

# Effect of host plant diversity on abundance of turnip aphid, cabbage aphid and cabbage caterpillar infesting Indian mustard

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# Introduction

- ▶ Turnip aphid, *Lipaphis erysimi* (Kaltenbach) is a serious pest of rapeseed-mustard in Indian subcontinent and many other countries of the world.
- ▶ Losses range from 19-96 % (Bakhetia and Sekhon, 1989; Singh and Sharma, 2002).
- ▶ In addition to this, cabbage aphid, *Brevicoryne brassicae* L. and cabbage caterpillar, *Pieris brassicae* L. are also important pest of rapeseed-mustard.



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- ▶ At present, these pests are largely managed by insecticidal chemicals which have their own adverse effects.
- Thus, the need for **alternate pest management strategy** is always sought after.



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- ▶ **Intercropping of main crop with other plants is considered important alternate pest management strategy which offers effective, economical and environment friendly method of pest management.**
- ▶ **In this study, we evaluated intercropping of mustard with chickpea, coriander and fennel on population development of turnip aphid, cabbage aphid and cabbage caterpillar.**



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# Objective of the study

1. To study the effect of host plant diversity on abundance of turnip aphid, cabbage aphid and cabbage caterpillar.



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# METHODS

- ❑ Study years: 2020-21 and 2021-22
- ❑ *B. juncea* variety: Giriraj
- ❑ Design: Randomized block design
- ❑ Replications: 3
- ❑ Plot size: 8 x 3 m
- ❑ Treatments: Four
  - T<sub>1</sub>: Mustard alone
  - T<sub>2</sub>: Mustard + Chickpea (4 rows x 4 rows alternately)
  - T<sub>3</sub>: Mustard + Coriander
  - T<sub>4</sub>: Mustard + Fennel



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# METHODS

- ▶ **At initiation of flowering data on incidence of aphids and cabbage caterpillar were recorded from 10 plants selected at random from each plot.**
- ▶ **In addition to this data on population of different natural enemies were also recorded.**
- ▶ **Yield data were recorded at harvest.**



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# RESULTS

Table 1. Effect of host plant diversity on abundance of mustard aphid (*Lipaphis erysimi*), cabbage aphid (*Brevicoryne brassicae*) and cabbage caterpillar (*Pieris brassicae*) during 2020-21 at Ludhiana

Std. Week	Mustard aphid (no/plant)					Cabbage aphid (no/ plant)					Cabbage caterpillar (no of larvae/plant)				
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	LSD (p<0.05)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	LSD (p<0.05)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	LSD (p<0.05)
1	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
2	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
3	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
4	1.5	0.0	0.0	0.0	0.2	1.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
5	1.9	1.4	1.0	1.6	NS	2.1	1.3	0.7	0.9	0.6	0.0	0.0	0.0	0.0	-
6	3.4	1.8	2.1	1.3	1.2	3.2	1.7	3.2	0.9	1.2	0.0	0.0	0.0	0.0	-
7	25.4	13.0	14.8	1.0	8.0	3.5	2.3	2.0	0.9	1.2	30.2	8.0	18.7	4.9	4.2
8	44.4	18.6	19.7	9.7	13.7	41.5	38.9	16.1	6.3	11.3	53.0	36.3	23.7	4.6	10.3
9	133.3	66.3	53.7	21.2	28.4	155.0	75.2	45.7	22.0	25.7	50.0	35.9	29.1	12.9	12.2
10	101.0	58.4	48.2	25.9	12.6	84.0	46.7	49.7	21.3	30.5	49.1	43.0	22.3	13.9	17.4
11	73.7	32.9	27.2	10.5	41.2	103.0	31.3	28.7	5.7	40.4	15.8	13.6	11.1	0.0	8.3
12	36.1	14.5	22.9	2.8	20.5	52.3	16.2	15.9	9.9	24.3	0.0	0.0	0.0	0.0	-
13	2.8	1.7	10.3	0.0	7.1	18.9	3.7	5.3	0.0	2.9	0.0	0.0	0.0	0.0	-
Overall mean	46.9	23.2	22.2	8.2	5.5	51.5	24.2	18.6	7.5	12.7	39.6	27.3	21.0	7.3	5.2

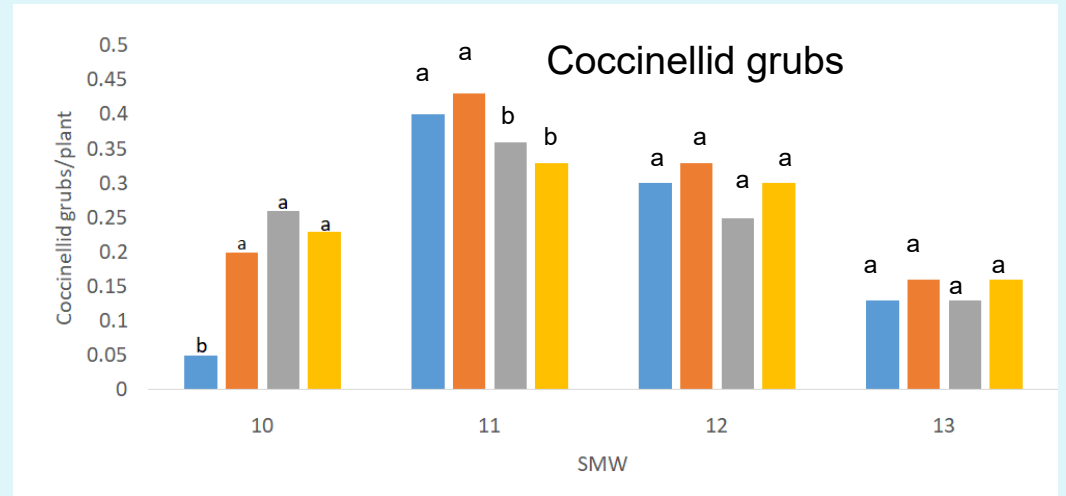
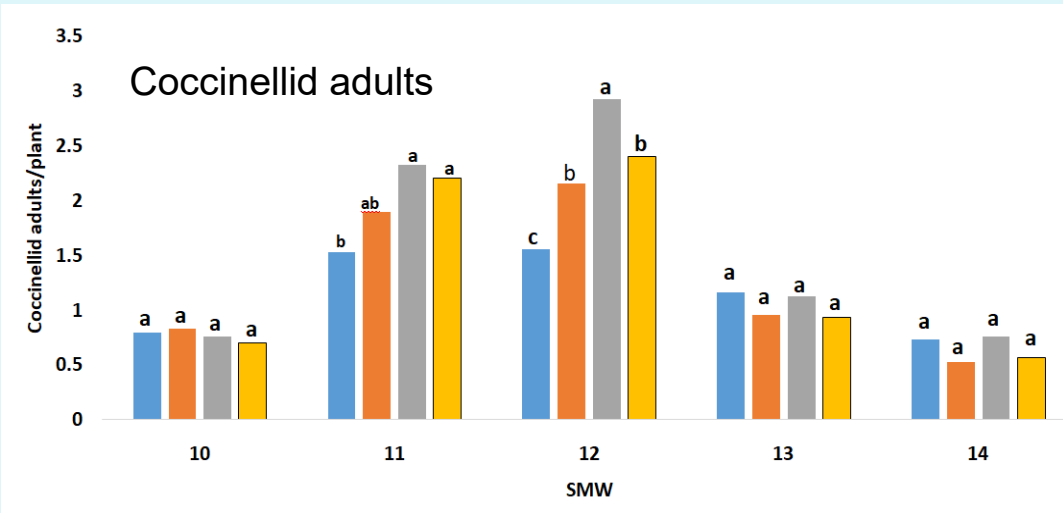
T<sub>1</sub>: Mustard alone, T<sub>2</sub>: Mustard+fennel, T<sub>3</sub>: Mustard+chickpea, T<sub>4</sub>: Mustard+coriander

**Table 2. Effect of host plant diversity on abundance of mustard aphid (*Lipaphis erysimi*) and cabbage caterpillar (*Pieris brassicae*) during 2021-22 at Ludhiana**

Std. Week	Mustard aphid (no/plant)					Cabbage caterpillar (no of larvae/plant)				
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	LSD (p<0.05)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	LSD (p<0.05)
1	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
2	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
3	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
4	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
5	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
6	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
7	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
8	0.9	0.8	1.4	1.0	-	0.0	0.0	0.0	0.0	-
9	7.7	3.8	5.2	4.7	NS	0.0	0.0	0.0	0.0	-
10	63.3	42.3	42.3	11.7	26.2	20.9	18.3	17.2	7.9	5.1
11	18.7	27.3	17.3	6.2	11.5	13.9	1.0	4.8	4.8	7.7
12	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
13	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-
Overall mean	22.7	18.6	16.6	5.9	7.5	17.4	9.7	11.0	6.3	6.0

T<sub>1</sub>: Mustard alone, T<sub>2</sub>: Mustard+fennel, T<sub>3</sub>: Mustard+chickpea, T<sub>4</sub>: Mustard+coriander  
 - No population of cabbage caterpillar was reported during 2021-22 crop season

**Fig 1. Natural enemies population in different treatments (2021-22)**

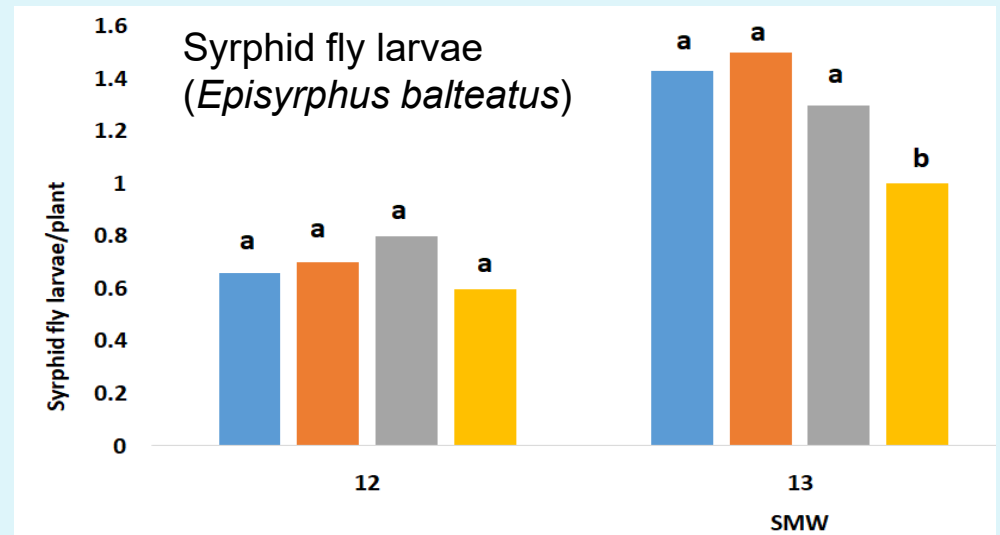
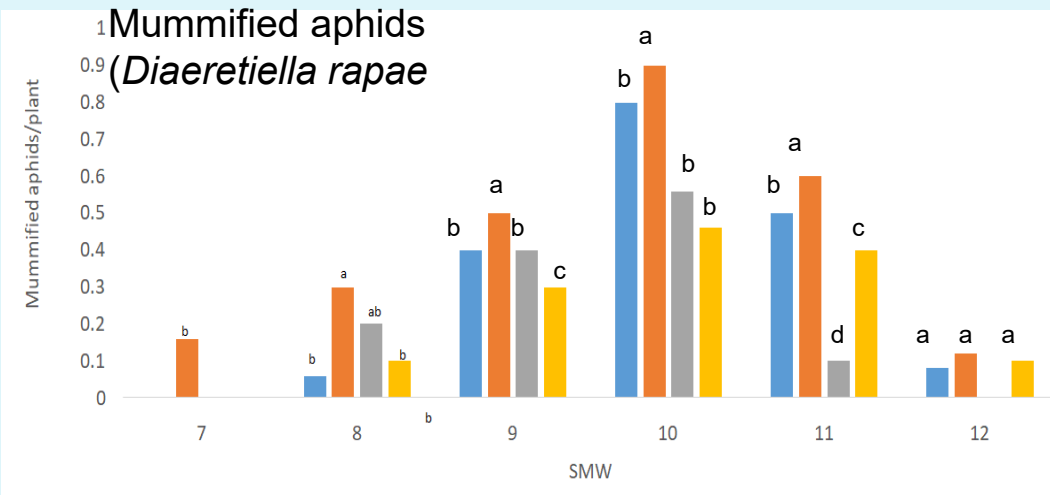


■ Mustard alone

■ Mustard+coriander

■ Mustard+chickpea

■ Mustard+fennel



Within a week bars with different alphabets at the top are significantly different from each other (p<0.05)

**Table 3. Economics of different treatments (2020-21)**

Tr. No.	Treatments	Mustard equivalent yield (kg/ha)	Gross return (Rs/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Benefit Cost Ratio
T <sub>1</sub>	Mustard alone	1423.6	66197.9	30000	36197.9	2.2
T <sub>2</sub>	Mustard + fennel	2984.3	138770.8	30500	108270.8	4.5
T <sub>3</sub>	Mustard + chickpea	3442.4	160072.5	32000	128072.5	5.0
T <sub>4</sub>	Mustard + coriander	2453.5	114087.5	31750	82337.5	3.6
	LSD (p<0.05)	476.4				

MSP: Mustard =46.50 Rs /Kg, Gram =51.00 Rs /Kg

Fennel =100.00 Rs /Kg, Coriander =65.00 Rs /Kg

Mustard equivalent yield = Mustard seed yield (kg/ha) +  $\frac{\text{seed yield of intercrop (kg/ha)} \times (\text{Price of intercrop (Rs/kg)})}{\text{Price of Mustard (Rs/kg)}}$



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**Table 4. Economics of different treatments (2021-22)**

Tr. No	Treatments	Mustard equivalent yield (kg/ha)	Gross return (Rs/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Benefit Cost Ratio
T <sub>1</sub>	Mustard alone	1497.2	75608.6	30000	45608.6	2.5
T <sub>2</sub>	Mustard + fennel	2892.8	146086.4	30500	115586.4	4.8
T <sub>3</sub>	Mustard + chickpea	3381.4	170760.7	32000	138760.7	5.3
T <sub>4</sub>	Mustard + coriander	2466.0	124533.0	31750	92783	3.9
	LSD (p<0.05)	378.1				

MSP: Mustard =50.50 Rs /Kg, Gram =51.00 Rs /Kg

Fennel =100.00 Rs /Kg, Coriander =65.00 Rs /Kg

Mustard equivalent yield = Mustard seed yield (kg/ha) +  $\frac{\text{seed yield of intercrop (kg/ha)} \times (\text{Price of intercrop (Rs/kg)})}{\text{Price of Mustard (Rs/kg)}}$



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# Conclusion

- ▶ Intercropping of mustard with coriander resulted in significant reduction in mustard aphid, cabbage aphid and cabbage caterpillar.
- ▶ The natural enemies' population was also higher in intercropped treatments than mustard alone.
- ▶ The intercropped treatments also resulted in higher net return and benefit cost ratio than mustard alone treatment.
- ▶ Among all the treatments, mustard+coriander resulted in maximum reduction in pest population and has the potential to be used for management of these pests.



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# Acknowledgements:

- ▶ **Indian Council of Agricultural Research and ICAR-DRMR for funding.**
- ▶ **Punjab Agricultural University, Ludhiana for the necessary facilities**



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