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Research Article

IMPACT OF WATER SOLUBLE GA_3 TABLETS IN MANIK CHAMAN GRAPES

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Abstract- A field trial was conducted to evaluate the efficacy of GA_3 tablets (soluble in water) in grapes for improving the quality and yield. The trial was conducted during the season 2016-17 in grower's vineyard located at Pandharpur (M.S.), India. The experiment was performed on Manik Chaman grape variety which was grafted on Dogridge rootstock. Different treatments of Gibberellic acid tablets (GA_3 93%) and powders (GA_3 90%) were applied at flowering, 3-4 mm berry stage and 6-8 mm stage of berry development. The observations of bunch weight, 100 berry weights, berry length, TSS, Acidity and yield parameters were taken at harvest. The data showed significant differences in mean bunch weight, berry size, quality and yield parameters. The mean bunch weight was recorded maximum in GA_3 tablets when applied @ 40 ppm (372 g) treatments whereas it was found lowest in no application of GA_3 (235.7 g). The berry sizes, skin thickness and yield per vine were also recorded significantly highest in GA_3 applied plants. No symptoms of any abnormality, toxicity were found either on the leaves, canes, shoot or in grapes berries with the application of GA_3 tablets up to 80 ppm concentration.

Key Words- GA_3, GA_3 Tablet, Bioefficacy, Manik Chaman Grapes.

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Introduction

Grape (Vitis spp.) is one of the major important fruit crop in India having export potential [5]. Grape is grown under a variety of soil and climatic conditions in three distinct agro-climatic zones, namely, subtropical, hot tropical and mild tropical climatic regions in India. The productivity of grapes in India is very high, and yields also increasing rapidly [10]. With grapes, nutritional factors are mainly related to the synthesis of proteins and carbohydrates; while, the utilization of these metabolites depends on the hormonal status of the plants. Plant growth regulators (PGR's) occupy a prime position in grape production [2]. Use of plant growth regulator particularly GA_3 have become a very common practice among the grape growers in India with respect to export [9]. Plant growth regulators are extremely important magical chemicals in the integration of several metabolic processes and are also concerned with the response of plants to the external physical environment. Plant growth regulators (PGR's) are used in grape for various purposes *viz*. increasing fruitfulness, inducing bud break apart from increasing rachis elongation for production of well filled bunch, berry setting and also for increase in berry size besides quality improvement & increase in shelf life [4]. Improvement of quality and yield are the most important aspects of grape production. Berry size is the core quality aspects in international markets, growers often over use the growth regulators like Gibberellic acid (GA_3) to enlarge berry size [14]. The quality is mainly determined by berry size, color and pulp content while, yield is governed by the number of bunches per vine and bunch weight. For the production o Table grape in India, the general practices include the use of GA_3 sprays which results in reduction of number of flowers that set and then additional GA_3 spray were followed to increase the berry size [12]. Manik Chaman is a Table grape variety has wide adaptability with seedless, cylindrical-elongated, golden-yellow berries with medium-thin skin. The juice is straw coloured, sweet with a TSS of 20-22% with good keeping quality and is generally used for Table purpose and raisin making.

Material & Methods

The field experiments were carried out in Manik Chaman grapes grafted on Dogridge rootstock in the farmer's vineyard for the year (2016-2017) Pandharpur (M.S.) India. In the experiment, three each of 5 year old trees, highly crack-susceptible cultivars of grapes, were selected for study. Each treatment including the untreated control was replicated thrice. These trees were grown on grape vineyard and irrigated with about 5 liters of water per plant on alternate day from the middle of November to middle of February. Grape bunches were sprayed with GA_3 thrice at an interval of 10 days in 3-4 mm stage. The treatment details were T1- GA_3 Tablets @ 40 ppm Dipping, T2- GA_3 Tablets @ 80 ppm Dipping, T3- GA_3 Powder @ 40 ppm Dipping, T4- GA_3 Powder @ 80 ppm Dipping, T5- GA_3 Tablets @ 40 ppm spraying with Knap- sack sprayer, T6- GA_3 Tablets @ 80 ppm spraying with Knap- sack sprayer, T7- Control.

Recommended dose of fertilizer as well as crop protection measures were adopted. Observations of GA_3 Tablets on berry length, berry diameter, skin thickness, 50 berries weight, TSS and acidity were recorded at harvest. The observation on berry length and berry diameter was derived by averaging 50 berries randomly from each treatment and measured using vernier caliper (0-300 mm, RSK™) and expressed in millimeter (mm). The fifty berry weight was derived by averaging a randomly selected berry from 5 bunches. Berry skin thickness was determined by means of micro screw gauze (Mitutoyo, Japan) and expressed in micrometer (µm). Total soluble solids and acidity of grapes were measured by making juice of 10 berries selected randomly from each treatment and gauged by hand refractometer (Tokyo, Japan) and Acid-base titration method respectively. Total soluble solids (TSS) were expressed in degree brix (°β) and acidity was expressed in percentage (%). The data was analyzed by one-way analysis of

variance (ANOVA) using SAS software (V 9.3). To determine the shelf life of Manik Chaman grapes, the uniformly ripened grape bunches were harvested in replicate from each treatment. The harvested bunches (5 kg/treatment) were placed in cardboard boxes and kept in cold storage (0° C) for 30 days as per the guidelines of international standard. After removing bunches from cold storage, observations were recorded daily up to 7 days (at the same time) for physiological loss in weight (PLW). The initial weight of fresh fruit was recorded and subsequently the weights were taken. The physiological loss in weight was estimated as given below and expressed in percent.

$$\text{PLW (\%)} = \frac{\text{Initial weight of the fruit} - \text{Final weight of the fruit}}{\text{Initial weight of the fruit}} \times 100$$

Results and Discussion

India has made tremendous strides in improving the horticultural outputs through use of recent agro-technologies. The plant growth regulators are being increasingly used in viticulture to improve the fruit quality and production [5]. The season during which trial was conducted was very dry with moderate temperature. The data showed that the application of GA_3 Tablets significantly increases the yield and quality of grapes. Among the all treatments T5 (GA_3 Tablets @ 40 ppm spraying with Knap- sack sprayer) shows maximum yield as compared to control and other treatments.

In addition to the yield parameters, various parameters of berry quality were also evaluated, results of which are summarized in [Table-1]. The maximum berry length (25.47 mm) was recorded with the application of T4 (GA_3 Powder @ 80 ppm Dipping). The maximum 100 berry weight (395.83 g), berry diameter (16.86 mm) and also bunch weight (372 g) was recorded with the application of T5 (GA_3 Tablets @ 40 ppm spraying with Knap- sack sprayer) these results are in accordance with Rafaat, *et al*. [8] who reported that spraying of sitofex (CPPU) and GA_3 significantly increased bunch weight of Thompson Seedless grapes. The increased bunch weight might be due to the increase in cell number and cell size and also due to influence of growth regulators possibly through induced hormonal activities. The quality parameters such as T.S.S. and acidity were greatly influenced by the application of GA_3. Among the quality parameters the highest Total Soluble Solid (17.83 °β) was recorded with T7 (Control). Yield per hectare (27.8 t/ha) and Brix yield (254.69 kg/ha) were found highest in treatment T5 (GA_3 Tablets @ 40 ppm spraying with Knap- sack sprayer). The growth regulators boost the overall vegetative growth and biological efficacy of the vine. This increase in yield was in line with findings of Ramteke, *et al*. [9] and Sheng-Baolong, *et al*. [13] in grapes. The data on TSS/acidity ratio indicates that highest TSS/acidity ratio (31.28) was recorded in T7 (control) while, lowest (23.68) was recorded in T3 (GA_3 Powder @ 40 ppm Dipping). The results are in agreement with Joblan, *et al*. [6] who reported that the application of GA_3 with CPPU reduced soluble solid-acid ratio in 10 years old Moscatel Rosada grape. The result of the present study was also in line with findings of Bhat, *et al*. [3] in grape. The shelf life study of the harvested grapes was also studied as depicted in [Table-2] which illustrate that the lesser weight loss (7.82%) was recorded in T6 (GA_3 Tablets @ 80 ppm spraying with Knap- sack sprayer). T5 treatment (GA_3 Tablets @ 40 ppm spraying with Knap- sack sprayer) also recorded the lowest weight loss (9.78%) which was on par with treatment T6 while, the higher weight loss (29.60%) was recorded in T2 (GA_3 Tablets @ 80 ppm Dipping). This reduced weight loss might be due to the increased pedicel thickness and its closer attachment with berries also delayed the formation of abscisic acid in peduncle. Post-harvest berry drop is prevalent in GA_3 treated Thompson Seedless grapes [2] and it has been related to increased loss of flexibility in pedicels [7, 11].

Table-1 *Effect of GA_3 tablet on yield and quality parameters in Manik Chaman grapes*

Treatments	Bunch wt.	100 berry wt.	Berry length	Berry Diameter	Skin thickness	Pedicel thickness	T.S.S	Acidity	TSS/Acid Ratio	Yield/ha	Brix yield
	(g)	(g)	(mm)	(mm)	(µm)	(mm)	(Brix)	(%)		(ton)	
1	236.07	285.33	22.13	15.13	17.66	1.16	17.47	0.61	28.64	17.67	164.06
2	315.03	281.33	22.8	15.16	17	1.50	16.83	0.65	25.89	23.54	212.46
3	285.4	343.17	24.83	15.3	18.66	1.29	16.07	0.68	23.63	21.43	184.36
4	324.8	395.83	25.47	16.23	20	1.65	17.33	0.6	28.88	24.38	224.35
5	372	357.67	25.43	16.86	22	1.37	17.17	0.59	29.10	27.8	254.69
6	345.67	282.83	21.53	14.33	19.33	1.56	16.93	0.65	26.05	25.84	234.3
7	235.7	245.17	20.3	14.03	14.33	1.00	17.83	0.57	31.28	17.39	168.04
SEM (±)	**17.88**	**11.483**	**0.17**	**0.14**	**0.82**	**0.02**	**0.14**	**0.01**	**1.25**	**0.07**	**0.28**
C.D @ 5 %	**55.71**	**35.773**	**0.53**	**0.46**	**2.57**	**0.05**	**0.42**	**0.03**	**0.78**	**0.22**	**0.88**

Table-2 *Effect of GA_3 tablet on Shelf life in Manik Chaman grapes*

Treatment	Day 1	Day 2	Day 3
	Weight Loss (%)	Weight Loss (%)	Weight Loss (%)
1	3.72	1.31	17.04
2	4.11	6.48	11.09
3	4.58	8.27	12.12
4	3.91	7.33	8.50
5	3.86	7.88	9.78
6	2.70	5.66	7.82
7	6.21	9.96	12.97
SEM (±)	**0.95**	**1.32**	**1.50**
C.D @ 5 %	**NS**	**4.12**	**4.67**

Conclusion

By conducting the above research, it was concluded that, the increase in yield and its components might be due to the influence of growth regulators possibly through induced hormonal activities. Application of GA_3 Tablets @ 40 ppm had significantly increased bunch weight in all the treatments as compared to control. Among the different growth regulator treatments imposed, berry length and berry diameter were increased linearly with increasing trends of GA_3 Tablets applications. The maximum berry length was found with application of GA_3 Tablets @ 40 ppm over control while, berry length was found higher with application of GA_3 Tablets @ 80 ppm. Also, the application of GA_3 Tablets had significantly increased the yield/vine and benefit cost ratio as compared to control. Shelf life of grape was also found better with the GA_3 treated berries as compared to control. Hence, it can be concluded that GA_3 Tablets @ 40 ppm should be applied at 3-4 mm size stage and repeated twice after 10 days to improve the yield and quality of Manik Chaman grapes.

Application of research

Research is applicable for grape growers for increasing their production with superior quality and residue free grapes.

Research Category: Grape yield and quality improvement

Abbreviations: TSS: Total soluble solids

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References

[1] Abdul A.H., Zhang S.S., Chen D., Chen L., Chen K., Xu, C.J. and Chen Z. (1998) *Scientia-Agricultura-Sinica,* 31(1), 92-94.
[2] Ben-Tal Y. (1990) *Am. J. Enol. Vitic*, 41, 142**-**146.
[3] Bhat Z.A., Srihari D. and Reddy Y.N. (2004) *Annals of Biology*, 20, 75-77.
[4] Cai-Li H., Hu- C. and Luo-Zheng R. (1996) *South-China-Fruits*, 25(2), 45**-**47.
[5] Chadha K. L. and Shikhamany S. D. (1999) Malhotra Publishing House, New Delhi, India, 338**-**380.
[6] Joblan M.J.P., Merino H.R., Wilckens E.R. and Medina E. (1995) *Agro-Ciencia*, 11(2),119-127.
[7] Nakamura M. and Hori Y. (1981) *Tokohu J. Agr. Res*, 32, 1-13.
[8] Rafaat. S., Elgendy S., Ghada S.S. and Ahmed O.A. (2012) *Journal of American Science*, 8(5), 21-34.
[9] Ramteke S.D., Somkuwar R.G., Shikhamany S.D. and Satisha J. (2002) *Indian J. Agric. Sci.*, 72(1), 3-5.
[10] Ramteke S.D. and Somkuwar R.G. (2005) *Ind. J. plant physi*ol, 10(2), 179**-**181.
[11] Retamales J. and Cooper T. (1993) *Acta Hortic*, 329, 81-83.
[12] Roper T.R. and Williams L.E. (1989) *Plant Physiology*, 89, 1136**-**1140.
[13] Sheng B., Lin J., Shao M., Rui D. and Chang Y.H. (2004) *Jiangsu. J. of Agril. Sci*, 20 (1), 32-37.
[14] Zoffoli J.P., Latorre B.A. and Naranjo P. (2009) *Postharvest Biology and Technology*, 51(2), 183**-**192.