Research Paper | *The Asian Journal of Horticulture,* (June, 2010) Vol. 5 No. 1 : 180-184

Effect of preharvest spray of growth regulators on yield and quality of seedless grape genotypes

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Accepted : *April, 2010*

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ABSTRACT

The present study was carried out to know the response of seedless grape genotypes to growth regulators in New orchard Department of Horticulture, University of Agricultural Sciences, Dharwad during 2002-2003. Three grape genotypes with two growth regulators were tried. Application of GA_3 50 ppm + BR 1 ppm twice after fruit set stage was more effective in increasing leaf area, chlorophyll content and dry matter content of seedless grape genotypes whereas yield parameters such as bunch length, bunch width and yield per vine were maximum in Arka Neelamani genotype.

Key words : Grape, Growth regulator, Gibberellic acid, Preharvest spray, GA_3, Brassinosteroid, Br

Grape is an important delicious fruit crop and is consumed by large population. Seedless grape genotypes are excellent cultivars for both table and raisin making. These cultivars are known to have small berry size mainly because of compactness of bunch. To get good quality fruits which could fetch remunerative price in the market, use of growth regulators like gibberellic acid (GA_3) and brassinosteroids (BR's) have been found to be effective (Shikhamany and Prakash, 1994). Application of growth regulators like Brassinosteroid alone and in combination with gibberellic acid (GA_3) are known to increase the leaf area, chlorophyll content and dry matter content of the leaves and also improve the productivity of the seedless grape genotypes (Anitha, 1993 and Vivency, 1995).

MATERIALS AND METHODS

The investigation was carried out on four year old seedless grape genotypes from November, 2002 to March 2003 using uniform vines. The vines planted 1.8 x 1.20 meters were used for this study. A set of three uniform bunches were randomly selected in each genotypes and considered as one treatment with three replications. Totally 108 bunches were selected and labelled before imposing the treatments. The experiment was laid-out in a split plot design with three genotypes in main plot and two growth regulators or growth regulator like substances in sub plot treatment.

Main treatments (genotypes)

G_1 – Thompson seedless

G_2 – Sharad seedless

G_3 – Arka Neelamani

Sub-treatments (growth regulators)

T_1 – Gibberellic acid (GA_3) – 50 ppm

T_2 – Brassinosteroid (BR) – 1 ppm

T_3 – Gibberellic acid (GA_3) – 50 ppm + Brassinosteroid (BR) 1 ppm

T_4 – Untreated (control)

The vines were sprayed with growth regulators at the time of fruit set stage and repeated the same spray after one week.

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussion have been summarized under following heads:

Leaf area:

The result obtained from this study revealed that application of GA_3 50 ppm + BR 1 ppm recorded the highest leaf area in Arka Neelamani at all the growth stages *viz.,* 15 DAT (192.62 cm^2), 30 DAT (201.04 cm^2), 45 DAT (210.83 cm^2), 60 DAT (220.82 cm^2) (Table 1). Whereas, Thompson seedless and Sharad seedless were found to be at par with each other. This could be probably due to the genotypic character of the vine and also exogenous application of brassinosteroid to plant induces various responses like stimulation and elongation of growth and retardation of senescence of the leaves. Similar findings were also observed by Vivency (1995) and Ramraj *et al.* (1997) in potato.

Table 1 : Effect of pre-harvest spray of growth regulators on leaf area of seedless grape genotypes

Treatments	15 DAT				30 DAT				45 DAT				60 DAT			
	Genotypes				Genotypes				Genotypes				Genotypes			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
T_1	185.02	181.30	190.30	185.54	198.72	190.58	199.63	196.31	209.65	201.64	211.83	207.71	217.65	208.64	221.83	216.04
T_2	188.56	183.60	196.00	189.39	196.53	192.03	203.00	197.19	203.62	199.10	211.00	204.57	211.96	206.10	221.00	213.02
T_3	200.55	195.80	207.00	201.12	212.38	202.83	214.67	209.96	221.42	211.90	224.67	219.33	229.42	218.90	234.67	227.66
T_4	173.00	170.30	177.17	173.49	178.28	178.60	186.87	181.25	186.02	186.07	195.80	189.29	194.02	193.07	205.80	197.63
Mean	186.78	182.75	192.62	187.38	196.48	191.01	201.04	196.18	205.18	199.68	210.83	205.23	213.26	206.68	220.82	213.59
			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)
Genotypes (G)			1.05	4.11			1.15	4.52			1.29	5.07			1.25	4.91
Treatments (T)			3.74	11.12			3.77	11.21			3.77	11.19			3.76	11.17
G x T – between two genotypes means at same growth regulators			5.71	NS			5.78	NS			5.80	NS			5.78	NS
T X G – between two growth regulators means at same genotypes			6.49	NS			6.54	NS			6.53	NS			6.51	NS

NS – Non significant

Total chlorophyll content of index leaf:

Significantly higher total chlorophyll content was recorded in Arka Neelamani at all the growth stages 15 DAT (1.15 mg/g), 30 DAT (1.51 mg/g), 45 DAT (2.66 mg/g), 60 DAT (2.47 mg/g) (Table 2), upon preharvest application of GA_3 to ppm + BR 1 ppm when compared to Thompson seedless and seedless over control. Increase in total chlorophyll content may be due to the genotypic character and also spraying of growth regulators might have caused favourable impact towards better physiological behaviour regarding increased photosynthesis (Singh *et al.*, 1991) and also exogenous application of growth regulators resulted in the retardation of senescence of leaves. Similar findings were reported by Davis (1995) and Suwandik (1988) in Thompson seedless grape.

Dry matter content of index leaf:

Arka Neelamani recorded significantly higher dry matter content of the index leaf at all the growth stages 15 DAT (23.18%), 30 DAT (25.84%), 45 DAT (29.34%), 60 DAT (33.01%) (Table 3) due to application of GA_3 50 ppm + BR1 ppm when compared to Thompson seedless and Sharad seedless over control. Increase in dry matter content must be due to response of Arka Neelamani to gibberellic acid and Brassinosteroid beneficial effect of these growth regulators attributed to an increase in photosynthetic activity, accelerated transport and efficiency of utilizing photosynthates. Thus resulted in increased cell division elongation in growing portions which has contributed to higher dry matter accumulation in leaves (Phinney *et al.*, 1957).

Length of the bunch:

Thompson seedless recorded significantly maximum (19.58 cm) bunch length (Table 4) when sprayed with GA_3 50 ppm + BR1 ppm as preharvest application when compared to Sharad seedless and Arka Neelamani over control. This increased bunch length might be due to cell elongation of rachis of bunches. Growth regulator treated bunches were known to have thicker rachis which is an indication of increase in size of the transporting path in peduncle (Singh and Sharma, 1972 and Anitha, 1993) which has resulted in an increased movement of metabolites to developing berries. These findings are in confirmation with findings of Vivency (1995) in Thompson seedless grape.

Width of the bunch:

Significantly maximum (7.77 cm) bunch width was recorded in Arka Neelamani (Table 5) upon spraying of GA_3 50 ppm + BR 1 ppm as pre-harvest application when

Table 2 : Effect of pre-harvest spray of growth regulators on total chlorophyll content (mg/g) of the index leaf in seedless grape genotypes

Treatments	Days after treatment (DAT)															
	15 DAT				30 DAT				45 DAT				60 DAT			
	Genotypes				Genotypes				Genotypes				Genotypes			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
T_1	0.98	0.76	1.16	0.97	1.33	1.04	1.56	1.31	2.58	2.09	2.86	2.51	2.08	1.59	2.53	2.07
T_2	0.73	0.51	0.94	0.73	1.09	0.80	1.34	1.08	2.34	2.00	2.50	2.28	1.84	1.35	2.31	1.83
T_3	1.23	1.04	1.60	1.29	1.59	1.32	2.00	1.64	2.72	2.51	2.96	2.73	2.34	1.84	2.96	2.38
T_4	0.47	0.36	0.76	0.53	0.83	0.60	1.16	0.86	2.08	1.69	2.33	2.03	1.58	1.09	2.09	1.59
Mean	0.85	0.67	1.15	0.88	1.21	0.94	1.51	1.22	2.43	2.07	2.66	2.39	1.96	1.47	2.47	1.97
			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)
Genotypes (G)			0.01	0.05			0.02	0.06			0.05	0.20			0.05	0.20
Treatments (T)			0.03	0.09			0.06	0.17			0.07	0.20			0.07	0.20
G x T – between two genotypes means at same growth regulators			0.05	NS			0.09	NS			0.11	NS			0.11	NS
T X G – between two growth regulators means at same genotypes			0.05	NS			0.10	NS			0.12	NS			0.12	NS

NS – Non significant

Table 3 : Effect of pre-harvest spray of growth regulators on per cent dry matter content of index leaf of seedless grape genotypes

Treatments	Days after treatment (DAT)															
	15 DAT				30 DAT				45 DAT				60 DAT			
	Genotypes				Genotypes				Genotypes				Genotypes			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
T_1	20.53	20.58	24.07	21.73	23.20	23.25	26.70	24.38	26.70	26.75	30.20	27.88	30.20	30.25	34.36	31.61
T_2	19.83	17.53	23.22	20.20	22.50	20.20	25.89	22.86	26.00	23.70	29.39	26.36	29.50	27.20	32.89	29.86
T_3	23.13	22.03	25.61	23.60	25.80	24.70	28.28	26.26	29.30	28.20	31.78	29.76	32.80	31.70	35.28	33.26
T_4	17.48	17.03	19.83	18.12	20.15	19.70	22.50	20.78	23.65	23.20	26.00	24.28	27.15	26.70	29.50	27.78
Mean	20.25	19.30	23.18	20.91	22.91	21.96	25.84	23.57	26.41	25.46	29.34	27.07	29.91	28.96	33.01	30.63
			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)
Genotypes (G)			0.33	1.31			0.33	1.31			0.41	1.61			0.25	1.00
Treatments (T)			0.32	0.95			0.31	0.93			0.33	0.98			0.33	0.99
G x T – between two genotypes means at same growth regulators			0.57	NS			0.58	NS			0.64	NS			0.56	NS
T X G – between two growth regulators means at same genotypes			0.55	NS			0.54	NS			0.57	NS			0.58	NS

NS – Non significant

Table 4 : Effect of pre-harvest spray of growth regulators on length of the bunch (cm) of seedless grape genotypes

Treatments	DAYS AFTER TREATMENT (DAT)															
	15 DAT				30 DAT				45 DAT				60 DAT			
	Genotypes				Genotypes				Genotypes				Genotypes			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
T_1	15.20	6.22	13.33	11.58	15.90	6.90	13.95	12.25	17.60	8.60	15.65	13.95	20.57	11.62	18.63	16.94
T_2	13.53	5.96	11.39	10.29	14.23	6.65	12.08	10.99	15.93	8.35	13.78	12.69	18.78	11.29	16.79	15.62
T_3	17.85	8.35	15.72	13.97	18.55	9.05	16.42	14.67	20.25	10.42	18.12	16.26	23.22	13.43	21.21	19.29
T_4	10.53	4.20	9.35	8.03	11.23	4.90	10.05	8.72	12.73	6.60	11.75	10.36	15.74	9.60	14.79	13.38
Mean	14.28	6.18	12.45	10.97	14.98	6.87	13.12	11.66	16.63	8.49	14.82	13.31	19.58	11.48	17.85	16.31
			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)
Genotypes (G)			0.06	0.25			0.04	0.16			0.05	0.19			0.03	0.13
Treatments (T)			0.29	0.87			0.32	0.94			0.31	0.93			0.35	1.04
G x T – between two genotypes means at same growth regulators			0.44	NS			0.48	NS			0.47	NS			0.53	NS
T X G – between two growth regulators means at same genotypes			0.51	NS			0.55	NS			0.54	NS			0.61	NS

NS – Non significant

Table 5 : Effect of pre-harvest spray of growth regulators on width of the bunch (cm) of seedless grape genotypes

Treatments	Days after treatment (DAT)															
	15 DAT				30 DAT				45 DAT				60 DAT			
	Genotypes				Genotypes				Genotypes				Genotypes			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
T_1	5.17	2.78	5.82	4.59	5.77	3.38	6.45	5.20	6.47	4.08	7.12	5.89	7.24	5.08	8.12	6.81
T_2	4.62	2.28	5.10	4.00	5.22	2.97	5.71	4.63	5.92	3.58	6.40	5.30	6.72	4.58	7.40	6.23
T_3	6.01	3.75	6.72	5.49	6.60	4.36	7.32	6.09	7.31	5.05	8.02	6.79	8.11	6.05	9.02	7.23
T_4	3.35	1.79	4.25	3.13	4.00	2.40	4.81	3.74	4.65	3.76	5.55	4.65	5.45	4.76	6.55	5.59
Mean	4.79	2.65	5.47	4.30	5.40	3.28	6.07	4.92	6.09	4.12	6.77	5.66	6.88	5.12	7.77	6.59
			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)			S.E.±	C.D. (P=0.05)
Genotypes (G)			0.03	0.12			0.06	0.24			0.09	0.37			0.14	0.55
Treatments (T)			0.08	0.22			0.11	0.31			0.17	0.50			0.18	0.54
G x T – between two genotypes means at same growth regulators			0.12	NS			0.17	NS			0.27	NS			0.31	NS
T X G – between two growth regulators means at same genotypes			0.13	NS			018	NS			0.29	NS			0.32	NS

NS – Non significant

Table 6 : Effect of pre-harvest spray of growth regulators on the yield per vine (kg) of seedless grape genotypes

Treatments	Genotypes			
	G_1	G_2	G_3	Mean
T_1	3.61	1.63	7.95	4.40
T_2	3.44	1.38	6.20	3.67
T_3	4.24	2.28	9.97	5.49
T_4	2.74	0.77	4.66	2.72
Mean	3.51	1.51	7.19	4.07
			S.E.±	C.D. (P=0.05)
Genotypes (G)			0.06	0.26
Treatments (T)			0.04	0.12
G x T – between two genotypes means at same growth regulators			0.09	0.26
T x G – between two growth regulators means at same genotypes			0.07	0.21

NS – Non significant

compared to Thompson seedless and Sharad seedless over control. Increased bunch width may be due to in size of the berry better fruit set and increase in size of the berry. Similar results were reported by Patil *et al.* (1980) and Mor *et al.* (1986) in grape.

Yield per vine:

Pre-harvest sprays of GA_3 50 ppm + BR 1 ppm was found to have significant influence on yield (Table 6) of the seedless grape genotypes. Maximum (7.19 kg/vine) yield was recorded in Arka Neelamani when compared to Sharad seedless and Thompson seedless over control. Increased yield may be due to more number of berries per bunch and better fruitset and increase in size of the berry might have helped to produce heavy bunches and increased the yield. Similar results were reported by Fallahi *et al.* (1995) in Thompson seedless grape.

It may be concluded that the application of GA_3 50 ppm + BR1 ppm twice after fruitset stage was more effective in increasing leaf area, chlorophyll content and dry matter content of seedless grape genotypes whereas yield parameters such as bunch length, bunch width and yield per vine were maximum in Arka Neelamani genotype.

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