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Prevalence and Relative Abundance of Coccinellid Beetles on Mustard (*Brassica campestris*) Crop

[1]M. Alamgir Hossain, [1]M.A. Ahad, [1]H.F. El Taj, [1]M.R. Amin and [2]A.K.M. Azad
[1]Department of Entomology, [2]Department of Genetics and Plant Breeding,
Hajee Mohammad Danesh Science and Technology University, Dinajpur-5200, Bangladesh

Abstract: The experiment was conducted during November, 1994 to January, 1995 for assessing the number of coccinellid species present, their prevalence relating plant age and stages and also their relative abundance on mustard crop. Seven different coccinellid species were found of which four were identified as *Micraspis discolor*, *Micraspis* sp., *Coccinella transversalis* and *Coccinella septempunctata.* The remaining three could not be identified and were designated as M1, M2 and M3. Of these, the species *Micraspis discolor* was the most abundant in terms of number and was also present for the longest period. These coccinellid predators appeared in the fields two weeks after sowing (WAS) and were present up to the harvesting stage of the crop with the maximum population recorded during the flowering stage from mid December to last January. In terms of relative abundance, *Micraspis discolor* was also found to be the dominant one and relativity was the highest 83.23% and lowest M2 and M3 respectively, at the mid of December.

Key words: Coccinellid beetles, prevalence, relative abundance, mustard

Introduction

The coccinellid beetles (Coleoptera:Coccinellidae) commonly known as ladybird beetles, have nearly 5000 species (Imms, 1977). They are of great economic importance as majority of them are predatory in nature at both the larval and adult stages on various crop pests namely aphids, coccids and other soft bodied insects (Rawat and Modi, 1969; Kring *et al.,* 1985). The mustard aphid (*Lipaphis erysimi* , Kalt.) which may cause 27.0-68.8% yield loss (Attle *et al*., 1987) in mustard. In developing countries like Bangladesh, use of pesticide is one of the major pest control methods for any crop pest. But sole reliance on chemical protection have some limitations, their prolonged and extensive use cause destruction of beneficial organisms such as natural predators, parasitoid, pollinators and other entomophagous micro-organisms, development of resistance in insect pests, phytotoxicity, residues in foods and feeds, and last but not least the environmental pollution (Luckman and Metcalf, 1978).

Now a days Integrated Pest Management (IPM), where all the suitable techniques are used to find ecologically sound, environment friendly and economically viable ways of pest control, is well known. In this regard, the predacious ladybird beetles may help to a great extent for the biological control of the mustard aphid as many coccinellid beetles feed on different aphid species (Sheikh *et al*., 1993). Before going to utilize the predatory coccinellid beetles in agro-ecosystem, it is essential to have a thorough knowledge on the number of species available, their prevalence and relative abundance in relation to crop age and season. At present a very little information is available on it. The present work on coccinellid predators was mainly aimed towards determining the number of coccinellid species, their prevalence and relative abundance in mustard field.

Materials and Methods

The experiment was conducted at the Bangladesh Agricultural University farm from November 1994 to January, 1995. Three separate sections each measuring (10 m × 10 m) were considered as the three replications. The experiment was conducted in randomized complete block design. The experimental area was kept free from any plant protection measure. Sampling was initiated from November, 1994 at weekly interval starting from two weeks after seeding (WAS) which continued up to the last of January, 1995 i.e., at the harvesting stage of mustard crop. Each sampling was done in the morning at 9:00 am by a sweep net (30 cm dia.) taking five sweeps/plot (ten strokes). The beetles of each sampling occasion were kept separately in polythene bags. The collected beetles were preserved following dry and wet (alcohol) preservation method. Later on, they were grouped on morphological resemblance and preliminary identification was made. Finally, the samples were brought to the Entomology Divisions of Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute and institute of Post Graduate studies in Agriculture, for cross identification. Data were transformed to square root values and analysis of variance were done. The means were compared by Duncan's Multiple Range Test (Duncan, 1951). The weather recorded during experimental period presented in the Table 3.

Results and Discussion

Prevalence of different coccinellid beetles in relation to crop age and growth stage.

Seven coccinellid species were recorded in the mustard field through out the growing season. Out of them, four species were identified as *Micraspis discolor, Coccinella transversalis, C. septempunctata* and *Micraspis* sp. The rest three species were unidentified and designated as M1, M2 and M3. In Bangladesh, Alam *et al*. (1964) also listed some coccinellid species and the first mentioned four species were common with his findings.

The species *Micraspis discolor* was absent up to two WAS (Table 1). After that, its population was started to buildup and reached the peak (77.67) at eight WAS and then started to decline. But there was no statistical difference among the populations recorded from six to 10 WAS. It is reported that, when mustard crop reaches the flowering and pod formation stages, then mustard aphid become abundant and consequently the predator coccinellid beetles also become more prevalent in the field (Al-Sheihria, 1984; Pathak, 1961; Verma and Singh, 1987; Khan *et al*., 1993). Kundu and Pant (1968) also reported that, aphid damage at pre-flowering stage was significantly lower than that of flowering and pod formation stages. The lower predator population at preflowering stage is quite expected due to the low population

Table 1: Population abundance of different coccinellid beetles in relation to plant age as observed during November, 1994 to January. 1995 at Mymensingh area

Crop age (week)	Number of various coccinellid species per five sweeps						
	MD	CT	M1	PMP	CS	M2	M3
2	0.00 d*	0.00c	0.00b	0.00 b	0.00 b	0.00 d	0.00 b
	(0.71)**	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)
3	0.33cd	0.00 c	0.00 b	0.00 b	0.00 b	0.00 d	0.00 b
	(0.88)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)
4	5.00 cd	0.00c	0.00b	0.00 b	0.00 b	0.00 d	0.00 b
	(2.11)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)
5	9.67 cd	0.00 c	0.00 c	0.00 b	0.00 b	0.00 d	0.00 b
	(2.82)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)
6	28.67 abed	0.00 c	0.00 c	0.00 b	0.00 b	0.00 cl	0.67 b
	(4.63)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.00)
7	72.87ab	1.67 abc	0.00 b	0.00 b	0.00 b	0.00d	3.00b
	(7.21)	(1.35)	(0.71)	(0.71)	(0.71)	(0.71)	(1.50)
8	77.67 a	8.33 a	1.33 ab	0.00 b	0.00 b	0.00 d	32.33a
	(7.79)	(2.26)	(1.18)	(0.71)	(0.71)	(0.71)	(4.47)
9	33.33 abc	5.33 a	2.00 ab	1.67 b	0.00 b	0.00 d	3.33h
	(5.05)	(2.31)	(1.32)	(1.25)	(0.71)	(0.71)	(1.80)
10	23.33 abed	2.33abc	2.67 a	0.67 ab	1.33 b	1.00 c	3.00b
	(3.92)	(1.64)	(1.76)	(1.05)	(1.27)	(1.23)	(1.86)
11	16.33 bcd	3.00ab	3.67 a	3.00 a	3.33 a	3.33 a	2.00b
	(3.50)	(1.86)	(2.02)	11.86)	(1.85)	(1.95)	(1.56)
12	5.67 cd	2.67ab	3.67 a	1.00 b	3.00 a	0.00 d	2.00b
	(2.33)	(1.77)	(2.04)	(1.10)	(1.86)	(0.71)	(1.58)
13	3.67 cd	1.67abc	2.33 ab	1.00 ab	3.67 a	1.67 b	1.00b
	(1.80)	(1.77)	(1.57)	(1.17)	(2.00)	(1.46)	(1.17)
14	3.33 cd	0.33 be	1.00 ab	1.00 ab	1.00 b	1.33 be	0.00b
	(1.79)	(0.88)	(1.17)	(1.17)	(1.17)	(1.34)	(0.71)
SX	1.28	0.30	0.28	0.23	0.17	0.05	0.75

* Values with different letters in a column are significantly different at 5% level of probability

**Data in parenthesis is the square root transformation values (Y =✓ X+0.5). MD = *Micraspis discolor,*

CT = *Coccinella transversalis,* MP = *Micraspis* sp. CS = *Coccinella septempunctata,* M1, M2 and M3 are the unidentified species

Table 2: Relative abundance in percentage (Ambasht, 1990) of different coccinellid beetles on mustard crop during November, 1994 to March, 1995 at Mymensingh

Coccinellid species	Relative abundance (%) (A/B×100)
Micraspis discolor	83.23 a
Coccinella transverses	6.34 b
M1	3.50 b
Micraspis sp.	1.69 b
Coccinella septe,punciata	2.84 b
M2	1.20 b
M3	1.20 b

Where, A = Total number of individual species

B = Total number of species

M1, M2 and M3 are unidentified coccinellid species

*Values with different letters in a column are significantly different at 1% level of probability

Table 3: Recorded monthly temperature, relative humidity and rainfall during the experimental period (November, 1994 to January, 1995)

Months	Average temp (°C)			Average RH (%)	Rainfall (mm)
	Max	Min	Mean		
November, 94	28.03	18.23	23.13	79.65	0.00
December, 94	26.51	11.74	19.13	75.81	0.00
January, 95	23.94	10.70	17.32	73.16	10.80

of its prey. Moreover Rahman *et al*. (1991) reported that both the adult and larvae of the coccinellid beetles choose pollen grains as alternate food. So maximum population of the coccinellid beetles attained at flowering stage might be associated due to its prey or pollen grains. The rest of the coccinellid species on the other hand were completely absent up to six to nine WAS. In general, the coccinellid populations were found to increase since their appearance, reaching the peak in different time depending upon the species and then started to decline gradually. Among the least dominated coccinellid, *C. transversalis* population reached the peak during eight WAS, whereas M1 *Micraspis* sp., *C. septempunctata,* M2 and M3 population showed the highest abundance at 11, 11, 13, 11 and 8 WAS, respectively. The populations of all the recorded coccinellid species came down to the lowest number at 14 WAS, when mustard crop was in ripening stage. The present study clearly revealed that, out of all the seven species, only *Micraspis discolor* was the dominant one both in terms of number as well as long duration prevalence at mid December.

Relative abundance of coccinellid species: The relative abundance of different coccinellid species is presented in (Table 2) from which it is clear that, *M. discolor* was relatively more abundant than other predators. Again, the relative abundance of *M. discolor* was the highest (83.23%). The abundance of all other species viz. *C. transversals,* M1, *Micraspis* sp., *C. septempunctata,* M2 and M3 were relatively lower than the *M. discolor.* Their relative abundance were maximum 6.34, 3.50, 1.69, 2.84, 1.20 and 1.20% respectively, from December to mid January.

Agarwala *et al.* (1988) reported the population abundance of *M. discolor* in the aphid infested crop fields during November to March. The findings of present study are in agreement with their views on the abundance of studied predators in mustard field. Ghose and Mitra (1983) reported that, imigrant alates (i.e., winged adults) of *Lipaphis erysimi* mainly appeares in

mustard fields in November at the seedling stage. They also added that, the population buildup was quite rapid and reached the peak by mid December. They further experienced that, the population began to decline from February and become very low between March to April. Khan *et al*. (1993) established the proportional presence of predators (Ladybird beetles) in respect to their prey (mustard aphid) populations in mustard field. However, they did not mentioned the individual relationships of different ladybird species with the aphid population.

The results of the present study revealed the higher abundance of coccinellid predator populations during the flowering and pod formation stages which can assumed due to the abundance of its prey i.e. mustard aphids. Compare to this, the presence of very low predator population at vegetative or preflowring stage of mustard might be related with the low population of mustard aphids as described by Khan *et al*. (1993). Ghose and Mitra (1983) also reported similar results with the highest aphid population in mid December. The results of present study appeared to have a great prospect of utilize coccinellid predators specially the *M. discolor* in the management of mustard aphid and also the results would be helpful in designing future research programmes relating IPM.

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