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IMPACT OF LADY BEETLE *COCCINELLA SEPTEMPUNCTATA* LINN. (COLEOPTERA : COCCINELLIDAE) ON THE PREY POPULATION IN WESTERN UTTAR PRADESH

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Coccinella septempunctata Linn. is an aphidophagous beetle and feeds upon aphids *e.g. Lipaphis erysimi* Kalt., *Brevicornyne brassicae* Linn., *Acyrthosiphon pisum* Harris, *Schizaphis graminum* Rondani, *Hyadaphis coriandari* Das, *Aphis gossypii* Glover, *Melanaphis sacchari* Zehntner and *Rhopalosiphum maidis* Fitch which are enormous in number infesting various valuable crops grown in the field like mustard, cabbage, wheat etc.

Key words : Coccinellids, population, western Uttar Pradesh.

INTRODUCTION

The growth of predator population is dependent on the availability of the prey aphids which serve as food plates to the predators. It shifts its infestation from one host plant to the other (Atwal & Sethi, 1963; Saxena *et al.*, 1970; Anand, 1983; Agarwala & Ghosh, 1988; Rana *et al.*, 1995; Sarospataki & Marko, 1995; Chander, 1996; Kaniuczak & Kumari, 2000; Omkar & Singh, 2002; Indu, 2003).

MATERIALS AND METHODS

The number of aphids and beetles *Coccinella septempunctata* Linn. are observed and studied by using quadrate frame 2 x 2 square meter. All the plants infested are randomly studied from bottom to the top and the number of aphids and beetles are recorded at five different sites (4 corners and the central quadrate) in different crop fields.

Number of plant in each quadrate depends upon the grower of the crop utilizing maximum possible closeness of distance in average number of plants. The statistical analysis of the data is carried out based on certain parameters *viz.* frequency, density and abundance of the population per month. The data has been recorded on monthly basis. The predator and prey population relationship is graphically represented in Fig. 1 between 2001 to 2003.

RESULTS AND DISCUSSION

Population studies on the nymph and adult aphids, number and adult Lady beetles have been carried out in the crop field. Predators are found in varying numbers from July of one year up to April of the next year. Firstly, the predator show maximum population during August/ September and March/April months with certain fluctuations whereas minimum population prevails during December of one year to February of the next year (Table I). The predator beetle shows either diapause or migrate to colder areas in hills in the vicinity of Saharanpur. However, the pupal stages lie in cracks or nearby shady locations in Saharanpur.

Table I : Population study.

Months & Year	Total no. of aphids		Total no. Predators	Total no. of quadrats 2 x 2 sq. m studied	Total no. of quadrats with species			Frequency (%)			Density			Abundance		
	Nym	Adu			Nym	Adu	Prd	Nym	Adu	Prd	Nym	Adu	Prd	Nym	Adu	Prd
Sep 01	23413	360	179	35	30	30	25	86	86	71	669	10	5	780	12	7
Oct 01	27090	296	165	30	28	25	27	93	83	90	903	10	6	968	12	6
Nov 01	17573	163	137	30	30	23	28	100	77	93	586	5	5	586	7	5
Dec 01	26566	139	30	35	32	23	23	91	66	66	759	4	1	830	6	1
Jan 02	150434	959	23	40	40	40	10	100	100	25	3761	24	1	3761	24	2
Feb 02	73472	626	84	40	36	34	26	90	85	65	1837	16	2	2041	18	3
Mar 02	10340	110	207	40	32	20	32	80	50	80	259	3	5	323	6	6
Api 02	13518	136	221	25	21	17	22	84	68	88	541	5	9	644	8	10
Jul 02	18337	800	100	30	30	30	28	100	100	93	611	27	3	611	27	4
Aug 02	22556	420	175	35	33	31	32	94	89	91	644	12	5	981	14	5
Sep 02	5168	182	86	25	23	23	20	92	92	80	207	7	3	225	8	4
Oct 02	9493	207	69	25	24	22	20	96	88	80	380	8	3	396	9	3
Nov 02	12327	132	60	25	25	23	22	100	92	88	493	5	3	493	6	3
Dec 02	3785	58	23	40	24	24	20	60	60	50	95	1	1	158	2	1
Jan 03	27089	99	9	35	33	16	6	94	46	17	774	3	1	821	6	2
Feb 03	54741	284	20	35	29	29	9	83	83	26	1564	8	1	1888	10	2
Mar 03	55202	437	144	40	36	31	33	90	78	83	1380	11	4	1533	14	4
Api 03	14717	504	135	25	19	20	12	76	80	48	597	20	5	785	25	11
Jul 03	15220	964	34	30	25	25	20	83	83	67	507	32	1	609	39	2
Aug 03	19600	587	92	30	30	28	30	100	93	100	653	20	3	653	20	3

Nym = Nymph: Adu = Adult: Prd = Predator.

Table II : Field study of the average number of predator and prey population.

S. No.	Month and Year	Average number of prey	Average number of predator
1.	September, 2001	792	7
2.	October, 2001	978	6
3.	November, 2001	591	5
4.	December, 2001	835	1
5.	January 2002	3785	2
6.	February, 2002	2058	3
7.	March, 2002	327	6
8.	April, 2002	650	10
9.	May, 2002*	2063	=/+
10.	June, 2002*	2809	=/+
11.	July, 2002	638	4
12.	August, 2002	696	5
13.	September, 2002	233	4
14.	October, 2002	404	3
15.	November, 2002	498	3
16.	December, 2002	160	1
17.	January, 2003	824	2
18.	February, 2003	1897	2
19.	March, 2003	1546	4
20.	April, 2003	761	11
21.	May, 2003*	1917	=/+
22.	June, 2003*	2488	=/+
23.	July, 2003	647	2
24.	August, 2003	673	3

* = Adult Coccinella septempuncatata Linn. show no reproduction and undergo diapause/ migrate and aphids only on one bottle gourd.: =/+ Diapasue.

During the absence of the lady beetle, the prey aphids show enormous population built up *i.e.* in May and June. Average number of nymph comprises the large share of prey *viz.* 69000 while adults are 1000 in a sample study in the field. Likewise, minimum number of aphid nymphs are in April and November months, when predators in abundance *viz.* 13000 to 14000 and also in November when number is reduced to 12000 to 14000. This shows that fluctuation of prey population occurs due to number of predators in the field. Thus, the rise and fall of population is dependent upon temperature, humidity and rainfall during these months.

Fluctuation in the predator and prey population is seen in the field. The predator population shows variation which are similar to the description given above. For instance during 2001 in a simple study of five quadrates maximum prey number is in the month of October (978) whereas the maximum number of predators in September (07). Similar is the observation for 2002 and graphical representation indicates maximum prey in the month of June (2809), when lady beetle undergo diapause or migrate elsewhere. Predators in April are 10 in numbers. In the year 2003, the maximum average number of prey from May to mid-July is in June (2488) showing steep rise and minimum number of prey showing a fall in mid-July (647) (Table II). Likewise, the maximum average number of predators is 11 in April during 2003 and minimum number in December 2001 and 2002 (01). Thus, the number of prey shows a fall with the increase in the number of predators. This depicts an inverse relationship between the two populations resulting into a bio-control mechanism operating in nature.

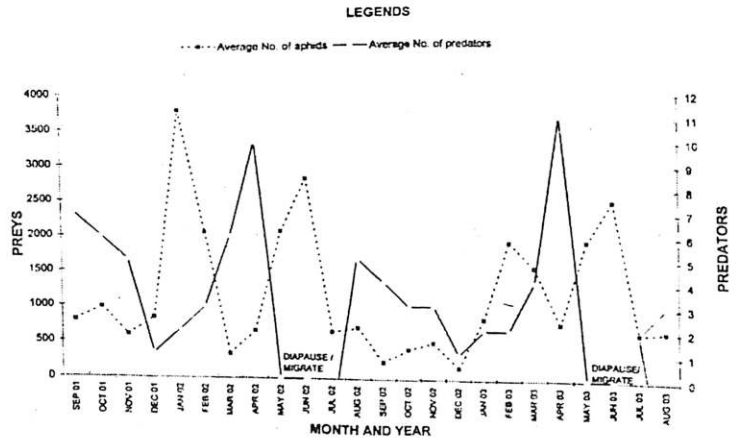

Fig. 1 : Relationship between predator-and prey population.

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