



ASPECTS OF THE HORMONAL PHYSIOLOGY OF FRUIT  
DEVELOPMENT IN VITIS VINIFERA L.

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A thesis submitted  
by  
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To YNIS

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ASPECTS OF THE HORMONAL PHYSIOLOGY OF FRUIT DEVELOPMENT  
IN VITIS VINIFERA.

SUMMARY

Two complementary studies were undertaken of the hormonal physiology of set and development of the fruit of Vitis vinifera, with special reference to gibberellin promoters and inhibitors. In one approach the effects of applications of factorial combinations of GA and CCC were measured on various parameters of cluster development. Time of application of each compound was also examined. In the second approach, estimations of endogenous GA-like and ABA-like compounds were made in extracts of flowers and fruits during the critical periods of anthesis and early pericarp development.

Pre-anthesis applications of GA increased fruit-set in the stenospermocarpic Sultana, decreased set in the parthenocarpic Cape and had no effect on three other cultivars. Anthesis applications increased the set of seedless berries in Doradillo, had no effect on Muscat, Cape or Zante, and decreased set in Sultana. Post-anthesis applications increased the set of seedless berries on cultivars other than the parthenocarpic. Pre-anthesis applications of CCC increased set though not always significantly. Post-anthesis applications were without effect on set.

Applications of GA prior to anthesis were the most effective in reducing seed development; post-anthesis applications were without effect on Doradillo but reduced seed development in Muscat. Intermediate results were generally obtained from anthesis applications. With one exception (Muscat pre-anthesis 1966-7) CCC did not alter the proportion of seeded and seedless berries set.

In general both compounds exerted significant, usually opposite, effects on pericarp development. Where seed growth was unaffected by GA application, this compound had no influence on the final fresh weight of the berry. However, if seed development was imperfect then GA had a profound effect on the final size of the berry. The magnitude of this effect depended upon the cultivar and time of application: those berries in which seed development was incomplete showed greatest response to GA applied at set, but where no seed growth occurred at all then response was greatest to anthesis applications. CCC, irrespective of time of application, significantly reduced berry size in all cultivars except those which were parthenocarpic.

GA significantly affected the shape of berries, especially when applied at anthesis. The degree of the response was unrelated to seed development, although in the seeded cultivar Muscat the change in shape was unaccompanied by any change in berry weight. Cape was the most responsive, while Muscat, Sultana and Zante were less so. Doradillo was unaffected. CCC significantly reduced the length/width ratio of all berries with a normal ratio greater than about 1.1.

GA often significantly increased the length of the rachis and pedicel but only when applied pre-anthesis. There was a trend, sometimes significant, for CCC to retard the elongation of the rachis and the pedicel.

Cluster weight was affected by the treatments in a manner similar to berry weight. Pre-anthesis applications of GA to seeded cultivars resulted in decreased yield because a greater proportion of berries had inhibited seed growth and were smaller. Later applications of GA, notably in Doradillo, increased yield because of reduced inhibition of seed growth and greater set and development of seedless berries. Anthesis applications of GA were most effective in increasing yield in Zante and Cape, while post-anthesis applications were more effective in Sultana.

In the examination of endogenous growth regulators in the fruit of Doradillo, Sultana and Cape, qualitative differences in GA-like compounds were noted between the parthenocarpic cultivar, Cape, and the other two cultivars; the difference between Sultana and Doradillo appeared to be only quantitative. Significant changes in concentration of GA-like substances during early development occurred only in the seeded cultivar Doradillo. No significant response to CCC was noted.

An ABA-like compound was present in all extracts examined and significant changes occurred in its concentration. There was a trend in all three cultivars (significant in Doradillo,  $P = 0.05$ ) for the level of the inhibitor, which was generally highest at anthesis, to decline more slowly after treatment with CCC.

These results and the results of others are used to formulate a general hypothesis of the control of fruit-set and pericarp development in Vitis vinifera.

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This thesis contains no material which has been accepted for the award of any other degree or diploma in any university and, to the best of my belief, no material which has previously been published or written by another person has been included, except when due reference is made in the text of this thesis.

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