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ON FARM VALIDATION OF BIO CONTROL OF MUSTARD APHID (*LIPAPHIS ERYSIMI*) KALT. BY LADY BIRD BEETLE (*COCCINELLA SEPTUMPUCTATA*)

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ABSTRACT

The populations of mustard aphid and its natural enemies on *Brassica napus c.v RSPN 25* was assessed during *rabi* 2008–09 at the Research farm of the Division of Plant Breeding and Genetics, FOA, SKUAST – Jammu (J&K), India. The incidence of *Lipaphis erysimi* on *Brassica napus c.v RSPN 25* began from December and continued till harvesting stage *i.e.* March. Initially the alate forms were noticed on the crop and subsequently apterous adults and nymphs appeared in large numbers, its density gradually increased from December and attained peak during inflorescence and pod formation stage during February–March. The seven spotted lady bird beetle, *Cocinella septempunctata* (Linn.) also appeared as a varacious feeder during February–March. The synchronized occurrence of both prey and predator reflect the dependence of the Coccinellid on aphid for its survival.

Key words: Aphid, Lady Bird Beetle, Biological control

INTRODUCTION

Mustard aphid *Lipaphis erysimi* (Kaltenbach) is a major pest of mustard crop, infesting a wide range of crucifers and other crops. The aphid usually feeds on the growing points, inflorescence besides the foliage. Severe infestations result in stunted growth and poor pod formation. The yield loss due to this aphid ranges from 30–90% in mustard (Prasad, 1996). In view of the economic importance of both pest and plant, an attempt has been made to find the possible ways to control this pest using ecofriendly method. One method of improving biological control in agricultural IPM systems is the use of natural enemies. The aphidophaguous lady bird beetle, *Coccinella septempunctata* L. is one of the potential predators of the mustard aphid, *Lipaphis erysimi* (Kalt). The beetle occupies a remarkable place among the naturally occurring biocontrol agents of mustard aphid. Not much work on the role of lady bird beetle as a predator has been reported from Jammu region of J&K, India. The present report was based on the investigation undertaken during *Rabi* 2008–09 in the mustard field of *Brassica napus* variety RSPN 25.

MATERIALS AND METHODS

The populations of mustard aphid and its natural enemies on *Brassica napus c.v RSPN 25* was assessed during *rabi* season of 2008–09 at the Research Farm of the division of Plant Breeding and Genetics, FOA, SKUAST Jammu, located at Chatha, Jammu (J&K), India. It is situated in the plains of Jammu and Kashmir, south of foothills of Himalayas (Shivalik range). This region is characterized by hot dry summer and cold winter. The summer temperature rises upto 45°C while it falls to 1°C in winter. The plot size of 5 × 4 m was taken and replicated three times. All the agronomic packages of practices were followed to raise the crop except the application of pesticides. Standard cultivation and agronomic practices were followed. Insect sampling was carried out once a week by random selection of 10 shoots observing on 10 cm shoot length for aphids. The field data on temperature, relative humidity and rainfall were recorded and correlated with insect density so as to know their effect on insect population.

RESULTS

The incidence of *Lipaphis erysimi* on *Brassica napus c.v RSPN 25* began from December and continued till harvesting stage *i.e.* March. Initially the alate forms were noticed on the crop and subsequently adults and nymphs appeared in large numbers, its density gradually increased from December and attained peak at inflorescence and pod formation stage during February–March (Plate 1). Studies on the relative occurrence and abundance of mustard aphid, *Lipaphis erysimi* (Kalt.) revealed that aphid appeared on leaves during 3rd week of January and on the inflorescences during 2nd week of February and continued up to harvesting (Mid March). The peak populations of

Plate 1 - Biological control of mustard aphid

Plate 2 - Mustard shoot heavily infested with aphids

215 per ten cm of shoot was recorded during late vegetative to early inflorescence stage from during late February to early March causing maximum economic loss to the crop (Table 1a). The period coincided with the change in weather accompanied by rise in temperature. The maximum temperature rising up to 31.4°C, seems to have favored the pest multiplication (Table 1C). There was a positive correlation between the rise in temperature and the aphid incidence (Table 1B). The incidence, growth and multiplication of mustard aphid were largely influenced by meteorological parameters like temperature, relative humidity, rainfall, wind speed and cloudiness, as also been reported by Dhaliwal *et al.* (2007). The predator species such as, green lacewing *Chrysoperla* sp., 7–spotted ladybird beetle, *Coccinella septempunctata* (Linn.) were recorded when the pest population of aphids was significantly hight in the Brassica varieties. *Coccinella septempunctata* (Linn.) was noted as a voracious feeder during February – March (Plate 2). The average number of coccinellids ranged from 4–7 per 10 cm of shoot where aphid rating was high (4) while it ranged from 1–3 where aphid rating was (1). Coccinellid numbers increased with changed environmental conditions (Kumar *et al.*, 1996), controlling aphid in the natural way to a large extent.

Aphids feed on foliage and stems of plants. Plant damage can appear as curling and stunting of leaves, in addition to the ability to transmit viruses, aphids cause direct damage by feeding on plant sap to acquire the proteins and sugars needed for their reproduction. Aphids

Table 1A: Population of aphid and coccinellids at different stages of crop growth

Plant No.	No. of aphids per 10 cm of shoot at 90 DAS	SCORE	No. of concinellids per 10 cm of shoot	No. of aphids per 10 cm of shoot at 120 DAS	SCORE	No. of concinellids per 10 cm of shoot
1.	0	0	0	45	1	5
2.	130	2	2	150	2	7
3.	65	1	1	110	2	5
4.	140	2	2	175	2	7
5.	70	1	1	110	2	4
6.	160	2	3	175	2	7
7.	205	4	3	240	4	7
8.	210	4	4	270	4	7
9.	215	4	4	245	4	6
10.	140	4	3	200	4	6
Mean	133.5			172		

* Aphid Infestation	**Score**	
	4	200–400
	2	100–200
	1	1–100

Table 1B. Correlation between temperature and aphid intensity

Days	Maximum temperature °C	Aphid Intensity
February 10, 2009	16.6	95
February 20, 2009	24.5	110
March 01, 2009	25.5	136
March 10, 2009	27.5	172
March 20, 2009	30.2	172

r = 0.885*

secrete excess sugars in the form of sticky 'honeydew'. Honeydew supports the growth of black sooty mold that affects plant photosynthesis, possibly reducing plant yields. The regular and frequent application of conventional insecticide creates lot of problems such as loss to biotic diversity, toxicity to non–target pests, pest resurgence and development of resistance in insects, environmental pollution etc. In order to minimize the harmful effect of chemicals, eco friendly practices involving the use of predators as biological control agents need to be identified and practiced. Aphids have widespread resistance to many classes of traditional insecticides, using

Table 1C. Meteorological data at Chatha, Jammu during February–March 2009

Days	Feb–09				March–09			
	Temperature (°C)		Relative humidity (%)		Temperature (°C)		Relative humidity (%)	
	Max.	Min.	Morning	Evening	Max.	Min.	Morning	Evening
1.	21.4	6.0	97	52	25.5	8.0	87	45
2.	22.0	6.0	90	41	26.8	8.6	89	42
3.	22.3	9.6	90	47	26.5	12.8	88	49
4.	24.5	8.0	81	39	27.0	16.0	85	58
5.	21.0	12.0	87	60	27.6	13.0	98	32
6.	22.5	11.6	80	40	27.6	11.3	83	48
7.	22.5	6.1	94	44	27.7	13.0	82	29
8.	23.3	5.5	97	49	25.5	10.4	93	46
9.	20.4	9.2	95	81	27.6	9.5	88	33
10.	16.6	10.8	83	88	27.5	9.2	82	26
11.	21.0	9.0	90	58	27.7	6.0	89	25
12.	21.5	9.2	85	58	29.0	6.9	81	30
13.	23.5	9.4	95	47	30.5	9.0	95	35
14.	22.3	10.5	88	49	29.8	11.0	88	41
15.	21.8	6.8	97	53	29.8	11.4	88	41
16.	22.2	6.5	94	47	30.0	12.4	86	40
17.	23.4	9.6	95	38	30.2	12.6	87	41
18.	24.2	6.6	97	46	30.3	12.6	82	35
19.	23.6	6.5	97	49	31.4	15.0	82	30
20.	24.5	13.0	88	43	30.2	12.8	79	31
21.	25.0	9.6	92	33	28.0	11.4	82	37
22.	23.7	10.5	88	48	25.0	12.0	93	52
23.	24.5	13.0	86	49	29.5	11.8	82	34
24.	25.2	11.6	88	42	27.5	13.5	70	45
25.	25.0	10.6	95	40	25.6	14.8	87	43
26.	25.0	6.2	91	38	26.6	10.2	89	43
27.	25.1	5.5	86	43	22.6	14.2	91	67
28.	25.0	4.0	91	38	23.8	13.0	77	59
29.					25.0	15.5	80	43
30.					28.5	14.0	82	40
31.					30.8	14.2	84	29

natural enemies offers an effective and alternative method of control. Regular use of pesticide may no longer be feasible as rapeseed mustard is being used by food industry and direct consumption of oil obtained from siliqua. Therefore, it becomes imperative to look for viable alternatives for the management of these insect pests. The synchronized occurrence of both prey and predator reflect the dependence of the coccinellid on aphid for its survival. The aphid infestation can be managed with the use of persistant, contact and systemic insecticides (Dutta 1992), but this pest requires need based application of insecticides at appropriate stage so as to minimize residues in mustard grain and oil.

The current finding is an effort to exploit the mutualism exhibited by mustard aphid *Lipaphis erysimi* and its attendant species *Coccinella septumpuctata*. Based on the above findings, it can be considered that this predator plays role to some extent in regulating the field density of aphids, but for most agricultural systems, conservation techniques for coccinellids are lacking, even though they are abundant in these habitats. Evaluation techniques are available, but quantitative assessment of the efficacy of coccinellids have been done for most species in most agricultural crops. Greater emphasis is needed on evaluation, predator specificity, understanding colonization of new environment, and assessment of community–level interactions to maximize the use of coccinellids in biological control.

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