

Bio-efficacy of some green pesticides against *Tetranychus ludeni* Zacher infesting Boch (*Acorus calamus* L.)



Science

KEYWORDS : Mortality, Repellency, *Tetranychus ludeni*, *Acorus calamus*, Bio-efficacy

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ABSTRACT

The present paper reports the result of study regarding bio-efficacy of green pesticides towards causing mortality and repellency of *Tetranychus ludeni* Zacher infesting Boch (*Acorus calamus* L.). Bio-pesticide II proved to be most efficacious giving mean mortality of 87.55% and was significantly superior to all other treatments while Neem was poorest amongst all registering lowest mean mortality of 76.66%. Palash (*Butea monosperma*) and Karanja (*Pongamia pinnata*) leaf extracts registered higher percentage of repellency initially but subsequently excepting Neem (*Azadirachta indica*), all other treatments were equally good giving 100% repellency.

Materials and Methods:

The test mite *Tetranychus ludeni* Zacher was found seriously infesting a medicinal herb, *Acorus calamus* L., causing chlorosis and the same mite was cultured on the same host maintained in earthen pots under laboratory conditions at room temperature (30 ± 2°C) with 75% RH.

A. Preparation of crude extracts: The test mite was collected from cultured pots. The respective plant extracts Neem (*Azadirachta indica*), Nisinda (*Vitex negundo*), Bhat (*Clerodendron inerme*), Palash (*Butea monosperma* Lamk.) Taub., Karanja (*Pongamia pinnata*), Bio-pesticide I (Tobacco leaves+garlic extract+*Acorus calamus* L. red chilli+Neem extract+Neem oil+emulsified), Bio-pesticide II (Pongamia extract+Neem oil+emulsified) were prepared using acetone as solvent and the dried leaves of test plants were powdered in a grinder. The powdered leaves were transferred in a conical flask (150cc) and kept immersed in acetone and then was shaken vigorously for 2 days. On the third day, the supernatant liquid was taken out, filtered and kept in Petri dish for allowing it to evaporate. After the evaporation was over, the crust which was the actual toxicant left on the Petri dish was scrapped out. It was then weighted and the respective percentage concentrations were prepared by mixing with required quantity of water.

B. Assessing Acaricidal Activity : The leaf-disc technique was followed for determining mortality percentage of plant extracts in bio-assay study. For control treatment, distilled water was sprayed. The leaf-discs of 1.5 cm diameter were immersed in extracted solution for 15 seconds and then kept on wet cotton pad in a Petri dish. Thereafter, 10 adult mites were released on each leaf-disc and the mortality was noted after interval of every 24 hours till 96 hour. The mites were considered to be dead when they made no movement of their appendages with a prick of a needle. Each treatment was replicated 4 times. Acaricidal activity was measured in terms of percentage mortality compared to mortality in control. The percentage mortality was calculated by using the following formula:-

$$\text{Percentage (\%)} \text{ Mortality} = \frac{\text{No. Of Dead Mites}}{\text{Total No. Of Mites}} \times 100$$

(Mc. Donald *et al.*, 1970)

STATISTICAL ANALYSIS: The data was subjected to statistical analysis using SPSS software 2008.

Repellency Test with Leaf extracts:

The technique which was used for performing repellency was according to Maitra *et al.* (2015).

Results and Discussion :

Mortality : The mortality achieved at different intervals has been given below.

24 Hours: At this interval the highest mortality (78.89%) was registered in case of Bio-pesticide II which was significantly superior to all other treatments. Bio-pesticide I and Bhat leaf extract registered mortality of 58.60% and 56.67%, respectively and were at par. The leaf extracts of Nisinda and Karanja registered mortality of 53.33% and 50.00%, respectively and had shown no significant difference among themselves. The extracts of Palash and Neem were next in order registering mortality of 46.67% and 40.00%, respectively, the former being superior to the latter. No mortality was observed in control treatment.

48 Hours: As was seen in the previous case, the highest mortality was registered in case of Bio-pesticide II (95.56%) and was superior to all other treatments. The descending order of mortality was 72.80% (Bio-pesticide I), 66.67% (Karanja), 64.00% (Bhat), 60.00% (Nisinda and Palash) and 56.67% (Neem). Excepting Karanja and Bhat which had shown no significant difference among themselves, all the other treatments were superior to the next other as mentioned in the descending order of mortality. In this case also, no mortality was observed in case of control treatment.

72 Hours: Bio-pesticide II registered 100% mortality and was superior to all other treatments while Bio-pesticide I, Karanja and Bhat were at par registering mortality of 85.76%, 86.67% and 83.33%, respectively. The treatments like Palash, Nisinda and Neem were also at par registering mortality of 73.33%, 73.33% and 76.67%, respectively. No mortality was observed in case of control treatment.

96 Hours: The performance of all the pesticides improved substantially at this interval in all the treatments raising mortality to 100% and hence performance of all was at par.

Mean Mortality: So far as mean mortality of all the treatments pulling the mortality data of all the four intervals, it appeared that Bio-pesticide II was significantly superior to all other treatments (87.55% mortality) followed by Karanja and Bhat, giving mortality of 80.66% and 80.80%, respectively and were at par. Bio-pesticide I and Nisinda registered 73.43% and 77.33%, respectively and were at par. Neem was the poorest among all wherein the percentage mortality was 74.66% and was inferior to all other treatments. At none of the intervals mortality was registered in the control treatment.

Repellency: All the 5 plant extracts had shown repellency effect against *Tetranychus ludeni* infesting Bach at different intervals as given in Table-2

1 hour: All the plant extracts had shown repellency and the percentage of repellency varied between 50.00% in case of Neem, which was significantly inferior to all the treatments while Karanja, Palash and Bhat leaf extracts had shown repellency of 76.67%, 73.33% and 73.33%, respectively and they were at par and were superior to Nisinda which registered 70.00% repellency.

2 hour: At this interval, Karanja leaf extract had shown repellency of 83.33% which was superior to all the other treatments while the remaining four had shown repellency ranging from 73.33% to 76.67% , all being at par.

3 hour: Karanja and Palash both were superior to all other treatments both registering repellency of 90.00% and in case of the other treatments, Neem had shown better repellency (86.67%) and were superior to both Nisinda and Bhat, both of which had given 83.33% repellency.

4 hour: All the treatments had shown 100% repellency and were at par.

Mean Repellency: So far as mean repellency is concerned excepting Neem, which had shown repellency of 77.50% , all the other four were at par, wherein the percentage repellency ranged between 82.50% to 87.50%.

Regarding performance of botanical extracts, quite a good number of publications are available from India of which mention may be made of Maitra & Gupta (2006), who reported 100% mortality of *Petrobia harti* and *Brevipalpus euphorbiae* with leaf extract of *Ocimum gratissimum*. Yathiraj & Jagadish (1999) reported 63.75%, 55.00%, 37.50%, 28.75% and 6.25 % mortality of *T. urticae* at 5%, 4%, 3%, 2% and 1%, respectively using leaf extract of *Clerodendron inerme*. Yathiraj & Jagadish (1999) reported 41.25%, 41%, 31.25%, 26.25% and 13.75% for *T. urticae* using

leaf extract of *Vitex negundo*. Therefore, the percentage mortality achieved in case of the present study was much higher as compared to those mentioned above. So far as leaf extracts of Palash (*Butea monosperma*) and Karanja (*Pongamia pinnata*) are concerned, the mortality in the present study also was of higher degree. Since, no study for repellency in respect of *Tetranychus ludeni* on Bach (*Acorus calamus*) was available, the present result could not be compared with those of others. Several other plant extracts like *Plumbago zeylanica*, *Mentha arvensis*, *Withania somnifera*, *Rauwolfia serpentina*, *Datura repens*, etc. were also tested by several workers and their results have been summarized in Gupta (2012). Since those extracts were not used in the present study, the results as included in this paper were not compared with those.

Conclusion:

Mortality Experiment :

The experiment can be concluded as below.

- All the plant extracts as well as Bio-pesticides I and II proved their acaricidal efficacy against *Tetranychus ludeni* infesting Bach.
- In none of the cases, mortality was observed in control treatments.
- Among all the treatments, Bio-pesticide II proved to be most efficacious giving mean mortality of 87.55% and was significantly superior to all other treatments while Neem was poorest amongst all registering lowest mean mortality of 76.66%.

Repellency Experiment :

The experiment can be concluded as below.

- All the plant extracts had proved repellency effect, the percentage of which varied between 77.50% to 87.50%.
- Though apparently Palash (*Butea monosperma*) and Karanja (*Pongamia pinnata*) leaf extracts registered higher percentage of repellency initially but subsequently excepting Neem (*Azadirachta indica*), all other treatments were equally good giving 100% repellency.

Table-1: Bio-efficacy of botanical pesticides towards mortality of *Tetranychus ludeni* Zacher, infesting Bach (*Acorus calamus*)

Treatments	Conc.	Initial Pop	Mean % mortality at different intervals after spraying				
			24 hrs	48 hrs	72 hrs	96 hrs	Mean
Neem	2.5%	10	40.00 (39.23) e	56.67 (48.44) e	76.67 (60.66) c	100 (90) a	74.668 (65.66) d
Nisinda	2.5%	10	53.33 (46.71) c	60.00 (50.16) d	73.33 (58.69) c	100 (90) a	77.332 (67.112) c
Bhat	2.5%	10	56.67 (48.44) b	64.00 (53.13) c	83.33 (65.64) b	100 (90) a	80.80 (69.44) b
Palash	2.5%	10	46.67 (42.70) d	60.00 (50.76) d	73.33 (58.69) c	100 (90) a	76.00 (66.43) d
Karanja	2.5%	10	50.00 (45.00) c	66.67 (54.33) c	86.67 (68.03) b	100 (90) a	80.66 (69.47) b
Biopesticide I	3%	10	58.60 (49.60) b	72.80 (58.07) b	85.76 (67.21) b	100 (90) a	73.43 (70.98) c
Biopesticide II	3%	10	78.89 (62.02) a	95.56 (77.08) a	100 (90) a	-	87.55 (81.82) a
Control	-	10	0	0	0	0	0
CD at 2.5%	-	-	4.17	4.72	4.68	4.16	4.43

Table-2: Bio-efficacy of botanical pesticides towards causing repellency of *Tetranychus ludeni* Zacher, infesting Bach (*Acorus calamus*)

Treatments	Conc.	Initial Pop	Mean % mortality at different intervals after spraying				
			1 hour	2 hour	3 hour	4 hour	Mean
Neem	2.5%	10	50.00 (45.08) c	73.33 (59.21) b	86.67 (63.43) b	100 (90) a	77.50 (64.43) b
Nisinda	2.5%	10	70.00 (56.79) b	76.67 (61.22) b	83.33 (66.28) c	100 (90) a	82.50 (68.57) a
Bhat	2.5%	10	73.33 (59.00) a	76.67 (61.22) b	83.33 (66.14) c	100 (90) a	83.33 (69.09) a
Palash	2.5%	10	73.33 (61.22) a	76.67 (66.14) b	90.00 (71.57) a	100 (90) a	85.00 (72.22) A
Karanja	2.5%	10	76.67 (61.22) a	83.33 (66.14) a	90.00 (71.57) a	100 (90) a	87.50 (72.24) a
Control	-	10	0	0	0	0	0
CD at 2.5%	-	-	5.23	5.51	5.72	5.23	5.49

Acknowledgements:

The authors are thankful to the National Medicinal Plants Board, Ministry of AYUSH, Govt. of India, for financial assistance and to Swami Sarvagananda Maharaj and Swami Yugeswarananda Maharaj, the Secretary and Assistant Secretary, respectively of Ramakrishna Mission Ashrama, Narendrapur for providing infrastructure facilities, moral support and encouragement to carry out the work, without which this study would not have been possible. Sincere thanks are also due to M/S Liebig's Agrochem (P.) kolkata-700026 and Ms Kamelia Banerjee, Sr. Biotechnologist for making their two products available for testing purpose.

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