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nfluence of boron spray on grapes yield (*Vitis vinifera*) cv. Muscat n Thondamuthur block of Coimbatore district

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Abstract: Two field experiments were conducted during winter and summer seasons with grapes cv. Muscat at Mathampatti, Coimbatore in the year 2000-2001 to find out the effect of foliar spray of B on the yield and quality of grapes. Among the treatments, foliar spray of 0.1 per cent agribor with freqeuncy of spraying of two times as well as three times registered higher fruit yield in winter season, while in summer season 0.2 per cent spray for one time spray was found to be better. Agribor application was quite effective in increasing the brix, total sugar content of the juice and at the same time decreasing the acidity of grape juice.

(Key words : Grapes, Agribor, Borax, Frequency of spray, Concentration, Yield, Quality)

Introduction

Boron is essential for pollen germination and its deficiency leads to flower abortion and frequently abscission. Boron deficiency leads to death of primary shoots, short internodes and a characteristic chlorosis. Necrotic areas in tendrils might occur (Chadha, 1965). Boron deficiency can be corrected by the application of B through various sources *viz.* borax, solubor, boric acid and calcium borate. However, borax was most suitable for soil application because of low solubility and boric acid is the better source for foliar spray (Shorrocks, 1997). Hence, the present study was undertaken to evaluate the concentration and frequencies of the B spray and B sources required to enhance the yield as well as the quality characteristic of grapes.

Materials and Methods

The present study was conducted in the farmers holding at Mathampatti during winter and summer in the year 2000-2001 on the 3 ½ and 5 year old vines of Muscat variety. The treatments comprised of three concentrations of spray fluid *viz.* water spray, 0.1, 0.2 and 0.3% and time of application *viz.* bud differentiation stage, full bloom and 15 days after full bloom. The experiment was replicated thrice with two boron sources *viz.* agribor and boric acid. The experimental soil was a neutral in pH, soil type of Typic Haplustalf and of sandy clay loam texture in 3 ½ years old vines and with organic carbon - 1.4 per cent, available N- 210 kg ha^{-1}, Olsen P-84.6 kg ha^{-1}, available K - 628 kg ha^{-1}, available B 0.42 mg kg^{-1} and a pH 8.1 and 5 year old vines with available N - 302 kg ha-1, Olsen P - 84.8 kg ha^{-1}, available K - 832 kg ha^{-1}, available B 0.38 mg kg^{-1}. The NPK fertilizer was applied as per the recommended dose of 260:160:600 g $vine^{-1}$. The crop was harvested and the fruit yield was recorded for the individual treatments. The juice was extracted for individual treatments and the quality components viz. brix was recorded using hand refractometer, total sugar as per the procedure adopted by Somogyi (1952) and the acidity of the juice as per A.O.A.C. (1980).

Results and Discussion

Fruit yield

The data on the yield of grapes are presented in Table 1. Among the concentration of foliar spray, 0.1% had a marked influence on the grapes yield while 0.2 and 0.3% did not have any added advantage. The interaction

effect of concentration x frequency, clearly indicated that twice or thrice spray at lower concentration was the best among treatments. Agribor application at 0.1% spray was found to have a favourable effect on grape yield during winter season whereas during summer season, 0.2% spray was best and it was comparable with 0.1% and 0.3%. All the three concentrations had a marked increase in the yield. The increase in yield was to a tune of 32.5 and 33.9% over the control for 0.1% three times spray during the first and second seasons respectively. Similar trend of results was reported by Kumar and Bushan (1978) and Rana and Sharma (1979).

Benefit cost ratio

The data on B:C ratio is presented in Table 2. Agribor application recorded relatively higher B:C ratio than boric acid. Among the concentration, 0.1% spray was sufficient to produ higher B:C ratio (3.51). The B:C ratio w relatively higher for one time spray while furth increase in the concentration brought out th reduction in B:C ratio under both the source As the frequency of spray increased, a margin decline in the B:C ratio could be observe due to decrease in the yield.

Brix value, total sugar and acidity

The results are presented in Table 3 As regards the brix value, 0.3% foliar spra registered higher brix value (22.47°) and i decreased with decreasing concentration of spra and the lowest was observed in the contro (18.47°). However comparing the concentratio with different frequencies it was evident tha only higher concentration (0.2 and 0.3%) showe a marked increase in brix value while at 0.1

Table 1. Effect of sources, concentrations, frequencies of B application on the yield of grapes (t ha^{-1}) in winter and summer seasons

Concentration	Frequency			Source		
	F_1	F_2	F_3	S_1	S_2	Mean
C_0 - Control	16.80	18.61	19.41	17.69	18.67	18.18
C_1 - 0.1%	19.60	22.04	22.27	21.51	21.09	21.31
C_2 - 0.2%	19.74	19.63	17.95	19.55	18.67	19.11
C_3 - 0.3%	19.12	17.06	18.45	18.00	18.42	18.21
Mean	18.80	19.32	20.33	19.76	19.21	19.48
	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.404	0.904	0.53	1.54	1.77	1.25	1.58
CD	NS	1.97	NS	3.05	3.73	2.64	NS

Concentration	Frequency			Source		
	F_1	F_2	F_3	S_1	S_2	Mean
C_0 - Control	20.16	20.82	21.83	21.28	20.59	20.94
C_1 - 0.1%	24.94	24.65	22.68	24.81	23.40	24.11
C_2 - 0.2%	26.14	25.26	22.36	24.84	24.32	24.58
C_3 - 0.3%	27.00	22.03	22.50	24.07	23.62	23.84
Mean	24.57	23.19	22.34	23.75	22.99	23.37
	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.253	0.537	0.595	0.759	0.842	1.190	1.684
CD	NS	1.17	1.212	NS	NS	NS	NS

ble 2. Benefit cost ratio in grapes for boron application (mean of two seasons)

Treatment	Basic cost (Rs.)	Treatment cost (Rs.)	Total cost (Rs.)	Yield (t ha^{-1})	Income	Net income	Benefit cost ratio
gribor							
$_0F_1$	50000	250	50050	18.02	180200	129950	2.59
$_0F_2$	50000	500	50500	19.98	199800	149300	2.96
$_0F_3$	50000	750	50750	20.46	204600	153850	3.03
$_1F_1$	50000	285	50285	21.69	216900	166615	3.31
$_1F_2$	50000	571	50571	24.78	247800	197230	3.90
$_1F_3$	50000	862	50862	23.02	230200	179338	3.53
$_2F_1$	50000	258	50258	22.57	225700	175443	3.49
$_2F_2$	50000	642	50642	24.46	244600	193958	3.83
$_2F_3$	50000	963	50963	20.06	200600	149637	2.94
$_3F_1$	50000	362	50362	2.69	226900	176538	3.51
$_3F_2$	50000	724	50724	20.09	200900	150177	2.96
$_3F_3$	50000	1085	51085	20.33	203300	152215	2.98
						Average	3.25
Boric acid							
C_0F_1	50000	250	50250	18.94	189400	139150	2.77
C_0F_2	50000	500	50500	19.45	194500	144000	2.85
C_0F_3	50000	750	50750	21.18	211800	161050	3.17
C_1F_1	50000	275	50275	22.89	228900	178625	3.55
C_1F_2	50000	540	50540	21.91	219100	168560	3.34
C_1F_3	50000	810	50810	22.44	224400	173590	3.42
C_2F_1	50000	290	50290	22.31	223100	172810	3.44
C_2F_2	50000	580	50580	20.93	209300	158720	3.14
C_2F_3	50000	870	50870	20.25	202500	151630	2.98
C_3F_1	50000	310	50310	23.45	234500	184190	3.6
C_3F_2	50000	620	50620	18.99	189900	139280	2.75
C_3F_3	50000	930	50930	20.63	206300	155370	3.05
						Average	3.17

	F_1	F_2	F_3	S_1	S_2	Mean
C_0 (Control)	2.68	2.91	3.10	2.86	2.93	2.89
0.1%	3.43	3.62	3.47	3.58	3.44	3.51
0.2%	3.46	3.48	2.96	3.42	3.19	3.30
0.3%	3.55	2.85	3.01	3.15	3.15	3.15
Mean	3.28	3.21	3.13	3.25	3.17	3.21

Cost particulars :

Basic cost (pruning, harrowing, fertilizer application, tipping spraying of pesticides and fungicides and harvesting) = Rs.50,000

Sale price of grapes fruit @ Rs.10 kg^{-1}

Cost of Agribor @ Rs. 75 kg^{-1}

Cost of Borax @ Rs. 50 kg^{-1}

Cost of Boric acid @ Rs. 40 kg^{-1}

Spray charges

Single time spray = Rs.250 spray^{-1} (for labour and rent of sprayer

Spray fluid requirement @ 500 litres ha^{-1}

Cost of Agribor @ 0.1% for single spray = Rs. 35 spray^{-1}

Cost of boric acid @ 0.1% for single spray = Rs. 20 spray^{-1}

Benefit Cost ratio = Net income (Rs.) / Total cost (Rs.)

Table 3. Effect of sources, concentrations, frequencies of boron application on the brix value, total sug and acidity of the grape juice (winter season crop)

(Mean of 3 replication

Concentration	Frequency			Source		
	F_1	F_2	F_3	S_1	S_2	Mean
Brix value (degree)						
C_0 - Control	18.30	18.67	18.45	17.86	19.09	18.47
C_1 - 0.1%	20.12	20.27	19.43	18.98	20.90	19.94
C_2 - 0.2%	20.35	22.22	19.33	20.01	21.22	20.63
C_3 - 0.3%	21.12	22.65	23.63	21.72	23.21	22.47
Mean	19.97	20.95	20.21	19.64	21.11	20.38
	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.20	0.30	0.31	0.50	0.40	0.61	0.80
CD	0.90	0.65	0.63	NS	NS	1.20	1.76
Total sugar (%)							
C_0 - Control	17.50	17.35	17.67	17.40	17.32	17.36	
C_1 - 0.1%	17.83	18.29	18.55	18.47	17.97	18.22	
C_2 - 0.2%	18.47	19.13	19.15	19.29	18.55	18.92	
C_3 - 0.3%	19.57	19.30	18.69	19.30	19.24	19.27	
F-Mean	18.24	18.57	18.52	18.62	18.27	18.44	
	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.03	0.05	0.04	0.06	0.05	0.08	0.36
CD	0.11	0.09	0.08	0.15	0.13	0.16	0.3
Acidity (%)							
C_0 - Control	1.26	1.31	1.26	1.25	1.30	1.27	
C_1 - 0.1%	1.01	0.94	0.87	0.87	1.01	0.94	
C_2 - 0.2%	0.80	0.90	1.0	0.86	0.95	0.90	
C_3 - 0.3%	0.97	0.96	0.94	0.94	0.97	0.96	
Mean	1.01	1.03	1.02	0.98	1.06	1.02	
	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.01	0.03	0.02	0.04	0.03	0.05	0.06
CD	0.03	0.07	NS	NS	NS	0.10	NS

concentraton the increase was negligible. Similar trend of results was reported by Dabas and Jindal (1985).

The acidity of the juice was reduced significantly by Agribor than boric acid. The concentration of 0.2% recorded lowest acidity (0.9%) while the highest was noticed in the control (1.27%). In the interaction effect, 0.2% one time spray recorded lowest acidity. Thus, increase in concentration of the spray resulted in the reduction of fruit juice acidity. This trend of results were supported by Yamdagni (1978) and Ravel and Leela (1975).

The total sugar content of the fruit was the highest in agribor (23.27%) than boric acid (22.84%). Increase in concentration of B spray increased the total sugar content. Among the frequencies of spray, two times spray was

ufficient for enhancing the total sugar while he higher concentration (0.3%) did not have ny added advantage. The interaction of sources concentration showed that 0.2 per cent spray was found sufficient to get higher total sugar ontent in the agribor whereas in boric acid, hree times spray is required to get highest otal sugar in fruit. Concentration x frequency howed that 0.3 per cent with one time spray vas sufficient in increasing the total sugar while t lower concentration increased number of sprays vas required to increase the total sugar.

Thus, agribor at lower concentration was uite effective in increasing the total sugar hile boric acid requires higher concentration or increasing the total sugar content in the tice. The increase in the sugar was to the ne of 19% over control similar trend was btained by Yamdagni *et al.* (1979).

Conclusion

The results of present study revealed that application of foliar spray of boron at 0.1 per cent agribor with frequency of spray of two times as well as three times registered higher fruit yield in winter season, whiel in summer season 0.2 per cent spray for one time spray was found to be better. Further the agribor at 0.3 per cent with the frequency of spray of two resulted in increasing brix, total sugar and acidity of grape juice.

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