

LOSSES IN RAPESEED/MUSTARD DUE TO LIPAPHIS ERYSIMI
(KALTENBACH) IN INDIA : A LITERATURE STUDY

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ABSTRACT

Among the many insect pests damaging rapeseed/mustard crops, Lipaphis erysimi (Kaltenbach) is most serious and is considered one of the major factors in decimating their production in India. The yield losses due to this insect in various states have been estimated to vary from 35.4 to 73.3 per cent, with a mean value of 54.2 per cent on country basis. In monetary terms, this loss amounts to approximately rupees 3780 million annually, which is about 63 per cent of the expenditure on importing edible oil in the country. Some common insecticides have been found quite effective and economical for the control of aphid, with an encouraging cost/benefit ratio of 1 : 3.40 to 10.54. Research-based recommendations for integrated control of the aphid and strategies for future research on estimating losses have been detailed.

INTRODUCTION

The area and production of rapeseed/mustard in India (Table 1) are subject to considerable fluctuations from year to year owing to the reasons that these crops are mainly grown as rainfed (about 90 per cent of area) or as mixed with wheat, gram and other rabi crops. Besides, these are highly vulnerable to a number of insect pests and diseases. Among insects, the mustard aphid, Lipaphis erysimi (Kaltenbach) is the most serious and causes enormous losses to the crop.

REVIEW OF LOSSES IN YIELD

A survey of the literature has revealed that the work on assessment of losses by the aphid in rapeseed/mustard is quite inadequate. The first report in this regard was published by Bindra (1970). He stated that rapeseed/mustard in India suffered an annual loss of Rupees 9000 million due to the aphid alone. This estimate was based on a comparison of the yields obtained

in treated vs untreated plots reported from Delhi by Pradhan *et al.* (1960) and from Punjab by Sidhu and Singh (1964), Chahal and Sukhija (1969) and Saini and Chhabra (1966). However, this estimate was based on very limited data and can not be considered true representative of the losses occurring in these crops at the national level.

Phadke (1980) estimated 11.6 to 77.5 per cent yield loss due to aphid under Delhi conditions. He also reviewed the previous work and stated losses from 24 to 95 per cent in some mustard growing regions of the country. Assuming 15 per cent overall loss in yield, he calculated a monetary loss of Rs. 700 and 730 million for 1976-77 and 1977-78 respectively.

Singhvi *et al.* (1973) reported that the mustard aphid caused 65 and 28 per cent losses in yields of toria (*B. campestris*) and rai (*B. juncea*) respectively in Haryana. Further they estimated that the losses in terms of oil produced per hectare were 67 and 32 per cent. In another communication (Singhvi *et al.* (1974), yield of sarson (*B. campestris*) and rai were reported under two schedules of pest control, which showed a loss of 65.7 and 24.9 per cent respectively.

In Punjab, Bakhetia (1982) estimated that yield losses due to mustard aphid were 80.6 per cent in sarson and 30.4 per cent in rai. Singh (1982) from Ludhiana (Punjab) reported that loss in yield was maximum when the aphid appeared at early stage of crop i.e. upto 81 and 91 days after sowing of rai and sarson respectively. Every unit increase in pest population beyond 25 aphids per plant resulted in a decrease of 769 grams of yield per hectare in rai variety RLM 198. The corresponding value for yellow sarson variety Pb 24 was 256 grams. The cost/benefit ratio was highest when the pest population was controlled at 50 aphids per plant on rai (1:9.4) and 100 aphids on yellow sarson (1:4.6).

ESTIMATED LOSSES DUE TO THE APHID

There are about 21 papers which contain yield data from the infested plots in comparison with the plots protected against the aphid. Besides, some data were available in the annual reports (1976 to 1982) of the All India Coordinated Research Project on Oilseeds (ALCORPO). Table 1 gives an account of area, production and estimated yield losses caused by L. erysimi in different states of the country.

The estimated mean loss in yield of rapeseed and mustard varies from 35.4 to 73.3 per cent under different agro-climatic conditions. The mean loss on all India basis works out as 54.2 per cent (Table 2). In terms of monetary value the loss comes to about rupees 3780 million, which is 63 per cent of our expenditure (Rs.600 crores) on importing edible oil in the country. This suggests for a campaign on community basis for aphid control in rapeseed/mustard crops.

Table 1 : Area and production (mean of 5 years i.e. 1977-81) and estimated loss in yield of rapeseed and mustard crops due to L. erysimi in different states of India.

State	Area ('000 ha)	Production ('000 tonnes)	% Loss in yield	References
Uttar Pradesh	2071	1016	45.1	1
Rajasthan	322	173	44.9	4,5
Madhya Pradesh . . .	214	82	—	—
Assam	194	83	—	—
Haryana	166	95	35.4	1,3-5,26,27
Punjab	100	60	54.9	7-11,20-24
Orissa	127	51	73.3	19
Bihar	89	42	55.2	12
Gujarat	102	47	—	—
West Bengal	105	50	63.6	1-3
Others	69	48	61.1	13-18,25
India	3556	1747	54.2	

Source : Oilseeds Statistics - Twenty five years at a Glance (1956-57 to 1980-81), Directorate of Oilseeds Development, Ministry of Agriculture, Govt. of India, Hyderabad 500 029.

Table 2 : Estimated loss in yield of rapeseed/mustard due to L. erysimi in India.

Mean loss (%)	Production ('000 tonnes)		Calculated loss	
	Actual	Potential	'000 tonnes	million Rs
54.2	1747	2693	9.46	378.4*

* Price of produce taken @ Rs. 4000/- per tonne.

INTEGRATED PEST MANAGEMENT

The chemical control of mustard aphid has attracted the attention of agricultural entomologists the most. Nowadays however the emphasis is on need-based use of pesticides integrated judiciously with other methods of pest control. An ad hoc integrated control programme, formulated on the basis of available information, is given below :

- 1 - Select resistant/tolerant varieties for sowing. The strains of B. juncea known as moderately resistant to the aphid are T 6342, RLM 198, Pant rai 35, RLM 82, UVR 751, RK 9, RG 199 and RLM 29/25.
- 2 - The crop should be sown early i.e. upto 20th October.
- 3 - Apply fertilizer in a balanced form.
- 4 - Whenever the crop shows 30 per cent plants infested by the aphid (economic threshold), use the following insecticides :

Foliar spray with 0.025% emulsion of oxydemeton methyl 25 EC/ dimethoate 30 EC/phosphamidon 100 EC or 0.035% emulsion of endosulfan 35 EC or 0.03% emulsion of chlorpyrifos 20 EC or 0.05% emulsion of malathion 50 EC @ 200-350 litres of spray fluid per hectare with a high volume sprayer OR Apply aldicarb 10 G/phorate 10 G/disulfoton 5 G/carbofuran 3 G @ 1 kg a.i./ha through broadcast followed by a light irrigation

ECONOMICS OF PEST CONTROL

On the basis of the data given in tables 1 and 2, the cost/benefit ratio for three of the commonly used insecticides was computed (Table 3). It varies from 1 : 3.40 to 10.54 in case of 1 to 3 sprays of oxydemeton methyl, 1 : 3.61 with aldicarb and 1 : 5.10 with phorate granules. It clearly shows that the adoption of control measures against the mustard aphid is an economically viable proposition.

STRATEGIES FOR FUTURE WORK

So far the method of comparing yield from the unprotected plot with that of the protected against the aphid had been followed for measuring the losses. Different methods of estimating yield losses in relation to aphid population and crop phenology need to be investigated with a view to find out the economic threshold and economic injury levels of the aphid.

Very often compounded injury occur owing to the combined infestation by more than one pest/disease at a time such as the aphid, leaf-miner and alternaria blight can damage the crop simultaneously. Thus the injury inflicted by a pest or disease is likely to affect the economic injury level of another pest. In such situations partitioning of losses due to individual organisms has to be done through more precise experiments under controlled conditions.

Table-3 : Economics of aphid control in rapeseed/mustard (Calculated on the basis of estimated losses given in Table 1 and Table 2).

Treatments for aphid control	Dose/ha	Cost of insecticide (Rs/ha)	Cost/benefit (Ratio)
Oxydemeton methyl 25 EC			
1 spray	800 ml	101	1: 10.54
2 sprays	1500 ml	195	1: 5.50
3 sprays	2500 ml	310	1: 3.40
Aldicarb 10 G @	1 kg a.i./ha 10 kg	295	1: 3.61
Phorate 10 G @	1 kg a.i./ha 10 kg	210	1: 5.10

Notes : 1 Oxydemeton methyl @ Rs. 70/litre ; Aldicarb @ Rs. 28/kg ; Phorate @ Rs. 20/kg.

2 One labour for granule application and 3 labours for one spray on one hectare. Charges @ Rs. 15 per labour per day.

REFERENCES

1. AICORPO, 1976. All India Seminar-cum-Workshop on Oilseeds held at PKV, Nagpur, April 5-9, 1976.
2. AICORPO, 1977. Progress report of 11th Annual Workshop (Rabi crops), held at G.B. Pant University of Agri. & Technology, Pantnagar, Aug. 31 - Sept. 3, 1977.
3. AICORPO, 1978. Progress report of 13th Rabi Oilseeds Workshop (Rapeseed & Mustard), held at HAU, Hissar, September 25-28, 1978.
4. AICORPO, 1981. Progress Report of Annual Meeting of Oilseeds Research Workers' Group (Rapeseed-Mustard), held at APAU, Rajendranagar (Hyderabad), Aug. 27-30, 1981.
5. AICORPO, 1982. Progress Report of Annual Rabi Oilseeds Workshop of Rapeseed-Mustard, held at IARI, New-Delhi, Aug. 9-13, 1982.
6. BAKHETIA, D.R.C. 1979. Insect pest problems and their management in rapeseed and mustard. Paper presented at the All-India Ann. Workshop-cum-Seminar on rapeseed and mustard, held at C.S. Azad Univ. Agric. & Tech., Kanpur, India Sept. 12-13, 1979.
7. BAKHETIA, D.R.C. 1982. Pest management strategies for rapeseed and mustard in India. Paper presented at the National Seminar on Production Problems and Prospects of Rapeseed/ Mustard in India, held at IARI, New-Delhi, August 9-10, 1982.
8. BAKHETIA, D.R.C., K.S. LABANA, H.S. SUKHIJA and K.S. BRAR 1979. Studies on the economic threshold of mustard aphid, Lipaphis erysimi (Kalt.) on Brassica juncea L. Symp. Recent Trends Aphidol. Studies, Utkal Univ., Bhubaneswar (Orissa), June 9-12, 1979, p. 33-34 (Abstr.).
9. Bindra, O.S. 1970. Telhan Patrika 2 (3) : 24-38.
10. Brar, K.S. and G.S. Sandhu, 1974. Pesticides. 8 (1): 30.
11. Chahal, B.S. and H.S. Sukhija, 1969. Progve Fmg PAU 5(3): 14.
12. Chaudhary, R. and C.S. Roy, 1975. Indian J. Ent. 37 : 264-68.
13. Peswani, K.M., K. Kumar and R. Lal, 1968. Indian Fmg (1968) p. 17-19.
14. Phadke, K.G. 1980. Strategy for increasing rapeseed and mustard production through pest control. Proc. FAI Group Discussion on Increasing Pulse and Oilseed Production in India, New Delhi, Sept. 4-5, 1980.
15. Pradhan, S. ; M.G. Jotwani and P. Sarup, 1960. Indian Oilseeds J. 4 : 125-41.
16. PRASAD, S.K. 1978. Indian J. Ent. 40 : 328-32.

17. PRASAD, S.K. 1978. Indian J. Ent. 40 : 401-04.
18. PRASAD, S.K. 1979. Indian J. Ent. 41 : 39-42.
19. ROUT, G. and B. Senapati, 1967. Pflanzenschutz Nachrichten
"Bayer" 20 (4): 680-86.
20. SAINI, M.L. and K.S. Chhabra, 1966. Plant Prot. Bull.
(Indian), 18 : 4-8.
21. SIDHU, H.S. and S. Singh, 1964. Indian Oilseeds J. 8. : 237-56.
22. SINGH, R. 1982. Estimation of losses in yield of mustard caused
by the aphid, Lipaphis erysimi (Kalt.). Ph. D.
Thesis submitted to PAU, Ludhiana, May 1982, p. 69.
23. SINGH, S. 1960. Indian Fmg. 10 (1): 27-28.
24. SINGH, S. and H.S. Sidhu, 1959. Indian Oilseeds J. 3 : 169-78.
25. SINGH, S. R.N. SINGH, K.M. SINGH, N.P. SINGH and S.N. SINGH,
1979. Indian J. Ent. 41 : 267-71.
26. SINGHVI, S.M., N.D. Verma and T.P. Yadava, 1973. Haryana agric.
Univ. J. Res. 3 : 5-7.
27. SINGHVI, S.M. ; A.N. Verma and T.P. Yadava, 1974. Oilseeds Jour.
4 (3): 15-19.