DOI: 10.55278/KZRY1465

Efficacy of entomopathogenic fungi against chrysanthemum aphid, *Macrosiphoniella sanborni* (Gillette)

Surani Pratikkumar M., Abhishek Shukla *and Mangali Ashwini

Department of Entomology, N.M. College of Agriculture

Navsari Agricultural University, Navsari-396450, Gujarat, INDIA

Corresponding author: abhishekshukla@nau.in (corresponding author)

Abstract

An experiment was carried out to evaluate different entomopathogenic fungi against chrysanthemum aphid, *Macrosiphoniella sanborni* (Gillette) under laboratory conditions at Biocontrol Laboratory, N.M. College of Agriculture, Navsari Agricultural University, Navsari during 2019-20 and 2021-21. The pooled mean corrected percent mortality revealed that among all the entomopathogenic fungi tested at 4g/L, *Verticillium lecanii* was found superior over the rest of the treatments by recording highest percent mortality (53.66%) of aphids, *M. sanborni* and it was followed by *Metarhizium anisopliae* and *Beauveria bassiana* with 36.84 and 32.61 percent mortality, respectively. The lowest per cent mortality of aphid was recorded by *Nomuraea rileyi* (25.55%). The chemical check, Dimethoate 30 EC at 1ml/L recorded highest percent mortality of aphids (77.82 %) among all the treatments.

Keywords: Chrysanthemum aphid, *Macrosiphoniella sanborni*, Entomopathogenic fungi

Introduction

Chrysanthemums (*Dendranthema grandiflora* Tzvelev), sometimes called mums or chrysanths, are flowering plants of the genus Chrysanthemum of the family Asteraceae. Countless horticultural varieties and cultivars of this flower exist. Presently, 2000 varieties are grown around the world and in India, about 1000 varieties are grown (Datta and Bhattacharjee, 2001). As many as seven insect pests are reported damaging this crop right from germination to harvesting of the crop. The important insect pests attacking Chrysanthemum are aphid, *Macrosiphoniella sanborni* (Gillette); thrips, *Haplothrips ramakrishnae* Krishna; Chrysanthemum caterpillar, *Diacrisia oblique* Walker; grub, *Holotrichia* spp. and leafminer, *Pytomyza syngenesiae* (Hardy). The Chrysanthemum aphid, *M. sanborni* is a widespread pest on cultivated Chrysanthemum throughout the world. It is a holocyclic species of East Asian origin (Heie, 1995). It feeds mainly on young leaves and developing flower buds and could become very abundant on them. In case of high infestation, the aphid causes significant damage which results in deformation and disturbance of flower development and it also acts as a vector to vein mottle and virus B

(Blackman and Eastop, 1984; Chan *et al.*, 1991). All these factors together become hereby significant and responsible for economic damage to the Chrysanthemum by decreasing the beauty and value of cut flowers (Zahedi, 1999). Pal and Sarkar (2009) reported *M. sanborni* as the major sucking pest of Chrysanthemum in hilly regions of West Bengal area by conducting field surveys. Considering the importance of Chrysanthemum aphid, the eco-friendly management and the growing demand for Chrysanthemum in South Gujarat, the present study was taken up to study the efficacy of various entomopathogenic fungi against the Chrysanthemum aphid under laboratory conditions.

Materials and methods

The laboratory experiment on efficacy of various entomopathogenic fungi against Chrysanthemum aphid, *M. sanborni* were carried out in Biocontrol Laboratory, N. M. College of Agriculture, Navsari Agricultural University, Navsari (20.925ºN, 72.908ºE) following Completely Randomized Design with six treatments and four repetitions during the year 2019-20 and 2020-21. The treatments included four entomopathogenic fungi *viz*., *Nomuraea rileyi* (1×10^8 cfu/g), *Beauveria bassiana* (1×10^8 cfu/g), *Lecanicillium* (*Verticillium*) *lecanii* (1×10^8 cfu/g) and *Metarhizium anisopliae* (1×10^8 cfu/g) along with chemical check Dimethoate 30 EC (1ml/L) and untreated control. The treatments were imposed by dipping the healthy Chrysanthemum leaves for five minutes in conidial solution of each treatment. The treated leaves were allowed to dry under ceiling fan. Twentyfive aphids were released on each treated leaf to study the mortality. After 15 minutes of exposure, the aphids on treated chrysanthemum leaves were transferred to fresh leaves. The mortality of chrysanthemum aphid were recorded at 3rd, 5th, 7th, 10th and 14th days after treatment. The turgidity of leaves was maintained by using standard technique (?). At an interval of 24 hrs., each leaf (*i.e.*, untreated) was changed with new fresh leaf in same Petri dish. The data obtained on cumulative dead chrysanthemum aphid counts were summed up and utilized for calculation of percent corrected mortality. The data of cumulative dead aphids were converted into arcsine transformation and analyzed statistically by using completely randomized design. The percent corrected mortality was worked out through utilizing the formula suggested by Henderson and Tilton (1955).

Results and discussion

The results on the efficacy of entomopathogenic fungi against chrysanthemum aphid, *M. sanborni* during the years 2019-20 and 2020-21 were presented in Table 1. The mean corrected percent mortality of 3, 5, 7, 10, 14 DAT (Days after Treatment) revealed that among all the entomopathogenic fungi, the highest mortality was recorded for *V. lecanii* with 52.93 per cent during 2019-20 and 54.40 per cent mortality during 2020-21. The next most effective treatment was *M.*

anisopliae with 35.51 per cent during 2019-20 and 38.17 percent mortality during 2020-21 which was on par with *B. bassiana* with 31.5 per cent mortality during 2019-20 and 33.72 percent during 2020-21. The lowest per cent mortality of aphid was recorded for *N. rileyi* with 25.11 and 26.00 per cent mortality during 2019-20 and 2020-21, respectively. However, chemical check Dimethoate 30 EC recorded 77.65 (2019-20) and 77.99 per cent mortality of aphid, *M. sanborni.*

The overall pooled data on corrected percent mortality of aphid, *M. sanborni* are presented in Table 1. The mean data of 3, 5, 7, 10 and 14 DAT revealed that among all the entomopathogenic fungi, the treatment of *V. lecanii* at proved to be the most effective with highest per cent mortality (53.66%), the next effective treatment was *M. anisopliae* at (36.84%) which was at par with *B. bassiana* at *i.e.* 32.61 per cent mortality. The lowest per cent mortality of aphid was recorded in the treatment with *N. rileyi* (25.55%). Among all the treatments, chemical check Dimethoate 30 EC recorded highest per cent mortality of aphid, *M. sanborni* (77.82%). The results of present study are in agreement with those obtained by Saranya *et al*. (2010) who reported 100 per cent mortality of cowpea aphid, *Aphis craccivora* by treating with *V. lecanii* and followed by *B. bassiana,* and *M. anisopliae*. Further, Husnain *et al.* (2014) reported *V. lecanii*, *M. anisoplaie* and *Paecilomyces lilacinus* as effective against aphids in Pakistan. *Verticillium lecanii* was also reported effective against cotton aphid, while the study of Palthiya and Nakat (2017) indicated that combination of entomopathogenic fungi like *V. lecanii* 1.15% WP + *M. anisopliae* 1.15% WP was very effective against okra aphid. In a study Janu *et al.* (2018) also reported *V. lecanii* and *B. bassiana* effective against mustard aphid, *Lipaphis erysimi.* Gore *et al.* (2021) also concluded that *V. lecani* was very effective against cotton aphid followed by *M. anisopliae* and *B. bassiana.* All these earlier studies thus, closely support the present findings.

Acknowledgements

The authors thank the Principal and Dean, N.M. College of Agriculture, Navsari as well as to the Director of Research and Dean PG Studies, Navsari Agricultural University, Navsari for providing necessary facilities.

Table 1: Efficacy of entomopathogenic fungi against Chrysanthemum aphid, *M. sanborni* under laboratory condition

Treatments	Con.	Corrected per cent mortality (Yr. 2019-2020)						Corrected per cent mortality (Yr. 2020-2021)						Corrected per cent mortality (Pooled)					
		3 DAT	5 DAT	7 DAT	10DAT	14DAT	Mean	3 DAT	5 DAT	7 DAT	10DAT	14DAT	Mean	3 DAT	5 DAT	7 DAT	10DAT	14DAT	Mean
B. bassiana	4g/l	20.49 (12.25)	22.9 (15.18)	29.97 (24.97)	42.98 (46.48)	49.99 (58.63)	34.14 (31.5)	21.42 (13.38)	23.5 (15.94)	31.1 (26.68)	43.97 (48.21)	50.37 (59.29)	35.49 (33.72)	20.95 (12.81)	23.2 (15.56)	30.53 (25.83)	43.48 (47.35)	50.18 (58.96)	34.5 (32.61)
M. anisopliae	4g/l	23.84 (16.33)	26.21 (19.54)	32.9 (29.52)	45.65 (51.14)	51.37 (61.01)	36.58 (35.51)	24.58 (17.33)	26.69 (20.2)	33.91 (31.13)	46.62 (52.82)	53.29 (64.23)	38.16 (38.17)	24.20 (16.83)	26.45 (19.87)	33.41 (30.33)	46.14 (51.98)	52.33 (62.62)	37.06 (36.84)
V. lecanii	4g/l	27.55 (21.42)	36.1 (34.72)	45.62 (51.08)	58.89 (73.21)	66.76 (84.23)	46.68 (52.93)	28.96 (23.46)	35.04 (32.97)	47.56 (54.45)	59.09 (73.51)	65.5 (82.74)	47.53 (54.4)	28.25 (22.43)	35.57 (33.85)	46.59 (52.77)	58.99 (73.36)	66.13 (83.48)	46.77 (53.66)
N. rileyi	4g/l	12.88 (5.08)	21 (12.96)	25.93 (19.23)	39.58 (40.64)	43.63 (47.62)	30.06 (25.11)	14.1 (6.08)	20.78 (12.73)	27.32 (21.1)	39.29 (40.14)	42.54 (45.71)	30.65 (26)	13.49 (5.58)	20.89 (12.84)	26.63 (20.17)	39.44 (40.39)	43.09 (46.67)	30.08 (25.55)
Dimethoate 30EC	1ml/L	47.92 (55.08)	53.84 (65.18)	59.26 (73.84)	76.2 (94.16)	90 (100)	61.79 (77.65)	48.76 (56.54)	54.3 (65.94)	58.21 (72.23)	79.35 (95.34)	90 (100)	62.03 (77.99)	48.34 (55.81)	54.07 (65.56)	58.73 (73.03)	77.77 (94.75)	90 (100)	61.88 (77.82)
Control	-	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
SE.m ±																			
Treatment (T)		0.56	0.79	0.85	1.16	1.11	0.39	0.78	0.76	0.63	1.93	0.92	0.45	0.47	0.55	0.53	1.13	0.72	0.25
(Y×T)		-	-	-	-	-	-	-	-	-	-	-	-	0.67	0.78	0.75	1.59	1.02	0.36
C.D. 5%																			
Treatment (T)		1.67	2.34	2.51	3.46	3.29	1.15	2.32	2.27	1.87	5.74	2.74	1.32	1.38	1.58	1.51	3.23	2.07	0.73
(Y×T)		-	-	-	-	-	-	-	-	-	-	-	-	NS	NS	NS	NS	NS	NS
C.V. (%)		5.10	5.92	5.24	5.31	4.40	2.23	6.80	5.72	3.81	8.64	3.67	2.50	6.04	5.82	4.57	7.20	4.05	2.04

Note: *Figures in parentheses are original values while those outside are arcsine transformed values, DAT: Days After Treatment

References

Blackman, R.L.and Eastop, V. F. 1984. Aphids on world crops, John Wiley and Sons, Chichester, UK. pp. 47-49.

Chan, C.K., Forbes, A. R., Raworth, O. A. 1991. Aphid transmitted viruses and their vectors of the world. Technical bulletin, Agriculture Canada Research Branch. pp. 208.

Datta, S. K. and Bhattacharjee, S.K. 2001. Chrysanthemum AICRP on Floriculture. Technical Bulletin, ICAR, New Delhi. 11: 50-56.

Gore, A. K., Sant, S. S., Kadam, A.K., Dhurgude, S. S. and Patange, S. B. 2021. Effect of botanicals and bio-pesticides on sucking pest in cotton. *Journal of Entomology and Zoology Studies* **9**(1): 1262-1265.Henderson, C. F. and Tilton, E W. 1955. Tests with acaricides against the brow wheat mite. *Journal of Economic Entomology*, **48**: 157-161.

Heie, O.E. 1995. The Aphidoidea (Hemipteral of Fennoscandia and Denmark) VI. Family Aphididae: Part 3 of tribe *Macrosiphini* of subfamily Aphidinae and Family Lachinidae. *Fauna Entomologica Scandinavica,* **31**: 1-217.

Husnain, H., Shahid, A.A., Haq, M. I., Ali, A., Muhammed. U. and Anam, U. 2014. Efficacy of entomopathogenic fungi as biological control agent against insect pests of *Gossypium hirsutum. Journal of Natural Sciences Research,* **4**(5): 68-72.

Janu, A., Yadav, G. S., Kaushik, H. D., Jakhar, P. 2018. Bioefficacy of *Verticillium lecanii* and *Beauveria bassiana* against mustard aphid, *Lipaphis erysimi* under field conditions. *Plant Archives,* **18**(1): 288-290.

Pal, S. and Sarkar, I. 2009. Pests infesting ornamental plants in hilly regions of West Bengal. *Journal of Plant Protection Sciences,* **1**(1): 98-101.

Palthiya, R. and Nakat, R. V. 2017. Efficacy of entomopathogenic fungi against aphids on okra. *International Journal of Current Microbiology and Applied Sciences*, **6**(8): 2980-2986.

Saranya, S., Ushakumari, R., Philip, P., Sosamma, D. and Jacob, B. M. 2010. Efficacy of different entomopathogenic fungi against cowpea aphid, *Aphis craccivora* (Koch). *Journal of Biopesticides,* **3**(1): 138-142.

Zahedi, K. 1999. Summer crops and ornamental plants pests and control in Iran. Iran University press, Tehran, Iran. p. 16.

MS Received 26 April 2022
MS Accepted 05 May 2022