

Evaluation of Eco-friendly Chemicals and Products against Mustard Aphid (*Lipaphis erysimi*)

RAJ KUMAR, P.B. SINGH AND H. PRASHANTH BABU

Indian Agricultural Research Institute, Regional Station, Karnal 132 001
rajknl@gmail.com

Mustard (*Brassica juncea*) is one of the important oilseed crops, constituting major source of edible oil for the human consumption and cake for animals. Every effort is being made to increase its productivity by adopting modern cultivation practices, such as use of high-yielding varieties, proper manuring, plant-protection chemicals and assured irrigation in order to meet the growing demand of oil. More than three dozen insect pests are known to be associated with various stages of mustard crop in India [1, 2]. The loss caused in yield due to these pests varies greatly within Brassicaceae under different agroclimatic regions of India.

The mustard aphid (*Lipaphis erysimi* Kalt.) is a major pest of *Brassica* [2]. The mustard aphid occurs in field from December to February. Both adults and nymphs of this aphid mainly cause damage to mustard plants at flowering stage. The aphids suck sap from leaves, flowers, flower-buds, pod and twigs. They also secrete sticky honeydew which acts as a medium for development of sooty mold fungus and reduce photosynthetic efficiency of plants. In severe infestation, leaves become curled, plants fail to develop pods, the young pods when developed fail to become mature and cannot produce healthy seeds. As a result, plants lose their vigour and growth becomes stunted [3]. The predacious coccinellid beetles, commonly known as lady bird beetles are considered to be of great economic importance in the agro-ecosystem. They have been successfully employed in the biocontrol to many injurious insects [4]. In the field mustard aphid population is naturally controlled to a large extent by its predator *Coccinella septempunctata* and

plays a vital role in lowering the population of mustard aphids in the field [5]. Good control of mustard aphid can be obtained by spraying traditional organic insecticides [6, 7]. However, some chemicals have posed serious problems to health and environmental safety, because of their high toxicity and prolonged persistence [8]. Thus, newer approaches for pest control are continuously being sought. In view of these, sincere efforts were made to test the effectiveness of eco-friendly chemicals and products against mustard aphid.

Present experiment was conducted at Indian Agricultural Research Institute Regional Station, Karnal, during *rabi*-2009-10. The trial was conducted under randomized complete block design (RCBD) with eight treatments and three replications. Each plot size was 4 m x 2.4 m with the spacing of 30 cm and 10-15 cm from row-to-row and plant-to-plant. Mustard variety "Pusa Vijay" was sown in first week of October. Treatments (Table 1) included: T₁ neem oil + surfactant; T₂ neem seed kernel powder + surfactant; T₃ Neemazal 10000 ppm; T₄ Dimethoate 30 EC; T₅ Imidacloprid 17.8 SL; T₆ Buprofezin 25 SC; T₇ Endosulfan 35 EC and T₈ the control. The neem kernel extract was prepared by soaking 100g powder in one litre of water with surfactant. In neem formulations, liquid surfactant was mixed at 0.5ml/litre of water in preparing spray solution.

The data were recorded from 10 randomly selected twigs during pre-treatment and post-treatment periods. The post-treatment observations were recorded after 7th day of spray. For this

Table 1. Treatment combinations of eco-friendly products and chemicals with their dosage

Treatment	Treatment combination	Dosage/ha	Category of chemical
T ₁	Neem oil+surfactant	2500ml	Eco-friendly
T ₂	Neem seed kernel powder+surfactant	2500g	Eco-friendly
T ₃	Neemazal 10000 ppm	1500ml	Eco-friendly
T ₄	Dimedhoate (30 EC)	1000ml	Synthetic insecticide
T ₅	Imidacloprid (17.8 SL)	100ml	Synthetic insecticide
T ₆	Buprofezin (25 SC)	750ml	Synthetic insecticide
T ₇	Endosulfan (35 EC)	1000ml	Synthetic insecticide
T ₈	Control	Water only	Control

Table 2. Per cent mortality of mustard aphids in different treatments

Treatment	Control (%)	Aphid population
T ₁	52.07	262.07 (15.82)
T ₂	53.17	284.73 (16.28)
T ₃	48.48	278.5 (16.50)
T ₄	86.53	65.63 (8.05)
T ₅	86.46	59.13 (7.05)
T ₆	57.72	231.23 (14.92)
T ₇	60.04	169.83 (12.95)
T ₈	36.09	292.83 (17.11)

Figures in parentheses are square root transformed values

purpose, aphids were gently brushed out on a white paper and counted. Percentage mortality of aphids with respect to pre-treatment data was calculated for each treatment combination.

The aphid population in pre-treatment period ranged from 59.13 to 292.83. All neem preparations, formulations and insecticides (Dimedhoate 30 EC, Imidacloprid 17.8 SL, Buprofezin 25 SC and Endosulfan 35 EC) and their combination treatments significantly reduced the aphid population during post-treatment period. Among

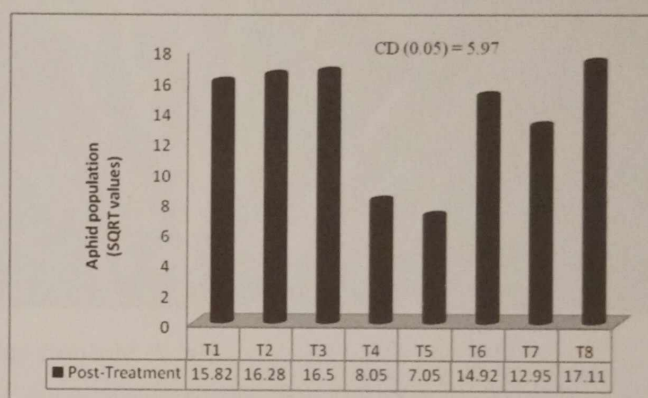


Fig. 1. Aphid population in post-treatment period

all the 8 treatments, incidence of aphid was minimum in Dimedhoate 30 EC and Imidacloprid 17.8 SL treated plots, followed by Endosulfan 35 EC and Buprofezin 25 SC with 86.53, 86.46, 60.04 and 57.72% of mortality, respectively. These results are in accordance with a study which tested Monocrotophos (0.04%), Phosphamidon (0.03%), Methyl-demeton (0.025%), Dimethoate (0.03%), Endosulfan (0.05%), Cypermethrin (0.3%) and Chlorpyrifos (0.05%) against *L. erysimi* on mustard. All the pesticides afforded 100% mortality one day after treatment except, Dimethoate [9].

The three botanicals treatments, viz. neem oil, neem seed kernel extract and Nemazal gave similar



Fig. 2: Mustard aphid and infected plant

level of control at 52.07, 53.17 and 48.48 per cent control. Similar finding of neem products was also reported against mustard aphids [10], linseed budfly [11] and safflower aphids [12]. The tested botanicals suit well for organic farming condition where synthetic insecticides cannot be used for pest control. Even though the efficacy of control was low in eco-friendly chemicals, their use is inevitable and necessary under organic condition.

CONCLUSION

Thus, it is concluded that Dimethoate and Imidacloprid were most effective insecticides against mustard aphids, hence these may be used whenever the aphid management is required. However, in organic crop production botanicals may be used as they are economical, eco-friendly and control aphids to a considerable extent.

REFERENCES

1. SINGH, H. & Z. SINGH (1983). New records of insect-pests of rapeseed- mustard. *Indian J. Agril. Sci.* 53(9): 970.
2. BAKHETIA, D.R.C. & B.S. SEKHON (1989). Insect-pests and their management in rapeseed-mustard. *J. Oilseeds Res.* 6: 269-299.
3. MORZIA, B. & S.B. HUQ (1991). Evaluation of different genotypes of Indian mustard (*Brassica juncea*) for their reaction to mustard aphid *L. erysimi*. *Indian J. Agril. Sci.* 61(3): 210-213.
4. AGARWALA, B.K., S. DAS & M. SEN CHOWDHURI (1988). Biology and food relation of *Micraspis discolor* an aphidophagous coccinellid in India. *J. Aphidol.* 2(1-2): 7-17.
5. KALRA, V.K. (1988). Population dynamics of various predators associated with mustard aphid, *L. erysimi* Kalt. *J. Bio. Control* 2(2): 77-79.
6. BAKHETIA, D.R.C. (1984). Chemical control of

Lipaphis erysimi (Kalt.) on rapeseed and mustard crops in Punjab. *J. Res. PAU* 21(1): 63-71.

7. KHURANA, A.D. & G.R. BATRA (1989). Bioefficacy and persistence of insecticides against *Lipaphis erysimi* Kalt. *J. Insect Sci.* 2(2): 139-145.
8. KULKARNI, N. & K.C. JOSHI (1998). Botanical pesticides as future alternatives to chemical in forests insect management. *SAIC Newsletter* 8(1): 3.
9. UPADHYAY, S. & R.K. AGRAWAL (1993). Efficacy of different insecticides on incidence of mustard aphid, *L. erysimi* on Indian mustard (*Brassica juncea*) and its economics. *Indian J. Agril. Sci.* 63(8): 522-525.
10. SINGH C.P. & G.C. SACHAN (2000). Bioefficacy of some neem formulations against *Lipaphis erysimi* Kalt. and effects on yield parameters of *Brassica juncea*, In: Extended summaries of national seminar on "Oilseeds and oil research and development needs in the millennium" Hyderabad, 2-4 Feb, pp. 213-314 & 283-284.
11. GUPTA, M.P., S.K. CHOURSIA & H.S. RAI (2000). Efficiency of neem plant products against the budfly (*Dasyneura lini*) on linseed. *Indian J. Agric. Sci.* 70(11): 762-764.
12. SINGH, VIJAY (2001). Management of safflower aphid through botanical insecticides. In: Proceeding of symposium on "Biocontrol based pest management for quality crop protection in the current millennium" Ludhiana, July 18-19, pp. 147.