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SHORT NOTE

RELATIVE TOXICITY OF DIFFERENT INSECTICIDES TO THE LARVAE OF *Chrysoperla carnea* (Stephens) UNDER LABORATORY CONDITIONS

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Pesticides have been the first line of defence of crop production since 1950s when organochlorines were introduced. The pesticides currently used are mostly non selective and affect the biotic component of the environment. The indiscriminate use of pesticides created a number of problems such as environmental pollution, resistance in insect pests, upsurge of the secondary pests due to elimination of their natural enemies, increased cost of production and hazards for human beings and animals (Toda and Kashio, 1997). However, insecticides still remain as the preferred components of IPM in many crops. Hence it is essential to assess their safety to natural enemies before recommending them. In the present study, the safety of seven commonly used insecticides was tested against predatory green lace wing, *Chrysoperla carnea* (Stephens) under the laboratory conditions.

Studies were conducted at the Bio-control Laboratory, Department of Agricultural Entomology, N.M. College of Agriculture, Navsari (Gujarat) in a Completely Randomized Design (CRD) with eight treatments repeated thrice along with a control (water spray) during the February 2008. The relative toxicity of insecticides was tested by using the thin film method as suggested by PDBC, Bangalore (Anonymous, 1994). For preparing the insecticidal film, plastic vials (5 x 2.5 cm) were treated by dipping them in respective insecticide solutions, followed by drying under a fan for 15 minutes. Ten second instar larvae of *C. carnea* were released into the treated vials and were allowed to remain in contact with insecticides for 45 minutes. Thereafter, larvae were transferred to fresh plastic vials (5 x 2.5 cm) containing aphids, *Aphis craccivora* Koch that served as food. The observations on larval mortality were recorded at 12, 24, 48 and 72 h after exposure to treatments.

The data in terms of percentage mortality at 12, 24, 48 and 72 h after insecticidal application are presented in Table 1. At 12 h after treatment, profenophos 40 per cent + cypermethrin 4 per cent (Polytrin-C @ 0.044%) caused the highest mortality (63.36%) and thus found to be most toxic to the larvae of *Chrysoperla*. This was followed by the treatment of acetamiprid (0.004%) with 43.28 per cent mortality. While, the minimum mortality was exhibited by methyl-O-demeton 0.05 per cent (4.75%) followed by thiamethoxam 0.005 per cent (1.38%). The data further revealed that no mortality occurred in endosulfan (0.075%), imidacloprid (0.005%), dimethoate (0.03%) and control (0.00%).

It could be seen from the data, obtained 24 h after the treatment, that profenophos 40 per cent + cypermethrin 4 per cent (Polytrin-C @ 0.044%) showed consistently highest mortality (76.79%) and remained relatively more toxic. This was followed by acetamiprid 0.004 per cent (53.31%). The toxicity of remaining insecticides in descending order was methyl-O-demeton 0.05 per cent (13.00%) > thiamethoxam 0.005 per cent (9.99%) > endosulfan 0.075 per cent (4.75%) > imidacloprid 0.005 per cent (0.00%) > dimethoate 0.03 per cent (0.00%) > control (0.00%).

The data on per cent mortality recorded 48 h after treatment indicated that profenophos 40 per cent + cypermethrin 4 per cent recorded significantly highest mortality (93.01%), followed by acetamiprid (66.70%). While, treatment of methyl-O-demeton 0.05 per cent (26.49%) and thiamethoxam 0.005 per cent (16.34%) remained at par with each other and found moderately toxic to the larvae of *Chrysoperla*. The treatment of thiamethoxam 0.005 per cent was also comparable with the treatment of endosulfan 0.075 per cent (9.99%) and imidacloprid 0.005 per cent (4.75%), which exhibited lowest mortality and found less toxic to the larvae. However, the treatment of dimethoate 0.03 per cent (0.00%) was at par with the control (0.00%) and found safer to the larvae of the predator.

At 72 h after exposure, significantly the highest cumulative mortality (100.00%) was observed in the treatment of profenophos 40 per cent + cypermethrin 4 per cent (Polytrin-C @ 0.044%) and thus proved highly toxic to the *Chrysoperla* larvae. This was followed by treatment of acetamiprid 0.004 per cent (80.64%). However, the treatment of methyl-O-demeton 0.05 per cent (39.82%) was at par with thiamethoxam 0.005 per cent (29.64%). While, the treatment of endosulfan 0.075 per cent (23.16%) remained at par with imidacloprid 0.005 per cent (16.34%) on one side and thiamethoxam 0.005 per cent (29.64%) on other side and found moderately toxic to the larvae of *Chrysoperla.* The treatment of dimethoate 0.03 per cent was at par with control, recording zero per cent mortality and thus found safest among all the tested insecticide to the Chrysopid larvae.

According to the pooled data, significantly the highest mortality (87.64%) of *C. carnea* larvae was recorded in the treatment of profenophos 40 per cent + cypermethrin 4 per cent and was followed by acetamiprid 0.004 per cent (61.38%). While, treatment of methyl-O-demeton 0.05 per cent (19.16%) and thiamethoxam 0.005 per cent (12.26%) remained at par with each other and found moderately toxic to the larvae of *C. carnea*. However, the treatment of thiamethoxam 0.005 per cent was also at par with the treatment of endosulfan 0.075 per cent (6.84%) which was further at par with the imidacloprid 0.005 per cent (2.75%) and found moderately toxic. Among different insecticides, zero per cent mortality was recorded only in dimethoate 0.03 per cent, even after 72 h of post treatment and was not different than the control, thus, found non-toxic to the larvae of *C. carnea.*

The descending order of toxicity of different insecticides to second instar larvae of *C. carnea* was profenophos 40% + cypermethrin 4% (Polytrin-C 0.044%) > acetamiprid 0.004 % >methyl O demeton 0.05 % > thiamethoxam 0.005 % > endosulfan 0.075 % > imidacloprid 0.005 > dimethoate 0.03 %.

The ANOVA of pooled analysis of data on per cent mortality over period revealed that the interaction (Period x Treatment) was significant, indicating non-consistent performance of various treatments over period of observation.

In the past, Vadodaria *et al.*, (2001) also reported that dimethoate and imidacloprid were safer against larvae of *Chrysoperla*, while, cypermethrin (13.33%), fenvalerate (20.33%), methyl-O-demeton (20.33 %) and endosulfan (33.33%) were found to be moderately safer and Polytrin-C 44 EC, chlopyriphos 25 EC, profenophos 50 EC, quinolphos 30 EC and Nurelle-D as highly toxic to *Chrysoperla* larvae.

Table 1. Relative toxicity of different insecticides against larvae of *C. carnea*

Treatments		Concentration (%)	Mean per cent mortality at different intervals				Pooled
			12h	24h	48h	72h	
Acetamiprid 20% SP		0.004	43.28 (41.14)	53.31 (46.90)	66.70 (54.76)	80.64 (63.90)	61.38 (51.58)
Imidacloprid 17.8% SL		0.005	0.00 (0.91)	0.00 (0.91)	4.75 (12.59)	16.34 (23.85)	2.75 (9.56)
Thiamethoxam 25% WG		0.005	1.38 (6.75)	9.99 (18.43)	16.34 (23.85)	29.64 (32.99)	12.26 (20.50)
Dimethoate 30% EC		0.03	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)
Endosulfan 35% EC		0.075	0.00 (0.91)	4.75 (12.59)	9.99 (18.43)	23.16 (28.77)	6.84 (15.17)
Methyl-O-demeton 25% EC		0.05	4.75 (12.59)	13.00 (21.14)	26.49 (30.98)	39.82 (39.13)	19.16 (25.96)
Profenophos 40% + Cypermethrin 4%		0.044	63.36 (52.75)	76.79 (61.20)	93.01 (74.67)	100.00 (89.06)	87.64 (69.42)
Control (Water spray)		-	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)	0.00 (0.91)
S.Em ±	P	-	-	-	-	-	-
	T	-	**3.08**	**2.50**	**3.67**	**2.63**	**2.96**
	PxT		-	-	-	-	**3.01**
C.D. at 5%	P	-	-	-	-	-	-
	T	-	**9.24**	**7.50**	**11.00**	**7.89**	**8.71**
	PxT		-	-	-	-	**8.50**
C.V. %		-	**36.54**	**21.27**	**23.41**	**13.05**	**21.46**

Figures in the parentheses are arc sin transformed values

P = Period T = Time

The safety of endosulfan was also reported by Srinivasan and Sundarababu (2000) and Sunithadevi *et al.,* (2006). The findings of above workers strongly support the present findings.

These findings are of considerable importance in developing IPM module in crops where *C. carnea* is included as a component.

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