**A LABORATORY STUDY OF THE EFFECTS OF
HYDROGEN CYANAMIDE ON LATANIA SCALE
(HEMIBERLESIA LATANIAE)**

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Hydrogen cyanamide (Hi-Cane) has gained widespread use in the kiwifruit industry since its registration in 1988 for promoting uniform, increased budbreak (Cliffe 1989; Henzell and Briscoe 1988). It is recommended that during the last 2 months of the dormant period, 500-700 litres of a 4-6% v/v solution of product (21-31 g ai/litre) be applied per hectare on mature vines (O'Connor 1989).

Hydrogen cyanamide is a caustic chemical with a strong herbicidal effect if used incorrectly. It has an acute oral LD₅₀ to rats of 285 mg/kg (O'Connor 1989) which is equivalent to many organosphosphate insecticides.

Armoured scale insects (Homoptera:Diaspididae) are major quarantine pests of kiwifruit and hydrogen cyanamide is applied at a time of year when cleanup sprays for these insects are recommended. The following trial was a preliminary laboratory experiment to determine whether hydrogen cyanamide has any insecticidal activity against armoured scale insects on kiwifruit.

The experiment was set up on 18 December 1989. Hydrogen cyanamide was sprayed through a Potter Tower onto potato tubers which had been infested with latania scale (*Hemiberlesia lataniae* Signoret) on 18-20 September 1989 and held at a temperature of 21-24 °C for scale development. At the time of the experiment, the potatoes had a heavy coverage of two generations of scale, including all age classes.

Treatments, replicated six times, were as follows:

1. 2 ml spray of 10% Hi-Cane
2. 2 ml spray of 5% Hi-Cane
3. 1 ml spray of 5% Hi-Cane
4. 0.5 ml spray of 5% Hi-Cane
5. Untreated control

The Potter Tower was calibrated to ensure an even spray coverage, and the spray was applied with compressed air at 69 kPa. Each potato was placed in the centre of the spray table and received a complete coverage over its upper surface. The treatments were designed to mimic the commercial low-volume spraying recommended for hydrogen cyanamide.

It is not possible to equate accurately the chemical deposition in these applications to that for sprays applied to a kiwifruit vine in the field. However, the application of 2 ml of solution to an area of 177 cm² was less than runoff volume, and in our estimation a deposition equivalent to the field application rate is probably achieved at or slightly above the rate of 1 ml.

Following spraying, the potatoes were held under ambient temperatures (17-25 °C) in a laboratory. Infestations in the sprayed area of the potatoes were examined on 8-9 January 1990. The number of live and dead scale in each of the three instar stages was assessed visually using a binocular microscope by assessing body coloration and turgidity. This method of assessment was checked by the more accurate method of examining specimens under a compound microscope (100X magnification) for signs of external or internal body movements, particularly pharyngeal pumping (the "pump test" (Witherell 1984)).

The results (Table 1) show that hydrogen cyanamide had a very pronounced effect upon scale mortality in three of the four treatments. The average percentage mortality, adjusted for mortality in untreated control, in the 1 ml application of 5% hydrogen

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TABLE 1: Effects of aqueous hydrogen cyanamide (520 g ai/litre) solutions sprayed through a Potter tower onto *Hemiberlesia lataniae* infesting potato tubers.

	2 ml of 10%		2 ml of 5%		1 ml of 5%		0.5 ml of 5%		Untreated	
	No.	% dead	No.	% dead	No.	% dead	No.	% dead	No.	% dead
Adult scale	446		477		477		624		460	
S.E.		100		99.0		93.0		65.0		55.0
		—		0.4		4.0		8.0		13.0
Second instar	414		463		421		405		483	
S.E.		100		99.5		99.6		72.0		53.0
		—		0.4		0.3		9.0		7.0
First instar	405		403		447		434		315	
S.E.		100		99.0		96.0		83.0		72.0
		—		0.8		0.2		6.0		9.0

cyanamide (the treatment which probably most closely mimicked the field application) was 85% for adult scale, 99% for second instars and 86% for first instars.

The experimental technique may be underestimating the mortality of first instars, because it is likely that crawlers from live adults on the underside of the potato were able to move onto the upper surfaces and begin to re-colonise the sprayed area after decay of the chemical residues and before the mortality assessment was made. This effect is unlikely to have influenced the results for older instars because insufficient time would have elapsed between treatment and assessment to allow the development of second or third instars from newly settled crawlers.

The relatively high level of mortality in the controls reflects the fact that the hard tests (armoured scale covering) of the scale insects survive for a long time after the death of the insect.

The laboratory temperatures at the time of the experiment, carried out in early summer, were somewhat higher than those typical of kiwifruit orchards in July and August. This may have enhanced the insecticidal property of the chemical.

In conclusion, this experiment shows that hydrogen cyanamide has insecticidal properties at rates comparable with those used under field conditions to promote bud break. This effect should be investigated on field populations of scale, in relation to current dormant season scale control recommendations.

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