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Field efficacy of biorational and chemical insecticides against mango leaf hoppers (*Amritodus atkinsoni* and *Idioscopus* spp.)

SANDEEP SINGH[1],*, RAJWINDER KAUR SANDHU[1], RAKESH KUMAR SHARMA[2], PRABHJOT KAUR[3], GURPREET SINGH MAKKAR[4] and HARPAL SINGH RANDHAWA[5]

Punjab Agricultural University, Ludhiana 141 004, India

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Mango (*Mangifera indica* L.) is a very important fruit of India grown over an area of 2.30 million ha with an annual production of 21.38 million tonnes (Anonymous 2021). Mango leaf hoppers, *Amritodus atkinsoni* (Leth) and *Idioscopus* spp. are most serious and widely spread insect-pests causing severe yield reduction in mango crop (Reddy *et al*. 2020). If the timely management interventions not initiated, the fruit quality can be severely affected and may cause considerable yield loss up to 50–60% (Adnan *et al*. 2014). Presently, mango growers are totally dependent on synthetic insecticides for its management and indiscriminate use of insecticides had led to harmful effect on natural enemies, development of insecticide resistance and environmental pollution. Therefore, an experiment was conducted to evaluate the bioefficacy of biorational, botanicals and chemical molecules to manage these hoppers.

During 2019 and 2021, efficacy of different insecticides, viz. lambda-cyhalothrin 5 EC (0.5, 1.0 and 1.5 ml/l), imidacloprid 17.8 SL (0.2, 0.4 and 0.6 ml/l), thiamethoxam 25 WG (0.05, 0.1 and 0.2 g/l), deltamethrin 2.8 EC (0.25, 0.5 and 0.75 ml/l), dimethoate 30 EC (0.82, 1.65 and 3.3 ml/l), buprofezin 25 SC (1.0, 2.0 and 3.0 ml/l), oxy-demeton methyl 25 EC (0.5, 1.0 and 1.5 ml/l) and PAU homemade neem extract and PAU homemade dharek extract (10, 12 and 14 ml/l) was tested along with malathion 50 EC (1.5 ml/l) as check insecticide. Two sprays were given with 15 days interval at flowering stage. A set of 5 trees was kept as untreated control. During 2019, research trial was carried out at Fruit Research Station (FRS), Gangian (Hoshiarpur) and during 2021, multi-location research trials were conducted at four locations, viz. Gurdaspur (Regional Research Station), Hoshiarpur [Government Garden and Fruit Nursery, Khiala Bulanda; FRS, Gangian; and Jhandia Kalan (Ropar)]. The observations on the number of leaf hoppers were made at 3rd, 7th, 10th and 14th days after spraying from randomly selected 10 inflorescences per tree. Nymphal and adult counts of leaf hoppers were used to calculate per cent reduction in population over control and were analyzed statistically by ANOVA with square root transformations (Sheoron 1998).

The data during 2019 (Table 1 and Table 2) indicated that there was significant ($P<0.05$) difference in population of hoppers on trees sprayed with different insecticidal treatments ($P=0.05$). After first spray, lambda-cyhalothrin 5 EC @1.5 ml showed best results after 14 days of spray followed by thiamethoxam 25 WG @0.2 g and imidacloprid 17.8 SL @0.6 ml. After second spray, lambda-cyhalothrin 5 EC @1.5 ml provided best control. PAU homemade neem extract and PAU homemade dharek extract @14 ml provided satisfactory reduction in hopper population.

The data recorded during 2021 at all locations have been presented in Fig 1 and Fig 2. Lambda-cyhalothrin 5 EC @1.0 ml/l resulted in maximum reduction in hopper population at 3 and 14 days after spray, respectively (Fig 1 and Fig 2). At 14 days after spray, imidacloprid 17.8 SL @ 0.4 ml/l provided best control followed by thiamethoxam 25 WG @0.1 g/l, deltamethrin 2.8 EC @0.5 ml/l, dimethoate 30 EC @1.65 ml/l, buprofezin 25 SC @2.0 ml/l, oxydemeton methyl 25 EC @1.0 ml/l and malathion 50 EC @1.5 ml/l. PAU homemade neem extract and PAU homemade dharek extract @ 14 ml/l were also effective. Although insecticides provided maximum reduction but botanicals also provided significant population reduction of hoppers. The findings of present studies are in line with the results obtained by Verghese (2000) and Anant *et al*. (2019) who showed that imidacloprid (0.2–0.8 ml/l) and lambda-cyhalothrin (0.5 ml/l) were effective in reducing mango hopper population to 55–60% The present results are in conformity with the results of Sarode and Mohite (2016) where imidacloprid

Punjab Agricultural University, Ludhiana, Punjab; [2]Farm Advisory Service Centre, Gangian, Hoshiarpur, Punjab; [3]Krishi Vigyan Kendra, Bahowal, Hoshiarpur, Punjab; [4]Krishi Vigyan Kendra, Ludhiana, Punjab; [5]PAU Regional Research Station, Gurdaspur, Punjab. *Corresponding author email: sandeep_pau.1974@pau.edu

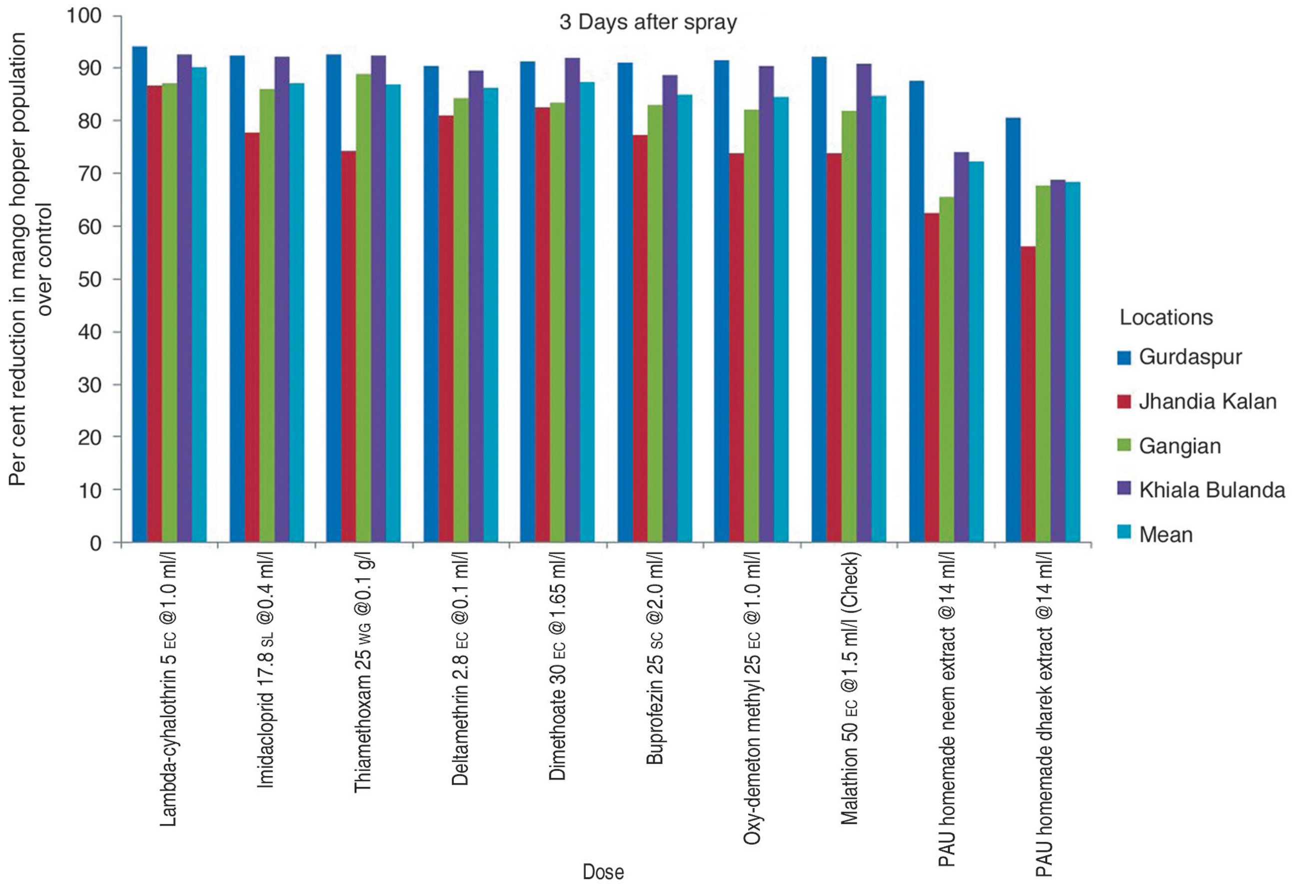

Fig 1 Per cent reduction in mango leaf hopper population 3 days after spray at different locations using insecticides/botanicals.

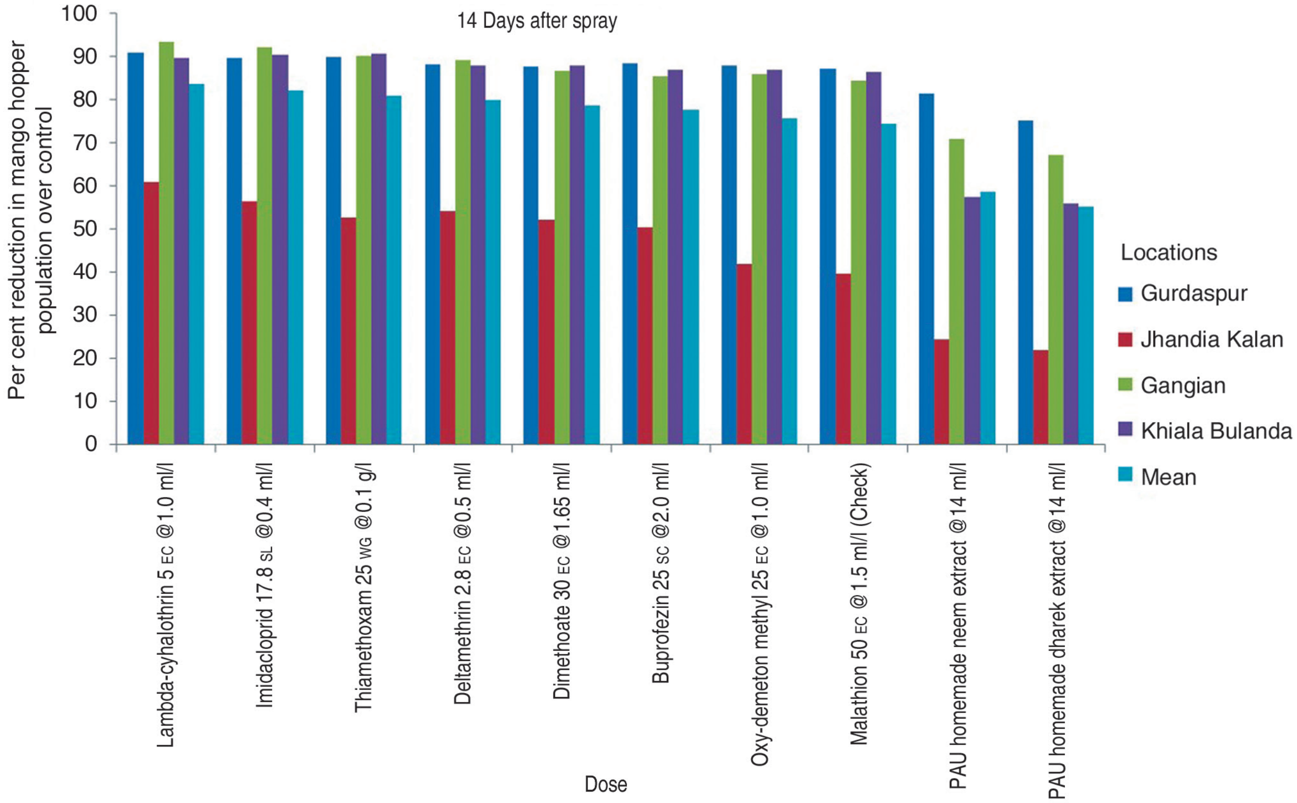

Fig 2 Per cent reduction in mango leaf hopper population 14 days after spray at different locations using insecticides/botanicals.

Table 1 Reduction in mango leaf hopper population after 1st spray at Fruit Research Station, Gangian during February-March 2019

Treatment	First spray			
	Hopper population per 10 inflorescences (No.)*			
	3 DAS	7 DAS	10 DAS	14 DAS
Lambda-cyhalothrin 5 EC @0.5 ml/l	4.00 (2.23)	4.10 (2.24)	3.50 (2.07)	3.90 (2.20)
Lambda-cyhalothrin 5 EC @1.0 ml/l	4.00 (2.23)	3.60 (2.11)	2.90 (1.99)	3.20 (2.06)
Lambda-cyhalothrin 5 EC @1.5 ml/l	3.48 (2.11)	2.00 (1.70)	2.50 (1.87)	2.76 (1.94)
Imidacloprid 17.8 SL @0.2 ml/l	4.40 (2.32)	4.30 (2.29)	3.70 (2.15)	4.00 (2.23)
Imidacloprid 17.8 SL @0.4 ml/l	4.28 (2.24)	3.20 (2.06)	2.50 (1.87)	3.60 (2.11)
Imidacloprid 17.8 SL @0.6 ml/l	3.76 (2.21)	2.69 (1.92)	2.76 (1.94)	3.00 (2.04)
Thiamethoxam 25 WG @0.05 g/l	5.50 (2.56)	3.20 (2.06)	2.90 (2.08)	3.40 (2.07)
Thiamethoxam 25 WG @0.1 g/l	4.00 (2.23)	2.50 (1.87)	1.70 (1.67)	3.00 (2.04)
Thiamethoxam 25 WG @0.2 g/l	3.80 (2.19)	2.60 (1.89)	1.50 (1.44)	2.80 (1.95)
Deltamethrin 2.8 EC @0.25 ml/l	5.00 (2.43)	4.80 (2.40)	3.90 (2.20)	6.20 (2.68)
Deltamethrin 2.8 EC @0.5 ml/l	4.70 (2.37)	3.70 (2.15)	2.80 (1.95)	4.20 (2.28)
Deltamethrin 2.8 EC @0.75 ml/l	4.55 (2.32)	3.56 (2.10)	4.10 (2.23)	4.40 (2.29)
Dimethoate 30 EC @0.82 ml/l	5.22 (2.48)	5.10 (2.45)	3.60 (2.11)	4.00 (2.23)
Dimethoate 30 EC @1.65 ml/l	4.67 (2.36)	4.05 (2.23)	3.10 (2.06)	5.40 (2.52)
Dimethoate 30 EC @3.3 ml/l	4.42 (2.33)	3.89 (2.20)	2.89 (2.08)	5.10 (2.45)
Buprofezin 25 SC @1 ml/l	5.00 (2.43)	4.00 (2.23)	3.00 (2.04)	5.50 (2.54)
Buprofezin 25 SC @2 ml/l	4.50 (2.31)	3.58 (2.10)	2.60 (1.89)	3.19 (2.06)
Buprofezin 25 SC @3 ml/l	4.20 (2.26)	3.90 (2.20)	3.00 (2.04)	4.20 (2.28)
Oxy-demeton methyl 25 EC @0.5 ml/l	4.70 (2.38)	4 .00 (2.23)	2.70 (1.94)	3.60 (2.11)
Oxy-demeton methyl 25 EC @1.0 ml/l	4.30 (2.29)	3.80 (2.16)	3.60 (2.11)	3.90 (2.20)
Oxy-demeton methyl 25 EC @1.5 ml/l	4.20 (2.25)	3.20 (2.06)	2.80 (1.92)	3.30 (2.06)
Malathion 50 EC @1.0 ml/l (Check)	5.00 (2.43)	4.50 (2.36)	3.80 (2.16)	4.00 (2.23)
Malathion 50 EC @1.5 ml/l (Check)	5.30 (2.49)	4.30 (2.29)	3.70 (2.15)	6.00 (2.65)
Malathion 50 EC @2.0 ml/l (Check)	5.40 (2.51)	4.40 (2.32)	3.50 (2.07)	5.10 (2.44)
PAU homemade neem extract @10 ml/l	11.00 (3.44)	8.00 (2.97)	7.50 (2.90)	8.60 (3.10)
PAU homemade neem extract @12 ml/l	12.30 (3.64)	11.00 (3.44)	10.00 (3.30)	15.33 (4.04)
PAU homemade neem extract @14 ml/l	9.67 (3.25)	10.33 (3.35)	9.67 (3.26)	14.33 (3.91)
PAU homemade dharek extract @10 ml/l	10.00 (3.30)	8.90 (3.14)	8.30 (3.05)	9.12 (3.20)
PAU homemade dharek extract @12 ml/l	11.67 (3.55)	10.33 (3.35)	9.00 (3.15)	13.67 (3.82)
PAU homemade dharek extract @14 ml/l	11.00 (3.44)	9.67 (3.26)	8.67 (3.10)	12.33 (3.62)
Control (water spray)	31.33 (5.68)	34.33 (5.90)	35.67 (5.94)	37.00 (6.16)
CD (P=0.05)	(0.68)	(0.70)	(0.75)	(0.44)

*Figures in parentheses are square root transformed values; DAS, Days after spray; Mean of 9 trees (3 trees per replication)

recorded minimum population (2.20/5 panicles) of mango hopper. Bhut and Jethva (2017) reported that application of imidacloprid reduced mango hopper population to 2.99 hoppers/inflorescence. Sharana *et al.* (2018), Shawan *et al.* (2018) and Kumar *et al*. (2019) found imidacloprid and neem oil effective against mango hoppers. Kadavkar *et al*. (2021) depicted that imidacloprid was found most effective with highest reduction of mango hopper population (77.66%) followed by thiamethoxam (68.26%) and azadirachtin (30.96%). Similar finding on the efficacy of neem oil against mango hoppers was also reported by Adnan *et al*. (2014), Chaudhari *et al*. (2017) and Rehman *et al*. (2018).

SUMMARY

Mango hopper is an important pest of mango that causes severe losses in yield and lower quality of fruit. The objective of the study was to investigate the susceptibility of mango hopper to the selected chemical and botanical insecticides and to find out the efficacy of different concentrations of selected insecticides/botanicals in controlling the mango hopper in the field conditions. Field experiments were conducted at four locations of Punjab, viz. Gurdaspur

Table 2 Reduction in mango leaf hopper population after 2nd spray at Fruit Research Station, Gangian during February-March 2019

Treatment	Second spray			
	Hopper population per 10 inflorescences (No.)*			
	3DAS	7DAS	10DAS	14DAS
Lambda-cyhalothrin 5 EC @0.5 ml/l	3.32 (2.06)	3.27 (2.06)	4.83 (2.41)	7.68 (2.96)
Lambda-cyhalothrin 5 EC @1.0 ml/l	2.94 (1.99)	2.84 (1.92)	4.36 (2.30)	6.49 (2.74)
Lambda-cyhalothrin 5 EC @1.5 ml/l	2.20 (1.80)	1.76 (1.72)	2.65 (1.89)	5.14 (2.45)
Imidacloprid 17.8 SL @0.2 ml/l	3.43 (2.07)	3.45 (2.07)	5.37 (2.51)	8.16 (2.28)
Imidacloprid 17.8 SL @0.4 ml/l	3.33 (2.06)	2.33 (1.83)	3.71 (2.18)	6.00 (2.65)
Imidacloprid 17.8 SL @0.6 ml/l	2.30 (1.83)	1.58 (1.49)	2.18 (1.76)	5.67 (2.57)
Thiamethoxam 25 WG @0.05 g/l	3.40 (2.07)	3.29 (2.07)	4.79 (2.39)	7.52 (2.77)
Thiamethoxam 25 WG @0.1 g/l	2.67 (1.90)	2.47 (1.87)	2.33 (1.83)	6.33 (2.70)
Thiamethoxam 25 WG @0.2 g/l	2.52 (1.88)	2.29 (1.81)	3.11 (2.06)	5.69 (2.57)
Deltamethrin 2.8 EC @0.25 ml/l	3.10 (2.06)	3.22 (2.06)	3.73 (2.18)	6.00 (2.65)
Deltamethrin 2.8 EC @0.5 ml/l	2.59 (1.89)	2.25 (1.80)	3.21 (2.06)	6.63 (3.12)
Deltamethrin 2.8 EC @0.75 ml/l	2.45 (1.85)	2.18 (1.76)	3.18 (2.06)	5.38 (2.49)
Dimethoate 30 EC @0.82 ml/l	3.45 (2.07)	3.56 (2.10)	5.41 (2.52)	7.40 (2.88)
Dimethoate 30 EC @1.65 ml/l	2.43 (1.85)	2.50 (1.88)	4.97 (2.45)	5.67 (2.57)
Dimethoate 30 EC @3.3 ml/l	2.33 (1.83)	2.22 (1.80)	4.62 (2.37)	6.00 (2.65)
Buprofezin 25 SC @1 ml/l	4.33 (2.31)	3.00 (2.04)	5.67 (2.57)	7.50 (2.92)
Buprofezin 25 SC @2 ml/l	3.67 (2.14)	3.33 (2.06)	5.34 (2.51)	6.69 (2.77)
Buprofezin 25 SC @3 ml/l	3.42 (2.07)	3.15 (2.06)	4.78 (2.39)	6.53 (2.91)
Oxy-demeton methyl 25 EC @0.5 ml/l	4.54 (2.33)	3.89 (2.20)	5.98 (2.64)	8.00 (2.97)
Oxy-demeton methyl 25 EC @1.0 ml/l	3.96 (2.21)	3.48 (2.08)	4.87 (2.42)	7.72 (2.97)
Oxy-demeton methyl 25 EC @1.5 ml/l	3.74 (2.18)	3.16 (2.06)	5.26 (2.50)	6.45 (2.74)
Malathion 50 EC @1.0 ml/l (Check)	3.42 (2.07)	3.55 (2.08)	5.74 (2.59)	8.50 (3.10)
Malathion 50 EC @1.5 ml/l (Check)	3.21 (2.06)	3.17 (2.06)	4.90 (2.44)	6.67 (2.77)
Malathion 50 EC @2.0 ml/l (Check)	2.67 (1.90)	2.79 (1.94)	4.58 (2.32)	5.33 (2.51)
PAU homemade neem extract @10 ml/l	12.34 (3.64)	11.00 (3.44)	11.54 (3.54)	15.56 (4.14)
PAU homemade neem extract @12 ml/l	11.33 (3.50)	9.67 (3.26)	9.00 (3.15)	14.67 (3.95)
PAU homemade neem extract @14 ml/l	10.67 (3.41)	8.33 (3.05)	7.67 (2.94)	12.33 (3.62)
PAU homemade dharek extract @10 ml/l	11.73 (3.57)	10.73 (3.45)	10.34 (3.35)	14.00 (3.90)
PAU homemade dharek extract @12 ml/l	10.67 (3.41)	9.00 (3.15)	11.11 (3.43)	11.67 (3.55)
PAU homemade dharek extract @14 ml/l	10.33 (3.35)	7.33 (2.89)	9.33 (3.33)	11.33 (3.50)
Control (water spray)	40.67 (6.45)	38.33 (6.26)	42.67 (6.61)	45.67 (6.83)
CD (P=0.05)	(0.45)	(0.55)	(0.44)	(0.68)

(Regional Research Station), Hoshiarpur [Government Garden and Fruit Nursery, Khiala Bulanda; FRS, Gangian; Jhandia Kalan (Ropar)] to evaluate different botanicals and chemicals along with Malathion 50 EC as check insecticide during 2019–21. Results indicated that lambda-cyhalothrin 5 EC @1.0 ml/l, imidacloprid 17.8 SL @0.4 ml/l, deltamethrin 2.8 EC @0.5 ml/l, thiamethoxam 25 WG @0.1 g/l, dimethoate 30 EC @1.65 ml/l, buprofezin 25 SC @2.0 ml/l, oxydemeton methyl 25 EC @1.0 ml/l and malathion 50 EC @1.5 ml/l were found significantly effective against mango leaf hoppers with reduction in population from 90–60%. PAU homemade neem extract @14 ml/l and PAU homemade dharek extract @4 ml/l resulted in 28–80% reduction, respectively. These wide options will help the farmers for opting wide range of insecticides and botanicals for need based spraying of these insecticides instead of schedule sprayings.

REFERENCES

Adnan S M, Uddin M M, Alam M J, Islam M S, Kashem M A and Rafii M Y. 2014. Management of mango hopper (*Idioscopus clypealis)* using chemical insecticides and neem oil. *Science World Journal* **1**: 1–5.

Anant A K, Awasthi A and Pandi G G P. 2019. Evaluation of insecticides against mango hoppers *Amritodus atkinsoni* and *Idioscopus clypealis. Indian Journal of Entomology* **81**(2):

340–46.

Anonymous. 2021. *Horticultural Statistics at a Glance*. Ministry of Agriculture and Farmers Welfare, Govt. Of India.

Bhut J B and Jethva D M. 2017. Effectiveness of different insecticides against hopper*, Amritodus atkinsoni* (Lethierry) in mango. *Bioscan* **12**(2): 807–09.

Chaudhari A U, Sridharan S and Singh S D S. 2017. Management of mango hopper with newer molecules and biopesticides under ultra high density planting. *Journal of Entomology and Zoology Studies* **5**(6): 454–58.

Kadavkar S S, Patil S A, Hole U B, Mohite P B and Thamidela M D. 2021. Efficacy of newer insecticides against mango hopper *Amritodus atkinsoni* Leth. *Journal of Pharmaceutical Innovation* **10**(3): 794–98.

Kumar A, Ananat A, AlokAwsthi G and Guru P P. 2019. Evaluation of insecticides against mango hoppers *Amritodus atkinsoni* and *Idioscopus clypealis*. *Indian Journal of Entomology* **81**(2): 340–42.

Reddy P V R, Rashmi M A, Sreedevi K and Singh Sandeep. 2020. Sucking pests of mango. *Sucking Pests of Crops,* 99 411–24. Omkar (Eds). Springer Nature, Singapore. https://doi.org/10.1007/978-981-15-6149-8_16.

Rehman M S, Jahan M, Islam M K S and Ahmmed S. 2018. Biorational management of mango hopper *Idioscopus clypealis* (leth.) using a microbial pesticide (*Beauveria bassiana*) and some botanicals. *International Journal of Agricultural Sustainability* **14**(7): 1–6.

Sarode B R and Mohite P B. 2016. Seasonal incidence and biorational management of mango hopper, *Amritodus atkinsoni* (Leth.) *International Journal of Agricultural and Veterinary Sciences* **9**(1): 29–31.

Sharana B, Pavithra H B, Maruthi M S and Nagarajappa A. 2018. Efficacy of different newer insecticides against mango leaf hoppers. *Journal of Entomology and Zoology Studies* **6**(1): 834–37.

Shawan S I, Rashed R U, Mitu A S and Jahan M. 2018. Efficacy of different chemical and botanical insecticides in controlling mango hopper *Amritodus atkinsoni* L. *Advances in Plants and Agriculture Research* **8**(2): 127–31.

Sheoran O P, Tonk D S, Kaushik L S, Hasija R C and Pannu R S. 1998. *Statistical software package for agricultural research workers*. Department of Mathematics Statistics, CCS HAU, Hisar, pp 139–43.

Verghese A. 2000. Effect of imidacloprid, lambda-cyhalothrin and azadirachtin on the mango hopper, *Idioscopus niveosparsus* (Leth.) (Homoptera: Cicadellidae). *Acta Horticulturae*: 733–36.