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Maturity responses of Sultanina grapes to gibberellic acid treatments¹⁾

by

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Der Einfluß von Gibberellinsäure-Behandlungen auf die Reife von Sultanina-Reben

Zusammenfassung. — Sultanina-Reben wurden ein- oder zweimal nach dem Beerenansatz sowie zweimal — in der Blüte und nach dem Ansatz — mit 20 ppm GA₃ besprüht. Die zweifache späte Behandlung bewirkte eine Verzögerung der Beerenreife, verglichen mit den anderen Behandlungen und der Kontrolle; diese Reifeverzögerung äußerte sich in einem geringeren Zucker- und einem höheren Säuregehalt.

Introduction

The stimulating effect of gibberellic acid on berry thinning and enlargement of seedless *Vitis vinifera* and the best timing of the treatments for these purposes, have been documented in many works (1, 2, 7, 8). Little attention was given in these studies to the influence of GA sprays on the maturation of the grapes (4, 7, 8).

The purpose of the present work was to clarify the effect of GA treatments on the ripening time of var. Sultanina grapes.

Materials and Methods

Experiments were carried out in 1971 and 1972 at two different locations, Zacharia and Omer, to study the effect of gibberellic acid sprays on the ripening of *Vitis vinifera* var. Sultanina. The grapes were sprayed with a gun sprayer of medium volume, with 20 ppm gibberellic acid (GA₃) and 0.02% Triton 100 x (as spreader). In 1971, the fruit tested was harvested at random from commercial plots of sprayed

Table 1

Details of the experimental treatments with GA₃ given to Sultanina grapes in 1971 and 1972

Angaben zur Durchführung der GA₃-Behandlungen von Sultanina-Reben 1971 und 1972

Year	Treatment	Number of sprays	Timing of sprays
1971	a	0	—
	b	1	10 days after berry set
	c	2	10 days after berry set and 7 days later
1972	a	0	—
	b	1	7 days after berry set
	c	2	7 days after berry set and 10 days later
	d	2	at bloom and 7 days later (after berry set)

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Table 2

The effect of GA₃ spray treatment on the crop¹⁾ of Sultanina vines, and on cluster and berry weight (1972)

Einfluß der GA₃-Sprühbehandlung auf Stockertrag sowie Trauben- und Beerengewicht von Sultanina-Reben (1972)

Treatment	Mean crop wt. per vine kg	Mean wt. per cluster g	Mean wt. per berry g
a	13.9	380	1.68
b	13.7	460	2.11
c	15.0	479	2.11
d	14.6	487	2.15

¹⁾ Avg. yield = 25 t/ha.

and unsprayed vines, the yield was of 25–30 t/ha. No thinning of clusters was done that year in any treatment. In 1972, each treatment included 20 vines in five randomized blocks. The vines which were to be sprayed were cluster-thinned (before blooming) to equalize their crops with the unsprayed vines. The treatments given are summarized in Table 1.

The fruit from all treatments in both years was harvested when the non-treated grapes were commercially ripe. In 1971, 8 kg of fruit from each treatment was picked at random from each plot. The stage of maturity of the grapes was determined as described by NELSON *et al.* (6), based on the specific gravity of the berries separated in sugar solutions with a 1% difference between them. The sugar content, as total soluble solids (TSS), was determined on the juice extracted from these berries, and the acidity was determined by titration with 0.1 N NaOH and calculated as grams tartaric acid per 100 ml juice.

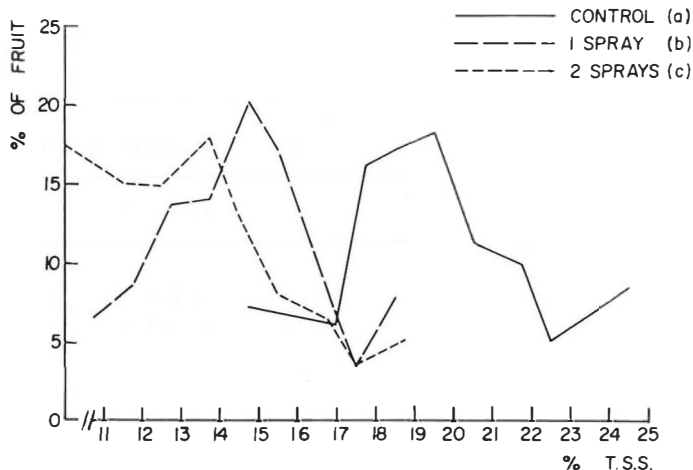


Fig. 1: Percentage of Sultanina fruit at different TSS concentrations (1971).

Prozentuale Verteilung der Sultanina-Beeren auf die einzelnen Konzentrationen der löslichen Trockensubstanz (1971).

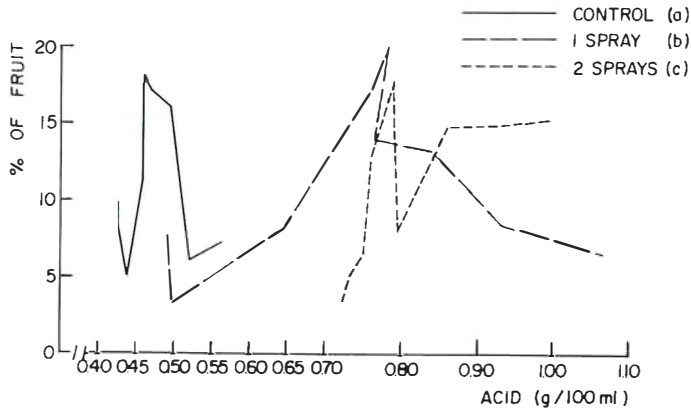


Fig. 2: Percentage of Sultanina fruit at different acid contents (1971).
 Prozentuale Verteilung der Sultanina-Beeren auf die einzelnen Säure-Konzentrationen (1971).

In 1972, the fruit of each treatment was harvested and weighed separately from five replicates (one vine each), bearing similar crops. In addition, ten clusters and 300 separated berries were chosen at random from each treatment and their weight was determined (Table 2). The stage of maturity of the grapes was tested in two ways: 8 kg of fruit from all the five vines of each treatment was examined by the method of NELSON *et al.* (6) as in 1971. In addition, the acid and sugar contents were determined on the juice of 3 kg of fruit harvested from each replicate.

Results and Discussion

In 1971 the retarding effect of the single and double sprays with GA_3 after berry set on the ripening of Sultanina grapes, was marked. The delay in ripening was evident not only in the range of sugar and acid, but also in the percent of berries at the different sugar and acid concentrations (Figs. 1, 2). Fifty percent of the non-sprayed fruit had a sugar concentration of 18–20% and an acid content between 0.50–0.46 g per 100 ml. In the single GA_3 treatment after fruit set the sugar concentration was between 14 and 16% and the acid content between 0.78 and 0.76 g per 100 ml; in the double GA_3 spray, the sugar concentration of 50% of the berries was between 11–13% and the acid content between 0.99–0.79 g per 100 ml juice. Since the treated vines were not thinned in 1971, their crop was approximately 20–25% higher than that of non-treated vines. In 1972, in the fruit tested by NELSON's method, the differences in sugar and acid concentration between the control fruit (treatment a), the single (treatment b) and the early double GA_3 sprays (treatment d), were small, as against the double spray after bloom (treatment c) (Fig. 3, 4).

The fruit from treatment c was evidently less mature than that from the other treatments: more than 50% of the berries had a sugar content of 12.5–13.5% and an acid content of 0.87–0.78 g per 100 ml. In the other treatments 50% of the berries had higher sugar and lower acid content. These findings were reinforced by the results obtained from the fruit of each replicate separately. Although there was no uniformity in the sugar concentrations or in the acid content between the replicates, there was a significant difference in the acid content of the fruit of the double late sprays (treatment c) in comparison with the fruit of the double early sprays (treat-

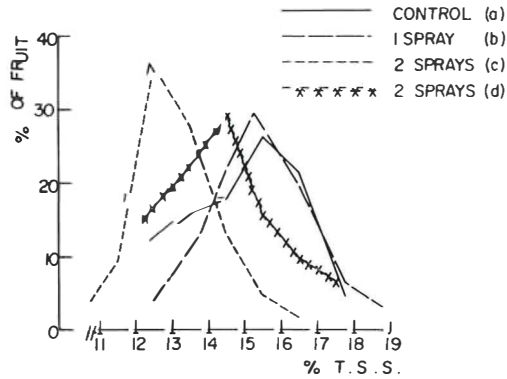


Fig. 3: Percentage of Sultanina fruit at different TSS concentrations (1972).
 Prozentuale Verteilung der Sultanina-Beeren auf die einzelnen Konzentrationen der löslichen Trockensubstanz (1972).

ment d), (0.93 g and 0.80 g tartaric acid, per 100 ml juice, respectively), which indicates that the grapes of the double late treatment (c) were less mature. In the fruit of all other treatments there was a trend toward an acid content lower than 0.93 g per 100 ml. As reported previously (3), the acid content is an important factor in determining the stage of maturity of the Sultanina cultivar.

The effect of gibberellic acid on the ripening of seedless *Vitis vinifera* varieties has been mentioned occasionally in different works. Often the results were erratic and the general opinion was that when differences in crop levels were eliminated, there was no effect of GA on maturation of Sultanina grapes (2, 4, 5, 7). WEAVER and POOL (8) mention that in treatments on the Sultanina variety with GA at a concentration up to 60 ppm, there was no effect on TSS or acid content. Only at a GA concentration of 1000 ppm there was a delay in maturity.

From our work it can be seen that two GA sprays at a concentration of 20 ppm, applied after fruit set, delayed ripening in both vineyards in both years, although the more marked delay in 1971 could be partly attributed to the additional effect

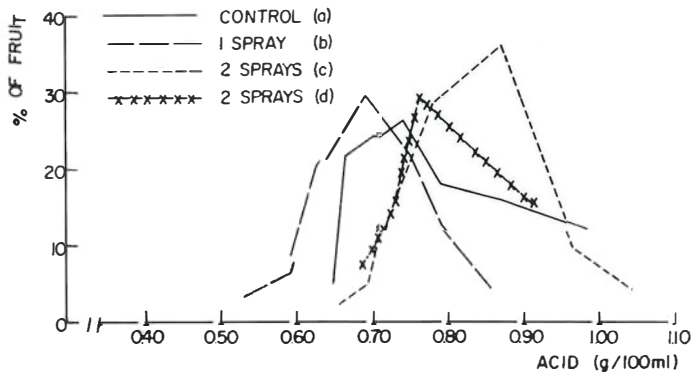


Fig. 4: Percentage of Sultanina fruit at different acid contents (1972).
 Prozentuale Verteilung der Sultanina-Beeren auf die einzelnen Säurekonzentrationen (1972).

of increased yield as against the control. One spray only, after fruit set, did not have a retarding effect on ripening when crops were equalized (as in 1972).

It is possible that small differences in timing of the single postbloom spray can have an effect on maturation. WEAVER and POOL (8) describe differences in response of the Sultanina variety to berry enlargement due to short lags in the timing of GA application after fruit set. In 1972 the single spray (treatment b) was applied about seven days after fruit set, whereas in 1971 it was applied ten days after fruit set.

In treatment d (one bloom spray and one after berry set), the grapes ripened at approximately the same time as the control fruit. The fruit in this treatment ripened definitely earlier than the fruit which received two late sprays, although the effect of the GA treatment on berry size and cluster weight was the same in both treatments (Table 2).

Practically, the retarding effect of the two late GA sprays could enable the grower to prolong the harvest and the marketing time of Sultanina grapes.

Summary

Sultanina vines were sprayed once or twice after berry set and twice — one spray at bloom and one after set, with 20 ppm GA₃. There was a retarding effect on ripening of the double late sprays in comparison with the other treatments and with the non-sprayed vines; it was expressed in the lower sugar content and the higher acid content of the grapes.

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