GAU Res. J. 1985. 10 (2) : 16-22

Residue Status of Monocrotophos in Coconut Water Injected by Stem Injection Technique

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ABSTRACT

Microbioassay method of residue analysis of coconut water at various intervals after application of monocrotophos (36 per cent w/w) by trunk injection technique revealed that residue status of monocrotophos was below tolerance level of 0.2 ppm after three weeks and four weeks at the doses of 10 ml and 20 ml per palm respectively.

(Received on 24th Janu. 1983)

INTRODUCTION

The coconut (*Cocus nucifera* L.) is the most useful palm of tropical region, because every part of the tree is exploited commercially. This tree so called "Kalpa Vriksha" or the tree of heaven (Annonymous, 1980) is reported to be infested by more than 100 insect pests (Nirula, 1955) among which Black headed Caterpillar (*Nephantis serinopa* Meyr.) is one of the most serious pest of coconut.

Many insecticides in form of foliar spray have been evaluated for the control of black headed caterpillar of coconut. But coconut tree being very tall and foliar spray of insecticide is cumbersome for the pest management in coconut plantation the trunk injection of monocrotophos have been reported to be effective in the control of *N. serinopa* Meyr. (Nadarajan and Channa Basavanna 1978, Sundaramoorthy 1979, Mithyantha *et al.* 1980, Nadarajan *et al.* 1980 and Anonymous, 1981). Similarly Patel (1982) has also reported the monocrotophos when applied through trunk injection technique at 10 ml (3.6 g a.i.) and 20 ml (7.2 g a.i.) per palm of 8 year age to be effective upto 60 and 90 days respectively for the control of pest in comparison to foliar spray.

The recent cry for environmental pollution throughout the globe has engaged a large number of scientists in different countries to tackle the problem from different angles and as such any research recommondations on chemical control of insect pests are considered to be incomplete if data on residue are not provided. It is therefore, necessary to know the residue status of monocrotophos in coconut water after stem injec-

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(iii) To the top layer of coconut water, 150 ml of chloroform and 100 grams of anhydrous sodium sulphate was added and the mixture was thoroughly shaken and allowed to separate. The lower layer was again passed through 20 grams of anhydrous sodium sulphate and was collected in the above one litre Erlenmayer flask.

(iv) The above procedure was again repeated using 100 ml of chloroform. In this way totally 350 ml of chloroform extract was collected in one litre Erlenmayer flask.

(v) Five boiling chips were added to above 350 ml of chloroform extract and was concentrated to approximately 10 ml on steam bath using a 3 ball snyder column attached to Erlenmayer flask.

(vi) To above 10 ml concentrated extract, 50 ml n-hexane was added and was concentrated to small volume. This procedure was repeated four times, so as to exchange the chloroform solvent with n-hexane.

(vii) The final volume of n-hexane was brought to 25 ml in a volumetric flask and the flask was stoppered to make it air tight and was labelled.

(viii) This aliquot was preserved in a refrigerator until futher use.

(E) Monocrotophos residue estimation in coconut water by Microbioassay:

The culture of Oregon-k (wild type) of *Drosophilla melanogastar* Meigen flies was obtained from the Veterinary College, Gujarat Agricultural University, Anand and was maintained in the laboratory of the Entomology department at N. M. College of Agriculture, Navsari. The flies were reared on an artificial diet suggested by Lewis (1960).

(i) One ml of refrigerated extract was used for micro-bioassay keeping four replications in each case.

(ii) This 0.5 ml of the solution was pipetted into each plate of petridish (10 cm diameter) duly marked as R1, R2, R3 and R4 for each replication.

(iii) The petridishes were swirled gently in order to spread the solution uniformly and the solvent was allowed to evaporate completely to dryness.

(iv) After the drying of the solution in dishes, a small lump of media was placed in each petridish as a food.

(v) Twenty anaesthetised laboratory reared male *Drosophilla melanogastar* Meigen, flies, pecies origon-k wild type (one day old) fiies were released into each pair of petridish.

TABLE 1

Percentage mortality corresponding to various quantities of monocrotophos after five hours of exposure.

Sr. No.	*Amount of Monocrotophos (ppm)*	*Actual mean percentage mortality*	*Worked out percentage mortality from regression equation* ($Y = 815.79\ x + 22.03$)
	x		y
1	*2*	*3*	*4*
1.	0.01	15.0	30.19
2.	0.02	27.5	38.35
3.	0.03	52.5	46.5
4.	0.04	63.75	54.66
5.	0.05	73.75	62.82

(vi) These petridishes were then kept in the humidity-temperature controlled cabinet where temperature was maintained 26±1 degree centrigarde.

(vii) The mortality count was taken at an interval of half an hour upto eight hours.

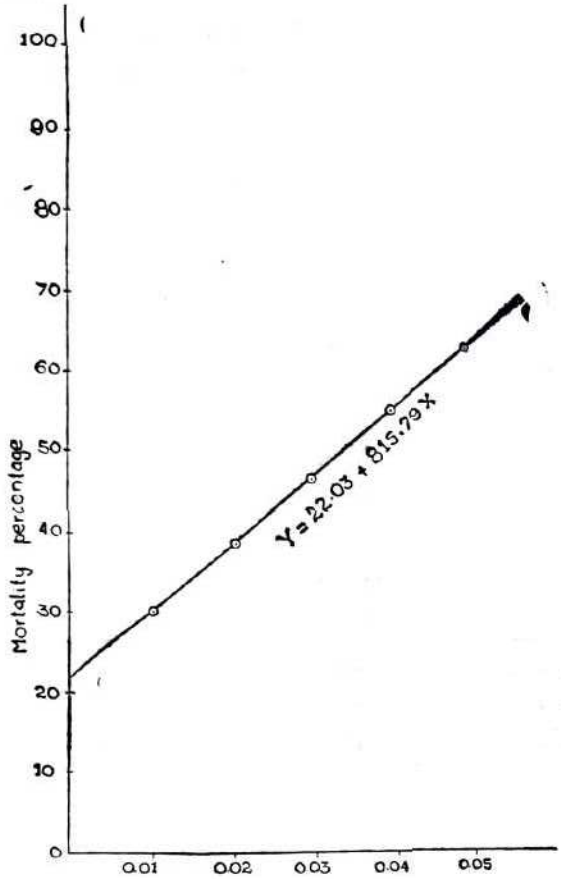

Fig. 1 : Standard Dosage mortality Response Curve for Monocrotophos in Coconut Water by Micro-Bioassay (Based on Five Hours Exposure Period for *D. Melanogester Meigen*)

(viii) The amount of residue of monocrotophos in the sample was estimated on the basis of five hours mortality count with reference to standard dosage mortality response regression curve (Table 1 and Figure 1) as per Sun and Sun (1952).

RESULTS AND DISCUSSION

The results obtained for monocrotophos residue in the water of tender coconut harvested at various intervals are presented in table 2. The data indicated that the monocrotophos residue in coconut water in the treatment of 10 ml monocrotophos per palm by T.I.T. after first and second week remained higher than the tolerance level of 0.2 ppm (Anonymous, 1972) while it was below detactable level after third, fourth and fifth week of the treatment. The monocrotophos residue in coconut water in the treatment of 20 ml monocrotophos per palm by T.I.T. after first, second and third week remained higher than the tolerance level of 0.2 ppm, but it was below detectable level after fourth and fifth week of the treatment.

The data on per cent reduction of monocrotophos residue in coconut water are presented in table 3 and the relation between the weeks after injection and monocrotophos residue is presented graphically in figure2. The data indicated that the monocrotophos residue in coconut water after first and second week in the treatment of 10 ml monocrotophos per palm by T.I.T. were 0.98 and 0.37 ppm, respectively, indicating 62.24 per cent reduction within two weeks. After third, fourth and fifth week of the above treatment, the monocrotophos residue was below detectable level in coconut water. Thus the percentage reduction is more than 97.3% per cent during the period of third week as the sensitivity of the micro-bioassay technique used is 0.01 ppm.

The monocrotophos residue in coconut water after first, second and third week in the treatment of monocrotophos 20 ml per palm by T.I.T. were 1.38, 0.89 and 0.39 ppm, respectively. Thus the percentage reduction of monocrotophos residue were 35.51 and 56.18 per cent during the second and third week respectively after the treatment. The monocrotophos residue was below detectable level during the period of fourth and fifth week after the treatment indicating more than 97.44 per cent

reduction in residue level of insecticide after fourth week of the treatment.

From the above result, it can be seen that in the treatment of 10 ml monocrotophos per palm by T.I.T., the monocrotophos residue have remained above prescribed tolerance limit of 0.2 ppm. of FAO/WHO recommendation (Anonymous, 1972), i.e. 0.98 and 0.37 ppm

TABLE 2

Residue of monocrotophos in ppm after treatment at week interval.

Sr. No.	Treatment	Week after treatment *** I	II	III	IV	V
1.	10 ml Monocrotophos per palm by T.I.T.	1.41 a (0.99)**	1.17 a (0.37)	1.0 a (0.0)	BDL*	BDL
2.	20 ml Monocrotophos per palm by T.I.T.	1.54 b (1.37)	1.37 b (0.88)	1.18 b (0.39)	BDL	BDL
3.	Control (untreated)	1.0 c (0.0)	1.0 c (0.0)	1.0 a (0.0)	—	—
	S. Em. ±	0.016	0.016	0.02	—	—
	C.D. at 5%	0.05	0.046	0.05	—	—
	C.V. %	3.39	3.79	4.22	—	—

* Below detectable level.

** Figure in perenthesis are retransformed value.

*** $\sqrt{X+1}$ transformation is followed.

Note: Treatment means having letter in common are statistically at par.

TABLE 3

Residue of monocrotophos (Nuvacron 40 E.C.) in the tender coconut water due to the treatment of 10 ml and 20 ml Nuvacron applied by trunk injection technique in 1981-82 (Estimated by Micro-bioassay).

Treatment	Residue in ppm after First week	Second week	Percentage reduction	Third week	Percentage reduction	Fourth week	Percentage reduction	Fifth week
10 ml monocrotophos per palm byT.I.T.	0.98	0.37	62.24	BDL	97.3	BDL	—	BDL
20 ml monocrotophos per palm by T.I.T.	1.38	0.89	35.51	0.39	56.18	BDL	97.44	BDL

BDL—Below Detactable Level.

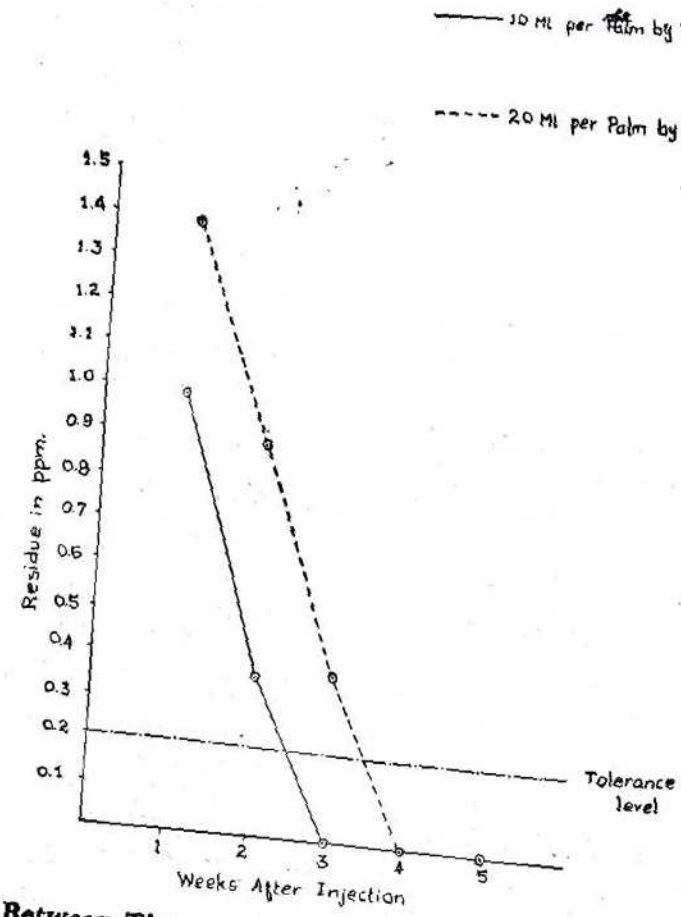

Fig. 2. Relation Between Time and Residue of Monocrotophos by TIT Method.

for the period of first and second week respectively after treatment. During the period of third week after the treatment of monocrotophos residue in coconut water reached below tolerance level. Thus it can be seen that it is safer to use the coconut water as drink only after third week of the treatment of 10 ml monocrotophos per palm by T.I.T. Similarly, in the treatment of 20 ml nonocrotophos per palm by T.I.T. the nsecticidal residue have remained above olerance limit upto a period of third eek after injection and has gone down elow detectable level after the period of e fourth week of the treatment. Thus, e result indicated that the coconut ter is safe for drinking from hazard int of view only after third week and rth week of the treatment of 10 ml and 20 ml monocrotophos per palm by T.I.T. respectively.

Mithyantha *et al.* (1980), have also worked out the monocrotophos residue in coconut water and copra and found the residue of monocrotophos below detectable level third week after the treatment of monocrotophos 2.5 and 5.0 g a.i. per palm. They reported the residue of moncrotophos below prescribed tolerance limit of 0.2 ppm one week after the treatment. Similarly Nadarajan *et al.* (1980), have also reported the monocrotophos residue below tolerance limit of 0.2 ppm three week after treatment of 3.5 ml and 7.0 ml monocrotophos a.i. per palm indicating that nuts were safe for use. In our finding the application of monocrotophos 10 ml and 20 ml per palm by T.I.T. found to be having be-

low tolerance limit of 0.2 ppm after third and fourth weeks of application respectively. Thus, the present findings are in concurrence with that reported by Mithyanatha *et al.* (1980) and Nadarajan *et al.* (1980) as far as dose of insecticide with residue status after three weeks of the treatment is concerned.

Thus on the basis of the above results, it can be concluded that it is advisable and preferable to use coconut water for drinking only after observing the withholding period of three and four weeks in the treatments of 10 ml and 20 ml monocrotophos applied in coconut palm by trunk injection technique respectively. This is because it is safer and residue level goes below tolerance level of 0.2 ppm only after above stated peroid.

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