

Bioefficacy of botanicals and biorationals against *Tetranychus ludeni* Zacher (Acari: Tetranychidae) on Sarpagandha (*Rauvolfia serpentina*) under laboratory conditions

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Introduction

Tetranychus ludeni is a serious pest of *Rauvolfia serpentina* during the summer months causing devastating damage leading to drying and death of plants due to severe chlorosis. An attempt was made to control this pest with botanicals and biorationals and the results thereof are presented in this paper.

Materials and Methods

The methodologies adopted for preparation of leaf extracts of Neem (*Azadirachta indica*), Nishinda (*Vitex nigundo*), Ramtulasi (*Ocimum grattisimum*), marigold (*Tagetes erecta*), pastes of chilli (*Capsicum annum*) and garlic (*Allium sativum*) and fermentation of cow urine were as per Yathiraj & Jagadish (1999), Maitra & Gupta (2006), Gupta et al. (2007), Patil & Nandihalli (2007), while application of pesticides was made topically as per Helle & Sabelis (1985). The observations towards mortality were recorded at 24, 48, 72 and 96 hours intervals. The percentage mortality was calculated as per following formula:

$$\% \text{Mortality} = \frac{\text{Number of dead mites}}{\text{Total No. of Mites}} \times 100 \text{ (Mc.Donald et al. 1970)}$$

The result was statistically analysed for interpretation.

Results and Discussion

The % mortality achieved at different intervals after spraying has been given in Table 1 and a perusal to that Table indicates the following:

24 Hours : At this interval, the highest mortality was 41.66% in case of chilli paste (5gm.) + cow urine (500ml.), followed by 36.11% in case of chilli paste (5%) as well as garlic paste (5gm.) + kerosene oil (250ml.) and neem leaf extract (5%) and all were at par. Nishinda 5(5%), chilli paste(2.5gm.) + cow urine (500ml.), Neem leaf extract (2.5%) and Ramtulasi leaf extract (5%), had given mortality of 30.55% and were at par. The % mortality of chilli paste (2.5%), garlic paste (5%), marigold leaf extract (5%) and Nishinda leaf extract (2.5%) were all at par. The lowest mortality was recorded in Ramtulasi leaf extract (2.5%) and marigold leaf extract (2.5%), both gave 13.89% mortality. So, at this interval chilli paste + cow urine proved to be best. No mortality was recorded in control treatment.

48 Hours : The mortality recorded in different intervals may be arranged in the following descending order: chilli paste (5gm.) + cow urine (500ml.) (58.81%)= garlic paste (5gm.) + k.oil (250ml.) (58.81%)>Neem leaf extract (5%) (52.78%)= chilli paste (5%) (52.78%)>chilli paste (2.5gm.) + cow urine (500ml.) (36.11%)= Neem leaf extract (2.5%) (36.11%)= Ramtulasi leaf extract (5%) (36.11%)= marigold leaf extract(5%) (36.11%)= Nishinda leaf extract (5%) (36.11%)>Nishinda leaf extract (2.5%) (33.33%)= chilli paste (2.5%) (33.33%)= Ramtulasi leaf extract (2.5%) (33.33%)>garlic paste (5%) (27.77%)>marigold leaf extract (2.5%) (13.89%). So, at this interval also marigold leaf extract was the poorest among all. No mortality was recorded in control treatment.

72 Hours : The mortality recorded in different intervals may be arranged in the following descending order: chilli paste + cow urine (77.78%)>Ramtulasi leaf extract (5%) (66.11%)= garlic paste (5gm.) + k. oil (250ml.) (63.89%)= chilli paste (5%) (63.89%)= Neem leaf extract (5%) (61.11%)>chilli paste (2.5gm.) + cow urine (500ml.) (52.47%)= Neem leaf extract (2.5%) (52.47%)= Nishinda leaf extract (5%) (52.47%)>chilli paste (2.5%) (44.51%)= Ramtulasi extract (2.5%) (44.41%)= marigold leaf extract (5%) (44.41%)= Nishinda leaf extract (2.5%) (44.41%)>garlic paste (5%) (38.89%)>marigold leaf extract (2.5%) (27.77%). No mortality was recorded in control treatment.

96 Hours : The mortality recorded at different intervals may be arranged in the following descending order: Chilli paste (5gm.) + cow urine (500ml.) (91.66%)>chilli paste (5%) (77.78%)= garlic paste (5gm.) + k.oil (250ml.) (77.78%)= chilli paste (2.5gm.) + cow urine (500ml.) (72.22%)= Neem leaf extract (5%) (72.22%)= Ramtulasi leaf extract (5%) (72.22%)>chilli paste (2.5%) (58.33%)= Nishinda leaf extract (5%) (58.33%)= Neem leaf extract (2.5%) (54.96%)= marigold leaf extract (5%) (52.17%)= Nishinda leaf extract (2.5%) (52.17%)= garlic paste (5%) (47.22%)= Ramtulasi leaf extract (2.5%) (48.41%)>marigold leaf extract (2.5%) (36.11%). No mortality was recorded in control treatment.

Table 1. %Mortality in different treatments of botanicals and biorationals at different intervals after spraying on *Tetranychus ludeni* infesting *Rauwolfia serpentina* under laboratory conditions.

Treatments	Initial population	% mortality at different intervals after spraying				
		24hrs.	48hrs.	72hrs.	96hrs.	Mean
1 Nishinda leaf extract (2.5%)	10	27.77	33.33	44.41	52.17	39.42
2 Nishinda leaf extract (5%)	10	30.55	36.11	52.47	58.33	44.36
3 Marigold leaf extract (2.5%)	10	13.89	13.89	27.77	36.11	22.91
4 Marigold leaf extract (5%)	10	27.77	36.11	44.41	52.17	40.11
5 Ramtulasi leaf extract (2.5%)	10	13.89	33.33	44.41	48.41	34.01
6 Ramtulasi leaf extract (5%)	10	30.55	36.11	66.11	72.22	51.24
7 Neem leaf extract (2.5%)	10	30.55	36.11	52.47	54.96	43.44
8 Neem leaf extract (5%)	10	36.11	52.78	61.11	72.22	55.55
9 Garlic paste (5%)	10	27.77	27.77	38.89	47.22	28.47
10 Garlic paste (5gm.)+K.oil (250ml)	10	36.11	58.81	63.89	77.78	59.14
11 Chilli paste (2.5%)	10	27.77	33.33	44.51	58.33	40.98
12 Chilli paste (5%)	10	36.11	52.78	63.89	77.78	57.64
13 Chilli paste (2.5gm.)+cow urine (500ml.)	10	30.55	36.11	52.47	72.22	47.83
14 Chilli paste (5gm.)+cow urine (500ml.)	10	41.66	58.81	77.78	91.66	67.47
15 Control (water spray)	10	0	0	0	0	0
CD at 5% level		6.92	4.22	5.11	10.19	6.60

Mean % mortality covering all the intervals

The mean % mortality recorded taking all the intervals together may be arranged in the following descending order: chilli paste (5gm.) + cow urine (500ml.) (67.47%)>garlic paste (5gm.) + k.oil (250ml.) (59.14%)= chilli paste (5%) (57.64%)= Neem leaf extract (5%) (55.55%)= Ramtulasi leaf extract (5%) (51.24%)= chilli paste (2.5gm.) + cow urine (500ml.) (47.83%)>chilli paste (2.5%) (40.98%)= Neem leaf extract (2.5%) (43.44%)= marigold leaf extract (5%) (40.11%)= Nishinda leaf extract (5%) (44.36%)= Nishinda leaf extract (2.5%) (39.42%)= Ramtulasi leaf extract (2.5%) (34.01%)= garlic paste (5%) (28.47%)>marigold leaf extract (2.5%) (22.91%).

Conclusion

From the above experiment the following conclusion can be derived:

1. All the tested botanicals and biorationals proved acaricidal properties though % mortality varied in different degrees.
2. The efficacy of botanicals /biorationals improved with the increase of time interval and no mortality was recorded in control treatment.
3. Among all the treatments, chilli paste (5gm.) + cow urine (500ml.) proved to be the best registering consistently good mortality of 41.66%, 58.81%, 77.78%, and 91.66% at 24,48,72 and 96 hours after application, respectively and its mean mortality was found be 67.47%.

4. Garlic paste (5gm.) + k.oil (250ml) + chilli paste (5%), Neem leaf extract (5%), Ramtulasi leaf extract (5%) all were also good registering mean mortality above 50% at all the intervals.

5. Marigold leaf extract (2.5%) was poorest among all.

6. This laboratory based experiment needs repetition under field conditions for further validation of the present result.

Discussion

Patil & Nandihalli (2007) in their experiment with botanicals and biorationals against eggs and adults of *Tetranychus macfarlanei* reported highest mortality in case of chilli-garlic-kerosine extract (2%) on adults causing 6.67% and 18.85% at 48 hours and 72 hours after application, respectively, while the corresponding mortalities on eggs in case of chilli-garlic aqueous -extract (2%) and chilli-garlic-kerosine extract both gave 10.35% and 10.35%, respectively. So, the mortality achieved in the present experiment appeared to be much higher as compared to the published report. Yathiraj & Jagadish (1999), while testing the bio-efficacy of Neem leaf extract against *Tetranychus urticae*, reported mortality of 60.25%, 72.5%, 58.75%, 56.25% and 51.25% at 5%, 4%, 3%, 2%, and 1%, respectively. Uma Maheswary et al. (1999) also reported good efficacy of neem leaf extract. Kumaran et al. (2007) recorded 45.20% and 31.63% reduction in population of *T.urticae* in Trial-1 and Trial-2, respectively using pongamia oil. On the contrary, 100% mortality was recorded

on *Brevipalpus euphorbiae* after 24 hours using chilli paste (Maitra & Gupta, 2006).

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References

- Gupta, S.K., Biswas, H. & Das, S.N. 2007. Bioeffectiveness of some plant extracts towards causing mortality of *Brevipalpus phoenicis* (Geij.) (Acari:Tenuipalpidae), a new pest of medicinal plant, on Vasak, *Justicia adhatoda* L. Nees (Acanthaceae). In: *Bioprospecting and application of medicinal plants in common ailments* (Eds. Gupta, S.K. & Mitra, B.R.). R.K. Mission, Narendrapur : pp. 121-126.
- Helle, W.M. & Sabelis, M.W. 1985. *Spider mites, their biology, natural enemies and control*. Vol.1A (pp.1-403), Vol.1B. (pp.1-457). Elsevier Publ., Amsterdam.
- Kumaran, N., Douressamy, S., Ramaraju, K. & Kuttalam, S. 2007. Bioefficacy of botanicals against two spotted spider mite *Tetranychus urticae* Koch (Acari:Tetranychidae) infesting okra. *J. Acarol.*, 17 (1-2): 105-107.
- Maitra, S. & Gupta, S.K. 2006. Effects of some botanical pesticides for control of four mite pests infesting medicinal plant in West Bengal. In: *Herbs in Health Care and Nutritional Benefits* (Eds. Gupta, S.K. & Mitra, B.R.). R.K. Mission, Narendrapur, : pp. 191-195.
- Mc.Donald, L. L., Guy, R. H. & Speirs, R.D. 1970. Preliminary evaluation of new candidate materials as toxicants, repellents and attractants against stored product insects. *Marketing Research Report 882 (ARS, USDA)*, Washington: p. 8.
- Patil, R. S. & Nandihall, B.S. 2007. Ovicidal and acaricidal action of biorationals against red spider mite, *Tetranychus macfarlanei* Baker and Pritchard under laboratory conditions. *J. Acarol.*, 17: 100-102.
- Uma Maheswari, T., Sharmila Berathi, C., Kanagarajan, R., Arivudalnambi, S. & Selvenarayan, V. 1999. Neem formulation and castor oil—a safe way to manage okra spider mite. *J.Acarol.*, 14:77-79.
- Yathiraj, B.R. & Jagadish, P.S. 1999. Plant extracts—future promising tools in the integrated management of spidermite, *Tetranychus urticae* (Acari:Tetranychidae). *J.Acarol.*, 15 (1-2): 40-43.

Flight Pattern of Migratory Birds Climate Change affects

The changing weather in Kumaon is affecting the flight pattern of migratory birds, delaying their arrival at many places in the region including the Corbett National Park, and leading to a dip in their numbers, according to avid birdwatchers who frequent the region.

Deep Rajwar, an ornithologist who is a regular at Corbett, told, "Irregular pattern of snow and rainfall has disturbed the migration cycle of many birds. Rise in temperature is an additional factor. Many birds who were earlier spotted from October to March are now visible from December to May. This will eventually affect the entire food chain and the ecosystem of the region."

Among the birds which migrate from the extreme cold of the Arctic region to the lower Himalayan ranges are Openbill Stork, Sandpiper, Plover, Marsh Harrier, Common Redshank, Common Merganser, Ruddy Shelduck, Flamingos and Blue-winged Stilt.

According to another ornithologist Pran Chaddha, out of the 1303 types of migratory birds which come to India, over 50% (728 varieties) visit Uttarakhand but many of them have now stopped coming. "The change in the weather cycle has forced many of the birds which come to the state to change their habitats. For instance, the Francolin birds which were earlier found at a height of 1400 meters above sea-level are now migrating to places above 2800 meters, which is an indication that everything is not going right for these birds".

He added that the migratory birds prefer shallow waters where there is no human interference but "it seems such conditions are not being made available to them at their regular habitats in Ramnagar".

Vijay Jandwani, another birdwatcher, added, "Ramnagar which lies at the entrance of the Corbett National Park, has for decades been a preferred spot for migratory birds. But this year, due to less snowfall and rains in the upper Himalayan regions, not only has their arrival been late but their numbers, too, have been few. It is evident that global warming is causing disturbances in the migration cycle of these birds."

Anup Sah, Nainital-based naturalist who is also a member of the state wildlife board, attributed the changes in migration cycle to multiple factors. "While change in weather pattern are definitely there—erratic snow and rain has been witnessed in the area more frequently than in the past few decades—there is increased interference in habitats as well."