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Kalpana Bisht
Department of Entomology and Agricultural Zoology, B.H.U, Varanasi, Uttar Pradesh, India

Correspondence
Kalpana Bisht
Department of Entomology and Agricultural Zoology, B.H.U, Varanasi, Uttar Pradesh, India

Impact of certain newer insecticides on spider population in chickpea field

Kalpana Bisht

Abstract
Chickpea is an important source of protein, carbohydrate, fibres, oil, calcium, phosphorus, magnesium, iron, zinc, β-carotene, unsaturated fatty acids. In addition, improves soil fertility by fixing atmospheric nitrogen in to soil. High protein content invites the Insect pests more which is probably the main bottleneck in legume production. It is recognized that immediate implementation of ideal IPM packages is not possible in Indian conditions, so chemical insecticides are still required as a last resort to manage severe pest infestation. In present studies population of spiders in chickpea field was investigated against insecticide treatments in a field experiment during 2015-16. Two foliar applications of various treatments were given and it was observed that the population of spiders was higher in control plot ranging between 1.0 to 2.64 per plant after first spray while the population range was observed 1.0 to 2.34 after second spray. Immediately after application the treatment had clearly reduced the pest population and favored the spider population, subsequently the population kept decreasing with time.

Keywords: newer insecticides, chickpea, spiders, foliar application

Introduction
Chickpea, *Cicer arietinum* L. is the largest produced food legume in South Asia and the third largest produced food legume globally, after common bean (*Phaseolus vulgaris* L.) and field pea (*Pisum sativum* L.). Chickpea is grown in more than 50 countries (89.7% area in Asia, 4.3% in Africa, 2.6% in Oceania, 2.9% in Americas and 0.4% in Europe). India is the largest chickpea producing country contributing around 64% of the global chickpea production. It is traditionally grown during rabi season in India and cultivated mainly in semi-arid and warm temperate regions where the temperature ranges from 20ºC-30ºC (Reddy, 2009) [11]. It is the richest protein (22.24%) yielding legume almost three times more than that of cereals. Chickpea seeds of 100g provide 360 calories of energy, 5.2g of fat, 2.2g of minerals and 55 per cent of carbohydrates. Apart from high nutritive value of pods, the leaves are enriched with malic and oxalic acids which is useful for recovering intestinal disorders. Chickpea accounts for more than 20 per cent of world’s pulse production and much of the world chickpea supply (80-90%) comes from India. Major chickpea producers include India, Mexico, Turkey, Canada and Australia (Anonymous, 2015) [1]. More than 150 species of insect pests are known to attack pulse crops in India. Of these, about 25 species cause serious damage to pulse crops grown during monsoon and winter (Bindra, 1968) [2]. A survey based on farmers of India have indicated that more than 30% of chickpea farmers use insecticides on their crops, so the use of newer insecticide molecules may be a better alternative than the application of conventional synthetic insecticides. Previous researches have revealed that spiders can significantly lowers the prey densities. As a biological control agents, spiders must be present in crop fields and feed upon specific agricultural pests. Spiders may be important natural enemy of crop pests such as aphids, leafhoppers, plant hoppers, leafhoppers, and Lepidopteran larvae. Over-dependence of chemicals is the important reason for rapid development of resistance and reduction of natural enemies in the field (Kaushik, 2016) [7]. Present studies were done to analyze the impact on spider population due to the application of newer Insecticides.

Material and Method
The present studies were conducted to investigate the effect of newer insecticides on the population of spider in chickpea ecosystem during 2015-16. L-550 variety of chickpea was sown at a row spacing of 30-40 centimeters at a depth of 8-10 cm by hand liner, as the seeds were treated with 0.25 per cent Thiram or Carbendazim (Bavistin). Hand weeding was done at 30 and 60 day after sowing (Muehlbaver, 1997) [10]. The experiment was laid out in a Randomized Block Design with three replications and nine treatments including control. The treatments taken for investigation were Quinalphos@2ml/lt,

Profenofos@3ml/lt, Azadirachtin@5ml/lt, Cyhalothrin@2ml/lt, Thiamethoxam@1ml/lt, Thiamethoxam@5g/kg seed+aerial spray with Thiamethoxam@0.3ml/lt, Imidacloprid@3ml/kg+ aerial spray with Thiamethoxam@0.5ml/lt, Thiamethoxam@ 2.4ml/seed+aerial spray with Imidacloprid@0.3ml/lt and Control. Two foliar applications were given for the management of pests of chickpea (Bisht *et al*., 2017) [3]. The data was collected by direct counting of 10 plants at random in the plot at five different points.

Table 1: Effect of various treatments on the population of spiders in chickpea ecosystem.

Treatments	Average number of spiders/10 plants/plot									
	30DAS* Pre Spray Count	Days after first application				60DAS Pre Spray Count	Days after second application			
		3	7	10	14		3	7	10	14
Quinalphos@ 2ml/lt (T1)	2.03	1.00	1.22	1.34	1.28	1.25	1.22	1.05	0.87	0.70
Profenofos@ 3ml/lt (T2)	1.87	1.22	1.46	1.58	1.67	1.52	1.34	1.22	1.05	0.87
Azadirachtin@5ml/lt (T3)	2.00	2.34	2.46	1.67	1.77	2.54	2.04	2.14	1.17	1.05
Cyhalothrin@2ml/lt (T4)	1.95	1.05	1.14	1.46	1.58	1.52	1.20	1.00	1.05	0.87
Thiamethoxam@ 1ml/lt (T5)	1.03	1.58	1.77	1.87	2.03	1.87	1.77	1.67	1.58	1.34
Thiamethoxam @5g/kg seed + aerial spray with Thiamethoxam@0.3ml/lt (T6)	0.87	1.46	1.67	1.65	1.77	1.68	1.58	1.46	1.28	1.22
Imidacloprid @3 ml/kg+ aerial spray with Thiamethoxam@0.5ml/lt (T7)	1.94	1.28	1.46	1.58	1.67	1.65	1.55	1.46	1.46	0.87
Thiamethoxam@2.4ml/ seed + aerial spray with Imidacloprid@ 0.3ml/lt (T8)	2.20	1.55	1.67	1.77	1.87	1.87	1.67	1.55	1.46	1.22
Control (T9)	1.03	2.25	2.64	2.34	2.41	2.84	2.34	2.12	1.95	1.58
SEM±	0.483	0.472	0.34	0.25	0.35	0.32	0.28	0.33	0.39	0.25
CD at 5%	0.35	0.50	0.30	0.24	0.34	0.34	0.27	0.38	0.49	0.36

*DAS- Days after sowing

The data obtained from field experiments were analysed in a Randomized Block Design methods given by Gomez *et al*., 1984 [5]. Critical difference values were calculated at 5% probability level and the treatment mean values were also calculated.

Results

The population of spider was observed from 30 DAS. The spider population at 30 DAS pre spray count ranged from 0.87 to 2.20 per plant and there was no significant difference in the population of spiders among the treatments. After the first foliar application, the population of spiders ranged from 1.00 to 2.25 per plant at 3rd day, 1.14 to 2.64 per plant at 7th day, 1.34 to 2.34 per plant at 10th day and 1.28-2.41 per plant at 14th day after first spray. A moderate population of spiders was noticed in the insecticides as compared to control while azadirachtin@5ml/lt treatment showed high spider population among all the treatments used in first spray (Table 1). Before the second round of foliar application, the population of spiders ranged from 1.25 to 2.84 per plant. After the second foliar application, a moderate population of spiders was observed in the insecticide treatments which ranged from 1.20 to 2.34 per plant at 3rd day, 1.00 to 2.12 per plant at 7th day while a lower population was observed at 10th and 14th day after second spray in which the population ranges between 0.87 to 1.95 per plant and 0.70 to 1.58 per plant respectively.

Discussion

Newer insecticide molecules in insect pest management programs are gaining recognition in recent years due to their compatibility with natural enemies in the field which reduces input cost. The present studies revealed that the population of spiders in chickpea was moderate in all the treatments except in azadirachtin@5ml/lt and the untreated plots. Hence it is concluded that no treatment had repressive effect on the population of spiders. This finding is in the support of the studies don by several authors. Nigussie *et al*. (2012) [12] reported that neem compound azadirachtin has antifeedant effect on insects. Mansour & Nentwig (1988) [8] found that acaricides are highly toxic to spiders. Stanislav Pekar (1997) [13] reported that both spiders and psyllids were almost unaffected by diflubenzuron application. Biswas *et al*. (2001) [4] reported that spiders, coccinellids, predatory stink bugs, preying mantids, black ants, parasitoids belonging to braconidae and ichenumonidae and fungal pathogens were found to attack insect pests of sesame. Misra (2008) [9] reported that the newer insecticides like rynaxpyr 20EC and flubendamide 48SC were found to be safe to natural enemies. Joseph *et al*. (2010) [6] reported that chemical pesticides like triazophos (0.05% conc.) and quinalphos (0.05% conc.) showed 64.78 and 46.79 % mortality in spider's population, respectively.

Conclusion

Though the use of chemical pesticides causes significant reduction in the spider population in the field but the innovation of newer insecticide formulations seems to maintain around four species of spider population in the field.

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