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Effect of CCC [(2-chloroethyl)-trimethyl ammonium chloride] on fruiting behaviour of Cabernet Sauvignon

by

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Einfluß von CCC [(2-Chloräthyl)-trimethylammoniumchlorid] auf die Ertragskomponenten von Cabernet Sauvignon

Zusammenfassung. — Wurden die Blätter von Cabernet Sauvignon mit 300 ppm CCC gespritzt, wenn die Calyptren der Blüten zu 25—100% abgefallen waren, so war der Ertrag im folgenden Jahr gesteigert; hierbei waren sowohl die Anzahl der Trauben als auch die Anzahl der Beeren/Traube vermehrt. Die Wirkung von CCC auf die Beerengröße wurde durch die Anzahl der Beeren/Traube beeinflußt.

Introduction

The vine growing areas of southern Tasmania have approximately 1000 degree days (Celsius) when calculated over the growing period from October to May using a threshold mean daily temperature of 10 °C. Fruit set occurs in mid-December and in some years fruit set can be as low as 25 % (MENARY 1977). During the period of fruit set vegetative growth is often very vigorous and this may contribute to poor set. COOMBE (1967) has shown that CCC will increase fruit set indirectly by retarding shoot growth. Weaver (1973) has shown that CCC will increase berry number/cluster on the variety Cabernet Sauvignon. This same effect has been observed by HERNANDEZ *et al.* (1974) and PEACOCK and JENSEN (1977). NATAL'INA *et al.* (1973) have shown that the number of inflorescences have increased in the second and third year after application of CCC.

Materials and methods

The vines used were 18-year-old vines of Cabernet Sauvignon under irrigation. CCC was applied at 300 ppm (active ingredient) at 25, 50 and 100 % cap fall. Controls were sprayed with water. There were 3 plants per treatment and 5 replications.

At vintage the following variables were measured: shoot length, number of berries/cluster, weight/berry, weight/cluster, weight of clusters/vine, % sugars and total acid (% tartaric). Acid was determined by titration with NaOH using phenolphthalein as an indicator.

All data were subjected to analysis of variance followed by the Newman-Keuls Test.

Results

Applications of CCC in December 1975 had no effect on variables measured except shoot length which was reduced by approximately 25 % in all treatments. The level of fruit set was high in all treatments, namely 190/cluster. The mean number of clusters/vine for all treatments was 22, and the mean berry size was 1.1 g.

Sprays of CCC in 1976 gave highly significant increases in yield/vine, number of clusters/vine and number of berries/cluster, but no significant change in berry size (Table 1). All CCC treatments decreased shoot growth by approximately 10 %.

A yield increase of 40 % on treated vines was brought about by an increase in the number of berries/cluster and the number of clusters/vine.

Table 1

Effect of CCC spray (300 ppm) on fruiting behaviour in 1976

Einfluß der CCC-Spritzung (300 ppm) auf die Ertragskomponenten (1976)

Variable	Control	Treatment			Significance
		25 % cap fall	50 % cap fall	100 % cap fall	
Yield/vine (kg)	3.66[a]	5.36[b]	4.96[b]	4.82[b]	1 %
Clusters/vine (n)	36.2[a]	45.6[b]	43.2[b]	47.4[b]	1 %
Berries/cluster (n)	126.0[a]	166.2[b]	184.4[b]	171.6[b]	1 %
Weight/berry (g)	0.8[a]	0.7[a]	0.7[a]	0.7[a]	NS

Table 2

Effect of CCC spray (300 ppm) on fruiting behaviour in 1977

Einfluß der CCC-Spritzung (300 ppm) auf die Ertragskomponenten (1977)

Variable	Control	Treatment			Significance
		25 % cap fall	50 % cap fall	100 % cap fall	
Yield/vine (kg)	3.34[a]	4.46[b]	5.18[b]	4.37[b]	1 %
Clusters/vine (n)	32.4[a]	39.8[b]	41.4[b]	35.0[a]	5 %
Berries/cluster (n)	124[a]	156[b]	172[b]	131[a]	5 %
Weight/berry (g)	0.88[a]	0.91[a]	0.86[a]	1.14[b]	1 %

In the 1977/78 season the sprays reduced shoot length by 25 % and gave a significant increase (40 %) in yield/vine. In the case of the spray at 100 % cap fall the increase was due to an increase in berry size. On the other hand, sprays at 25 and 50 % cap fall caused an increase in yield by increasing cluster number/vine and number of berries/cluster (Table 2).

Sugar, acid and pH were not significantly affected by treatment and typical figures at vintage were 21.2 °BRIX, 0.87 % and 3.5, respectively.

Discussion

CCC sprays did not affect berry size in the first or second year of the experiment. In both cases, the berry size appeared to be related to number of clusters/vine.

When number of clusters/vine was 22, the mean berry size was 1.1 g, while at higher fruit load, 43 clusters/vine, the berry size was 0.7 g. In the third year, fruit load and berry size were similar to those observed in the second year. However, where vines were sprayed at 100 % cap fall a different response was observed. In the second year, this treatment did not influence cluster number/vine, while in the third year it had its effect on berry size. The effect of CCC on berry size was related to fruit load and may have been mediated through its effect on shoot growth and distribution of assimilate. The application of CCC at 100 % cap fall may have been too late to influence critical events within the axillary bud. When CCC was applied at 25 or 50 % cap fall the effect observed was increased fruit set on current inflorescences and increased fruitfulness of the axillary bud. In this case, the target for CCC was the developing inflorescence in the bud and, perhaps for fruit set, the current inflorescence.

In this experiment, CCC has decreased vegetative vigour and influenced cluster number/vine in the year following its application. The influence of CCC on fruit set may be conditioned by cluster number/vine but the effect was apparent in the second and third year of the trial. It appears that CCC could be acting indirectly via its effect on shoot growth (Coombe 1967) or directly via its effect on flower initiation, anlagen formation and tendril growth (Mullins and Srinivasan 1978). Suguira *et al.* (1976) have used CCC sprays on the cultivar Muscat of Alexandria to induce inflorescences in place of tendrils. These sprays were applied under long days (11—16 h) and low temperatures (20 °C). These conditions prevail in Tasmania during flower initiation and differentiation, and the formation of tendrils instead of inflorescences is a feature of the cultivar Cabernet Sauvignon.

CCC appears to provide a useful method for achieving increased yields through increases in cluster number and number of berries/cluster. Because CCC has had no significant effect on sugar, acid and pH of juice, this chemical could be applied as a standard spray to foliage and inflorescences at 25 or 50 % cap fall in order to achieve a regular level of cropping.

Summary

A foliar spray of CCC (300 ppm) applied at the stage when inflorescences were between 25 and 100 % cap fall will increase total yield by increasing cluster number and number of berries/cluster in the year following treatment. The effect of CCC on berry size is influenced by the number of berries/cluster.

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