Pest Management in Horticultural Ecosystems,
Vol. 16, No. 1 pp 73-77 (2010)

SHORT NOTE

BIO-EFFICACY OF CERTAIN INSECTICIDES AND NEEM FORMULATIONS AGAINST OKRA FLEA BEETLE, *Nodostoma* sp.

T. BOOPATHI[1], K.A. PATHAK[1], S.V. NGACHAN[2] and NABAJYOTI DAS[1]

[1]ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib - 796 081, Mizoram
E-mail : boopathiars@gmail.com
[2]ICAR Research Complex for NEH Region, Umroi Road, Umiam - 793 103, Meghalaya

Okra, *Abelomoschus esculentus* Moench is one of the most important vegetable crops of India and it is grown throughout the year. Okra is attacked by as many as 72 insect pests (Ambegaonkar and Bilapate, 1984) and among them, flea beetle, *Nodostoma* sp. is a major insect pest under subtropical climatic conditions of Mizoram. Flea beetle attacks the crop from seedling to harvest stage affecting the vigour and resulting in drastic reduction in yield. Currently, the control measures rely heavily on the use of conventional synthetic insecticides. However, the indiscriminate use of insecticides has given rise to resistance of the pest species (Georghious and Lagunes-Tejeda, 1991), besides environmental hazards. Hence, it was felt necessary to search for alternative and effective insecticides against okra flea beetle, *Nodostoma* sp. Keeping this in view, the present studies were conducted to evaluate different chemical insecticides and neem formulations against *Nodostoma* sp.

Field studies were conducted at ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib, Mizoram during *kharif* season 2009 to evaluate the efficacy of different chemical insecticides and neem formulations against okra flea beetle, *Nodostoma* sp. The trial was laid out in a randomized block design (RBD) with eighteen treatments and five replications. Crop was grown at a spacing of 60 x 30 cm with a plot size of 20m^2. The treatments used are given in Table 1. Two sprays of treatments were given during vegetative phase of the crop. All recommended agronomical practices were followed for raising the crop. Field observations on the bio-efficacy of different insecticides and neem formulations against *Nodostoma* sp. were recorded from five randomly selected plants in each plot before insecticide application and 1, 7 and 15 days after spraying. The spraying were done during morning hours in such a way as to give uniform coverage and to avoid drift using a pneumatic knapsack sprayer. The data were transformed to square root values and analyed statistically using IRRISTAT and AGRES statistical software.

The effect of various treatments on the population of *Nodostoma* sp. is presented in Table 1. Perusal of data revealed that at one day before spraying, the flea beetle population per plant varied from 1.40 to 5.80. All the chemical insecticides were superior over control. But, application of phosphamidon 40% SL recorded hundred per cent mortality of *Nodostoma* sp. and was followed by malathion 50% EC (0.20 per plant), cypermethrin 10% EC (0.20 per plant), deltamethrin 2.8% EC (0.20 per plant) and dimethoate 30% EC (0.20 per plant). However, chlorpyriphos 20% EC was least effective in reducing flea beetle population (1.00 per plant).

Among the neem formulations tested, neem oil 0.3% EC was the most effective treatment (0.20 per plant).

On the seventh day of first spray also all the chemical pesticides except permethrin 25% EC were superior over untreated check and the flea beetle counts ranged from 0.40 to 3.20 per plant while it was 3.40 in control (Table 1). Imidacloprid 200% SL was most effective treatment (0.40 per plant), which was followed by chlorpyriphos 20% EC (0.60 per plant) and chlorpyriphos 50% EC + cypermethrin 5% EC (0.60 per plant). Permethrin 25% was least effective against flea beetle. Among the neem formulations, neem oil 0.3% EC recorded significantly lower population of flea beetle (0.60 per plant), while control had maximum population (3.40 per plant) at seven days after spray.

On the fifteenth day, flea beetle population data ranged from 2.20 to 6.40 per plant while it was 6.80 per plant in untreated check (Table 1). Monocrotophos 36% EC was most effective treatment on against flea beetle population (2.80 per plant) which was followed by imidacloprid 200% SL (3.80 per plant), endosulphon 25% EC, cypermethrin 10% EC, deltamethrin 28% EC, chlorpyriphos 50% EC + cypermethrin 5% EC and endosulphon 35% EC + cypermethrin 10% EC. But, the least effective treatment was chlorpyriphos 20% EC (6.00 per plant) against *Nodostoma* sp. of the neem formulations, neem oil 0.3% EC was observed to be significantly most effective against beetle (2.20 per plant), while untreated check registered maximum population (6.80 per plant).

The data on mean flea beetle count after first spray (Table 1) revealed that monocrotophos 36% EC recorded minimum population (1.47 per plant) followed by imidacloprid 200% SL (1.67 per plant) and chlorpyriphos 50% EC + cypermethrin 5% EC (1.67 per plant). But, permethrin 25% EC was found least effective against *Nodostoma* sp. (2.60 per plant). Among the neem formulations, neem oil 0.3% EC recorded most effective against *Nodostoma* sp. (1.00 per plant), while untreated check was noticed maximum population (4.00 per plant).

After second spray, all the treatments both chemical insecticides and neem formulations were found superior over untreated check. Spraying of endosulphon 25 EC, malathion 50 EC, imidacloprid 200 SL, cypermethrin 10 EC, deltamethrin 28 EC, fenvalerate 20 EC, dimethoate 30 EC, chlorpyriphos 50% EC + cypermethrin 5 EC and permethrin 25 EC recorded hundred per cent reductions of *Nodostoma* sp. at one day after spray. But, dichlorvos 76% EC was found to be least effective against *Nodostoma* sp. (1.20 per plant). Among the neem formulations, neem oil 0.3% EC was found most effective on population reduction of flea beetle (0.80 per plant), whereas untreated check was observed maximum population (4.00 per plant).

At seven days after treatment, spray of malathion 50% EC registered cent per cent reduction on flea beetle population which was followed by imidacloprid 200% SL (0.20 per plant) followed by dimethoate 30% EC (0.40 per plant) and endosulphon 35% EC + cypermethrin 10% EC (0.40 per plant). However, deltamethrin 2.8% EC (4.00 per plant) was least effective against *Nodostoma* sp. (Table 1). Of the neem formulations tested, neem oil 0.3% EC was found to be most effective (0.40 per plant), while untreated check was noticed maximum flea beetle population (5.00 per plant).

Fifteen days after imposition of treatments, endosulphon 25% EC, malathion 50% EC and monocrotophos 36% EC observed cent per cent mortality against flea beetle which was followed by imidacloprid 200% SL (0.20 per plant) followed by phosphamidon 40% EC (0.40 per plant) and dimethoate 30% EC (0.40 per plant) (Table 1). Among the neem formulations tested, neem oil 0.3% EC was found to be most effective in reducing flea beetle population (0.40 per plant),

Table 1. Effect of different neem formulations and insecticides on population of *Nodostoma* sp.

Treatments	Dose (per ha)	Mean number of *Nodostoma* sp. per plant*									
		First spray					Second spray				
		Pre-spray	1 DAS	7 DAS	15 DAS	Mean	Pre-spray	1 DAS	7 DAS	15 DAS	Mean
Neem oil 1% EC	1000 ml	2.60	3.00 (1.73	2.60 (1.61)	4.80 (2.19)	3.47	4.80	2.60 (1.61)	2.60 (1.61)	3.00 (1.73	2.73
Neem oil 0.3% EC	1000 ml	1.60	0.20 (0.45)	0.60 (0.77)	2.20 (1.48)	1.00	2.20	0.80 (0.89)	0.40 (0.63)	0.40 (0.63)	0.53
Neem oil 0.03% EC	2000 ml	1.60	2.20 (1.48)	3.20 (1.79)	6.40 (2.53)	3.93	6.40	1.40 (1.18)	1.40 (1.18)	1.20 (1.10)	1.33
Endosulphon 25% EC	1000 ml	4.20	0.80 (0.89)	0.80 (0.89)	4.00 (2.00)	1.87	4.00	0.00 (0.00)	2.20 (1.48)	0.00 (0.00)	0.73
Malathion 50% EC	1000 ml	2.00	0.20 (0.45)	0.80 (0.89)	4.20 (2.05)	1.73	4.20	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00
Monocrotophos 36% EC	750 ml	3.60	0.40 (0.63)	1.20 (1.10)	2.80 (1.67)	1.47	2.80	0.40 (0.63)	0.60 (0.77)	0.00 (0.00)	0.33
Dichlorvos 76% EC	675 ml	4.20	0.80 (0.89)	1.00 (1.00)	5.40 (2.32)	2.40	7.40	1.20 (1.10)	3.80 (1.95)	3.40 (1.84)	2.80
Imidacloprid 200% SL	125 ml	3.00	0.80 (0.89)	0.40 (0.63)	3.80 (1.95)	1.67	3.80	0.00 (0.00)	0.20 (0.45)	0.20 (0.45)	0.13
Cypermethrin 10% EC	125 ml	3.20	0.20 (0.45)	1.40 (1.18)	4.00 (2.00)	1.87	4.00	0.00 (0.00)	2.00 (1.41)	0.60 (0.77)	0.87
Deltamethrin 2.8% EC	125 ml	3.20	0.20 (0.45)	1.60 (1.26)	4.00 (2.00)	1.93	4.00	0.00 (0.00)	4.00 (2.00)	4.00 (2.00)	2.67
Chlorpyriphos 20% EC	1000 ml	5.80	1.00 (1.00)	0.60 (0.77)	6.00 (2.45)	2.53	6.00	0.20 (0.45)	1.80 (1.34)	1.00 (1.00)	1.00
Phosphamidon 40% EC	675 ml	3.00	0.00 (0.00)	1.00 (1.00)	5.60 (2.37)	2.20	5.60	0.40 (0.63)	2.00 (1.41)	0.40 (0.63)	0.93
Fenvalerate 20% EC	375 ml	1.40	0.40 (0.63)	1.40 (1.18)	5.40 (2.32)	2.40	5.40	0.00 (0.00)	1.60 (1.26)	0.60 (0.77)	0.73
Dimethoate 30% EC	675 ml	3.20	0.20 (0.45)	1.60 (1.26)	4.60 (2.14)	2.13	4.60	0.00 (0.00)	0.40 (0.63)	0.40 (0.63)	0.27
Chlorpyriphos 50% EC + Cypermethrin 5% EC	675 ml	4.60	0.40 (0.63)	0.60 (0.77)	4.00 (2.00)	1.67	4.00	0.00 (0.00)	1.60 (1.26)	1.20 (1.10)	0.93
Endosulphon 35% EC + Cypermethrin 10% EC	675 ml	0.80	1.20 (0.89)	4.00 (1.10)	2.00 (2.00)	4.00	0.40	0.40 (0.63)	2.80 (0.63)	1.20 (1.67)	
Permethrin 25% EC	125 ml	2.80	0.60 (0.77)	2.40 (1.55)	4.80 (2.19)	2.60	4.80	0.00 (0.00)	1.20 (1.10)	1.80 (1.34)	1.00
Untreated control	-	3.60	1.80 (1.34)	3.40 (1.84)	6.80 (2.61)	4.00	6.80	4.00 (2.00)	5.00 (2.24)	4.40 (2.10)	4.47
SE(d)		1.4617	0.6995	0.9615	0.9146	1.1919	1.9816	0.6235	1.7335	1.0843	1.1471
CD (5%)		2.9167	1.3931	1.9151	3.8134	2.3739	3.9543	1.6473	4.5801	2.8649	3.0308
CV (%)		75.64	140.00	94.43	61.78	98.74	66.51	167.09	187.73	137.16	163.99

* Figures in parentheses are square root transformed values, DAS: Days after spray

whereas untreated check registered maximum flea beetle population (4.40 per plant).

The data on mean flea beetle population after second spray (Table 1) elicit that hundred per cent reduction of the flea beetle population was observed in malathion 50% EC which was followed by imidacloprid 200% SL (0.13 per plant) and dimethoate 30% EC (0.27 per plant). But, dichlorvos 76% EC (2.80 per plant) was least effective against Nodostoma sp. In the neem formulations, neem oil 0.3 % EC was found to be most effective (0.53 per plant) against flea beetle, whereas untreated check was recorded maximum population (4.47 per plant).

Pooled efficacy

Overall pooled results revealed that all the treatments were superior over control. Spray of neem oil 0.3 % EC was found most effective (0.77 per plant) against Nodostoma sp. The results were in accordance with the findings of Saikia and Nath (2001), who reported that application of neem extract was effective against cabbage flea beetle, *Phyllotreta cruciferae*. Neem products had been reported for growth inhibitory property (Abdul Kareem *et al.* 1977; Heyde *et al.* 1983; Saxena and Rembold, 1984). Emosairue and Ukhe (1997) reported that application of neem products was most effective on the control of okra flea beetle, Podagrica spp. Solanine is a major compound in neem besides being toxic; it reported to deter feeding of insects (Rembold and Sieber, 1981). Even though botanicals do not have quick knock-down effect of the reduced physical activities of insects would make them more vulnerable to the natural enemies. However, neem oil 1% EC was least effective against Nodostoma sp., whereas untreated check recorded maximum flea beetle population (4.24 per plan).

Among the insecticides tested, malathion 50% EC was most effective against flea beetle (0.87 per plant) followed by monocrotophos 36% EC (0.90 per plant) and imidacloprid 200% SL (0.90 per plant). Sujatha and Srinivasan (2009) reported that seed dressing with imidacloprid @ 6g and 3g a.i./kg or carbosulfan @ 6.25 g a.i./kg or thiamethoxam @ 3.5 g a.i/kg was found to be most effective against flea beetle, *Longitarsus belgaumensis* J. on French bean. The application of carbaryl 50% WP or chlorpyriphos was found to effective in reducing population of crucifer flea beetle, Phyllotreta cruciferae reported by Atwal and Dhaliwal (2003). Neonicotinoids and other conventional insecticides could be highly effective and specific in their action against sucking pests and other insect pests (Vastrad, 2003; Dhawan and Simwat, 2002, Vadodaria *et al.*, 2001). Application of synthetic pyrethroids was found to be effective against hoppers and other insect pests (Basu, 2000). Dikshit *et al.* (2002) reported that the application of imidacloprid and betacyfluthrin was found more effective in reducing the insect pest complex of okra.

REFERENCES

Abdul Kareem, A., Parameswaran, S. and Thangavel, P. 1977. Evaluation of certain newer insecticides in the control of boll worms in irrigated cotton in Tamil Nadu. *Pesticides*, **11**(2) : 33-40.

Ambegaonkar, J. K. and Bilapate, G. G. 1984. Growth, development and biometrics of Earias vittella (Fab.) on cotton and okra. *Journal of Maharashtra Agricultural University*, **9**(3) : 254-256.

Atwal, A. S. and Dhaliwal, G. S. 2003. Agricultural Pests of South Asia (4th Edition). Kalyani Publishers, New Delhi.

Basu, P. R. 2000. Bioefficacy of certain insecticides, Bt and neem formulations against insect pests complex of brinjal, Solanum melongena (L.) under field conditions. M. Sc. Thesis, Post Graduate School, Indian Agricultural Research Institute, Pusa, New Delhi.

Dhawan, A. K. and Simwat, G. S. 2002. Field evaluation of thiamethoxam for control of cotton jassid, *Amrasca biguttula biguttula* (Ishida) on upland cotton. *Pestology*, **23**(1) : 15-19.

Dikshit, A. K., Lai, O. P., Sinha, S. R. and Srivastava, Y. N. 2002. Safety evaluation: Persistence and bioefficacy of imidacloprid and betacyfluthrin on okra. Part II. *Pestology*, **26**(7) : 30-37.

Emosairue, S. O. and Ukhe, D. A. 1997. Field trial of neem products for the control of okra flea beetles (*Podagrica* spp.) in South Eastern Nigeria.. *Global Journal of Pure and Applied Sciences*, **3** : 13 -19.

Georghiou, G. P. and Lagunes-Tejeda, A. 1991. The Occurrence of Resistance to Pesticides in Arthropods, F AO, Rome.

Heyde, J. V. D., Saxena, R. C. and Schmutterer, H. 1983. Neem oil and neem extracts as potential insecticides for the control of hemipterous rice pest. In Proceeding of First International Neem Conference, Rauischholzhausen, FRG 25 - 28 May, 1983. (Eds) Schmutterer, H. and K. R. S. Ascher, G. T. Z., Eschboron. pp. 337--390.

Rembold, H. and Sieber, K. P. 1981. Inhibition of oogenesis and ovarian ecdysterioid synthesis by azadirachtin in *Locusta migratoria* Z. *Naturforsch*, **36** : 490-496.

Saikia, D. K. and Nath, R. K. 2001. Field efficacy of certain plant products against mustard flea beetle *Phyllotreta cruciferae* (Goeze). *Journal of the Agricultural Science Society of North East India*, **13**(1) : 79-80.

Saxena, K. N. and Rembold, H. 1984. Orientation and ovipositional response of *Heliothis armigera* to certain neem constituents. Natural pesticides from the neem tree and other tropical plants. In: Proceeding of Second International Neem Conference. (Eds.) Schmutterer, H. and K. R. S. Ascher. Rauischholzhausen, Germany. pp.199-210.

Sujatha, G. and Srinivasan, S. 2009. Management of early season insect pests by seed dressing with new formulations of insecticides in French bean (*Phaseolus vulgaris* L.). *Current Biotica*, **2**(4) : 501-506.

Vadodaria, M. P., Patel, U. G., Patel, C. J., Patel, R. B. and Maisuria, I. M. 2001. Thiamethoxam (Cruiser) 70 WS: A new seed dresser against sucking pests of cotton. *Pestology*, **27**(7) : 60-63.

Vastrad, A. S. 2003. Neonicotinoids-current success and future outlook. *Pestology*, **27** : 60-63.