

EFFECT OF INSECT GROWTH REGULATOR, CGA 211446, ON THE THIRD INSTAR OF THE HEART-SHAPED SCALE ON AVOCADOS

W.P. STEYN, W.J. DU TOIT & E.A. DE VILLIERS

Institute for Tropical and Subtropical Crops, Private Bag X11208, Nelspruit, 1200, RSA

ABSTRACT

*The heart-shaped scale, *Protopulvinaria pyriformis* (Cockerell) (Hemiptera : Coccidae), has developed from a sporadic to a serious pest on avocados in South Africa. The insect feeds on the leaves and produces excessive quantities of honeydew which serves as a growth medium for sooty mould fungi. Leaves and fruit become stained. Various concentrations of CGA 211446 (Ciba Geigy), a chitin synthesis inhibitor, was tested for its influence on the third instar of the scale and also to compare it to the registered product, buprofezin (FBC). At the time of spraying, 80% of the scale population was in the third instar. Best results were obtained by CGA 211446 at 40ml / 100 of water and higher. All the treatments differed significantly from the untreated check.*

INTRODUCTION

The heart-shaped scale, *Protopulvinaria pyriformis* (Cockerell) (Hemiptera : Coccidae) has developed from a sporadic to a serious pest on avocados in South Africa. This soft scale has been known in South Africa since 1916 (Brain, 1920). The scale also attacks guava (*Psidium guajava*), citrus (*Citrus spp.*) and various ornamentals. *P. pyriformis* widely spread in South and North America, Africa, Asia and the Mediterranean area. It is also a serious pest of avocado in Israel (Wysoki, 1978).

The insect (mature and immature stages) feeds on the leaves, usually on the underside of the leaf in association with the veins. Fruits are normally not attacked. Although the insect may cause direct injury by feeding on the leaves, the principal damage can be related to the production of excessive quantities of honeydew, which assembles on the lower hanging leaves, fruits and branches. The honeydew serves as a growth medium for sooty mould fungi of the genus *Capnodium*. The leaves and fruit become stained, and the fungal layer also interferes with the penetration of sunlight which reduces photosynthesis and subsequently leads to crop reduction.

Although natural enemies are present (various parasitic wasps and two predatory beetles), producers are often forced to control the pest chemically. A chitin synthesis inhibitor, buprofezin (FBC), is the only product registered for the control of the heart-shaped scale on avocados in South Africa.

Du Toit and De Villiers (1990) conducted a trial to investigate the effect of various growth regulators in comparison to the registered product against the second instar of

the scale. Within 5 weeks of treatment with the chitin synthesis inhibitor CGA 211446 (Ciba Geigy), a 99,7% reduction occurred in the scale population. This treatment was significantly better than the other growth regulators. The aim of the present study was to test the influence of various concentrations of CGA 211446 against the third instar of the heart-shaped scale and also to compare it to buprofezin.

MATERIALS AND METHODS

The trial was carried out in a 24-year old Fuerte avocado orchard at Nelspruit (30° 27'S, 30° 58'E). Five leaves per branch were labeled and all live scales on these leaves were counted prior to spraying as well as 4, 8, 12, 16 and 20 weeks after spraying. A knapsack sprayer was used to apply a full cover spray to the point of run off from the leaves. There were five treatments with four random replicates each and the untreated control (Table 1). At the time of spraying 80% of the scale population was in the third instar.

RESULTS AND DISCUSSION

(Figures were not provided in the original article)

According to Fig.1, the pre-treatment counts of live *P. pyriformis* on avocado leaves did not differ significantly at a 5% level between the six different treatments, indicating a relative homogenous population of scale insects. Four weeks after treatment, however, showed a significant reduction in scale population in the CGA 40 ml, 60 ml, and 80 ml treatments (Fig. 2) in comparison with the registered product, buprofezin, while the CGA 20 ml treatment also differ from the scale numbers of the untreated control. The reductions of scale population were about the same at 12 weeks after treatment (Fig. 3). At 16 weeks after treatment all the chemical treatments caused a significant reduction in scale population (Fig. 4), in comparison with the untreated control but with no significant differences ($P = 0.05$) between the chemical treatments. No significant differences in the scale population could be observed between any of the treatments and the control at 20 weeks

TABLE 1 Treatments used against the third instar of *P. pyriformis*.

Treatment	*Formulation	Active ingredient	Dosage / 100 ℓ water
Control			
CGA 211446	EC	200 mg / ℓ	20 ml
CGA 211446	EC	200 mg / ℓ	40 ml
CGA 211446	EC	200 mg / ℓ	60 ml
CGA 211446	EC	200 mg / ℓ	80 ml
Buprofezin	WP	150 mg / ℓ	30 g

* WP = wettable powder, EC = emulsifiable concentrate

Analysis of results

A randomized block design was used in this spray trial and the results were subjected to analysis of variance (ANOVA). After application (Fig. 5), due to the establishment of a new generation of scale crawlers on the leaves. According to these results, the chitin synthesis inhibitor CGA 211446 can control the heart-shaped scale effectively, even at a low concentration of 40 ml/100 water. This product, however, is still in a developing stage and its toxicity to predators and parasitoids of pest insects are yet unknown.

ACKNOWLEDGEMENTS

Thanks are due to Mr A. Toerien, Mrs E. Pont and Miss T. Brink for assistance with statistical analysis.

REFERENCES

- BRAIN, C.K., 1920. The Coccidae of South Africa. *Bulletin Entomological Research* 11: 1 - 42.
- DU TOIT, W.J. & DE VILLIERS, E.A., 1990. Effects of insect growth regulators on the development of the heart-shaped scale (Hemiptera:Coccidae) on avocados in South Africa. *Tests of Agrochemicals and Cultivars*. No. 11, (*Annals of applied biology*) 16, Supplement): 4 - 5.
- WYSOKI, M., 1978. A bibliography of the pyriform scale *Protopulvinaria pyriformis* (Cockerell), 1984 (Homoptera:Coccidae), up to 1986. *Phytoparasitica* 15: 73 - 77.