Safety of neem products to tetragnathid spiders in rice ecosystem

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ABSTRACT

Spiders are the most abundant group of predators in rice fields. The laboratory study carried out to evaluate the safety of neem based compounds and chemical pesticides to two major tetragnathid spiders in the rice fields brought out that neem compounds are far safer than chemical compounds. The mortality of *Tetragnatha mandibulata* and *Tetragnatha maxillosa* when treated with the synthetic insecticides like triazophos 0.05 per cent and quinalphos 0.05 per cent was extremely high (56.73 and 35.56 per cent and 64.78 and 46.79 per cent, respectively). Whereas, imidacloprid 0.005 per cent was found to be safer than the other chemical compounds. NSKE 5 per cent recorded the least mortality. Topical application of the compounds was found to be more fatal to spiders than indirect contact.

Key words: Tetragnathid, *Tetragnatha mandibulata, Tetragnatha maxillosa,* imidacloprid

INTRODUCTION

Spiders are the most abundant group of predators in any agroecosystem, especially in rice fields (Bambaradeniya and Edirisinghe, 2008) and are insect's worst enemies feeding on a variety of prey, thus killing far more pests than commercial insecticides. But the overuse of plant protection chemicals for maximizing production took a heavy toll on these beneficial creatures. Most of the spiders in rice fields seem to evacuate the field after application of chemical insecticides, thus their predatory capacity was suppressed and caused a negative impact on the population densities of rice field spiders (Lee *et al.*, 1993). Where as the neem formulations were found to be quite safe to them (Samiayyan and Chandrase kharan,1998). Studies were, therefore, undertaken to find out the effect of neem products and chemical pesticides (used for rice pest management) on the two major rice dwelling tetragnathid spiders, *Tetragnatha mandibulata* Walckenaer and *Tetragnatha maxillosa* Thorell, to evaluate their safety/toxicity.

MATERIALS AND METHODS

The experiment was carried out as pot culture in the laboratory using completely randomized block design (CRD) with five replications. The spiders and the prey insects were obtained from the pesticide free plots maintained for the experiment. The treated neem products were azadira chtin 0.004 per cent, neem oil 2 per cent and NSKE 5 per cent (neem seed kernel extract) and chemical pesticides included acephate 0.05 per cent, imidacloprid 0.005 per cent, triazophos 0.05 per cent and quinalphos 0.05 per cent and the two methods employed for testing their efficacy were topical application and release of spiders on treated surface. In topical application the spiders were made anaesthetic by keeping in the refrigerator for five minutes in plastic vials and the spray solution was uniformly sprayed upon each spider using an atomizer. After ten minutes, when the spray solution was dried, the treated spiders were released into the cages set for the experiment. In the second method pesticide solution was sprayed on to the paddy plants raised for the experiment, until the droplets rolled down, *i.e.,* just enough to wet the foliage and this was exposed to air for ten minutes to dry and placed inside the cage. Ten adult spiders were released in to the cages, along with prey insects. Mortality of the spiders was recorded after every 24 hours for seven days and the prey insects were supplied daily.

RESULTS AND DISCUSSION

The results of the study indicated that the chemical pesticides are more fatal to the spiders, than the neem products (Table 1). The mortality of *T. mandibulata* and *T. maxillosa* when treated with the synthetic insecticides like triazophos 0.05 per cent and quinalphos 0.05 per cent in the dosage recommended for pest management was extremely high, 56.73 and 35.56 per cent and 64.78 and 46.79 per cent, respectively. Acephate 0.05 per cent caused 30.58 and 36.75 per cent mortality of the spiders, respectively which was on par with azadirachtin 0.004 per cent (24.50 and 34.52, respectively). The mortality caused by

Table 1. Effect of neem formulations and synthetic insecticides on *T. mandibulata* and *T. maxillosa* mortality (in %)

Treatments	*T. mandibulata*			*T. maxillosa*		
	Topical application	Release onsprayed plants	Mean	Topical application	Release onsprayed plants	Mean
Acephate	41.66(6.53)	19.49(4.53)	30.58(5.53)	47.72(6.98)	25.77(5.17)	36.75(6.08)
Imidacloprid	27.52(5.34)	7.39(2.90)	17.46(4.12)	37.65(6.22)	13.52(3.81)	25.59(5.01)
Triazophos	71.80(8.53)	41.66(6.53)	56.73(7.53)	77.82(8.88)	51.73(7.26)	64.78(8.07)
Quinalphos	49.80 (7.13)	21.31 (4.72)	35.56 (5.93)	67.80 (8.29)	25.77 (5.17)	46.79 (6.73)
Azadirachtin	33.83 (5.90)	15.16 (4.02)	24.50 (4.96)	47.72 (6.98)	21.31(4.72)	34.52 (5.85)
Neem oil	21.84 (4.78)	13.62 (3.82)	17.73 (4.30)	35.83 (6.07)	5.99 (2.64)	20.91 (4.36)
NSKE	10.29 (3.36)	1.14 (1.46)	5.72 (2.41)	17.26 (4.27)	7.14 (2.85)	12.20 (3.56)
Mean	36.67 (5.94)	17.11 (4. 00)		47.41 (6.81)	21.60 (4.52)	

Insecticides : (0.825) Insecticides : (0.803), C.D (0.05) Methods : (0.441), Methods : (0.429), Treatments : (1.167), Treatments : (1.136)

imidacloprid 0.005 per cent (17.46 and 25.59 per cent, respectively) was relatively lower than that caused by neem oil 2 per cent (17.73 and 20.91, respectively) and were on par. NSKE 5 per cent (5.72 and 12.20, respectively) recorded the least mortality to the spiders and differed significantly from the other chemicals.

Topical application of synthetic and botanical insecticides on spiders caused significantly higher mortality of spiders (36.67 and 41.48 per cent) than when the araneae were released on treated plants (14.97 and 21.60 per cent). The low mortality recorded when released on the treated surface, was probably due to lack of direct contact with the chemicals. The spiders came in contact with the toxicants only indirectly or either through intake of poisoned prey or by drinking water from field or plant caused the mortality of the spiders.

Out of the different synthetic insecticides evaluated, the most toxic was triazophos 0.05 per cent which caused significantly high mortality of the spiders. The observation was in agreement with the study by Babu *et al.* (2002). Imidacloprid 0.005 per cent caused the least mortality of the spiders and thus found to be a safer chemical when compared to others tested. The observation agreed with the findings of Katole and Patil (2000). Among the neem products, azadirachtin 0.004 per cent, caused relatively high mortality and was almost similar to the chemical pesticides in its effect, where as neem oil and NSKE were safe to the spiders. This was in agreement with the observations made by Samiayyan and Chandrasekharan (1998). Broad-spectrum insecticide applications definitely alter the arthropod including spider community in the agroecosystem (Michael Nash *et al*., 2010). Imidacloprid was safer than azadirachtin, as proved by the relatively low mortality caused by the chemical and hence it could be utilized for pest control when pest infestation is severe without harming the spider fauna. Neem based compounds can be used along with safer molecules for pest management in rice fields.

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