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Effect of Quantum on Increasing Growth, Yield and Quality of Grapes

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Abstract: A field experiment was carried out during 1999-2000 to study the effect of quanturm (N-acetyl thiaozolidine -4- carboxylic acid), a plant bio-stimulant on grape variety Tas- A- Ganesh grafted on 1613 C rootstock, Treatments comprised of Quantum @ 0.02, 0.05 and 0.1 per cent sprayed at 45, 75 and 90 DAP (days after pruning). Clusters were also dipped twice at 102 and 112 DAP. Results reveated that quantum increased the mean shoot length, but not leaf size,leaf chlorophyll content and specific leaf weight (SLW). The treatment with quantum @ 0.05% with two foliar sprays at 45 and 75 DAP and bunch dipping once at 102 DAP was considered as the best and was effective in increasing the yield and improving berry characters.

Introduction

Bioregulators are generally used for regulation of vegetative and reproductive growth and are very effective particularly in grapes. The use of bioregulators in grapes is more than any other crop to stimulate flower bud differentiation and reproductive growth at backward and forward pruning, respectively. The quantum is astabilized extract of certain plants and minerals which contain growth stimulating substances.

Quantum (N-acetyl thiazolidine-4-caroxylic acid) is a stabilizer buffer, when applied to plants helps to tolerate certain types of stresses more effectively (Berg, 1986). It is applied as foliar spray absorbed by the leaves to stimulate photosynthesis and leaf growth (Curry and William, 1983 and Syltie, 1988). The bioefficacy of quantum is therefore assessed in Tas-A- Ganesh grapes grafted on 1613 C rootstock.

Material and Methods

Field experiment was conducted during 1999-2000 in Tas- A- Ganesh grape genotype or 3 times at 45, 75 and 90 DAP with 0.02, 0.05 and 0.1 per cent quantum. Clusters were also dipped twice at 102 and 112 DAP, the treatment details are indicated below:

Treatment details

T_1: Quantum (0.02 %)-2 foliar sprays + 1 cluster dipping

T_2: Quantum (0.05 %)-2 foliar sprays+1 cluster dipping

T_3: Quantum (0.10%)-2 foliar sprays + 1 cluster dipping

T_4: Quantum (0.02%)-2 foliar sprays+2 cluster dippings

T_5: Quantum (0.05%)-2 foliar sprays+2 cluster dippings

T_6: Quantum (0.10%)-2 foliar sprays+2 cluster dippings

T_7: Quantum (0.02%)-2 foliar sprays+2 cluster dippings

T_8: Quantum (0.05%)-3 foliar sprays+2 cluster dippings

T_9: Quantum (0.10%)-3 foliar sprays+2 cluster dippings

T_{10}: Quantum (0.02%)-3 foliar sprays+1 cluster dipping

T_{11}: Quantum (0.05%)-3 foliar sprays+1 cluster dipping

T_{12}: Quantum (0.10%)-3 foliar sprays+1 cluster dipping

T_{13}: Quantum (no quantum spray)

Note: 2 foliar sprays at 45 & 75 DAP sprays at 45, 75 & 90 DAP 1 cluster dippings at 102 DAP, 2 cluster clippings at 102 & 112 DAP

Three vines in each plot were tagged and there were three replications. A total of 117plants were utilized in the experiment. Observations on

morphological, biochemical and yield parameters were recorded at 90 days after October pruning. Biochemical analysis was done for chlorophyll and anthocyanin content in peels by following standard procedures (Aron, 1949).

Yield and yield attributes were recorded at harvest. Shell life study was made by keeping grape samples were kept in the cold storage for 30 days after perfecting them for24 hours by keeping them in cold storage within 6 hours. After 30 days of cold storage, the samples were then kept in shelf and observations on physiological loss in weight was recorded every day upto 7 days.

Results and Discussion

Significant differences were observed in shoot length due to quantum application with T_6 recording significantly higher shoot length over all other treatments, except T_2 and T_3 (Table 1). The lowest shoot length of 100. 17 cm was observed in control which was significantly lower over all other treatments, except T_1, T9 and T_{10}. This indicates that the foliar application of quantum at early stages (45 and 75 DAP) resulted in increased shoot length. However, quantum application did not bring any significant change in leaf area, chlorophyll content and SLW.

Observations on yield and berry quality attributes presented in table 2 revealed that treatments of quantum increased the yield per vine, mean bunch weight, 50 berry weight, pedicel thickness berry length, berry crispness, but reduced the anthocyanin content. Treatments did not influence the berry number, its diameter, chlorophyll content in peels and TSS content of berries. Higher 50 berry weight was recorded in all the quantum treatments. However, it was

Table 1. Effect of quantum on growth characters in Tas-A-Ganesh on 1613 C rootstock

Treatments	Shoot length (cm)	Mean leaf area (cm^2)	Chlorophyll content in leaves (mg/g. fresh wt.)	Specific leaf weight (mg/cm2)
T1	116.50	133.09	3.055	7.71
T_2	142.17	128.79	2.525	6.98
T_3	140.07	114.35	2.015	8.98
T_4	134.50	118.35	2.540	8.89
T_5	135.50	123.15	3.085	8.25
T_6	164.90	119.99	2.635	8.97
T_7	127.03	110.60	2.555	9.04
T_8	127.83	120.84	2.610	8.41
T_9	111.50	104.76	2.805	1.02
T_{10}	135.10	125.85	2.680	0.90
T_{11}	111.13	112.25	2.450	1.06
T_{12}	121.50	99.74	2.885	1.07
T_{13}	100.17	100.96	2.120	0.89
S.Em±	9.01	12.293	0.210	0.87
C.D. at 5%	26.30	NS	NS	NS

Table 2. Effect of quantum on yield, berry characteristics and quality in Tas-A-Ganesh on 1613 c rootstock

Treat Ments	No. of berries/ bunch	50 berry weight(g)	Mean bunch weight(g)	Berry length (mm)	Berry diameter (mm)	Berry crispness (0-10 scale)	Dry matter of berries (g)	Anthocyanin content in peels (mg/g fresh wt.)	Chlorophyll content in peels mg/g fresh wt.)	Pedicel thickness (mm)	TSS (0B)	Acidity (%)	Yield vine (kg)
T_1	81.7	72.08	147.40	16.97	12.33	7.00	0.340	0.345	0.530	2.12	23.33	0.568	6.500
T_2	111.3	96.83	204.43	20.80	12.83	7.33	0.473	0.282	0.685	1.91	23.33	0.545	7.693
T_3	90.6	110.50	173.20	21.33	13.80	7.00	0.563	0.289	0.520	2.34	24.73	0.487	7.037
T_4	95.8	74.90	166.16	16.93	12.63	5.66	0.380	0.133	0.500	1.85	23.73	0.483	5.940
T_5	102.3	82.77	161.43	19.03	12.70	6.66	0.423	0.311	0.690	1.93	24.20	0.515	5.283
T_6	86.7	91.40	164.00	18.63	13.33	5.66	0.447	0.481	0.690	1.83	24.00	0.498	7.007
T_7	87.5	71.10	137.93	17.13	12.40	6.33	0.353	0.307	0.440	1.95	23.60	0.533	4.670
T_8	85.3	78.53	128.76	19.20	12.13	6.33	0.383	0.394	0.490	2.12	23.80	0.555	6.210
T_9	108.0	82.10	159.40	18.07	2.17	6.66	0.333	0.465	0.510	2.03	22.47	0.567	6.200
T_{10}	93.3	86.07	144.70	19.37	12.97	7.00	0.417	0.265	0.440	1.83	26.67	0.630	5.050
T_{11}	73.0	68.70	158.47	17.30	12.13	5.66	0.373	0.493	0.560	1.67	25.40	0.615	5.060
T_{12}	98.3	67.60	135.37	16.73	12.03	6.00	0.343	0.446	0.520	1.52	23.33	0.310	6.460
T_{13}(control)	89.2	64.57	119.87	15.37	11.50	5.33	0.327	0.455	0.580	1.83	24.40	0.588	3.833
S.Em±	8.34	7.43	6.04	1.02	0.44	0.450	0.033	0.070	0.038	0.012	0.74	0.023	0.267
C.D at 5%	NS	21.70	17.635	2.970	NS	1.457	0.095	0.204	0.120	0.033	NS	0.068	0.780

highest in quantum treatment at 0.1% as 2 foliar sprays and 1 dip. Likewise, mean bunch weight was also more in all the quantum treatments and among the treatments, it was highest when the quantum was given @ 0.05% as two foliar sprays and dipping once. Significant differences in berry size, particularly in terms of berry length were observed in quantum treatments compared to conrol. Berries were more crisp in quantum treatments as compared to control (no quantum), indicating the influence of quantum on crispness. Dry matter content of berries determines the pulp content was higher in quantum treatment over control and the maximum pulp content was recorrded when the quantum was applied as two foliar sprays @ 0.1% and also when the bunches were dipped once. This indicates that the crispness of berry and pulp content are interlinked with each other. Chlorophyll and anthocyanin contents which determine the colour of berries were recorded the peels to see the effect of quantum in reducing browning or pink berries in the bunch. In general, the anthocyanin content was higher due to quantum treatments. This indicates that the quantum helps in retaining greenness of berries. Dubravec and Licul (1983) also reported an increase in chlorophyll content in the samples with the application of agrigospon and ergostim, which are similar products as that of quantum. Agri the pedicel thickness is a prerequisite to reduce the berry drop in the transit.

Quantum sprayed vines had thick pedicels comparee to control. With respect to quality parameters, only acidity differed significantly between the treatments. In general it was found that the acidity was more when the quantum was applied 3 times as a foliar spray. This indicates that quantum must be helping in the synthesis of organic acids and helps to have higher acidity in the berries. Quantum treatment also resulted in higher yield/vine as compared to control. Among treatments, maximum yield was recorded when th quantum was applied @ 0.05% as two foliar sprays and dipped once. The treatment of quantum @ 10.1% as 2 foliar sprays

Table 3. Effect of quantum on growth characters in Tas-A-Ganesh on 1613 C rootstock

Treatments	Days in shelf				
	1	2	3	4	5
T1	2.00 (8.07)	5.42 (13.41)	9.99 (18.33)	12.87 (20.87)	25.54 (29.87)
T_2	3.35 (9.98)	7.19 (15.45)	8.40 (16.78)	10.63 (18.97)	14.5 (22.27)
T_3	1.43 (6.83)	4.98 (12.83)	7.39 (14.80)	11.65 (19.75)	12.86 (20.93)
T_4	2.78 (9.45)	4.49 (12.03)	9.03 (17.33)	11.13 (19.38)	13.73 (21.65)
T_5	6.10 (14.24)	6.13 (14.30)	10.19 (18.56)	11.23 (19.56)	15.72 (23.34)
T_6	4.44 (10.27)	5.38 (13.26)	9.00 (16.96)	11.19 (19.19)	14.38 (22.11)
T_7	1.97 (7.48)	4.44 (11.82)	6.03 (13.08)	9.26 (17.60)	13.10 (21.06)
T_8	2.92 (9.84)	6.81(15.07)	7.22 (15.53)	9.67 (18.10)	12.79 (20.93)
T_9	1.63 (7.15)	4.29 (11.85)	6.64 (14.87)	9.15 (1.48)	11.98 (20.15)
T_{10}	3.82 (10.58)	3.38 (10.26)	8.25 (16.36)	15.84 (22.77)	18.16 (25.11)
T_{11}	3.39 (10.29)	5.78 (13.82)	7.34 (15.63)	11.34 (19.57)	15.07 (22.72)
T_{12}	2.45 (8.95)	5.95 (13.91)	8.28 (16.56)	10.78 (19.03)	14.10 (21.72)
T_{13}(control)	9.16 (17.58)	12.71 (20.84)	14.49 (22.29)	15.89 (23.39)	18.22 (25.17)
S.Em±	1.77	1.38	2.27	1.89	2.02
C.D. at 5%	5.18	4.05	NS	NS	NS

and one dip or two dips were also on par with the best treatment. (Dubravee *et al.,* 1995) also reported an increase in the yield due to the application of ergostim. The data on physiological loss in weight (PLW) in shelf after 30 days of cold storage indicated significant differences upto second day in dhelf (Table 3). All the treatments of quantum recorded minimum PLW as compared to the control. Remteke *et al.,* (2002) also reported an increase in shelf life with the application of bioregulators like, CPPU, 6BA and 4 CPA.

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