Pest Management in Horticultural Ecosystems
Vol. 28, No.2 pp 189 -191 (2022)

DOI Number: 10.5958/0974-4541.2022.00059.5

RESEARCH NOTE

Efficacy of biorational insecticides against aphids, *Aphis craccivora* in amaranthus

B. J. MANJUSHREE*[1], JAYALAXMI NARAYAN HEGDE[2], K. RAJASHEKARAPPA[3], B. GANGADHARA NAIK[4] and NAGARAJAPPA ADIVAPPAR[5]

[1,2,3]Department of Entomology, [4]Department of Plant Pathology, [5]Zonal Agricultural and Horticultural Sciences, College of Agriculture, Navile, Shivamogga- 577 204, Karnataka

***E-mail**: manjushreebj@gmail.com

ABSTRACT: A field experiment was conducted to study the bioefficacy of biorationals against cowpea aphid, *Aphis craccivora* infesting amaranthus during *rabi* 2019-20 at the Zonal Agricultural and Horticultural Research Station (ZAHRS), Shivamogga. Out of six biorationals evaluated, the highest per cent reduction of aphid population was recorded in *Lecanicillium lecanii* 1 × 109 CFU @ 1 g/l (62.87 %), followed by NSKE 5% (53.59%). Concerning the B: C ratio, NSKE 5 % recorded the highest return per rupees invested, *i.e.,* 1: 2.45, followed by azadirachtin 10,000 ppm @ 2 ml/l (1: 2.16) and *Beauveria bassiana* 1×10^9 CFU/g @ 1 g/l (1: 2.12).

Keywords: Amaranthus, Aphids, *Lecanicillium lecanii*, NSKE 5%, Organic management,

Amaranthus is one of the most important leafy vegetables with high nutritional and medicinal properties (Martirosyan *et al.,* 2007). Several insect and non-insect pests attack amaranthus, *viz.*, *Hymenia recurvalis* (Fabricius)*, Spodoptera litura* (Fabricius)*, Erectomocera impectella* (Walker), *Psara basalis* (Walker), *Helicoverpa armigera* (Hub.), *Agrotis segetum, Liriomyza* sp. beet worm moth, *Spoladea recurvalis*, *Hypolixus truncatullus,* leaf beetles, aphids and grasshoppers (Manjula and Kotikal, 2018, Manikandan and Kannan, 2019, Seni, 2018).

The cowpea aphid, *Aphis craccivora* Koch. (Hemiptera: Aphididae) is an important sucking pest that damages different parts of the plants throughout the crop growth and affect the economic yield. To manage the aphid in amaranthus, farmers are indiscriminately spraying different insecticides in unscientific ways without knowing the ill effects of synthetic inorganic insecticides. Since amaranthus is consumed regularly in our daily food, it is necessary to manage the insect pests organically to avoid health hazards and reduce the insecticide residue in the produce. Keeping this in view, a field experiment was conducted on the bioefficacy of organic insecticides against aphids, *A. craccivora* in amaranthus, to know the effective biorationals to manage the aphids in amaranthus.

The present study was carried out at Zonal Agricultural and Horticultural Research Station (ZAHRS), Keladi Shvappa Nayaka University of Agricultural and Horticultural Sciences, Navile, Shivamogga during *Rabi* 2019-20 (13°27' N and 74°37' to 75°52' E, 650 meters above MSL). Six biorationals were evaluated and compared with standard check, malathion 50 EC @ 2 ml/l and untreated control. The experiment was laid out in randomized complete block design with three replications. Six biorationals *viz*., Neem Seed Kernel Extract (NSKE) 5 %, azadirachtin 10,000 ppm @ 2 ml/ l, pongamia oil 5 %, *Beauveria bassiana* 1×10^9 CFU/g @ 1 g/l, garlic extract 2 % and *Lecanicillium lecanii* 1×10^9 CFU/g @ 1 g/l along with a standard check, malathion 50 EC @ 2 ml / and untreated control were evaluated against aphids. Pre-treatment counts were made the day before spraying on 5 cm of the shoot length, and post-treatment observations were recorded at 3, 5, 7 and 10 days after spraying. The yield was also recorded, and the cost-benefit ratio was worked out for each treatment. Per cent reduction over the control was also calculated. The statistical analysis of the data obtained using Web Agri. Stat Package (WASP- 2) developed by the Indian Council of Agricultural Research, Research Complex, Goa.

Fifty grams of well-dried neem seed kernels were powdered using a pestle and mortar and soaked overnight in 500 ml water. The next morning, the solution was stirred with a wooden stick till the solution became milky white. One per cent detergent was added to the solution. Then the solution was filtered through double-layered muslin cloth, and the volume was made to one litre by adding water. To prepare 2 % garlic extract, 20 g of grinded garlic paste was soaked in 20 ml of kerosene overnight. The next morning, the mixture was stirred well, and one per cent of detergent was added to the solution. Then the solution was filtered through muslin cloth, and the volume was made to one litre by adding water.

Table 1. Efficacy of biorationals against aphids, *Aphis craccivora* on amaranthus during *Rabi* 2019-20

Treatment details	Mean number of aphids per 5 cm shoot					Overall Mean	Per cent reduction over control	B: C ratio
	1 DBS	3 DAS	5 DAS	7 DAS	10 DAS			
T_1-NSKE 5%	26.93 (5.23)	11.53 (3.45)^{de}	9.46 (3.15)^{de}	12.43 (3.56)^{c}	14.26 (3.82)^{de}	11.92	53.59	2.45
T_2-Azadirachtin 10,000 ppm 2ml/l	25.13 (5.06)	13.63 (3.75)^{cd}	11.66 (3.48)^{cd}	15.96 (4.05)^{b}	16.76 (4.15)^{cd}	14.50	43.54	2.16
T_3-Pongamia oil 5%	26.13 (5.16)	15.73 (4.02)^{bc}	13.86 (3.78)^{bc}	17.13 (4.19)^{b}	19.33 (4.45)^{bc}	16.51	35.71	1.76
T_4- *Beauveria bassiana* 1×10^9 spores 1g/l	27.06 (5.24)	18.46 (4.35)^{b}	16.86 (4.16)^{b}	19.26 (4.44)^{b}	21.43 (4.68)^{b}	19.00	26.02	2.12
T_5- Garlic extract 2%	25.86 (5.13)	15.56 (4.00)^{bc}	14.36 (3.85)^{bc}	17.46 (4.23)^{b}	19.13 (4.42)^{bc}	16.62	35.27	1.71
T_6- *Lecanicillium lecanii* 1×10^9 spores 1g/l	27.40 (5.28)	9.33 (3.11)^{ef}	7.63 (2.84)^{e}	9.53 (3.16)^{cd}	11.66 (3.48)^{ef}	9.53	62.87	1.88
T_7- Malathion 50 EC 2ml/l	25.86 (5.13)	6.53 (2.64)^{f}	4.46 (2.22)^{f}	8.33 (2.96)^{d}	9.66 (3.16)^{f}	7.24	71.79	3.07
T_8- Control	27.53 (5.29)	25.23 (5.07)^{a}	22.56 (4.80)^{a}	26.53 (5.19)^{a}	28.43 (5.37)^{a}	25.68		1.54
SEm±	0.16	0.15	0.14	0.13	0.13			
CD@(P=0.05)	0.50	0.47	0.44	041	0.40			
CV (%)	NS	7.16	6.45	6.29	5.68			

Figures in parentheses are √x+0.5 transformed values;
Means in the columns followed by the same alphabet do not differ significantly by DMRT (P = 0.05);
DBS- Day before spray;
DAS- Days after spraying

Before the imposition of the treatment, the mean population of aphids ranged from 25.13 to 27.53 per 5 cm of the shoot length and were found to be statistically non-significant in different treatment plots (Table 1).

Three days after spray, there was a significant difference among the treatments with respect to the mean number of aphids per 5 cm of shoot length. Among the organic insecticides evaluated, *L. lecanii* @ 1 g / l was found superior (9.33 mean aphids / 5 cm of shoot length), followed by NSKE 5 % (11.53 mean aphids / 5 cm of shoot length). Standard check malathion 50 EC @ 2 ml / l was found superior of all the treatments, which recorded the lowest mean number of aphids per 5 cm of shoot length (6.53).

There was a significant difference among the treatments five days after the spray. Among the biorationals evaluated, the lowest aphid population per five centimetres of shoot length was recorded with *L. lecanii* @ 1 g / l (7.63), followed by NSKE 5 % (9.46). Standard check malathion 50 EC @ 2 ml/l was found superior among all the treatments, with the lowest mean number of aphids per 5 cm of shoot length (4.46). *Lecanicillium lecanii* @ 1 g / l recorded the least mean aphid population per 5 cm shoot length (9.53), followed by NSKE 5 % (12.43). Standard check malathion 50 EC @ 2 ml / l was found superior, with the lowest mean number of aphids per 5 cm of shoot length (8.33).

Among the biorationals evaluated, *L. lecanii* @ 1 g/l recorded the least number of aphids per plant (11.66 aphids/ 5 cm of shoot length), followed by NSKE 5 % (14.26 aphids/5 cm of shoot length). Standard check malathion 50 EC @ 2 ml/l was found superior among all the treatments, with the lowest mean number of aphids per 5 cm of shoot length (9.66).

Among the biorationals evaluated, the significantly highest per cent reduction of aphid population over the control was recorded in treatment *L. lecanii* @ 1 g /l (62.87). These research findings are in close line with the results of Salam and Hawary (2011), who reported the

virulence of *L. lecanii* in the adults and nymphal stages of aphids. They also observed 100 per cent mortality in adults and nymph over three days of treatment with the concentration of 5×10^6 CFU/ml and 1 × 106 CFU/ml. Salam *et al*. (2012) reported that *V. lecanii* was virulent against bean aphids, *A. craccivora*, and it could reduce the aphid population density by 73.33 per cent. Suresh *et al*. (2012) also reported that *V. lecanii* @ 1×10^9 CFU/ml recorded 71.62 % mortality of aphids. Khade *et al*. (2014) reported that *V. lecanii* @ 4 g showed a 64.84 per cent reduction of aphids. In addition, the present study reported that the application of NSKE 5 % resulted in a 53.59 % reduction in the aphid population. These are in close line with Aziz *et al.* (2014), who evaluated the different neem products against mustard aphids on the Canola crop and reported that NSKE 5 % reduced the pest population by 86.13 %.

Out of the biorationals evaluated against aphids, the benefit-cost (B:C ratio was highest in the case of NSKE 5 %, *i.e*. 2.45 due to a higher leaf yield of 14.54 t/ha, followed by azadirachtin 10,000 ppm @ 2 ml/l which recorded B: C ratio of 2.16 with leaf yield of 13.14 t/ha, *B. bassiana* which recorded B: C ratio of 2.12 with leaf yield of 12.72 t/ha, *L. lecanii*, which recorded B: C ratio of 1.88 with leaf yield of 11.30 t/ha, pongamia oil 5% which recorded B: C ratio of 1: 1.76 with leaf yield of 10.62 t/ha and garlic extract 2 % which recorded B: C ratio of 1.71 with leaf yield of 10.24 t/ha (Table 1). Manjula *et al*. (2015) also reported cost benefits of insecticides and botanicals against defoliators on amaranthus, wherein treatments NSKE 5 % and azadirachtin gave leaf yield of 12.22 t/ha and 13.89 t/ha with 22.00 and 14.28 % increase in the cost-benefit ratio, respectively. However, by standard check, malathion 50 EC @ 2 ml/l recorded the highest B: C ratio (1: 3.07) compared to all other organic insecticides with a leaf yield of 18.60 t/ha. But, since green leafy vegetables are consumed daily, the aphids and other insect pests should be managed organically to avoid pesticide residue in the harvested greens and to avoid health hazards to the consumers. Hence, the organic insecticides NSKE 5 %, followed by azadirachtin 10,000 ppm @ 2ml/l, can be used to manage this aphid.

REFERENCES

Aziz, A. M., Shahzad, R. A., Naeem, M. and Shabbir, G. 2014. Evaluation of different neem products in comparison with imidacloprid against different morphs of mustard aphid (*Lipaphis erysimi* KAL.) on canola crop. *Asian Journal of Agriculure and Biol*ogy, **2** (3): 191-201.

Khade, K. N., Undirwade, B. D., Tembhurne, R. D. and Lande, G. K. 2014. Biorational management of sucking pests of cowpea, *Vigna sinensis* L. *Trends in Biosci*ences, **7** (20): 3212-3217.

Manikandan, P. and Kannan, R., 2019. Efficacy of an insect growth regulator on Amaranthus leaf caterpillar, *Spoladea recurvalis* (Fab.) (Lepidoptera; Crambidae). *Pest Management in Horticultural Ecosystems*, **25**(2): 241-246.

Manjula, K. N., Kotikal, Y. K., Patil, H. B. and Biradar, I. B. 2015. Studies on insect fauna, their natural enemies and pollinators in fenugreek. *Karnataka Journal of Agricultural Sciences*, **28** (2): 279-281.

Manjula, K. N. and Kotikal, Y. K. 2018. Studies on insect fauna of Amaranthus and loss estimation due to major defoliators. *International Journal of Pure and Applied Biosci*ence, **6** (2): 341-351.

Martirosyan, D. M., Lidia, A. M., Svetlana, N. K., Pogojeva, A. V. and Zoloedov, V. A. 2007. Amaranth oil application for coronary heart disease and hypertension. *Lipids in healh and disease*, **6** (1): 1-12.

Salam, A. M. F. and Hawary, F. M. A. 2011. Lethal and pathogenic effects of *Beauveria bassiana* and *Lecanicillium lecanii* on the adul and nymph of *Aphis craccivora* Koch. *Archives of Phytopathology and Plant Prot*ectiton, **44** (1): 56-66.

Salam, A. M. E., Salem, S. A. and Kholy, M. Y. 2012. Efficacy of nimbecidine and certain entomopathogenic fungi formulations against bean aphids, *Aphis craccivora* in broad bean field. *Archives of Phytopathology and Plant Prot*ectiton, **45** (19): 2275-2277.

Seni, A. 2018. Insect pests of Amaranthus and their management. *International Journal of Enviroment, Agriculure and Biotechnology,* **3** (3): 1100-1103.

Suresh, B. C., Khader, K. H. and Prasanna, P. M. 2012. Efficacy of different entomopathogenic fungi against cowpea aphid, *Aphis craccivora* Koch under laboratory and field conditions. *International Journal of Plant Prot*ection, **5** (1): 68-71.

MS Received: 04 August 2022
MS Accepted : 03 October 2022