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EFFECT OF CONVENTIONAL AND NON-CONVENTIONAL CHEMICALS TO PREVENT BUNCH COMPACTNESS OF THOMPSON SEEDLESS GRAPE

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ABSTRACT

Conventional and non- Conventional chemicals were examined for reducing the excessive fruit set and to improve yield and fruit quality of Thompson Seedless grapevines (Vitis vinifera L.) by spraying the sesame oil at 0.5, 1.5, 2.0% and mustard oil at 0.5, 1.5, and 2.0% in comparison with standard GA_3 at full bloom stage. However, these chemicals had a clear trend on reducing the cluster and berries rot as well as reducing cluster compactness and increasing berry length, diameter and cluster weight than control. The obtained results proved a good chance of replacing the synthetic chemical product of GA_3 with sesame and mustard oil at the full bloom stage to reduce the excessive fruit set for improving the yield and quality of Thompson Seedless grapes. In this respect, the application of sesame oil 0.5% and mustard oil 2.0 % is highly recommended.

Keywords: *conventional and non- conventional chemicals, bunch compactness, yield and quality thompson seedless grape*

INTRODUCTION

Grape (*Vitis vinifera* L.) is one of the most important fruit crops of the temperate zone, which has acclimatized to the sub-tropical and tropical agro-climatic conditions prevailing in the eastern zone of Afghanistan. It is a fairly good source of minerals like calcium, phosphorus, iron and vitamins (B1 and B2). Grape cultivation is believed to have originated in Armenia near the Caspian Sea in Russia, from where it seems to have spread westward to Europe and east-ward to Iran and Afghanistan. Good quality grapes invariably fetch a premium price in the market. In European markets, clusters of uniform large berries with characteristic colour, flavour, texture and longer shelf life are preferred and seedlessness is always a prerequisite (Khamis *et al*., 2015). Loose bunch production in grapes is commonly practiced to reduce excessive bunch compactness and crop load, so as to get high-quality fruit and also to minimize the incidence and spread of berry rot. However, the use of natural products viz., Mustard oil, Sesame oil and Standard GA_3 are in horticultural practices instead of other synthetic chemical products is becoming the main target for many fruit crop producers where, the world market has been growing rapidly in recent years for organic fruit production (Maia *et al*., 2014). Therefore, the present investigation is aimed at this target of identifying suitable techniques to prevent bunch compactness for better yield and quality in Thompson Seedless grape.

OBJECTIVE

To know the effect of conventional and non-conventional chemicals to prevent bunch compactness of Thompson seedless grape

METHODOLOGY

The present study was conducted in 2020&2021 atNangarhar Province Angor bagh area eastern region of Afghanistan. Twelve years old healthy vines having uniform growth and vigour were selected for the experiment. These vines were trained on extended 'T'trellis. The clusters were sprayed with conventional and non-Conventionalchemicalthinning agentsSesame oil with a concentration of 0.5, 1.5, 2.0% and Mustard oil 0.5, 1.5, 2.0% viz., 100% bloom stage.The treatments were imposed at seven different conventional and non-conventional chemical thinningagents' levels in a Randomized Block Design with three replications. Vines were planted at a spacing of3.0 x 1.5 mapart.The following thinning treatments were evaluated aiming to prevent bunch compactness in Thompson Seedless grape(*Vitis vinifera* L.). The treatment details studied in the experiment were.

Thompson Seedless Grape	
Treatment	**Treatment details**
T_1	Mustard oil 0.5%
T_2	Mustard oil 1.5%
T_3	Mustard oil 2.0%
T_4	Sesame oil 0.5%
T_5	Sesame oil 1.5%
T_6	Sesame oil 2.0%
T_7	Standard GA_3.

All the vines under the experiment belonged to Thompson Seedless variety and were given uniform cultural practices such as fertilizers, irrigation and plant protection measures.

RESULTS AND DISCUSSION

The results of the present investigation, as well as relevant discussion, have been summarized under the following headings:

Berry characters

The berry length was maximum (2.45cm) in T_4 (Sesame oil 0.5%). In variety Thompson seedless followed by (2.24 cm) in T_3(Mustard oil 2.0%) whereas, minimum berry length (1.44 cm) was noticed in T_7 (Standard GA_3) accordingly. The elongation in berries is also caused by cell division and cell enlargement. Cell division in the pericarp region starts conceivably under the influence of hormones by gibberellins. In addition, the increase in berry size with the application of plant regulators is presumably due to the augmentation of the native supply of plant hormones. Thinning and loosening effects of GA_3 were also responsible for the greater development of berries of the treated bunches. An increase in berry length has also been reported by KOk (2011) in Perlette grapes;

Berry breadth was significantly affected by the application of conventional and non-conventional chemical thinning agents (Table 1). The berry breadth was minimum (1.21 cm) in T_7 (Standard GA_3) and maximum (1.76 cm) in T_4 (Sesame oil 0.5%) it was closely followed by T_3 (Mustard oil 2.0%) significant difference observed among the treatments respectively. This increase in berry diameter can be the result of the radial expansion of cells in addition to the longitudinal increase. This kind of expansion of radial growth of berry has also been reported by Ahmad and Zargar (2005) in the Blanc Corinth variety.

Berry's character was significantly affected by the application of conventional and non- Conventional chemical thinning agents (Table 1). The berry weight was recorded minimum (1.78 gr) in T_7 (Standard GA_3) and maximum (2.38 gr) in T_4 (Sesame oil 0.5 %.) Followed by (2.25 gr) in T_3 (Mustard oil 2.0%) significantly.

The increase in berry weight was mainly due to cell division at the initial stages and later due to faster expansion of cells associated with the influx of metabolites and water into the berry which caused the overall increase in berry weight. Akin, (2011) also reported that the berry development in Thompson Seedless grapes may be due to the role of hormones which mobilize elaborated food material, increase in water uptake, solute storage and synthesis of cell components.

The 50 berries weight significantly differed among the treatment of conventional and non- Conventional chemical thinning agent foliar application (Table1). In Thompson seedless, maximum numbers of 50 weight (176.02 gr) was found in T_4 (Sesame oil) followed by Mustard oil 2.0% and minimum fifty berry weight (129.85 gr) was found in T_1 respectively. All the treatments were significantly affected by the foliar application of the conventional and on-conventional chemical thinning agents. The increase in fifty berry weight was mainly due to cell division at initial stages and later due to faster expansion of cells associated with the influx of metabolites and water into the berry which caused the overall increase in fifty berry weight. These findings are in close

Table 1 : Effect of conventional and non-conventionalchemical on berry and bunch character ingrapes variety Thompson seedless

Treatments	Berry length (cm)	Berry breadth (cm)	Berry weight (g)	50 Berry weight (g)	Bunch length (cm)	Bunch breadth (cm)	No of berry per bunch	Bunch weight (g)
T_1	1.78	1.59	2.10	129.85	16.72	10.58	91.86	205.57
T_2	1.61	1.43	1.95	141.48	16.58	10.83	94.87	203.88
T_3	2.24	1.68	2.25	148.25	18.49	12.45	97.67	218.63
T_4	2.45	1.76	2.38	176.02	18.97	13.17	107.10	240.45
T_5	1.84	1.59	2.24	147.41	17.25	11.74	95.78	205.77
T_6	1.62	1.20	1.83	138.27	16.55	11.64	84.93	186.32
T_7	1.44	1.21	1.78	133.75	15.11	8.70	76.77	177.86
S. Em. +	0.08	0.06	0.06	2.58	0.12	0.22	1.85	1.40
C.D. @ 5%	0.11	0.08	0.08	3.65	0.17	0.32	2.61	1.98
CV %	7.37	6.42	4.71	3.08	1.24	3.43	3.45	1.18

agreement with Roberto (2015), who mentioned that the cluster weight and berry weight of 'Flame seedless' grapes were significantly increased after the vines were sprayed with GA_3 at bloom and fruit setting stages. Moreover, spraying GA_3 on the seedless grape cultivar at full bloom increased cluster weight, berry weight, berry diameter, length and yield per vine. (Youssef & Roberto., 2014) in 'Crimson seedless' grape.

Bunch character

The results obtained in the present study in respect of bunch length showed that T_4 (Sesame oil 0.5%) was significantly superior to the rest of the treatments which was (18.97cm), followed by (18.49 cm) in T_3 (Mustard oil 2.0%) while (15.11 cm) was in T_7 (Standard GA_3) showed minimum bunch length than the rest of conventional and non-conventional thinning agent's treatments significantly. The main reason for the increase in bunch length could be due to an increase in cell number and length which ultimately resulted in the highest rachis length that consequently could have contributed to an increase in bunch length. The increase in bunch length was more pronounced in the case of conventional thinning agents compared to other chemicals with increasing concentrations. The increase in bunch length has also been reported by Masroor Ahmad *et al*., (2005) in Perlette grapes.

The data on bunch breadth recorded at the time of harvest are presented. Bunch breadth was significantly influenced by the foliar-applied treatment. Maximum bunch breadth (13.17 cm) was observed in treatment T_4 (Sesame oil 0.5%) followed by 12.45cm in T_3 (Mustard oil 2.0%) and minimum bunch breadth (8.70 cm) noted in treatment T_7 (Standard GA_3) respectively. The increase in bunch width could be the result of an increase in berry size and can be a major factor contributing to the bunch breadth. Similar results are obtained by Kohale *et al*., (2013) in the Kishmish Chernyi variety through GA_3 application.

The foliar application of conventional and non-conventional chemicals had exhibited a significant effect on the bunch weight, no of berry per bunch, bunch length and breadth in Thompson seedless variety of grapes (Table 1). The maximum number of berry per bunch (107.10gr) was observed in T_4 (Sesame 0.5%), closely followed by 97.67gr in T_3 (Mustard oil 2.0%) while all the essential oil treatments, superior as compared to T_7 (Standard GA_3) respectively. The data clearly indicates that berry numbers in all treatments differ significantly in their effect from standard GA_3, at different concentration and cap fall stages. Thinning the flower clusters by reducing the fruit set helps in increasing the size and shape of berries. Similar results have been reported by Hanni *et al*., (2013).

The maximum bunch weight 240.45 gr was observed in T_4 (Sesame 0.5%) closely followed by 218.63gr T_3 (Mustard oil 2.0%) as compared to 177.86gr in T_7 (Standard GA_3). Elongation of the cluster is one of the most striking responses of grapes to Gibberellin acid. The increase in berry size can be a major factor contributing to the bunch's weight. Masroor Ahmad *et al*., (2005) in Perlette grapes as well as from the above results, it is clear that due to higher metabolic activity of the vine and accumulation of carbohydrates as a result of the effect of sesame oil and Mustard oil spray. These findings are in agreement with (Hanni *et al*., 2013).

Rodrígueze *et al*., (2013) observed maximum bunch length in 'Kishmish Charni' grape cultivar treated with 25 ppm GA_3. Khamis and Roberto, 2014, reported the increased bunch width (11.35 cm) with GA_3 (100 ppm) applied at full bloom followed by GA_3 at 50 ppm in the variety 'Perlette'.

Chemical composition

The quality of the table grape is judged by various organic and inorganic components present in the juice. In grape, a variety is judged as superior or inferior depending upon its TSS content percentage of sugars, acid content and sugar-acid blend for the taste. The data obtained in respect of TSS, acidity and TSS acid ratio are presented in (Table 2) for Thompson seedless variety of grapes.

In respect of conventional and non-conventional chemical thinning agents, it is observed that TSS was significantly affected by conventional and non-conventional thinning agent's treatment. The significantly minimum TSS 17.67 was noticed in treatment T_7 (standard GA_3) and maximum (18.87%) was recorded in treatment T_4 (Sesame oil) followed by T_3 (Mustard oil) and (18.72%) significantly. The increase in total soluble solids can be attributed to the effect of Gibberellic acid and Gibberellic acid like substances which could increase the capacity of berries to draw more carbohydrates through the increase in hormonal activity. A possibility can thus also be entertained that the increase in total soluble solids may be due to the quick metabolic transformation of insoluble compounds Kok (2011). It is evident from the data that conventional thinning agents were more effective in increasing the TSS than other treatments. Improvement in total soluble solids has also been found by Kohale (2013) in Thompson seedless.

Acidity was significantly affected by conventional and non-conventional chemical thinning agent's treatment levels. The significantly minimum acidity 0.64 was noticed in T_4 (Sesame oil 0.5%), followed by T_3 (Mustard oil 2.0%) and T_7 respectively. Improvement in the acidity of grapes is

Table 2: Effect of conventional and non-conventionalchemical on quality attributesand yield attributes in grapes variety Thompson seedless

Treatments	TSS (%)	Acidity (%)	TSS/acid ratio	No of bunches per vine	Yield/vine (kg)	Yield (t/ha)
T_1	18.30	0.80	24.97	25.10	6.50	14.68
T_2	18.37	0.74	24.68	25.92	7.29	15.82
T_3	18.72	0.72	28.45	27.58	7.73	17.17
T_4	18.87	0.64	31.70	33.23	9.15	21.75
T_5	18.54	0.73	27.67	25.94	7.45	16.80
T_6	18.43	0.81	25.39	22.17	5.53	13.48
T_7	17.67	0.73	24.82	20.38	5.37	12.95
S. Em. +	0.08	0.02	0.23	0.39	0.13	0.17
C.D. @ 5%	0.11	0.02	0.32	0.55	0.19	0.24
CV %	0.75	3.99	1.48	2.60	3.31	1.83

seen in this investigation, this reduction in acidity content of treated berries can be mainly due to the transformation of organic acids to sugars. Similar results have been given by Khamis and Roberto, (2014).

The TSS/acid ratio was significantly affected by Conventional and non-conventional chemical thinning agents at different treatment levels. The significantly minimum TSS acid ratio was noticed in treatment T_2 and T_7, and maximum TSS acid ratio was recorded in T_4, T_3, and T_5 respectively. Improvement in the TSS acid ratio of grapes was seen in this investigation, this increase in TSS/acid ratio could be attributed to an increase in TSS content with a corresponding decrease in acidity content of berries over control. These findings are in agreement with the results reported by other workers like Youssef & Roberto., (2014). The gradual increase in total sugars, TSS acid ratio and decrease in acidity during maturity may be due to the conversion of starch and acid into sugars in addition to the continuous mobilization of sugars from leaves to fruits (Gil *et al*., 2013, Rodríguez *et al*., 2013).

Yield

The yield of grapes was significantly affected by foliar application of conventional and non-conventional chemical thinning agents (Table 2). The results obtained in the present study in respect of the number of bunches per vine, yield per vine and yield per hectare showed that a significantly lower number of bunches per vine was obtained from control T_7 (standard GA_3) and higher numbers of bunches obtained in treatment T_4, T_3, and T_2 respectively. While significantly minimum yield per vine were obtained from T_7 (standard GA_3) and maximum yield per vine was (9.15 kg/vine) in T_4 closely followed by (7.73 kg/vine) in T_3 and (7.45 kg/vine) in T_5 in Thompson seedless. This increase in the yield may be due to the application of Gibberellic acid and Gibberellic acid like substances and have contributed to an increase in yield per vine which can be due to the cumulative effect of the physical characteristics of bunches and berries. The growth regulators influenced the growth and development process by promoting cell elongation and cell multiplication. The yield increase appears to have been indicated through an increase in bunch size as well as berry size and weight. These results are in conformity with findings obtained by Khamis *et al*., (2015).

The maximum yield per hectare (21.75 tonnes/ha) was obtained from T_4 closely followed by (17.17 tonnes/ha) in T_3 and (16.80 tonnes/ha) in T_5 while minimum yield (12.95 tonnes/ha) was obtained from spraying T_7 (standard GA_3) respectively. The increase in yield per hectare appears to have been indicated through an increase in bunch size as well as berry size and weight. These results are in conformity with those obtained by Karoglan *et al*., (2014). The cumulative effects of the physical characteristics of berry/bunches and their weight has resulted in an increase in yield per vine and tonnage harvested from a unit area. A similar increase in yield was reported by many previous workers (Mascarenhas. 2013). To explain the mode of action for using lemongrass extract at the full bloom stage it contains about 75-82%, oil. Omari and Sampth (2016) confirm that oil was used as photosynthetic inhibitors as a mode of acting alone or in combination with the other thinners to induce flower and fruit abscission.

CONCLUSION

Spraying Conventional and non- Conventional chemicals viz., Sesame oil 0.5% Mustard oil 2.0 % seems to be the promising treatment under this experiment. It shows the same effect as GA_3 on reducing the number of berries per bunch and prevents bunch compactness which improves berry character that is reflected in increasing the bunch weight, yield and quality parameters. The obtained results show a good chance to use sesame and mustard oil instead of synthetic chemical products of GA_3 to reduce the excessive fruit set for improving yield and fruit quality in Thompson seedless. Since the result presented has pertained to only one season, therefore, it will be desirable to continue further study for confirmation of the result.

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