

Efficacy of chemicals and bio-pesticides against Mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard

Abstract

The present investigation was conducted during *rabi* season of 2023-2024 at Crop Research farm, NAI, SHUATS, Prayagraj using Randomized Block Design (RBD) method and 8 treatments in replicated thrice. Results revealed that, among all the treatments Imidacloprid 17.8 SL recorded lowest population of aphid (55.67), followed by Spinosad 45% SC (66.51), Cypermethrin 10% EC (78.55), Sixer plus (94.49), Nisco MECH 333 (96.17), Neem oil 5% (99.44), and *Beauveria bassiana* (109.90) was less effective among all the treatments. While, the highest yield and cost benefit ratio was obtained with Imidacloprid 17.8 SL (18.15 q/ha.), (1:5.20) Followed by Spinosad 45% SC (17.85 q/ha.), (1:4.78), Cypermethrin 10% EC (16.35 q/ha.), (1:4.54), Sixer plus (14.98 q/ha.), (1:4.18), Nisco MECH 333 (14.58 q/ha.), (1:4.08), Neem oil 5% (13.03 q/ha.), (1:3.61), *Beauveria bassiana* (12.55 q/ha.), (1:3.48) Least monetary return was obtained with control(9.17 q/ha.), (1:2.74).

Keywords:- Field efficacy, Imidacloprid, Insecticides, *Lipaphis erysimi*, Mustard

Introduction

The term "mustard" originally referred to a condiment and was derived from the Latin word "mustum". Mustard, *Brassica juncea* (L.) A significant oilseed crop in the Cruciferae (also known as the Brassicaceae) family is czern and coss. Brown mustard or Indian mustard has chromosomal number ($2n=36$). **(Sen and Kumar 2023)**

Mustard is also rich in minerals like Calcium, Manganese, Copper, Iron, Selenium, Zinc, Vitamin (A, B and C) and proteins. 1000 g mustard seed contains 508 k. cal. energy, 28.09 g carbohydrates, 26.08 g proteins, 26.08 g total fat and 12.2 g dietary fibre, 31 I.U. Vitamin A, 4.733 mg Niacin, 7.1 mg Vitamin C, 266 mg Calcium, 9.21 mg Iron, 370 mg Magnesium, 13 mg Sodium and 738 mg Potassium **(Dharavath et al., 2016)**.

India ranks world's third important oil crop in terms of production and area. it is one of the three major oilseeds crops along with groundnut and soybean contributing around 25 per cent of the total oilseeds production. **(Sen et al., 2017)**.

Lipaphis erysimi belongs to family Aphididae and is commonly known as mustard aphid. It is a cosmopolitan insect and found on both the leaf surfaces and in leaf folds of developing heads, on leaf stalks, and on leaf axles. They are found primarily on the growing points of the host plants, including tips, flowers and developing pods and cover the whole plant with high density. They suck sap from the hosts and infested plants become stunted and distorted. **(Sharma et al., 2020)**.

Newer insecticide molecules are a better alternative to conventional synthetic insecticides in the context of environmentally benign management tactics so also in order to mitigate the adverse effect on the total environment. In many cases, alternate or eco-friendly methods of insect management offer adequate levels of pest control with less hazards and safety to non-target organisms.



Materials and Methods

The experiment was conducted at the experimental research plot of the Department of Entomology, Central Research Farm, Sam Higginbottom University of Agriculture Technology and Sciences, during the *rabi* season of 2023-2024. in a randomized block design with eight treatments replicated three times using variety, kala Sona seeds in a plot size of 2m×1m at a spacing of 15cm×20cm with a recommended package of practices excluding plant protection. The treatments includes-Nisco Mech 333@ 5ml/lit., Spinosad 45 SC @0.3ml/lit., Cypermethrin 10% EC @1.2 ml/lit., Sixer plus@5ml/lit., Imidacloprid 17.8 SL @1ml/2.5lit., Neem oil 5%@ 5ml/lit., *Beauveria bassiana* 1.15WP @5gm/lit.



The observations on population of mustard aphid were recorded visually using a magnifying lens and a paper for counting the population of aphid, early on top 10cm central apical twig per plant from five randomly selected plant. The population of aphids was recorded in the field on the five randomly selected plants from each plot at one day before spray and 3rd, 7th and 14th days after one spray of insecticides and statically analysed.



Result and discussion

The results (Table-1) after spray revealed that all the treatments were significantly superior over control. Among all the treatments, minimum infestation of aphid was recorded in Spinosad 45% SC (66.51) which was lower than the check treatment Imidacloprid 17.8 SL (55.67) followed by Cypermethrin 10 % EC (78.54), Sixer plus (94.49), Nisco Mech 333 (96.17), and Neem oil 5% (99.44) The least effective treatments was *Beauveria bassiana* (109.90). Maximum infestation was recorded in control (241.87).

The highest yield and cost benefit ratio was obtained with Imidacloprid 17.8 SL (18.15 q/ha.), (1:5.20) Followed by Spinosad 45% SC (17.85 q/ha.), (1:4.78), Cypermethrin 10% EC (16.35 q/ha.), (1:4.54), Sixer plus (14.98 q/ha.), (1:4.18), Nisco MECH 333 (14.58 q/ha.), (1:4.08), Neem oil 5% (13.03 q/ha.), (1:3.61), *Beauveria bassiana* (12.55 q/ha.), (1:3.48) and control plot (9.17 q/ha.), (1:2.74).

The data on the mean aphid population after spray in Imidacloprid 17.8 SL were (55.67) .These results were supported by **Dotasara et al., (2017), Pippal et al.,(2022) and Raju and Tayde (2022)**. Spinosad 45% SC was also found to be next effective (66.51). The results were also observed by Aktar et al., (2021) and Sairam and Kumar (2022) .Cypermethrin 10% EC were (78.55). Similar findings were observed by **Bhatta et al., (2019) and Sreeja and Kumar (2022)**. Nisco Mech 333 was (96.17) is found to be next effective treatment which is in line with the findings of **Sairam and Kumar (2022)**

The cost benefit ratio ranged between 1:5.20 and 1:2.74. Maximum cost benefit ratio (1:5.20) and yield (18.15 q/ha) was obtained in Imidacloprid 17.8 SL treated plots , which is supported by **Saiteja and Tayde (2022) and Sen and Kumar (2023)** and , followed by Spinosad 45 SC with cost benefit ratio (1:4.78) and yield (17.85 q/ha), and the results were similar to the findings of **Sairam and Kumar (2022)**. Cypermethrin 10% EC also had a profitable yield of (16.35 q/ha) and cost benefit ratio (1:4.54) lined to **Sreeja and Kumar (2022)**.

Table 1- Efficacy of selected chemicals and biopesticides on the incidence of mustard aphid, *Lipaphis erysimi* (Kaltenbach) during *rabi* Season 2023-2024 (1st spray)

| S. No. | Name of treatments | Dosages | Population of mustard aphid /top 10 cm central twig of plant | Mean population of mustard aphid /top 10 cm central twig of plant | | | | Yield (q./ha.) | Cost benefit ratio (C:B) |
|-------------------------|----------------------------------|-------------|--------------------------------------------------------------|-------------------------------------------------------------------|---------------------|----------------------|---------------|----------------|--------------------------|
| | | | (Day before spraying) | 3 rd DAS | 7 th DAS | 14 th DAS | Mean | | |
| T ₀ | Control | - | 238 | 239.2 | 241.33 | 245.07 | 241.87 | 9.17 | 1:2.74 |
| T ₁ | Nisco Mech 333 | 5 ml/ lit. | 256.13 | 175.5 | 71.40 | 41.60 | 96.17 | 14.58 | 1:4.08 |
| T ₂ | Spinosad 45 % SC | 0.3ml/lit. | 243.13 | 128.2 | 49.87 | 21.47 | 66.51 | 17.85 | 1:4.78 |
| T ₃ | Cypermethrin 10% EC | 1.2ml/lit | 268.73 | 154.50 | 55.47 | 25.67 | 78.55 | 16.35 | 1:4.54 |
| T ₄ | Sixer Plus | 5 ml/lit | 251.87 | 173.40 | 67.73 | 42.33 | 94.49 | 14.98 | 1:4.18 |
| T ₅ | Imidacloprid 17.8 SL | 1ml/2.5 lit | 254.67 | 113.60 | 41.40 | 12.00 | 55.67 | 18.15 | 1:5.20 |
| T ₆ | Neem oil 5% | 5 ml/lit. | 247.47 | 177.60 | 77.80 | 42.93 | 99.44 | 13.03 | 1:3.61 |
| T ₇ | <i>Beauveria bassiana</i> 1.15WP | 5gm/lit | 245.73 | 196.7 | 85.80 | 47.67 | 109.90 | 12.55 | 1:3.48 |
| Overall mean | | | - | 169.83 | 86.35 | 59.84 | 105.32 | | |
| F- test | | | NS | S | S | S | S | | |
| SE. d (±) | | | - | 2.56 | 2.20 | 1.67 | 21.02 | | |
| C. D. (P = 0.05) | | | - | 5.488 | 4.717 | 3.577 | 45.091 | | |

DAS*- Day after spray

NS*- Non significant

S*- Significant

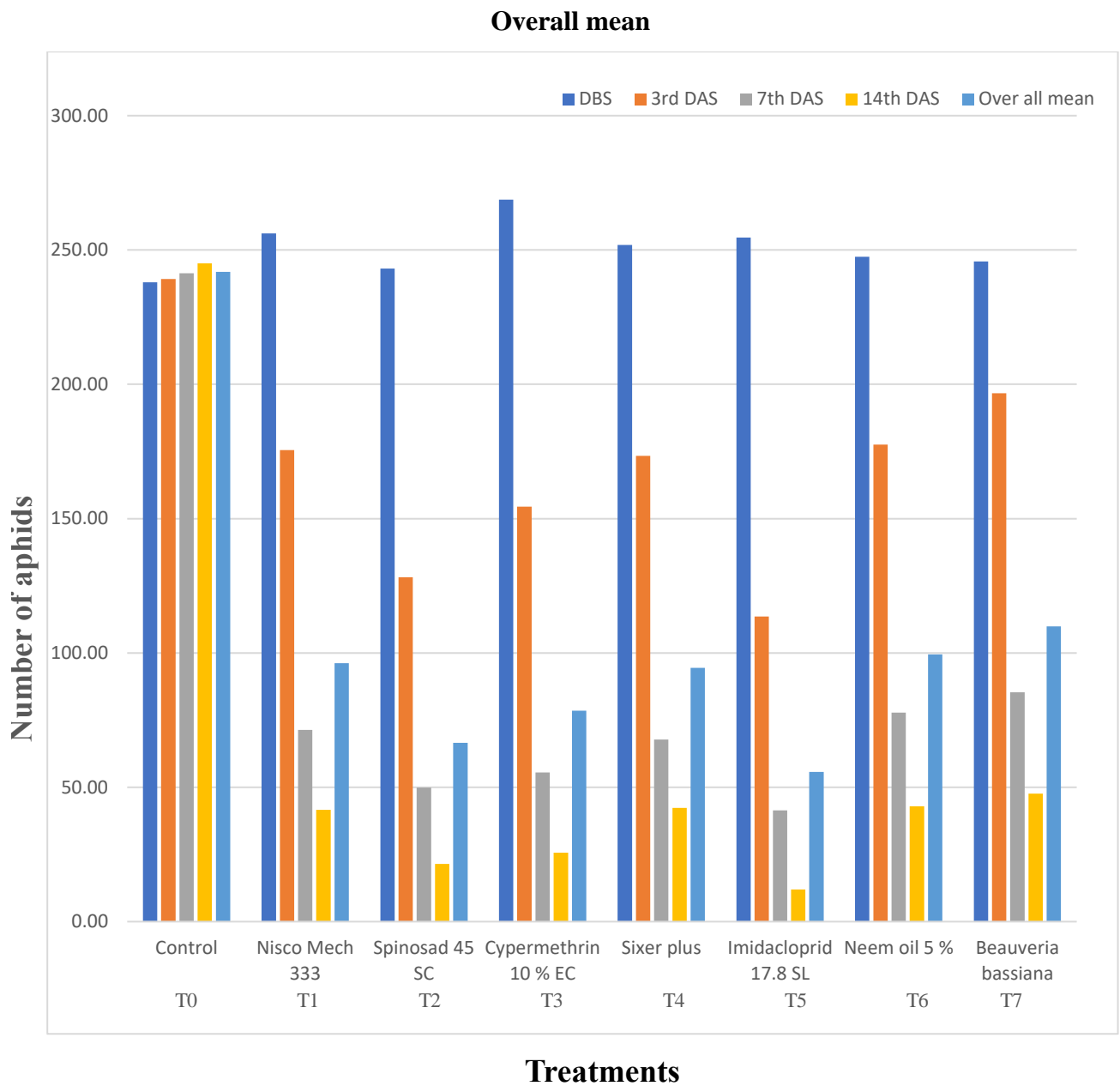


Fig. 1 Efficacy of selected chemicals and biopesticides against mustard aphid, *Lipaphis erysimi* (Kaltenbach

From the above discussion it was found that, spraying of insecticides significantly reduced the mustard aphid population on mustard. The present findings conclude that the new generation insecticides like T₁ Nisco Mech 333, T₂ Spinosad 45% SC, T₃ Cypermethrin 10% EC, T₄ Sixer Plus, T₅ Imidacloprid 17.8 SL, T₆ Neem oil 5%, T₇ *Beauveria bassiana* 1.15WP. T₄ Spinosad was found effective against *Lipaphis erysimi* along with an additional yield level in mustard. Which was lower than my check treatment Imidacloprid 17.8 SL. Further, it was observed that the cost benefit ratio was also high with Imidacloprid 17.8 SL and Spinosad 45% SC. Hence, it is suggested that the effective insecticides may be alternated in harmony with the existing Integrated pest management programs in order to avoid the problems associated with insecticidal resistance, pest resurgence etc.

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