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***The effect of a natural plant extract and
synthetic plant growth regulators on
growth, quality and endogenous hormones
of Actinidia chinensis and Actinidia
deliciosa fruit***

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for the degree of Master of Science in Horticultural Science
at Massey University New Zealand



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Abstract

Kiwifruit are of huge economic importance for New Zealand representing 29 percent of total horticultural exports. Fruit size is the biggest determinant of what consumers are willing to pay, and there is also a positive relationship between consumer preference for flavour and percentage dry matter. The two main cultivars exported from New Zealand are *Actinidia chinensis* 'Hort 16A' (gold kiwifruit) and *A. deliciosa* 'Hayward' (green kiwifruit). Under current commercial practice the only product allowed for use on kiwifruit to increase fruit size in New Zealand is Benefit[®]. Benefit[®] has been shown to induce different results when applied to *A. chinensis* and *A. deliciosa*, whereas synthetic plant growth regulators such as the cytokinin-like substance N-(2-chloro-4-pyridyl)-N'-phenylurea (CPPU) have been found to promote similar increases in fresh weight of fruit in both cultivars. Final fruit size is determined by both cell division and cell enlargement. It was been shown that fresh weight can be increased in both of the major *Actinidia* cultivars even though their physiology differs. Hormonal control of fruit size in relation to cell division and cell enlargement phases of fruit growth was studied in both *A. chinensis* and *A. deliciosa*.

CPPU was applied to both cultivars in a growth response experiment where fruit were collected throughout the growing season. The objective of this experiment was to create growth curves, to compare and contrast the effect on *A. chinensis* and *A. deliciosa*, and to provide material for hormone analysis. Application of CPPU was found to significantly increase the fresh weight of both *A. chinensis* and *A. deliciosa* fruit (46.98 and 31.34 g increases

respectively), and alter the ratio of inner and outer pericarps of *A. chinensis* fruit. CPPU and Benefit[®] were applied individually and together to both cultivars. It was found that only *A. chinensis* fruit were affected by the application of Benefit[®]; fresh weight was increased by 26.38 g, and percentage dry matter was significantly reduced. There was a statistically significant ($p < 0.05$) interaction between CPPU and Benefit[®] when applied to *A. chinensis*. 3,5,6-trichloro-2-pyridyloxyacetic acid (3,5,6-TPA) was applied to *A. deliciosa* on two application dates at three concentrations and was found to decrease fresh weight of fruit, but significantly increase percentage dry matter regardless of application date or concentration. Lastly CPPU and 1-naphthalene acetic acid (NAA) were applied to *A. deliciosa* at two application dates and in all combinations. Application date affected the response to both a low concentration of CPPU and NAA. A synergistic interaction was observed when CPPU was applied early plus NAA late (CPPU early (4.53 g increase) plus NAA late (13.29 g) < CPPU early plus NAA late (33.85 g)).

Finally endogenous hormone content was studied. Methods were developed and tested for the simultaneous analysis of both indole-3-acetic acid (IAA) and cytokinins. Freeze dried fruit were purified using Waters Sep-pak[®] cartridges and Oasis[®] columns then IAA was quantified by high pressure liquid chromatography. Preliminary results indicate a correlation between application of CPPU and endogenous IAA, high concentrations of IAA correlated well with periods of rapid fruit growth particularly for CPPU treated fruit.

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