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Effect of sources, concentration and frequencies of B application on the petiole nutrient content in graphs (*Vitis vinifera*) cv. Muscat.

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Abstract: A field expetiment was conducted at Mathampatti to study the effect of B spray on the petiole nutrient content of the grapes at full bloom stage. The study revealed that N, P, K content of the potiole increased with B application while a depressive effect was noticed on Ca content. Micronutrients like Cu, B, Zn and Fe content were also found to increase with B application.

Key words: Agribor, Boricacid, Concentration of spray, Frequency of spray, Petiole nutrient

Introduction

Grape is subtropical fruit and its cultivation is fast expanding. It is taken up on wide range of soils in different agrolimatic situations of India. In Tamilnadu it is grown in selected districts of Theni, Dindugal, Madurai and Coimbatore. Generally five crops are grown in 2 years. Due to continuous fruting habit and faster growth and heavy yield, it require nutrient supply throughout its growth period. The yields are found to be erratic due to depletion of secondary and micronutrients (Tandon, 1993). Leaf analysis serves as an ideal indicator of the nutritional status of the plant at any time during growing season (Bhargava and Chadha, 1988). Petiole samples collected at flowering stage will helps to monitor nutrition for quality rather than yield (Bhargava and Summer, 1987). However, the information regarding the petiole nutrient status of grapes is lacking under local conditions. Hence, the present study was carried out to study the impact of boron spray on the petiole nutrient content at full bloom stage.

Materials and Methods

The present study was carried out in the farmers holding at Mathampatti during the year 2000-2001 on a fully grown 31/2 year old grapevine. The experiment was carried in a Typic Haplustalf, sandy clay loam in texture with a pH 7.7, available N 210 kg ha^{-1} Olsen P 84.6 kg ha^{-1} and Hotwater soluble B-0.42 mg kg^{-1}. The trial was laid out in a split plot design with 2 sources of boron *viz.* agribor and boric acid comprising of 3 concentrations of spray *viz.* water spray, 0.1% spray, 0.2% and 0.3% spray with three frequencies *viz.* one, two and three times at three critical stages, *viz.* bud differentiation stage, full bloom and 15 days after full bloom. The recommended dose of NPK @ 260:160:600g per vine was applied for all the plots and all other cultural operations were carried out uniformly. The petiole samples opposite to flower cluster were collected from each plot at the full bloom stage (Bhargava and Chadha, 1988). The petiole samples were washed with 0.1N HCl followed by double distilled water, dried and powered in a stainless steel whilleymill and the samples were digested in diacid extract and the extract was analysed for nitrogen (Humphries, 1956). Triple acid extract of the sample was used for the estimation of phosphorus (Jackson, 1953); K (flamephotometry); B (Page *et al.* 1983); Ca (Versenate method); microinutrients (Lindsay and Norwell, 1978).

Results and Discussion

Petiole nitrogen, phosphorus and potassium

The petiole nutrient content of Muscat grapes sampled at full bloom stage indicated

Table 1. Effect of sources, concentrations and frequencies of B spray on the petiole N, P and K conten of grapes.

(Mean of 3 replications)

i. Nitorgen content (%)

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	1.63	1.67	1.66	1.65	1.66	1.65
C_1 - 0.1%	1.64	1.68	1.77	1.72	1.68	1.70
C_2 - 0.2%	1.75	1.78	1.75	1.79	1.75	1.77
C_3 - 0.3%	1.75	1.76	1.77	1.79	1.74	1.76
Mean	1.69	1.72	1.74	1.74	1.71	1.72

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.003	0.013	0.007	0.03	0.002	0.019	0.046
CD (P=0.05%)	NS	0.02	NS	NS	NS	0.04	NS

ii. Phosphorus content (%)

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	0.43	0.44	0.45	0.43	0.46	0.44
C_1 - 0.1%	0.36	0.34	0.43	0.37	0.44	0.40
C_2 - 0.2%	0.40	0.35	0.40	0.40	0.43	0.41
C_3 - 0.3%	0.44	0.44	0.45	0.45	0.43	0.44
Mean	0.41	0.39	0.43	0.41	0.44	0.42

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.001	0.01	0.06	0.02	0.01	0.02	0.03
CD (P=0.05%)	NS	0.02	NS	NS	NS	NS	NS

iii. Potassium content (%)

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	2.30	2.32	2.26	2.35	2.24	2.37
C_1 - 0.1%	2.33	2.49	2.58	2.49	2.45	2.48
C_2 - 0.2%	2.53	2.78	2.36	2.62	2.49	2.55
C_3 - 0.3%	2.33	2.33	2.47	2.42	2.34	2.38
Mean	2.37	2.48	2.42	2.47	2.38	2.42

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.03	0.03	0.02	0.04	0.05	0.07	0.07
CD (P=0.05%)	0.13	0.06	0.05	NS	0.10	NS	NS

Table 2. Effect of sources, concentrations, frequencies of B spray on the petiole Ca (%), B and Zn (mg kg^{-1}) of grapes.

(Mean of 3 replications)

i. Calcium content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	1.84	1.74	1.82	1.78	1.82	1.80
C_1 - 0.1%	1.82	1.82	1.71	1.79	1.80	1.79
C_2 - 0.2%	1.77	1.81	1.70	1.76	1.76	1.76
C_3 - 0.3%	1.65	1.74	1.65	1.68	1.67	1.67
Mean	1.77	1.78	1.72	1.76	1.76	1.76

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.03	0.02	0.02	0.04	0.06	0.05	0.05
CD (P=0.05%)	NS	0.03	NS	NS	0.12	NS	NS

ii. Boron content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	162	171	193	176	174	175
C_1 - 0.1%	214	217	219	217	217	217
C_2 - 0.2%	221	219	221	222	218	220
C_3 - 0.3%	220	224	226	225	222	222
Mean	204	208	215	210	207	208

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	1.6	2.6	2.7	3.73	5.41	3.82	9.3
CD (P=0.05%)	NS	5.3	NS	NS	NS	NS	18.6

iii. Zinc content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	36.3	36.8	37.5	36.1	34.5	35.3
C_1 - 0.1%	37.1	37.7	38.4	37.8	37.6	37.7
C_2 - 0.2%	38.8	39.8	39.7	39.1	39.7	39.4
C_3 - 0.3%	39.2	38.3	37.3	38.6	38.1	38.3
Mean	37.8	38.1	38.22	37.9	37.5	37.7

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.39	0.40	0.35	0.65	0.71	0.87	1.23
CD (P=0.05%)	NS	0.9	NS	NS	NS	NS	NS

Table 3. Effect of sources, concentrations, frequencies of B spray on the petiole Cu and Fe and Mn (mg kg^{-1}) of grapes.

(Mean of 3 replications)

i. Copper content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	110	116	114	113	114	113
C_1 - 0.1%	116	119	122	119	120	119
C_2 - 0.2%	121	115	114	116	120	118
C_3 - 0.3%	113	117	118	117	115	116
Mean	115	117	117	116	117	116

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	1.28	1.15	1.05	2.00	2.10	1.91	2.98
CD (P=0.05%)	NS	2.3	NS	NS	NS	NS	NS

ii. Iron content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	197	192	190	198	194	196
C_1 - 0.1%	200	197	202	201	199	200
C_2 - 0.2%	206	203	204	205	205	205
C_3 - 0.3%	207	193	183	191	193	192
Mean	202	196	195	199	198	198

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.94	2.80	2.00	3.83	4.69	4.06	6.60
CD (P=0.05%)	NS	5.7	NS	NS	NS	NS	NS

iii. Manganese content (mg kg^{-1})

Concentration	Frequency			Source		Mean
	F_1	F_2	F_3	S_1	S_2	
C_0 - Control	54.4	54.7	54.8	54.8	54.5	54.6
C_1 - 0.1%	55.0	54.9	55.9	55.6	55.0	55.3
C_2 - 0.2%	55.8	56.7	56.4	56.4	56.2	56.3
C_3 - 0.3%	55.8	55.6	56.3	55.3	56.3	55.8
Mean	55.2	55.5	55.9	55.5	55.6	55.5

	S	C	F	SxC	SxF	CxF	SxCxF
SEd	0.64	0.82	0.56	1.42	1.12	0.97	1.59
CD (P=0.05%)	NS	NS	NS	NS	NS	NS	NS

that foliar spray of boron increased the petiole N content. The mean values ranged from 1.65 to 1.77 per cent. Among the concentrations of spray, the effect of 0.2 and 0.3 per cent were comparable. In concentration x Frequency interaction, 0.1 per cent spraying thrice was effective in increasing the petiole N content (Table 1). Increased frequency increased the petiole N content which might be due to the positive interaction of N and B in plant system as reported by Yadav and Manchanda (1979). The petiole P content was increased at 0.3 % spray followed by 0.2% spray. The highest P content was recorded at 0.3% (0.44 %) and it was similar to the findings as reported by Prabha (1995). The agribor recorded higher K content. Among the concentrations, 0.2% recorded higher K in the petiole as well as two times spray registered the highest K content (2.48%). In concentration x frequency interaction, 0.2, per cent at one or two times spray was beneficial. This might be due to the positive effect of B on K nutrition

Petiole calcium, boron and zinc

The results are given in Table 2. Petiole Ca decreased with B application. The petiloe Ca decreased as the concentration increased beyond 0.1% and result could be seen in both the sources. Similar reduction in the content was noticed by Marhorkar and Patel (1987).

Petiole B content was markedly increased with increased concentration. The highest B content was observed at 0.3 per cent (222 mg kg^{-1}) while lowest in control (175 mg kg^{-1}) (Table 2). Increase in the frequency of spray brought out relative increase in the B content in the petliole and this might be due to effective translocation of boron to petiole due to direct supply of B to the foliar tissue through foliar spray as reported by Shorrocks (1997). Petiole Zn was increased due to B treatments. Increase in concentration of spray increased the Zn concentration in the petiole. Application of 0.2 per cent (39.4 mg kg^{-1}) spray registered increasing petiole Zn content whereas further increase result in decline in petiole Zn content.

Petiole Copper, Iron and Manganese:

Copper content in the petiole was the highest in 0.1 per cent spray (199 mg kg^{-1}) while control registered 113 mg kg^{-1} of Cu. This was due to the positive correlation between B and Cu as reported by Sabanayagam (1996). Increase in concentration of B spray increased the Fe content at 0.2 per cent (205 mg kg^{-1}) while a further increase in concentration caused a reduction in petiole Fe (Table 3.) This corroborates with the findings of Singh *et al.* (1990). Manganse content was not much influenced by the B treatments.

Conclusion

The results of present study emphasized that application of foliar of boron significantly increased the N, P and K content in the petiole while the Ca content decreased with increase in boron spray due to negative interaction of Ca with B. As regards to micronutrients, Cu, Mn increased while Fe content decreased.

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