0.2%)	5.1	5.7	4.79	4.82	2.31	2.38	2.25	2.31
Plant extract (0.05%) + chitosan (0.05%)	5.3	5.8	4.72	4.74	2.30	2.36	2.24	2.31
Plant extract (0.1%) + chitosan (0.1%)	4.7	5.4	4.80	4.83	2.35	2.41	2.27	2.34
Plant extract (0.2%) + chitosan (0.2%)	4.3	5.1	4.87	4.91	2.39	2.44	2.31	2.36
New LSD at 5%	**0.5**	**0.4**	**0.08**	**0.09**	**0.04**	**0.04**	**0.03**	**0.03**

3.3. Berry chemical quality characteristics

The impact of foliar sprinkle of plant extract (turmeric, garlic, and green tea) and chitosan on the berry chemical properties of Early Sweet grapevines, including TSS%, total sugar percentage, total acidity, total solids/total acidity, and were shown in Table 3 for the 2023 and 2024 seasons, respectively.

Table 3 outlined that the vines were substantially optimized in terms of the TSS%, total sugar percentage, total acidity, total solids/total acidity content of the berries compared to the untreated vines when the vines were treated with plant extract and chitosan at varying concentrations (0.05, 0.1, and 0.2% for each). Additionally, the statistical analysis indicated that the addition of plant extract or chitosan individually resulted in substantial variations in the TSS%, total sugar percentage, total acidity, total solids/total acidity content of the berries. The highest TSS, total sugar percentage and TSS/TA and lowest acidity were observed with 0.2% chitosan, with no discernible difference between 0.1% and 0.2% chitosan. Furthermore, the interaction between the treatments revealed substantial differences in TSS, total sugar percentages, TSS/TA and acidity between the two seasons. The maximum values of TSS, total sugar percentages, TSS/TA and lowest of acidity were achieved at a concentration of 0.2% for both plant extract and chitosan, followed by 0.1% for both. There was no significant difference between the two treatments during the 2023 and 2024 seasons.

Table (3). Early Sweet grape vines' berries T.S.S%, total sugar%, T.S.S/acidity, total acidity and as affected by foliar spraying with some plant extract and chitosan across 2023 and 2024 seasons

Characteristics / Treatments	TSS%		Total sugar%		TSS/acidity ratio		Total acidity%	
	2023	2024	2023	2024	2023	2024	2023	2024
Control	19.0	19.4	16.9	17.2	25.2	26.2	0.755	0.740
Plant extract (0.05%)	19.6	20.1	18.0	18.1	27.0	28.3	0.726	0.710
Plant extract (0.1%)	20.2	20.6	18.7	18.7	28.4	29.6	0.711	0.695
Plant extract (0.2%)	20.5	21.0	19.0	19.1	29.3	30.7	0.700	0.685
Chitosan (0.05%)	20.1	20.6	18.6	18.7	28.3	29.9	0.709	0.690
Chitosan (0.1%)	20.7	21.2	19.1	19.2	29.8	31.4	0.694	0.675
Chitosan (0.2%)	20.9	21.5	19.5	19.6	30.6	32.3	0.682	0.666
Plant extract (0.05%) + chitosan (0.05%)	20.6	21.1	19.2	19.3	29.8	31.4	0.689	0.672
Plant extract (0.1%) + chitosan (0.1%)	21.0	21.6	19.7	19.8	31.3	32.9	0.670	0.656
Plant extract (0.2%) + chitosan (0.2%)	21.3	21.9	19.9	20.1	32.2	33.9	0.660	0.646
New LSD at 5%	**0.4**	**0.5**	**0.5**	**0.5**	**1.0**	**1.2**	**0.013**	**0.011**

The obtained data concerning the effect of chitosan on chemical quality of grapevines as (TSS, total acidity, TSS/TA and total sugar) align with those obtained by **Abd El-Rahman (2021)** demonstrated that the foliar application of chitosan once, twice, or thrice affected on TSS %, sugars %, and TSS/acid ratio, which were increased, and the total acidity % was decreased. **Masoud *et al.* (2024),** on Ruby Seedless grapevines found that foliar spraying with chitosan at 2% led to an increase in TSS, reducing sugar, acidity and TSS/TA compared to the untreated vines.

The beneficial effects of these plant extracts on advancing maturity explained these results. This effect was attributed to containing these plant extracts on mineral as magnesium, boron, sulphur, sugars

and amino acids, (**Dhekney, 2016**), which reflected in berries chemical content of Early Sweet grapevines. Garlic is composed of a variety of vitamins, minerals, flavonoids, ascorbic acid, sulfur, and trace amounts of iodine. Garlic contains a total of seventeen amino acids, among which eight are classified as essential. The influence of garlic extract on the characteristics of fruit has been indicated by **El-Shayeb (2009**). The Tables B, C, and D (Material section), respectively delineated the quantitative composition of the aqueous plant extracts of turmeric, garlic, and green tea. **El-Senosy *et al.* (2021**) demonstrated that foliar application with turmeric or green tea increased reducing sugar, TSS, TSS/TA and the total acidity was reduced. **Auda *et al.* (2023)** stated that sprinkle vines with garlic extract led to a substantial increase in reducing sugars, total soluble solids and total protein.

4. Conclusion

The present study has demonstrated that the physical and chemical qualitative attributes of the berries, as well as the yield kg/vine, were influenced by the application of a mixture of natural plant extract and/or chitosan. Ultimately, it is advised to administer 0.1% plant extract in conjunction with 0.1% chitosan three times: at the onset of growth, immediately after berry set, and one month later. Consequently, these procedures would result in a reduction in costs under the same circumstances.

References

A.O.A.C., Association of Official Agricultural Chemists (2000). Official Methods of Analysis 14th ed. Benjamin Franklin Station, Washington D.C.U.S.A., pp. 490-510.

Abada, M. A. (2014). A comparative study for the effect of green tea extract and some antioxidants on Thompson seedless grapevines. International Journal of plant & soil Science, 3(10), 1333-1342.

Abada, M. A., Uwakiem, M. K. and El-Saman, A. Y. (2023). Effect of Spraying Some Amino Acids, Algae Extract, and Turmeric Extract on Shot Berries, Yield and Berries Quality of Prime Seedless Grapevines. New Valley Journal of Agricultural Science, 3(7), 603-613.

Abd El- Rahman, M. A. (2021). Studies on the effect of chitosan on productivity of flame seedless grapevines. Thesis Phd, Agricultural Sciences (Hort. Pomology), Faculty of Agriculture, Al Azhar Univ. (Assiut Branch), Egypt.

Abd El–Hamied, Sh. A. and El-Amary, E. I. (2015). Improving Growth and Productivity of 'Pear' Trees Using Some Natural Plants Extracts under North Sinai Conditions. I.O.S.R. Journal of Agriculture and Veterinary Science (IOSR-JAVS). 8 (1), 01–09.

Abdel Aal, A. M. K., Abdelaziz, F. H., Ahmed, F. F., Mohamed, A. Y. and Abdel-Halim, S. (2021). Effect of spraying some plant oils and green tea extracts on growth and nutritional status of Barhee date palms grown under Aswan region conditions. SVU-International Journal of Agricultural Sciences, 3(2), 1-11.

Akl, A. M. M., Abada, M. and Gadalla, F. (2017). Effect of some plant extracts on growth and nutritional status of flame seedless grapevine transplants. Journal of Productivity and Development, 22(2), 323-337.

Ali, H. A., Faissal, F. A., Uwakiem, M. Kh. And Sayed, H. M.M. (2023). Berry physicochemical properties of Superior grapevine cv. in relation to spraying seaweed extract and chitosan. The future of biololgy. DOI: 10.37229/fsa.fjb.2023.12.30.

Ali, M. M., Anwar, R., Yousef, A. F., Li, B., Luvisi, A., De Bellis, L., Aprile, A. and Chen, F. (2021). Influence of Bagging on the Development and Quality of Fruits. Plants, 10(2), 358.

Ali, M., Cheng, Z. H., Hayat, S., Ahmad, H., Ghani, M. I. and Tao, L. I. U. (2019). Foliar spraying of aqueous garlic bulb extract stimulates growth and antioxidant enzyme activity in eggplant (Solanum melongena L.). Journal of Integrative Agriculture, 18(5), 1001-1013.

Ammon, H. P., & Wahl, M. A. (1991). Pharmacology of Curcuma longa. Planta Medica, 57(01), 1-7.

Auda, M. S., Gabash, H. M. and Resan, A. Z. (2023). Effect of spraying with garlic extract and silicon on some physical, chemical, and productive characteristics of date palm Phoenix dactylifera L. Bionatura, 8(1), 1-8.

Babalık, Z., Demirci, T., Aşcı, Ö. A. and Baydar, N. G. (2020). Brassinosteroids modify yield, quality, and antioxidant components in grapes (*Vitis vinifera* cv. Alphonse Lavallée). Journal of Plant Growth Regulation, 39, 147-156.

Bedrech, S. A. and Farroh, K. Y. (2022). The Impact of Foliar Spray of Chitosan Nano-particles and Bulk Form on Crimson Seedless Grapevine Quality and Productivity. Egyptian Journal of Horticulture, 49(1), 15-24.

Dhekney, S. A. (2016). Encyclopedia of food and health. Academic Press. Oxfor. pp.261 - 265.

El-Senosy, O. A., Abada, MM. A. M. and El- Masry, S. M.A. (2021). Response of flame seedless grapevines grown under sandy soil to foliar spraying of some plant extracts. Egyptian-Arab J. Applied Sci. and Tech. (EAJAST), 1(2):11- 19.

El-Senosy, O. M. A. R. (2022). Effect of Chitosan and Seaweed Extracts on Fruiting of Flame Seedless Grapevines Grown Under Sandy Soil Condition. International Journal of Modern Agriculture and Environment, 2(1), 24-32.

El-Shayeb, N. S. (2009). Physiological studies on Oenothera biennis (bio-fertilizer and plant extracts) (Doctoral dissertation, Horticulture Department, Faculty of Agriculture Moshtohor, Benha University).

Ghasemifar, E. and Saeidian, S. (2014). The effects catechin on stability of grape anthocyanin-copigment complex. *International Journal of Scientific Research in Environmental Sciences, 2(4),* 150.

Grohar, H. N. (1992). Green tea composition, consumption and polyphenol. *Chemistry Prev. Med*, *21*, 334-350.

Kamra, D. N., Agarwal, N., Sakthivel, P. C. and Chaudhary, L. C. (2012). Garlic as a rumen modifier for eco-friendly and economic livestock production. Journal of Applied Animal Research, 40(2), 90-96.

Lee, L. S., Kim, S. H., Kim, Y. B. and Kim, Y. C. (2014). Quantitative analysis of major constituents in green tea with different plucking periods and their antioxidant activity. Molecules, 19(7), 9173-9186.

Li, S., Yuan, W., Deng, G., Wang, P., Yang, P. and Aggarwal, B. (2011). Chemical composition and product quality control of turmeric (*Curcuma longa* L.). Stephen F. Austin state Univ. SFA sholar works.

M.A.L.R. (2019). Ministry of Agriculture and Land Reclamation Publishes. Economic Affairs Sector.

Masoud, A. A., Mohamed, A. K., Abdou Zaid, I. A., El-Hakim, A. and Mohamed, H. (2024). Effect of foliar application of some natural compounds on growth and fruiting of ruby seedless grapevines. Assiut Journal of Agricultural Sciences, 55(4), 177-188.

Mead, R., Curnow, R. N. and Harted, A. M. (1993). Statistical methods in Agricultural and Experimental Biology. 2nd Ed. Chapman & Hall, London pp. 10-44.

Mohamed, M. H., Badr, E. A., Sadak, M. S. and Khedr, H. H. (2020b). Effect of garlic extract, ascorbic acid and nicotinamide on growth, some biochemical aspects, yield and its components of three faba bean (*Vicia faba L.*) cultivars under sandy soil conditions. Bulletin of the National Research Centre, 44, 1-8.

Pacurar, M. and Krejci, G. (2010). Garlic Consumption and Health. Nova Science Publishers, 1ne. New York, pp: 1- 60.

Refaai, M. and Silem, M. (2021). Impact of spraying chitosan and turmeric extract on fruiting of Flame seedless grapevines. Egyptian-Arab Journal of Applied Sciences and Technology, 1(2), 21-28.

Rouphael, Y. and Colla, G. (2020). Toward a sustainable agriculture through plant biostimulants: From experimental data to practical applications. Agronomy, 10(10), 1461.

Sharif, R., Mujtaba, M., Ur Rahman, M., Shalmani, A., Ahmad, H., Anwar, T., Tianchan, D. and Wang, X. (2018). The multifunctional role of chitosan in horticultural crops; a review. Molecules, 23(4), 872.

Shiri, M. A., Bakhshi, D., Ghasemnezhad, M., Dadi, M., Papachatzis, A. and Kalorizou, H. (2013). Chitosan coating improves the shelf life and postharvest quality of table grape (*Vitis vinifera*) cultivar Shahroudi. Turkish journal of agriculture and forestry, 37(2), 148-156.

Srimal, R. C. (1997). Turmeric: a brief review of medicinal properties. Fitoterapia (Milano), 68(6), 483-493.

Wilde, S. A., Corey, R. B., Lyre, I. G. and Voigt, G. K. (1985). Soil and Plant Analysis for Tree Culture. 3" d Oxford 8113M publishing Co. New Delhi, 96-106.

Yaseen, R., IS Ahmed, A., M Omer, A., KM Agha, M. and M Emam, T. (2020). Nano-fertilizers: Bio-fabrication, application and biosafety. Novel Research in Microbiology Journal, 4(4), 884-900.

Zulfiqar, F., Casadesús, A., Brockman, H. and Munné-Bosch, S. (2020). An overview of plant-based natural biostimulants for sustainable horticulture with a particular focus on moringa leaf extracts. Plant Science, 295, 110194.

تأثير الرش بمستخلصات نباتيه مختلفه مع الشيتوزان على إنتاجية و جودة العنب إيرلى سويت

محمد أحمد السيد و محمود ناجح عونى عبد الهادي

قسم البساتين – كلية الزراعة – جامعة المنيا – مصر

تم رش العنب صنف إيرلى سويت المزروع فى مزرعه خاصة بقرية السرايريه – شرق سمالوط – محافظة المنيا، بتركيزات مختلفة من مزيج المستخلصات النباتيه والشيتوزان ثلاث مرات فى بداية النمو وبعد العقد مباشرة وبعدها بشهر خلال موسمى ٢٠٢٣ و ٢٠٢٤. فى تجربه بتصميم القطاعات الكاملة العشوائية بها ٣٠ كرمه حيث كررت ٣ مرات وإحتوت على تركيزات (٠,٠٥، ٠,١، ٠,٢%) من خليط مستخلصات نباتيه و /أو شيتوزان بصوره فرديه أو مجتمعه لتصبح التجربه ١٢ معامله . أظهرت النتائج أن الكروم التى تم رشها بإستخدام الشيتوزان كانت أكثر تفوقا من الرش بخليط المستخلصات النباتيه، فى حين أن مزيج من المعاملات وخاصة عند الرش بتركيز ٠,١% مستخلص نباتى + ٠,١% شيتوزان سجل أفضل النتائج من الناحية الإقتصاديه والأعلى على صفات العنقود والحبات والمحصول تحت نفس ظروف الأراضى الطمييه بمحافظة المنيا.

الكلمات الدالة: مستخلص نباتى، كركم، ثوم، شاى أخضر، شيتوزان وعنب إيرلى سويت.