Karnataka J. Agric. Sci., 22(3-Spl. Issue) : (635-636) 2009

Effects of pesticides and agro-inputs on the abundance of soil macro fauna

Soil micro and macro arthropods exert significant control over litter decomposition and nutrient release (Blair *et al.,* 1992) and contribute directly to humus fraction and also polish the soil, permitting necessary complexes of soil organisms to exist (Butcher *et al.,* 1971). By there very number, they play important role in several soil process, such as organic matter decomposition, material and energy cycles and soil formation, some macro fauna acts as secondary and tertiary consumers in maintaining homeostasis. With this background the present study was carried out to know the effect of agro inputs and pesticides on soil macro fauna.

The study was conducted at the University of Agricultural Sciences, Bangalore, Karnataka. The prevailing climate was tropical monsoon with bimodal type of rainfall in the year. The previous 10 years average annual rainfall of the site is 890 mm. The field experiment was established in June 2008 to assess the effect of botanicals and pesticides on the activities of soil macro fauna. An experiment was laid out in a randomized complete block design with eight treatments (Table 1) and replicated thrice. High volume sprayer was used for the application of foliar pesticides. Second spray of the foliar application was done on 10 days after first application.

Pit fall traps were placed in each plot for 36 hour for the collection of soil macro fauna. Each trap measured 7 cm height and 5 cm diameter. Traps were placed into the soil such that their rims were in level with the top surface of the soil. These were filled with 50 ml of ethyl alcohol 40 per cent and few drops of glycerol as the combination gives a fruity odour which acts as attractant. After 36 hours the traps were removed and fauna were sorted out, pinned, labeled, dried and preserved.

The macro fauna collected from the pit fall traps included ants, short horned grasshoppers, beetles, millipedes, centipedes and spiders.

Significantly lower activity of macro fauna was noticed in dicofol which was on par with neem cake, fertilizer, carbendazim 50WP and phorate 3 G in toxicity to macro fauna. However, latter two treatments were also on par with carbofuran 3G and chlorpyriphos 20 EC in toxicity to macro fauna. All the agro inputs recorded significantly lower activity of macro fauna compared to control (Table.1).

Maximum pitfall catches were recorded on 45 days after treatment (DAT) and was on par with the catches on 30 DAT. The activity of macro fauna reduced from 60 DAT. However, the activity increased slightly during 90 and 105 DAT. The variation in the activity of macro fauna depended on the food availability or reduced toxicity of treated agro inputs due to rainfall or sun shine or detoxification by soil micro organisms.

Table 1. Effect of pesticides and agro-inputs on the abundance of soil macro fauna

Sl. No.	Treatments	Macro fauna at different days after treatment (Number of insects/pitfall trap)								
		10DAT	20DAT	30DAT	45DAT	60DAT	75DAT	90DAT	105DAT	Mean
1	Phorate 10G @ 1.0 kg a.i. ha^{-1}	2.33	5.66	7.00	8.66	4.00	2.00	2.33	1.33	4.16
		(1.67)	(2.46)	(2.73)	(3.00)	(2.11)	(1.55)	(1.64)	(1.28)	$(2.06)^{bc}$
2	Carbofuran 3G @ 0.9 kg a.i. ha^{-1}	4.66	7.66	9.00	8.33	4.33	1.66	2.00	2.00	4.95
		(2.24)	(2.85)	(3.06)	(2.96)	(2.19)	(1.46)	(1.46)	(1.55)	$(2.22)^{ab}$
3	Chlorpyriphos 20 EC @ 0.5 kg a.i. ha^{-1}	7.00	4.00	6.00	8.66	3.00	3.00	3.00	1.66	4.54
		(2.66)	(2.11)	(2.52)	(3.02)	(1.85)	(1.85)	(1.85)	(1.44)	$(2.16)^{b}$
4	Dicofol 18.5 EC @ 0.5 kg a.i. ha^{-1}	2.66	3.00	6.66	7.00	4.00	1.66	1.00	3.00	3.62
		(1.77)	(1.85)	(2.61)	(2.73)	(2.08)	(1.46)	(1.17)	(1.85)	$(1.94)^{c}$
5	Neem cake @ 150 kg ha^{-1}	4.00	4.00	6.33	5.00	4.33	0.66	2.66	2.66	3.70
		(2.11)	(2.08)	(2.60)	(2.33)	(2.18)	(1.05)	(1.77)	(1.76)	$(1.98)^{c}$
6	Carbendazim 50 WP @1.25kg ha^{-1}	4.33	4.33	5.66	8.00	4.00	1.00	2.66	2.00	4.00
		(2.18)	(2.18)	(2.46)	(2.91)	(2.06)	(1.17)	(1.76)	(1.46)	$(2.02)^{bc}$
7	Fertilizers (50:40:25 NPK kg ha^{1})	2.00	5.00	6.00	5.00	4.33	2.66	3.00	1.66	3.70
		(1.55)	(2.28)	(2.50)	(2.30)	(2.18)	(1.73)	(1.85)	(1.46)	$(1.98)^{c}$
8	Control	6.00	6.66	8.00	9.00	7.00	1.33	2.33	3.00	5.41
		(2.52)	(2.64)	(2.91)	(3.06)	(2.73)	(1.34)	(1.67)	(1.87)	$(2.34)^{a}$
Mean		4.12	5.04	6.83	7.45	4.37	1.75	2.37	2.16	
		(2.09)	(2.31)	(2.67)	(2.79)	(2.17)	(1.45)	(1.65)	(1.58)	-

Source	S.Em.±	C.D. (0.05)
Treatments	0.07	0.21
Days	0.09	0.22
Interaction	0.20	0.59

Treatments1, 2, 5 & 7- Soil application, Treatments 3, 4 & 6- Foliar applications

DAT-Days after treatment; Figures in parentheses are $\sqrt{x+0.5}$ transformed values

The abundance of macro fauna differed significantly among the treatments on 10 DAT. Significantly lower macro fauna were trapped in fertilizer treated plots (2.00) compared to rest of the treatments except phorate 10G, dicofol 18. 5 EC, neem cake and carbendazim 50WP during 10 DAT. Activity of macro fauna was maximum in control (6.00) and was followed by chlorpyriphos 20 EC and carbofuran 3G. Slight increase in population was noticed in all the plots during 20 DAT, but toxic effect was more pronounced in dicofol 18.5EC (3.00) and it recorded lower catches of macro fauna through out the period of observation compared to control. Similarly, all the agro inputs treatments reduced the activity of macro fauna than control upto 105 DAT. The subsequent recovery in the population may be attributed to the gradual decrease in the toxic effect influenced by biological and non-biological degradation. The present results are in accordance with Sarath and Gupta (1986), Srinivasareddy (2002) and Cockfield and Potter (1983) where in they also recorded variation in soil faunal population due to application of various agro-chemicals.

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