The Pharma Innovation Journal 2022; SP-11(8): 1838-1841

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(8): 1838-1841

www.thepharmajournal.com
Received: 08-06-2022
Accepted: 13-07-2022

Pankaj Kumar Rajpoot
Ph.D. Research Scholar, Department of Entomology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Jitendra Kumar
Assistant Professor, Department of Entomology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Rishabh Mishra
Ph.D. Research Scholar, Department of Entomology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Arun Kumar
Ph.D. Research Scholar, Department of Entomology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Pawan Kumar
Ph.D. Research Scholar, Department of Entomology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India

Corresponding Author
Pankaj Kumar Rajpoot
Ph.D. Research Scholar, Department of Entomology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

The effectiveness of various bio pesticides and insecticides against the aphid, *Rhopalosiphum maidis* Fitch on barley, (*Hordeum vulgare)* Linn

Pankaj Kumar Rajpoot, Jitendra Kumar, Rishabh Mishra, Arun Kumar and Pawan Kumar

Abstract
The investigation entitled, The effectiveness of various bio pesticides and insecticides against the aphid, *Rhopalosiphum maidis* Fitch on barley (*Hordeum vulgare* Linn.)' was conducted at the Crop Research Farm, Nawabganj, C.S. Azad University of Agriculture and Technology, Kanpur during *Rabi* season 2019-20. The bio efficacy of the treatments evaluated against aphid on barley crop showed that lowest population of application of acetamiprid 20 SP (3.72 aphids/shoot) was found significantly superior in reducing the aphid population in comparison to other bio pesticide and insecticide except flubendiamide 480 SC and imidacloprid 17.8 SL also gave similar effect of acetamiprid 20 SP statistically. The application of Azadirachtin was found to be least effective having (31.67 aphids/shoot). All treatments were found to be statistically superior in comparison to be untreated check (78.45 aphids/shoot). The percentage reduction in population over untreated check in various treatments varies from 45.05 to 82.21 percent, the lowest in Azadirachtin and highest in acetamiprid 20 SP.

Keywords: Various bio pesticides, insecticides, aphid, *Rhopalosiphum maidis* Fitch, (*Hordeum vulgare*) Linn

Introduction
Barley (*Hordeum vulgare*, 2n-14), a member of the grass family, is a major cereal grain grown in temperate areas around the world. Barley is one of the founder crops of old-world agriculture and one of the first domesticated cereals. After wheat, rice, and maize, barley (*Hordeum vulgare* L.) ranks fourth in cultivation and third in total cereal production. Morocco, Ethiopia, Turkey, Canada, the United States of America, Spain, the United Kingdom, Australia, the Soviet Union, and France are the main producers of barley. The barley crop is planted on 0.7 million hectares in India, with a production of 18.18 Lakh tons and a productivity of 29.85 q/ha (IIWBR 2020-2021) [2]. Uttar Pradesh, Rajasthan, Bihar, Madhya Pradesh, Haryana, Punjab, Himachal Pradesh, West Bengal, Maharashtra, Sikkim, Delhi, and Jammu and Kashmir are the key barley producing states in our country. It is critical to protect the crop against *R. maidis* early on. Growers can control the insect far ahead of time by knowing its distinctive appearance and peak infection period. Not only this Environmental influences play a significant part in influencing this insect's behavior. It is the most important criterion for pest management that is both effective and efficient.

The use of different systemic pesticides for the control of insect pests of barley has been recommended, however in certain cases, survivors quickly build up their population due to fast reproduction in the absence of natural enemies. In light of this, the majority of workers have emphasized the use of newer, safer insecticides with novel modes of action, such as bio pesticides. Only tiny amounts of these pesticides are necessary compared to a previous class of chemicals. In several commercial crops, the neoniconoids Imidacloprid, Thiamethoxam, and others have been proven to be effective against aphids and other sucking insect pests (Wing *et al.*, 2000 [6]; Radha *et al.*, 2006 [5]; Kaur *et al.*, 2012) [4].

Methods and Materials
Preparation of field
To make the soil fully pulverized and clear of weeds, the trial area was ploughed first with a soil turning plough and then again with a desi plough. At the time of the last sloughing, farm yard manure was also applied at a rate of 150 q/ha.

Experimental Design and layout

Trial was conducted for the study of control of barley aphids. Bio pesticide and insecticidal evaluation of the experiment in randomized block design (RBD) having 3 replications laid out measuring 3 x 5 m (15 m^2) a plot. Each treatment was allowed combat the side effect of neighboring crop and facilitates the Cultural operations, a field border of 1 m was provided around the field. Block border of 1 m width was also provided between replications.

Seed and sowing

The experiment was started on November 24, 2019. The bio pesticides and insecticidal trial, which was seeded on November 24, 2019, utilized seed of susceptible variety K551 at a rate of 100 kg/ha. Sowing was done in furrows behind a Desi plough, with a row spacing of 23 cm.

Bio pesticide and insecticide spraying method and observation

The pre-population of aphids was counted in the treated experiment. The following observations were taken on before spraying and after 1, 2, 7, and 15 days. A total of 10 randomly chosen shoots from each plot were counted for aphids. After the emergence of aphids, one spray treatment with a knapsack sprayer @ 600 lit/ha was done to evaluate the effectiveness of insecticides and bio pesticides against barley aphids. The spray solution was prepared on the basis following formula.

$V = C \times A\% / a.i.$

Where,
V= Volume of insecticide
C = Concentration required
A = Amount of spray solution needed (600 l ha^{-1})
% a.i. = Percentage of active ingredient of the insecticide

Result and Discussion

Application of Bio pesticides and Insecticides

The observation recorded on bio pesticides and insecticides efficiency against *R. maidis* after one day of first spraying are given in table 1. The data indicated that all the bio pesticide and insecticide showed their superiority in minimizing the aphid population. The damage of aphid in comparison to untreated check keeping 18.65 aphids/shoots. The application of Acetamiprid 20SP (6.84 aphids/shoot) was proved to be significantly superior and most effective to rest of the treated except Flubendiamide (fame 480 SC) having only (7.09 aphids/shoot). The application of Flubendiamide (fame 480 SC) was found to be at par with imidacloprid 17.8 SL, *Beauveria bassiana*, *Metarhizium anisopliae*, chlorantraniliprole 18.5 SC and Azadirachtin being 7.66, 9.28, 10.31, 12.81, and 15.30, aphids/shoots, respectively. The efficacy of *Metarhizium anisopliae* and Azadirachtin was inferior among the bio pesticide and insecticide but statistically at par with all the bio pesticide and insecticide except Acetamiprid 20 SP and Flubendiamide (fame 480 SC).

Table 1: Aphid Population and its percentage reduction one day after spray

S. No.	Treatments	Dosages (g, ml, ha, g, ml / Lit)	No. of aphid/Shoot	Percent reduction over control
1	Imidacloprid 17.8% SL	100 ml/ha	7.66(16.11)	37.11
2	Flubendiamide (fame 480 SC)	250 ml/ha	7.09(15.45)	39.69
3	Acetamiprid 20SP	100 g/ha	6.84(15.12)	40.98
4	Chlorantraniliprole 18.5% SC	100 ml/ha	12.81(20.96)	18.18
5	Azadirachtin 1500 ppm (0.15% EC)	3.0 ml/lit	15.30(23.03)	10.10
6	*Beauveria bassiana* (1×10^9 CFU/gm)	5.0 g/lit	9.28(17.96)	30.67
7	*Metarhizium anisopliae* (1×10^8 CFU/gm.)	3.0 g/lit	10.31(18.72)	26.93
8	Control		18.65 (25.62)	
SEm ±			0.186	
C.D at 5%			0.568	
SED			0.262	
C.V.			1.684	

The percentage reduction in population over untreated check was maximum in treatment Acetamiprid 20 SP 40.98 which was followed by flubendiamide 480 SC, imidacloprid 17.8 SL, *Beauveria bassiana*, *Metarhizium anisopliae*, chlorantraniliprole 18.5 SC and Azadirachtin being 39.69, 37.11, 30.67, 26.93, 18.18 and 10.10%, respectively.

The data regarding bio pesticidal and insecticidal efficacy against aphid population after 2 days of spray are presented in Table 2. It was clear from the table that all the bio pesticide and insecticide were found to be significantly superior over untreated check in minimizing the aphid population. The spray application of acetamiprid 20 SP having 4.05 aphids/shoots was proved to be most effective which did not differ significant to flubendiamide 480 SC, imidacloprid 17.8 SL and *Beauveria Bassiana* being 5.33, 5.8 and 11.72 aphids/shoot, respectively. Although, treatment Azadirachtin keeping 18.06 aphids/shoot did not differ from the flubendiamide imidacloprid and *Beauveria Bassiana*. The application of Azadirachtin was found to be least effective, which was at par chlorantraniliprole having 12.69 aphids/shoot. All the treatment were provided to be statistically superior in comparison to untreated check (27.30 Aphid/shoot). The percentage reduction over untreated check in different treatment ranged from 20.06 to 63.36% being minimum in the host treated with Azadirachtin and maximum in acetamiprid.

Table 2: Aphid Population and its percentage, reduction two day after spray

S. No.	Treatments	Dosages (g, ml, ha, g, ml / Lit)	No. of aphid / Shoot	Percent reduction over control
1	Imidacloprid 17.8% SL	100 ml/ha	5.8(13.94)	55.74
2	Flubendiamide (fame 480 SC)	250 ml/ha	5.33(13.31)	57.74
3	Acetamiprid 20 SP	100 g/ha	4.05(11.54)	63.36
4	Chlorantraniliprole 18.5% SC	100 ml/ha	12.69(20.88)	33.71
5	Azadirachtin 1500 ppm (0.15% EC)	3.00 ml/lit	18.06(25.18)	20.06
6	*Beauveria Bassiana* (1×10^9 CFU/gm.)	5.0 g/lit	11.72(20.00)	36.50
7	*Metarhizium Anisopliae* (1×10^8 CFU/gm.)	3.0 g/lit	15.67(23.34)	25.90
8	Control		27.30(31.50)	
SEm ±			0.436	
C.D at 5%			1.334	
SED			0.616	
C.V.			3.779	

The observation regarding aphid population after 7 days of spray have been presented in Table 3. revealed that application of acetamiprid 20 SP (4.43 aphids/shoot) was found significantly superior in reducing the aphids population in comparison to other bio pesticide and insecticide except flubendiamide 480 SC, imidacloprid 17.5 SL and *Beauveria Bassiana* also gave similar efficacy statistically to acetamiprid 20 SP. The application of Azadirachtin (31.57 aphids/shoot) was found to be least effective, which was at par chlorantraniliprole 18.5 SC having 21.83 aphid/shoot. All the treatments were proved to be statistically superior in comparison to untreated check (89.58 aphids/shoot). The percentage reduction in population over untreated check was highest treatment acetamiprid (82.98). Rest of the treatment such as flubendiamide, imidacloprid, *Beauveria bassiana*, chlorantraniliprole, *Metarhizium anisopliae* and Azadirachtin provided the reduction population of aphids as 79.42, 78.60, 73.70, 60.90, 55.83, and 51.95 percent respectively.

Table 3: Aphid Population and its percentage, reduction 7 day after spray

S. No.	Treatments	Dosages (g, ml, / ha, g, ml / Lit)	No. of aphid / Shoot	Percent reduction over control
1	Imidacloprid 17.8% SL	100 ml/ha	6.86(15.23)	78.60
2	Flubendiamide (fame 480 SC)	250 ml/ha	6.40(14.65)	79.42
3	Acetamiprid 20SP	100 g/ha	4.43(12.11)	82.98
4	Chlorantraniliprole 18.5% SC	100 ml/ha	21.83(27.83)	60.90
5	Azadirachtin 1500 ppm (0.15% EC)	3.00 ml/lit	31.57(34.20)	51.95
6	*Beauveria Bassiana* (1×10^9CFU/gm)	5.0 g/lit	10.33(18.72)	73.70
7	*Metarhizium Anisopliae* (1×10^8CFU/gm.)	3.0 g/lit	27.20(31.44)	55.83
8	Control		89.58(71.19)	
SEm ±			0.406	
C.D at 5%			1.244	
SED			0.575	
C.V.			2.498	

The observation regarding aphid population after 15 days of spray have been presented in Table 4. Revealed that application of acetamiprid (3.72 aphids/shoot) was found significantly superior in reducing the aphid population in comparison to other bio pesticide and insecticide except flubendiamide imidacloprid, and chlorantraniliprole also gave similar efficacy statistically to acetamiprid. The application of Azadirachtin (31.67 aphids/shoot) was found to be least effective, which was at par *Metarhizium anisopliae* having 26.53 aphids/shoot.

Table 4: Aphid Population and its percentage, reduction 15 days after spray

S. No.	Treatments	Dosages (g, ml, ha, g, ml / Lit)	No. of aphid / Shoot	Percent reduction over control
1	Imidacloprid 17.8% SL	100 ml/ha	6.19 (14.42)	76.87
2	Flubendiamide (fame 480 SC)	250 ml/ha	5.61 (23.26)	62.70
3	Acetamiprid 20SP	100 g/ha	3.72 (11.09)	82.21
4	Chlorantraniliprole 18.5% SC	100 ml/ha	11.92 (20.18)	67.64
5	Azadirachtin 1500 ppm (0.15% EC)	3.0 ml/lit	31.67 (34.27)	45.05
6	*Beauveria Bassiana* (1×10^9 CFU/gm.)	5.0 g/lit	10.27 (18.63)	70.12
7	*Metarhizium anisopliae* (1×10^8 CFU/gm)	3.0 g/lit	26.53 (30.98)	50.32
8	Control		78.45 (62.37)	
SEm ±			1.674	
C.D at 5%			5.127	
SED			2.367	
C.V.			11.242	

All the treatment were proved to be statistically superior in comparison to be untreated check (78.45 aphids/shoot). The percentage reduction, over untreated check was highest in treatment acetamiprid (82.21). Rest of the treatments such as imidacloprid, *Beauveria Bassiana*, chlorantraniliprole, *Metarhizium anisopliae*, and Azadirachtin provided the

reduction population of aphids as 76.87, 70.12, 67.64, 60.47, 50.32 and 45.05 percent, respectively. These results agree with the view of Ahmad *et al.* (2016) [1] Reported that Imidacloprid 200 SL (0.008%) was the most effective in reducing population followed by thiamethoxam 25 WG (0.0125%), dimethoate 30 EC (0.03%), oxy-demeton methyl 125 EC (0.03%), quinalphos 25 EC (0.05%), clothianidin 50 WDG (0.025%), acetamiprid 20 SP (0.06%), flubendiamide 480 SC (0.003%) and neem seed kernel extract (NSK) (5%). The maximum yield was recorded with imidacloprid (32.65 q/ha) followed by thiamethoxam (31.72 q/ha) and dimethoate (30.59 q/ha). Choudhary *et al.* (2017) [3]. The bio efficacy of the treatments evaluated against aphid on barley crop showed that lowest population of 19.32, 20.81, 20.88, 20.95 and 21.13/ tiller was recorded in acetamiprid (0.004%), imidacloprid (0.005%), fipronil (0.01%), thiamethoxam (0.005%) and dimethoate (0.03), respectively and were found statistically at par in their efficacy. The *Beauveria Bassiana* (1 g/ l), NSKE (5.0%), imidacloprid (8 g/ kg), thiamethoxam (8 g/ kg) and acetamiprid (8 g/ kg) registered 42.57, 42.97, 48.47, 49.26 and 51.60 aphids/ tiller, respectively. The highest aphid population was recorded in untreated control (81.23/ tiller). The data of seed yield revealed that maximum yield of 34.25 q ha^{-1} was recorded in the plots treated with imidacloprid (0.005%) followed by acetamiprid (0.004%), thiamethoxam (0.005%), fipronil (0.01%) and dimethoate (0.03%) which gave 33.85, 33.01, 32.90 and 32.58 q ha^{-1} seed yield, respectively and all these found statistically at par each other and proved significantly superior over rest of the treatments. The maximum net profit (Rs. 11444 ha^{-1}) was recorded from plots treated with imidacloprid (0.005%) which gave benefit cost ratio of 7.43 followed by acetamiprid (0.004%), imidacloprid (0.005%), thiamethoxam (0.005) and dimethoate (0.03%) with benefit cost ratio of 8.66, 7.43, 5.42 and 8.04, respectively.

Conclusion

Spray of tested bio pesticides and insecticides was observed overall effect of four observations, it was found that the application of acetamiprid (3.72 aphids/shoot) was found significantly superior in reducing the aphid population in comparison to other bio pesticide and insecticide except flubendiamide, imidacloprid also gave similar efficacy statistically to acetamiprid. The application of Azadirachtin (31.67 aphids/shoot) was found to be least effective, which was at par chlorantraniliprole, *Metarhizium anisopliae*. All treatments were found to be statistically superior in comparison to be untreated check (78.45 aphids/shoot). The percentage reduction in population over untreated check in various treatments varies from 45.05 to 82.21 per cent, the lowest in Azadirachtin and highest in Acetamiprid 20SP.

References

1. Ahmad H, Mir IA, Sharma D, Srivastava K, Ganai SA, Sharma S. Seasonal incidence and management of wheat aphid, *Sitobion avenae* (F.). Indian Journal of Entomology. 2016;78(2):148-152.
2. Anonyms. Annual progress report of Barley improvement ICAR, IIWBR, Karnal, 2021.
3. Choudhary PK, Jakhar S, Kumawat KC. Evaluation of Some Insecticides and Biopesticides for Management of Barley Aphid (*Rhopalosiphum maidis*). International Journal of Current Microbiol. App. Science. 2017;6(8):1330-1338.
4. Kaur A, Sharma N, Kaur G, Dhawan AK. Relative efficacy of new insecticides against wheat aphid, *Rhopalosiphum maidis* (Fitch). Indian Journal of Entomology. 2012;74(2):206-208.
5. Radha ITS, Madhumathi T, Rao PA, Rao VS. Studies on management of major insect pests on maize with different groups of insecticides. Indian Journal of Plant Protection. 2006;34(2):252-255.
6. Wing KD, Sacher KY, Tsurubuchi Y, Mulderig L Connair SM. Bio activation and mode of action of the oxadiazine indoxacarb in insects. Crop Protection. 2000;19(8-10):537-545.