



**EFFECT OF CHITOSAN AND CALCIUM CHLORIDE ON THE
YIELD AND QUALITY OF RED GLOBE GRAPE Cv. (*VITIS
VINIFERA L.*)**

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ABSTRACT

The present investigation was carried out during two successive seasons 2018 and 2019 on Red globe grape Cv. to study the effect of chitosan at 0.5% or 0.75% and calcium chloride at 2% and their combinations on the yield per vine and its quality. Spraying was achieved either at pea stage (mid of April-first date of spraying) or at veraison stage (mid of June-second date of spraying). Besides, calcium chloride at 2% was sprayed at veraison stage at mid of June.

Results showed that date of spraying chitosan at 0.5% had no significant effect on the studied parameters (weight of cluster and yield per vine). In the same time, number of sprays (once or twice) had significant effect in the two used concentrations except the highest concentration of chitosan since no static difference had been noticed between spraying it at mid of June and the two sprays (mid-April+ mid-June). It's deserve to mention that the less cluster weight and yield per vine was of that of the control. In other words all treatments were superior than the control in this respect. The differences between them were proved statistically. Spraying vines with chitosan at 0.75% combined with calcium chloride at 2% at mid of June presented the heaviest cluster weight and yield per vine either compared with the control or any other treatment. The differences between them were statistically significant in the two experimental seasons. Finally, all treatments had increased the yield per vine and improved its quality.

Keywords: Chitosan- calcium chloride- Red globe-yield-quality

INTRODUCTION

Several investigators had examined the effect of chitosan and

calcium chloride on the yield and its component of different fruit trees.

El-kenawy (2017) sprayed Thompson seedless with chitosan at 500 ppm three times annually (at growth start, one week after berry set and at veraison stage). Chitosan enhanced cluster weight, berry weight, yield per vine in addition to soluble solids content and total acidity. Similar results were shown by Meng and Tian (2009) on Thompson seedless. Kumaran et al (2019) sprayed Muscat Humburg grapevines twice annually at (pea and veraison stage) at a concentration of 0.2% and 0.4% as a foliar application. Chitosan resulted in improving number of bunches per vine, bunch length and width, yield per vine as well as TSS and acidity. Results further showed that both of the two concentrations used were effective in the previous parameters. From the economical point of view, using the lowest concentration of chitosan is recommended.

Other investigators showed similar results when spraying chitosan on strawberry such as Abedel-Mawgoud et al (2010), El-Miniawy et al (2013), He-y et al (2018) and Soppelsa et al (2018).

The present study aimed to investigate the effect of chitosan and calcium chloride on the yield and its components of Red globe grapevines

MATERIALS AND METHODS

The present investigation was carried out during 2018 and 2019 seasons on Red globe grapevines Cv. to study the effect of chitosan and calcium chloride on the yield and its quality. The selected vines (30) were grown at Beni-Mazar district – Minia

Governorate –Egypt. The vines were 11 years old at the start of this experiment, spaced at 2×3 m apart, trained as a cane shape and grown in a clay soil.

The following ten treatments were carried out as follows :-

- 1-control (vines sprayed with water)
- 2-vines sprayed once with chitosan at a concentration of 0.5% at pea stage (mid-April- first spray).
- 3-vines sprayed once with chitosan at a concentration of 0.5% at veraison stage (mid-June -second spray).
- 4- vines sprayed twice with chitosan at a concentration of 0.5% at pea and veraison stage (first and second spray).
- 5- vines sprayed once with chitosan at a concentration of 0.75% at pea stage (mid-April -first spray).
- 6- vines sprayed once with chitosan at a concentration of 0.75% at veraison stage(mid of June - second spray)
- 7- vines sprayed twice with chitosan at a concentration of 0.75% at pea and veraison stage(first and second spray).
- 8- vines sprayed with calcium chloride at a concentrations of 2% at veraison stage (mid of June)
- 9- vines sprayed with a combination between chitosan (0.5%)and calcium chloride at 2% at veraison stage (mid of June)
- 10-vines sprayed with a combination between chitosan (0.75%) and calcium chloride at 2% at veraison stage (mid of June)

It's worth to mention that Triton B at 0.5% was used as a wetting agent in all treatments.

The experiment was set in a complete randomized Block design (CRBD).

Before harvesting, the yield per vine was calculated in terms of number of clusters per vine. At the commercial harvesting date, samples of four clusters/vine were picked up and transferred to the laboratory where the physical and chemical properties were carried out.

*Samples per each vine (4 cluster) were weighted and the average cluster weight was delivered, consequently the yield per vine was estimated.

*Total soluble solids (TSS) in the juice was determined by using hand refractometer.

*Reducing sugars was carried out according to Lane and Eynon volumetric method as outlined in A.O.A.C (2000).

*Acidity in the juice was estimated as mg tartaric acid per 100 ml of juice by titration with sodium hydroxide of a known normality (0.1) using phenolphthalein as an indicator (A.O.A.C 2000).

The obtained data were tabulated and statistically analyzed according to Gomez and Gomez (1984) and Snedecor and Cochran (1989)

RESULTS AND DISCUSSION

Effect of chitosan and calcium chloride on the cluster weight and yield per vine of Red globe grapevines.

The influence of chitosan and calcium chloride on the cluster weight and yield per vine of Red globe grape

Cv. are presented in Tables (1) and (2).

Results showed that the cluster weight of any treatment was higher than that of the control (Table 1). The differences between any of them and the control was statistically significant. Results further showed that spraying chitosan at mid-April did not differ than that sprayed at mid-June only in the first experimental season either spraying was carried out with chitosan at 0.5% or 0.75% concerning their effect in this concern. Results further showed that the cluster weight of vines received only one spray of chitosan differ statistically than that of vines received two sprays annually. Data in the same (Table 1) indicated that the heaviest cluster weight was obtained from vines sprayed at mid-June with chitosan at 0.75% combined with calcium chloride at 2%. This was true in the two experimental seasons. The difference between the effect of this treatment and that of the rest treatments including the control was statistically significant.

The present results are in agreement with those obtained by El-kenawy (2017) on Thompson seedless and Kumaran et al (2019) on Muscat Humburg. Similar results had been noticed on strawberry by El-Miniawy et al (2013).

Regarding the effect of chitosan and calcium chloride on the yield per vine of Red globe grapevines, results indicated that the lowest yield per vine was of that of the control (Table 2) Spraying chitosan or calcium chloride or the combination between them had a positive effect in

increasing the yield per vine over the control (Table 2). Varying the date of spraying (mid-April or mid-June) seems to be of meaningless effect on the present parameter in the two experimental seasons. Data in the same table further showed that vines received two sprays of chitosan at any concentration used were of higher yield per vine compared with that received one spray only with few exceptions. Moreover, the results also indicated that spraying Red globe grapevines with chitosan at 0.75%

combined with calcium chloride at 2% at mid-June presented the heaviest cluster weight per vine in the two experimental seasons.

These results are in agreement with those of Meng and Tian (2009) and El-kenawy (2017) on Thompson seedless. Similar results were also shown by Kumaran *et al.* (2019) on Muscat Humburg. Moreover, El-Miniawy *et al.* (2013) and Rahman *et al.*, (2018) found similar results concerning the effect of chitosan on strawberry.

Table(1) effect of chitosan and calcium chloride on cluster weight of Red globe grape cv. during 2018 and 2019 seasons.

Treatments	Cluster weight (g)	
	First season (2018)	Second season (2019)
Control	614.0	629.0
ch.0.5 % at pea stage	704.0	761.3
Ch.0.5% at veraison stage	696.0	665.7
Ch.0.5% at pea and veraison stage	767.3	824.3
Ch.0.75% at pea stage	753.7	739.3
Ch.0.75% at veraison stage	746.3	861.7
Ch.0.75% at pea and veraison stage	774.3	863.0
Cacl ₂ 2% at veraison stage	777.3	809.0
Ch.0.5% +cacl ₂ 2% at veraison stage	690.3	843.3
Ch.0.75% + cacl ₂ 2% at veraison stage	860.0	895.0
L.S.D 5%	28.4	24.1

Pea stage (mid-April)

veraison stage (mid-June)

Table(2) effect of chitosan and calcium chloride on the yield per vine of Red globe grape cv. during 2018 and 2019 seasons.

Treatments	Yield per vine (kgs)	
	First season (2018)	season (2019) Second
Control	17.6	18.7
ch.0.5 % at pea stage	19.7	22.8
Ch.0.5% at veraison stage	20.2	20.2
Ch.0.5% at pea and veraison stage	23.8	24.5
Ch.0.75% at pea stage	21.9	20.8
Ch.0.75% at veraison stage	22.4	23.4
Ch.0.75% at pea and veraison stage	24.3	25.9
Cacl ₂ 2% at veraison stage	22.8	24.0
Ch.0.5% +cacl ₂ 2% at veraison stage	20.7	24.2
Ch.0.75% + cacl ₂ 2% at veraison stage	25.8	26.6
L.S.D 5%	1.9	2.7

Pea stage (mid-April)

veraison stage (mid-June)

Effect of chitosan and calcium chloride on total soluble solids, reducing sugars and acidity of Red globe grapes.

Results of chitosan and calcium chloride on TSS, reducing sugars and acidity of Red globe berries are shown in Tables (3,4 and 5)

The obtained data declared that chitosan and calcium chloride enhancing berries quality since total soluble solids and reducing sugars were almostly higher than that of the control in most cases. No significant effect had been noticed between the different treatments sprayed with chitosan or calcium chloride with only one exception which included spraying chitosan at 0.75% and calcium chloride at 2% sprayed at mid-June. This treatment resulted in increasing the TSS than any other one with significant differences in most cases except those sprayed with chitosan at 0.75% twice annually. Similar results were also noticed by calcium chloride sprayed at 2% at mid-June. The prementioned results

were existed in the two experimental seasons.

Regarding the effect of chitosan and calcium chloride on reducing sugars of Red globe grapes, resulted in (Table 4)took similar trend to that of the TSS. Moreover, results in(Table 5) indicated that the previous treatments (chitosan and calcium chloride) decreased the acidity in the juice of berries.

The present results confirmed by that obtained by Ali *et al.*, (2014) and Ali and Toliba (2018) on peach. Similar results were also confirmed by Conway *et al.*, (2002) and Neilson *et al.*, (2005) on apple.

Finally, one can state that chitosan and calcium chloride improved berries quality of Red globe by increasing TSS and reducing sugars and decreasing the acidity in the juice.

As a conclusion and on the light of the previous results, spraying Red globe by chitosan at 0.75% combined with calcium chloride at 2% at veraison stage is recommended to obtain high yield with good quality.

Table(3) effect of chitosan and calcium chloride on total soluble content of Red globe grape cv. during 2018 and 2019 seasons.

Treatments	T S S	
	First season (2018)	season (2019) Second
Control	17.3	18.0
ch.0.5 % at pea stage	18.3	19.3
Ch.0.5% at veraison stage	19.0	19.7
stage Ch.0.5% at pea and veraison	19.3	20.0
Ch.0.75% at pea stage	18.7	19.7
Ch.0.75% at veraison stage	19.3	20.0
Ch.0.75% at pea and veraison stage	20.3	20.3
Cacl ₂ 2% at veraison stage	20.0	20.3
Ch.0.5% +cacl ₂ 2% at veraison stage	19.3	19.7
Ch.0.75% + cacl ₂ 2% at veraison stage	21.7	21.8
L.S.D 5%	1.9	1.6

Pea stage (mid-April)

veraison stage (mid-June)

Table(4) effect of chitosan and calcium chloride on reducing sugars of Red globe grape cv. during 2018 and 2019 seasons.

Treatments	Reducing sugars	
	First season (2018)	Second season (2019)
Control	14.4	14.1
ch.0.5 % at pea stage	14.8	15.7
Ch.0.5% at veraison stage	15.5	16.0
Ch.0.5% at pea and veraison stage	15.6	16.0
Ch.0.75% at pea stage	15.1	15.9
Ch.0.75% at veraison stage	15.6	16.0
Ch.0.75% at pea and veraison stage	16.1	16.2
Cacl ₂ 2% at veraison stage	16.3	16.5
Ch.0.5% +cacl ₂ 2% at veraison stage	15.4	16.0
Ch.0.75% + cacl ₂ 2% at veraison stage	17.5	17.4
L.S.D 5%	1.7	1.3

Pea stage (mid-April) veraison stage (mid-June)

Table(5) effect of chitosan and calcium chloride on acidity of Red globe grape cv. during 2018 and 2019 seasons.

Treatments	Acidity	
	First season (2018)	Second season (2019)
Control	0.563	0.553
ch.0.5 % at pea stage	0.549	0.536
Ch.0.5% at veraison stage	0.535	0.544
Ch.0.5% at pea and veraison stage	0.542	0.537
Ch.0.75% at pea stage	0.550	0.540
Ch.0.75% at veraison stage	0.539	0.536
Ch.0.75% at pea and veraison stage	0.512	0.528
Cacl ₂ 2% at veraison stage	0.511	0.520
Ch.0.5% +cacl ₂ 2% at veraison stage	0.536	0.539
Ch.0.75% + cacl ₂ 2% at veraison stage	0.509	0.509
L.S.D 5%	0.023	0.024

Pea stage (mid-April) veraison stage (mid-June)

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تأثير بعض المعاملات علي انتاجية وحيوية الثمار في العنب صنف الريد جلوب

عبد الحميد واصل - علي حسن علي - عبد الرحمن مصطفى - ولاء عاشور

أجريت هذه الدراسة خلال موسمي الدراسة 2018 و2019 علي كرمات عنب صنف الريد جلوب نامية في أرض طمبية بمزرعة تقع بمركز بني مزار بمحافظة المنيا- مصر. وكان عمر الكرمات 11 عام عند بداية التجربة مرياه بالطريقة القصية وكانت مسافات الزراعة 3×2 م . تم اختيار (30) كرمة أجري عليها 10 معاملات علي النحو التالي :-

- 1- الكنترول (الرش بالماء فقط).
- 2- الرش باستخدام مادة الشيتوسان بتركيز 0.5 % في منتصف أبريل (pea stage)
- 3- الرش باستخدام مادة الشيتوسان بتركيز 0.5% في منتصف يونيو (veraison stage)
- 4- الرش باستخدام مادة الشيتوسان بتركيز 0.5% في منتصف (أبريل ويونيو) (pea and veraison stage).
- 5- الرش باستخدام مادة الشيتوسان بتركيز 0.75% في منتصف أبريل (pea stage)
- 6- الرش باستخدام مادة الشيتوسان بتركيز 0.75% في منتصف يونيو (veraison stage).
- 7- الرش باستخدام مادة الشيتوسان بتركيز 0.75% في منتصف (أبريل ويونيو) (pea and veraison stage).
- 8- الرش باستخدام مادة الكالسيوم كلوريد بتركيز 2% في منتصف يونيو (veraison stage).
- 9- الرش باستخدام مادة الشيتوسان بتركيز 0.5% مع كلوريد الكالسيوم بتركيز 2% في منتصف يونيو (veraison stage).
- 10- الرش باستخدام مادة الشيتوسان بتركيز 0.75% مع كلوريد الكالسيوم بتركيز 2% في منتصف يونيو (veraison stage).

وقد تم تصميم التجربة بنظام القطاعات كاملة العشوائية (CRBD).

قبل جمع المحصول تم عد العناقيد علي كل كرمة وعند نضج المحصول تم أخذ (4) عناقيد من كل كرمة وتم نقل جميع العينات الي المعمل حيث أجري عليها القياسات الاتية:

- متوسط وزن العنقود
- تقدير كمية المحصول علي الكرمة بضرب عدد عناقيد الكرمة في متوسط وزن العنقود
- كذلك تم تقدير بعض الصفات الكيماوية التي تشمل المواد الصلبة الذائبة الكلية والسكريات المختزلة كذلك تم تقدير الحموضة .

- تم جمع البيانات وتحليلها احصائيا.
 - فيما يلي أهم النتائج المتحصل عليها خلال عامي الدراسة (2018-2019):-
 - أدت جميع المعاملات الي زيادة معنوية في كلا من وزن العنقود وكمية محصول الكرمة وذلك عند مقارنتها بالكنترول .
 - كما وجد أن هناك تأثير واضح بالنسبة لرش الكرمات بالشيتوسان مرتين في كل من التركيزات المستخدمة بالمقارنة بالرش مرة واحدة في العام حيث أدت الي زيادة ملحوظة في كل من وزن العنقود وكمية المحصول للكرمة.
 - كذلك أدي الرش بكلوريد الكالسيوم بتركيز 2% الي نفس النتائج المشار اليها سابقا.
 - أدي الاستخدام المشترك بين الشيتوسان بتركيز 0.75% مع كلوريد الكالسيوم بتركيز 2% في منتصف يونيو الي أعلى زيادة معنوية في كلا من وزن العنقود وكمية محصول الكرمة سواء كانت المقارنة بالنسبة للمعاملات المستخدمة بما فيهم الكنترول.
 - أدت جميع معاملات الشيتوسان وكلوريد الكالسيوم الي تحسين جودة الثمار .
- تحت ظروف التجربة والمناطق المماثلة لها فانه يوصي برش كرمات العنب صنف الريد جلوب بالشيتوسان بتركيز 0.75% مع كلوريد الكالسيوم 2% في منتصف يونيو وذلك لزيادة كمية محصول الكرمة وتحسين جودته.

