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Relative toxicity of some newer molecules against rice moth (*Corcyra cephalonica*)

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Worldwide sustainability of agriculture suffers a severe setback arising from the use of chemical pesticides on living systems and the environment. The use of organophosphates and chlorinated insecticides pose problems, such as poisoning in man and other animals (22), pest resistance to pesticides (4). In India, owing to its climatic conditions and its particular environment, agriculture suffers severe losses due to pests along with some other environmental hazards (12, 13). The Indian farmers are in need of effective tools to fight against pests. On account of above the farming community needs safer, effective and economical insecticides (19). The avermectins, streptomycete-derived macrocyclic lactones originally isolated as antiparasitic agents (14) have demonstrated high potencies in laboratory evaluations against insect pests of several orders. For its high-efficacy, biological origin and rapid degradability, it can be easily incorporated in IPM modules (11). Exposer of lepidopteran insects to abamectin resulted in increased mortality reduced feeding, disrupted development and reduced fecundity (17).

Azadirachtin has been used to combat ravages of pest in modern pest management for the several decades. Neemacin is a new formulation from neem seed kernels (triterpenoids) based EC containing azadirachtin 0.15%, 0.5% and 1.0% w/w and this is safe to mammals including man.

Indoxacarb 14.5% SC is another new millennium insecticide (1) and efficient against most of the 2nd and 3rd instar lepidopteron larvae. Indoxacarb is designated by the EPA to be a "reduced-risk" pesticide and is considered an organophosphate replacement (7). Bioassays of Indoxacarb showed that ingesting Indoxacarb was highly toxic to third instars of lepidopteron larvae in course of exposure between 2 to 5 days (23).

The toxicity of these three insecticides has been analyzed against larvae of rice moth *Corcyra cephalonica* (St.) to ensure further effective laboratory experiments and field level managements.

Moths are directly collected into a both end net closed oviposition cages. Eggs are collected from the base Petridish. To rear the larvae, a cheaper diet (a combination of wheat flour and crashed corn 5:4 by volume) was used and culture was maintained in large glass containers at 28 ±1^{o}C and 90 ± 5 % R.H. For collection of the adults, the apparatus and method were improved (24, 25) so that the adults dropped into a container when they flew from the rearing tray, reducing the effort required for collection (5). The relative toxicity of insecticides has been evaluated on the basis of percentage of mortality of treated larvae at various doses of each insecticide. Indoxacarb 400, 200 and 100 ppm solution, abamectin 200, 100 and 50 ppm solution and azadirachtin 10000, 5000 and 2500 ppm solution were prepared by mixing indoxacarb 14.5% SC, abamectin 1.9% w/w EC and neemacin respectively with distilled water. The toxicity analysis was carried for each concentration of the chemicals. 100 numbers of 3rd instar larvae of *Corcyra cephalonica* (St.)

were treated with each different concentration by topical application with the help of hand atomizer. Lethal toxicity tests were conducted thrice and the average was used to calculate median lethal concentration. LC_{50} values were calculated for 24, 48 and 72 h by method described by Finney (8) and simplified by Busvine (2).

Corrected mortality percentage was calculated with the help of control treatments. From results, acute toxicity and relative toxicity of each insecticide is calculated and finally we get the order of relative toxicity for these three chemicals against larvae of *C. cephalonica* (9).

The percent mortality at various doses of insecticides is subjected to probit analysis. The LC_{50} values (the concentration that gives 50% mortality of test insects) and the relative toxicity were obtained (Table I). The heterogeneity values with degrees of freedom, regression equation and fiducial limits (upper and lower values), relative toxicity and order of relative toxicity have also been presented.

Some similar former works have been done on the effect of these insecticides on larvae of *C. cephalonica* and results were almost similar (21, 6, 3, 4, 14, 18). In the present study all the three insecticides proved to be toxic and effect of all was more or less similar, i.e., the larvae become black that resulted in there death. Freshly emerged 3rd instar larvae were more sensitive (15). Percentage survival rate of the larvae decreased with increasing concentration of the insecticides. It is evident from the result table that the acute toxicity (24 hours) of abamectin 1.9% w/w EC was highest (LC_{50} value 144.30 ppm) to the 3rd instar larvae of *Corcyra cephalonica* (St.) during the course of investigation and the mortality percentage was as high as 57.89% (in 200 ppm application). Previously some scientists also found some efficient result of avermectin against test insects (24, 10, 20).On the basis of LC_{50} values, the next best insecticide was indoxacarb 14.5%SC (1087.81 ppm) according to the descending order of relative toxicity. Ramasubhramanian *et. al.* (16) found the same result against some other lepidopteron insects. Neemacin showed lowest acute toxic effect with highest LC_{50} value 5681.99 ppm (21).

The relative toxicity values (24 hours) were 39.38 and 5.22 for abamectin and indoxacarb taking neemacin as unit due to its highest LC_{50} value. Relative toxicity at 48 hours was 55.55 and 1.37 for abamectin and indoxacarb. At 72 hours those values was 119.22 and 21.63 respectively. By placing these three insecticides in a descending order of relative toxicity we found abamectin 1.9% w/w EC at the top followed by indoxacarb 14.5% SC and neemacin at second and third place, respectively.

Considering overall relative toxicity, abamectin 1.9% W/W EC was found to be most effective against *C. cephalonica* larvae under laboratory conditions.

Literature Cited

1. Allen CT MS Kharboutli C Jr Capp Earnest L. 1999 *Arkansas Agricultural Experiment Station, University of Arkansas, Fayetteville, Special Report* **193**: 56-64.
2. Busvine JR. 1971 Critical review of the technique for testing insecticides. *Commonwealth Agriculture Bureau*, England, pp.267-82.
3. Chakraborti S Chatterjee ML. 1996 *Pest Management and Economic Zoology* **4**: 37-43.
4. Chand R. Pratap S Birthal S. 1997 *Indian Journal of Agricultural Economics* **52**: 488-98.
5. Chanda S and Chakravorty S. 1998 *Entomon* **23**: 153-56.
6. Dales MJ. 1994 *Bulletin*, Natural Resources Institute, issue 64 p.

7. EPA FACTSHEET (New Chemical) Indoxacarb, October 30, 2000 URL http://www.epa.gov /opprd001/ factsheets/ indoxacarb.html
8. Finney DJ. 1952 Probit analysis 2nd edition, Cambridge University Press, 318 p.
9. Gomez KA Gomez AA. 1984 Statistical procedures for agricultural research 2nd edition, John Wiley New York, 93p.
10. Hajek AE Bauer LS. 2008 *Field Manual of Techniques in Invertebrate Pathology*, Springer **10**: 1007.
11. Lasota JA and Dybas RA. 1991 Avermectins, a novel class of compounds: implications for use in arthropod pest control. *Annual Review of Entomology* **36**: 91-117.
12. Mathur YK Nigam S. 1996 *Neem and Environment* **1**: 335-42
13. Mukherjee I Gopal M. 2002 *Environmental Monitoring and Assessment* **76**: 185-93.
14. Paliwal A Yadav M. 2008 *Flora and Fauna Journal,* Flora and Fauna, India **14**: 309-10.
15. Putter I Mac Connell JG Preiser FA Haidri AA Ristich SS Dybas RA. 1981 *Cellular and Molecular Life Sciences* **37**: 35-39.
16. Ramasubhramanian T Raghupathy A. 2004 *Journal of Entomology* **1**: 21-23.
17. Reed DC Harrold C. 1985 Food availability, seaurchin grazing, and kelp forest community structure, *Ecology* **66**:1160-69.
18. Rembold H Sharma GK Czoppelt Ch Schmutterer H. 1982 *Zeitschrift fur Angewandte Entomologie* **93**: 12-17.
19. Ruiu L Satta A Floris I. 2008 *Biological Control* **47**: 66-70.
20. Sabry AbdEl-Monem Abd-ElAal Abd-AllAh. 2008 Tanta University, Faculty of Agriculture, Department of Plant Protection, *Ph.D. Thesis*, pp. 45-74.
21. Sharma GK. 1992 *Phytoparasitica* **20:** 47-50.
22. Singh AK Spassova D White T. 1998 *Journal of Chromatography Biomedical Sciences and Applications* pp.231-44.
23. Tong-Xian L Sparks AN Jr Chen W Liang G Brister C. 2002 *Journal of Economic Entomology* **95**: 360-67.
24. Wang ZN. 1989 Taiwan Sugar Research Institute, *Report* **126**: 13-26 .
25. Wu TK. 1993 *Chinese Journal of Entomology* **13**: 9-15.

Table 1.
Relative toxicity of insecticides with their respective LC_{50} value during different hours after treatments

Hours	Insecticide	df	χ^2 value	Regression equation	LC_{50} (in ppm)	Fiducial Limit (in ppm)		Relative Toxicity	Order of relative toxicity
						Lower	Upper		
24	Indoxacarb 14.5% SC	1	1.085	Y = 1.6597 X – 5.0396	1087.81	634.24	5004.89	5.22	2
	Abamectin 1.9% w/w EC	1	0.003	Y = 1.3841 X – 2.9887	144.30	112.83	215.82	39.38	1
	Neemacin	1	0.607	Y = 1.6511 X – 6.1991	5681.99	4619.23	7232.62	1	3
48	Indoxacarb 14.5% SC	1	0.064	Y = 0.8218 X – 2.7006	1933.44	684.23	2548.64	1.37	2
	Abamectin 1.9% w/w EC	1	0.411	Y = 1.5799 X – 2.6536	47.80	28.39	62.67	55.55	1
	Neemacin	1	0.024	Y = 1.8027 X – 6.1727	2655.45	1811.35	3327.77	1	3
72	Indoxacarb 14.5% SC	1	1.649	Y = 1.5687 X – 2.7044	52.96	18.63	880.93	21.63	2
	Abamectin 1.9% w/w EC	1	0.269	Y = 1.5854 X – 1.5581	9.16	0.21	22.64	119.22	1
	Neemacin	1	1.564	Y = 2.5987 X – 7.9495	1145.71	423.25	1682.68	1	3