COCOS (1989), 7, 30-35
Printed in Sri Lanka

A Technique for the Application of Systemic Insecticides Through "Petiolar Wells" in Coconut

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ABSTRACT

Application of systemic insecticide through a cavity in the base of a petiole ("petiolar well") in the coconut palm has been demonstrated to be useful in the control of foliar pests of coconut. The movement of systemic insecticides through the crown of mature coconut palms was monitored through larval mortality of the coconut caterpillar, *Opisina arenosella* Wlk. *(Nephantis serinopa* Meyr). Maximum effect was recorded when the insecticide was fed via "petiolar wells" in the 11th frond.

The usefulness of other fronds for treatment and the advantage of this method over the conventional trunk injection and soil dressing methods are also discussed.

INTRODUCTION

In Sri Lanka, several important coconut pests are controlled by biological methods. Nevertheless, insecticides are often useful as a complementary control method, particularly for the control of the coconut caterpillar *(Opisina arenosella* Wlk.)

The use of insecticides against foliar pests on adult coconut palms is made difficult and hazardous due to the height of the palm and the geometry of the crown. In spite of requiring a large volume of spray liquid, it is often difficult to obtain uniform coverage of the crown by spraying. Other difficulties are the inability to direct the spray and considerable pollution of the environment. Other methods of insecticide application available are:

(a) Trunk injection

This method is widely used for the control of the red palm weevil *(Rhynchophorus ferrugineus)* and occasionally used for the control of foliar pests such as *Brassolis sophorae* and *Castnia daedalus* (Rai, 1973), *Cerataphis variabilis* (Reinart & Woodiel, 1974), and *Opisina arenosella* (Kanagaratnam & Pethiyagoda, 1976). However, the process of injection is rather difficult and the effectiveness of the method depends to a very large extent on the care taken in drilling. Furthermore, the damage done to the trunk is permanent, often causing subsequent stem bleeding, and repeated application requires new cavities.

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(b) **Soil dressing**

This method has been less common but has been used successfully for the control of foliar pests such as *Cerataphis variabilis* (Reinart & Woodiel, 1974), *Aspidiotus destructor* (Mariau & Julia, 1977) and *Promecotheca cumingi* (Perera, unpublished). The work on *cumingi* in Sri Lanka indicated the necessity for very heavy doses of insecticide to achieve significant control.

It would be reasonable to expect more efficient control of foliar pests by the application of insecticides on to the foliage itself or on the crown as the insecticide would be translocated faster, the loss through dilution would be less and as a result, the effect of the insecticide on the pest would be quicker.

The application of a systemic insecticide through cavities drilled in petioles ("petiolar wells") appears promising due to quicker translocation, low insecticide requirement and relatively less pollution. Compared with the trunk injection method, "petiolar wells" do not make permanent damage to the palm.

MATERIALS AND METHODS

The experiment was carried out in a uniform stand of approximately 20-year-old coconut palms of average height of about 7 m at Udappuwa, Sri Lanka, spread in an area of about 2 ha, with a natural heavy infestation of the coconut caterpillar *Opisina arenosella* Wlk. (Lepidoptera; Oecophoridae). An infested frond had, on an average, 50 – 60 actively feeding *O arenosella* larvae.

The insecticide used was Monocrotophos as a 60% water soluble concentrate (W S C). Vertically positioned circular wells 2 cm deep and 1.7 cm in diameter were cut using a cork borer on the inside of the broad basal end of the leaf petiole, about 15 – 20 cm from the point of attachment. Fifteen ml of undiluted insecticide were poured into each well by repeated refilling and allowed to seep into the tissue. The time taken for complete absorption of the insecticide varied from palm to palm and leaf to leaf with a range of 2 to 8 h.

As one of the objectives of the study was to investigate the pattern of movement of systemic insecticides within the crown of the coconut palm, six leaves of different maturity were selected from the same palm of which one was treated with insecticide. The leaves selected were numbered 3, 7, 11, 15, 19 and 23, considering the youngest fully opened leaf as leaf number 1 so that there were six treatments corresponding to the six leaves and a control. The experiment was replicated four times.

Insecticidal activity was studied through larval mortality from population counts taken 48 h and 120 h after insecticide application from leaf nos. 3, 7, 11, 15, 19 and 23.

The numbers of live and dead caterpillars on each sample were counted.

RESULTS AND DISCUSSION

Corrected percent mortalities (Abbot's correction) 48 h and 120 h after the application of insecticide are presented in Figs. 1 to 3. The larval mortality of *Opisina* indicates the pattern and intensity of translocation of the insecticide within the crown. In this regard, the following interesting observations are evident from Fig. 1.

(a) In general, a higher mortality of larvae was observed in fronds other than the treated one indicating that the bulk of the insecticide was moved out of the frond.

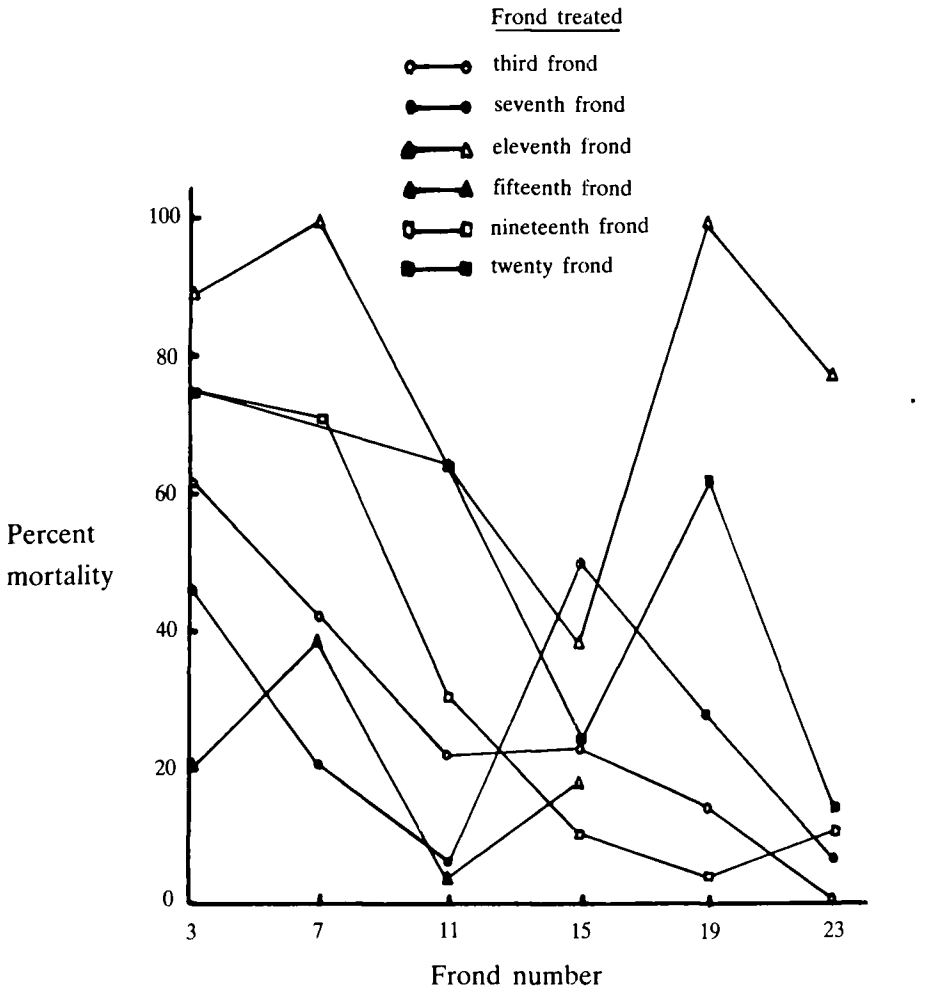

Fig. 1 Larval mortality observed in the 3rd, 7th, 11th, 15th, 19th and 23rd fronds, 48 h after application of insecticide through a selected frond.

(b) When older fronds (Nos. 23, 19, 15) were injected, the insecticide appeared to move progressively into the younger fronds. This was not surprising as older leaves generally 'export' materials. For instance, when leaves 19 and 23 were injected, the highest larval mortality was observed on leaf 11. The results indicated that very little or no insecticide moved into the very young fronds Nos. 3 and 7.

(c) A rapid and uniform distribution of the insecticide causing heavy larval mortality was observed when frond No. 11 was injected.

Although data in Fig. 1 indicate an initial 'export' of insecticide from the frond, data in Figs. 2 (a) to 2 (f) show that at 120 h after application of the insecticide, it is re-distributed considerably. This is generally true of all fronds.

From Fig. 3, it is seen that the larval mortality after 48 h was highest in the palm where leaf No. 11 had been injected. This is perhaps because of the rapid movement of the insecticide upwards and downwards. At 120 h sampling, the highest mortality was seen in the palms where frond No. 15 had been treated. Fig 2 & 3

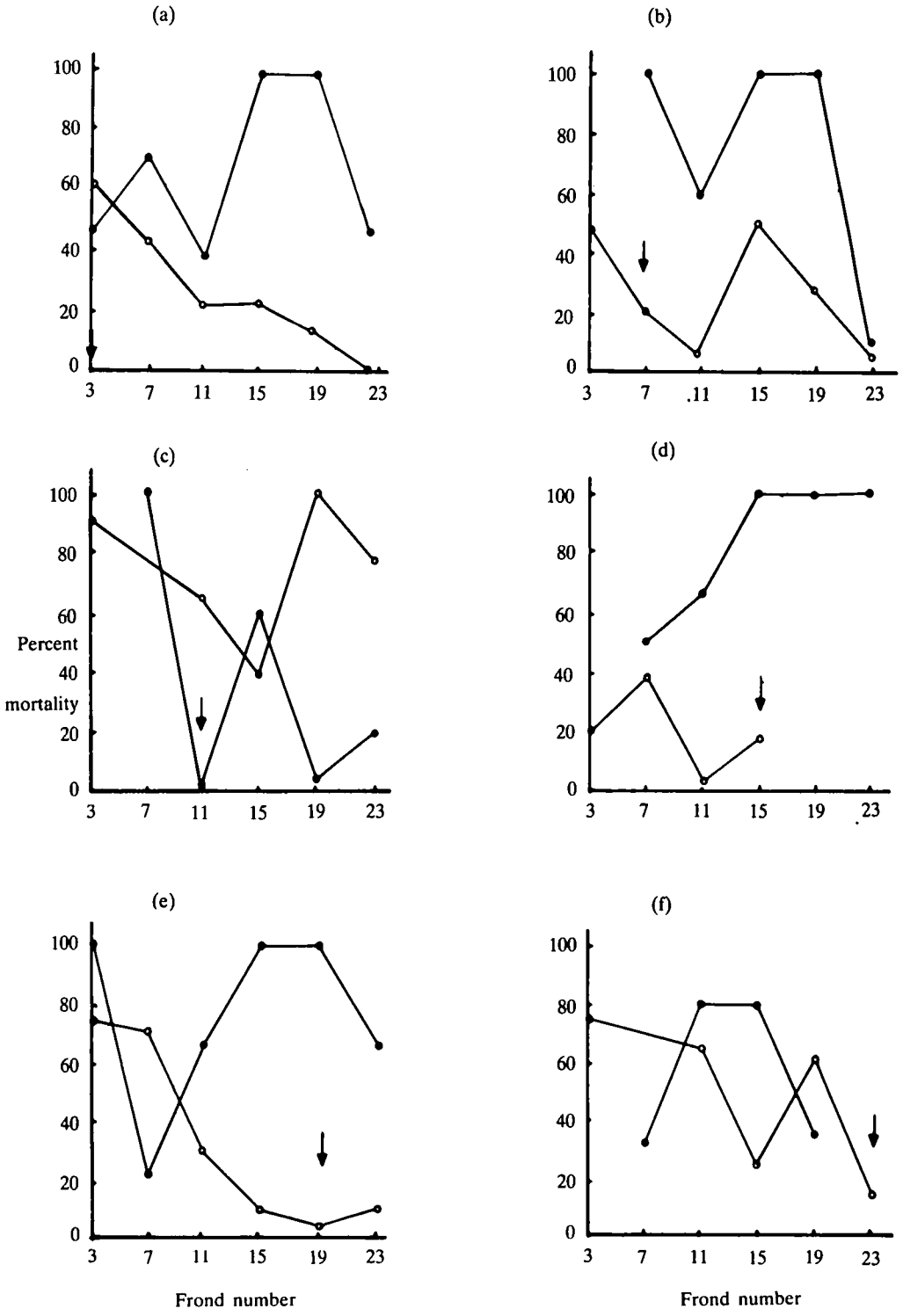

Fig. 2. Larval mortality observed in the 3rd, 7th, 11th, 15th, 19th and 23rd fronds after 48 h of application of insecticide via "petiolar wells" in a single frond. Arrow indicates the frond treated.

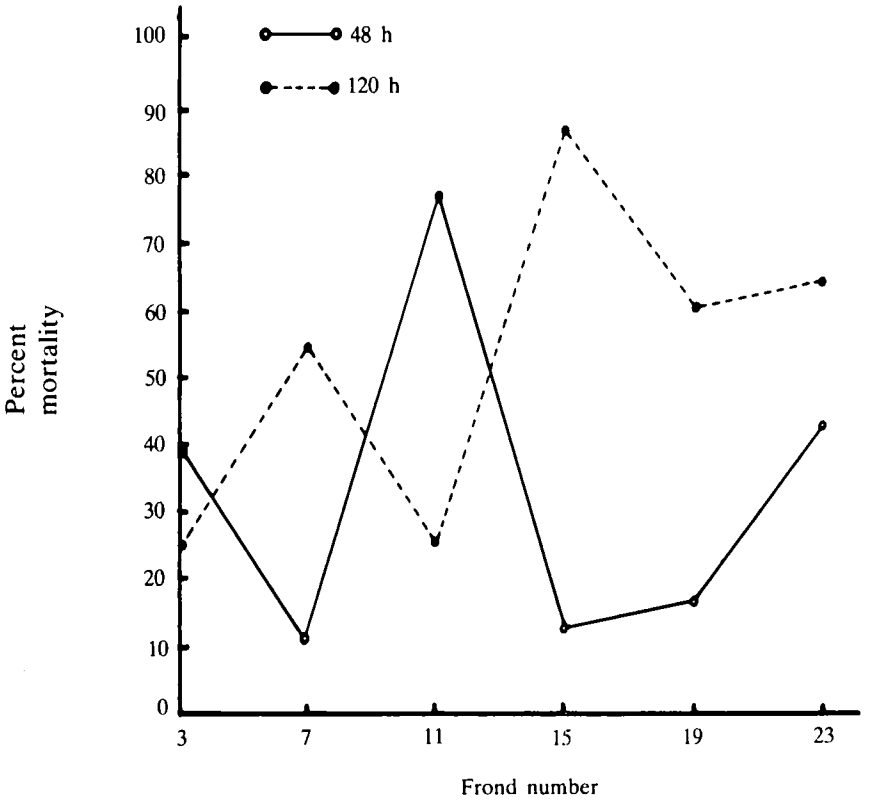

Fig. 3 – Larval mortality observed in fronds at 48 h and 120 h after application of insecticide into the respective fronds.

These results indicate the usefulness of this technique for administering insecticides for the control of foliar pests of coconut. This method has advantages over the conventional method of trunk injection because the latter causes a permanent injury to the stem. The damage to the petiole in making a "petiolar well" is less severe and is not permanent because of the natural removal, with time, of the treated frond from the crown. However, it is necessary to climb the palms for treatment.

Some of the distinct advantages of this method over soil application are in the more complete uptake of the systemic insecticide by the plant so that less insecticide is needed for application, and the avoidance of possible interference with soil microfauna. Also, this method could be used with advantage in treating young palms where the stem has not formed.

In field application of this method, quick mortality could be obtained by using the 11th frond. Older leaves could also be used effectively, as demonstrated in this paper. As mortality is directly dependent on larval feeding, this method would be most effective when the pest is in the larval stage.

Although the present knowledge on the translocation pattern within a coconut crown is hardly adequate to explain some of the observations in these experiments, a promising pest control technique for foliar pests of coconut has been introduced.

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