

## Population Abundance of Predators in Alfalfa and Cotton Fields at Tandojam

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**Abstract:** The studies on Population abundance of predators in alfalfa and cotton fields were carried out at the experimental field of Integrated Pest Management (IPM), Agriculture Research Institute (ARI) Tandojam, during June to September 2000. Twelve predators were recorded *Campylomma nicolasi*, *Brumus suturalis*, *Staphylinid hutchinsoni*, *Paederus fuscipes*, *Coccinella undecimpunctata*, *Orius laevigatus*, *Chrysoperla carnea*, *Geocoris tricolor*, *Formicomus antiquus*, *Laius malleifer*, *Delta sp.*, and Spider (un-identified). The predators population recorded on alfalfa through sweep net method showed that the maximum population of *Orius laevigatus* (1170) was recorded throughout the season followed by *Campylomma nicolasi* (979), Spiders (318), *Laius malleifer* (123), *Formicomus antiquus* (60), *Paederus fuscipes* (53), *Geocoris tricolor* (51), *Staphylinid hutchinsoni* (47), *Coccinella undecimpunctata* (36), *Chrysoperla carnea* (34) and *Brumus suturalis*, *Delta sp.*, (9) respectively. The maximum population of predators (2889) was recorded through sweep net method on alfalfa followed by (891) direct count method on alfalfa and through sweep net method on cotton (476) respectively. The better suitability sweep net method for sampling population of predators on alfalfa than direct count method on alfalfa and cotton. The population of predators was more on alfalfa than cotton. The availability of biotic agent predators are large in number in the alfalfa field indicates that, alfalfa harbours sufficient number of pest hosts as food for predators. Since, the alfalfa is a perennial crop and good source of biocontrol agents; therefore, it can be grown in strips near major field crops and can be exploited for the control of pests through predators.

**Keywords:** Predators, Spider, Abundance, Alfalfa, Cotton

### Introduction

Alfalfa, *Medicago sativa* L. is a very important belongs to the family leguminous. An important winter fodder crop grown as perennial crop. It is persistent productive as well as heat and drought resistant crop, which provides better seasonal distribution than berseem (Bhatti and Soomro, 1996). Alfalfa is also considered to be the best fodder and it is cultivated on large scale in Pakistan. It contains fibre (30%), protein (18%), carbohydrates (11%), fat (8%) and minerals (6%). The dry matter is equally nutritious, having calcium, magnesium, and other mineral salts. It is also valuable in adding nitrogen to the soil and in reducing the salinity level in irrigated lands (Shafi, 1994). Some farmers of Sindh give preference to alfalfa over berseem, *Trifolium alexandrinum* L. (seasonal fodder) Nov-April because alfalfa can supply fodder in hot months i.e. May and June. Like berseem, alfalfa improves soil fertility (Khosro, 1992). In agriculture the insecticides are used primarily for the control of the pests of crops, fruits and vegetables to increase the yield per hectare. But their indiscriminate use has resulted in killing of natural enemies and environmental pollution problem on the large scale. Besides, contaminating food and food products, pesticides are being accumulated in the soil, water and air to a critical level. This calls for a safe and cheap control methods. This can only be achieved by the adoption of integrated pest management (IPM) a pest control strategy which ensures safety of environment. In this regard encouragements of natural enemies occupy a central position in integrated pest management, because biological control of pests and weeds through natural enemies is safe to the environment, permanent and economical (Kapadia and Puri, 1991 and Fischer et al., 1992). Under Sindh conditions a diversified cropping pattern is practiced where the natural enemies are occurring in large numbers. The natural enemies pass their successive generations on a wide variety of their hosts (insect pests). No systematic work on the occurrence of natural enemies particularly the predators on alfalfa has been reported so far from Sindh. Keeping in view the above points, an experiment on the association of predators on alfalfa and cotton crop was investigated during June through September. The preliminary information on predators associated with alfalfa will be utilized for the management of major crop pests under agro ecological conditions of this area.

### Materials and Methods

The population abundance of predators in alfalfa and cotton was recorded at Integrated Pest Management

(IPM), Agriculture Research Institute (ARI) Tandojam, during June to September, 2000. Weekly observations were recorded by using sweep net and direct count method (per 5 sq.ft) for counting the predators on cotton and alfalfa comparing the suitability of methods. Randomly fifty sweeps were performed for each observation at 8.30 a.m. The collected predators both mature and immature were brought to a laboratory into a plastic bag. The predator's species were frozen in a deep freezer at 0°C for 24 hours. The specimens were sorted out by the help of camel hair brush into Petri dishes for identification purpose. The species were identified by comparing the species available at museum of IPM. The identified specimens were deposited in the museum of Entomology Department, Sindh Agriculture University, Tandojam. The meteorological record was obtained from Drainage and Reclamation Institute of Pakistan, (DRIP) at Tandojam. The data collected were subjected to statistically analysis where chi-square test was used for significance.

### Results and Discussion

The population abundance of different species was observed using direct count and sweep net method on alfalfa and cotton. The data indicate that twelve different predator's species were observed throughout period under study on alfalfa and cotton. The species recorded were *Brumus suturalis*, *Campylomma nicolasi*, *Staphylinid hutchinsoni*, *Paederus fuscipes*, *Coccinella undecimpunctata*, *Orius laevigatus*, *Chrysoperla carnea*, *Geocoris tricolor*, *Formicomus antiquus*, *Laius malleifer*, *Delta sp.*, and Spider (unidentified) shown in taxonomic Table 1. The data Table 2 indicates the predators population through sweep net method on alfalfa shows the total population of *Orius laevigatus* was maximum recorded during the entire season followed by *Campylomma nicolasi* Spider un-identified *Laius malleifer* *Formicomus antiquus* *Paederus fuscipes* *Geocoris tricolor* *Staphylinid hutchinsoni* *Coccinella undecimpunctata* *Chrysoperla carnea* *Brumus suturalis* and *Delta sp.*, respectively. The data Table 3 shows the population of predator species on alfalfa by direct count method indicates that maximum population of *Formicomus antiquus* followed by *Orius laevigatus* Spider un-identified *Paederus fuscipes* *Laius malleifer* *Staphylinid hutchinsoni* *Campylomma nicolasi* *Brumus suturalis* *Coccinella undecimpunctata* *Chrysoperla carnea* *Delta sp.*, and *Geocoris tricolor* respectively. However, the highest population of *formicomus antiquus*, *Orius laevigatus*, Spider (un-identified) and *Paederus fuscipes* could be due to availability of pest hosts and favourable

biotic factors. The predators collected from cotton crop through sweep net method Table 4 indicates the highest population of *Orius laevigatus* was followed by *Campylomma nocolasi* Spider un-identified *Formicomus antiquus* *Staphylinid hutchinsoni* *Laius malleifer* *Brumus suturalis*, *Paederus fuscipes*, and *Geocoris tricolor* *Chrysoperla carnea* and *Delta sp.*, respectively. Table 5 further shows the highest population was observed on alfalfa through sweep net method followed by direct count method on alfalfa and on cotton crop through sweep net method. This means that sweep net method showed the better suitability for sampling population of predators on alfalfa than direct count method. Secondly, the population of predators was more on alfalfa than cotton. The highest number of predators on alfalfa could be due to stay of the crop for longer time i.e. from November 1999 to September 2000 which harboured pests and natural enemies in absence of other crops in that area. The third reason could be the wet conditions due to frequent irrigation given to alfalfa were favourable for pests available such as aphids, thrips, cutworms etc, which survived as food for natural enemies. The fourth reason could be favorable biotic condition and availability

of continuous food without application of pesticides on alfalfa might have favoured the population of natural enemies. Weekly data in Table 2 and 3 further depicts that maximum number of predators was recorded during June and July with a range of 31.38 to 33.81°C and 62.25 to 74.31% relative humidity (RH) was favourable for the population of the predators Table 6. The continuous availability of food for pests in alfalfa without disturbance of pests and predators population through pesticides provided ample chances for the multiplication of predators in alfalfa field. Based on the field data of predators of present study, it is advisable that the alfalfa can be grown in strips near major field crops and can be exploited for the pest control through natural enemies. The survey of natural enemies i.e. *Amblyseus gossipi*, *Coccinella undecimpunctata*, *Chrysoperla carnea*, *Phaenobremia aphadivora*, *Eretmocerus transvena* was carried out by (Kapadia and Puri, 1990 and Ntarajan, 1990) from India, who reported their peak numbers during July to October, which were predate upon thrips and white fly on cotton. Similarly (Boomo, et al., 1991) from Italy reported that releases of *Chrysoperla carnea* gave effective control of strawberry aphids.

**Table 1: Taxonomic Position of Predators Associated with Alfalfa and Cotton During 2000**

Common Name	Technical Name	Family	Order
Mirid bug	<i>Campylomma nocolasi</i>	Miridae	Hemiptera
Ladybird beetle	<i>Brumus suturalis</i>	Coccinellidae	Coleoptera
Beetle	<i>Staphylinid hutchinsoni</i>	Staphylinidae	Coleoptera
Rove beetle	<i>Paederus fuscipes</i>	Staphylinidae	Coleoptera
Ladybird beetle	<i>Coccinella undecimpunctata</i>	Coccinellidae	Coleoptera
Pirate bug	<i>Orius laevigatus</i>	Anthocoridae	Hemiptera
Green lace wing	<i>Chrysperla carnea</i>	Chrysopidae	Neuroptera
Lygaeid bug	<i>Geocoris tricolor</i>	Lygaeidae	Hemiptera
Ant	<i>Formicomus antiquus</i>	Formicidae	Hymenoptera
Beetle	<i>Laius malleifer</i>	Malachiidae	Coleoptera
Wasp	<i>Delta sp.</i>	Pteromalidae	Hymenoptera
Spider (un-identified)	--	--	--

**Table 2: Weekly Seasonal Population Fluctuations of Different Predators in Alfalfa Crop Assessed Through Sweep Net Method During June to September 2000**

Month	Week	Brumus	Coc-II	Laius	Staphy	Paeder	Chryso	Geocor	Orius	Campyl	Formi	Delta	Spider
June	3rd	2	4	15	6	7	1	13	55	105	2	0	46
	4th	0	1	4	0	0	2	0	52	20	1	0	13
July	1st	2	4	19	3	15	14	8	77	24	2	3	27
		1	2	5	3	11	5	4	55	29	2	0	21
	3rd	2	20	26	15	19	10	23	205	205	6	1	77
	4th	0	4	9	8	1	2	3	236	110	6	5	43
Aug	1st	0	0	9	1	0	0	0	64	81	1	0	11
	2nd	2	1	19	5	0	0	0	280	148	2	0	29
	3rd	0	0	4	3	0	0	0	60	92	22	0	30
	4th	0	0	5	0	0	0	0	41	77	10	0	5
Sept	1st	0	0	3	0	0	0	0	15	64	1	0	8
	2nd	0	0	3	3	0	0	0	20	14	5	0	3
	3rd	0	0	2	0	0	0	0	10	10	0	0	5
Sum		9	36	123	47	53	34	51	1170	979	60	9	318
Mean		0.69	2.76	9.46	3.61	4.07	2.61	3.92	90.0	75.30	4.61	0.69	24.46

**Khuhro et al.: Population Abundance of Predators in Alfalfa and Cotton Fields at Tandojam**

**Table 3: Weekly Seasonal Population Fluctuations of Different Predators in Alfalfa Crop Assessed Through Direct Count Method (Per 5 Sq. Ft.) During June to August 2000**

Month	Week	<i>Brumus</i>	<i>Coc-II</i>	<i>Laius</i>	<i>Staphy</i>	<i>Paeder</i>	<i>Chryso</i>	<i>Geocor</i>	<i>Orius</i>	<i>Campyl</i>	<i>Formi</i>	<i>Delta</i>	<i>Spider</i>
June	3rd	2	0	10	1	38	0	1	27	0	38	0	13
	4th	1	0	6	4	12	0	0	16	0	30	0	8
July	1st	1	0	4	4	9	2	0	22	0	24	0	6
	2nd	5	2	3	2	7	0	0	13	0	17	0	7
	3rd	2	4	5	4	22	3	0	17	0	28	0	14
	4th	6	5	7	4	28	4	0	34	2	24	3	34
Aug	1st	0	2	6	4	11	2	0	23	4	14	1	20
	2nd	2	3	6	1	7	0	0	20	4	20	0	20
	3rd	1	2	6	2	2	0	0	16	4	16	1	22
	4th	0	0	4	1	0	0	0	17	6	13	0	23
Sum		20	18	57	27	136	11	1	205	20	224	5	167
Mean		2	1.8	5.7	2.7	13.6	1.1	0.1	20.5	2	22.4	0.5	16.7

**Table 4: Weekly Seasonal Population Fluctuations of Different Predators in Cotton Crop Assessed Through Sweep Net Method During June to September 2000**

Month	Week	<i>Brumus</i>	<i>Coc-II</i>	<i>Laius</i>	<i>Staphy</i>	<i>Paeder</i>	<i>Chryso</i>	<i>Geocor</i>	<i>Orius</i>	<i>Campyl</i>	<i>Formi</i>	<i>Delta</i>	<i>Spider</i>
June	3rd	0	0	6	19	1	0	0	6	0	1	0	4
	4th	0	0	1	8	0	3	0	18	2	5	2	5
July	1st	0	0	1	3	0	0	0	21	2	3	0	4
	2nd	1	0	0	3	0	0	0	46	6	7	0	5
	3rd	2	0	1	1	1	0	1	35	10	13	0	7
	4th	1	0	2	0	2	0	2	32	34	1	1	4
Aug	1st	0	0	0	0	0	0	1	3	5	0	0	2
	2nd	0	0	0	0	0	0	0	15	14	2	0	2
	3rd	0	0	4	0	0	0	0	7	11	2	0	2
	4th	0	0	0	1	0	0	0	7	8	2	0	2
Sept	1st	0	0	2	1	0	0	0	10	9	0	0	3
	2nd	0	0	1	4	0	0	0	1	0	2	0	1
	3rd	0	0	0	0	0	0	0	6	5	4	0	4
Sum		4	0	18	40	4	3	4	207	106	42	3	45
Mean		0.30	0	1.48	3.07	0.30	0.23	0.30	15.92	8.15	3.23	0.23	3.46

**Table 5: Comparative Efficiency of Different Methods in Sampling Predators in Cotton and Alfalfa Crops**

Insect	m1	m2	m3	Chi-square
<i>Brumus suturalis</i>	4	9	20	10.6 HS
<i>Coccinella undecimpunctata</i>	0	36	18	34.0 HS
<i>Laius malleifer</i>	18	123	57	83.6 HS
<i>Staphylinid hutchinsoni</i>	40	47	27	4.8 HS
<i>Paederus fuscipes</i>	4	53	136	136.9 HS
<i>Chrysoperla carnea</i>	3	34	11	28.6 HS
<i>Geocoris tricolor</i>	4	51	1	83.9 HS
<i>Orius laevigatus</i>	207	1170	205	1173.1 HS
<i>Campylomma nicolasi</i>	106	979	20	1526.7 HS
<i>Formicomus antiquus</i>	42	60	224	186.3 HS
<i>Delta sp.</i>	3	9	5	2.9 HS
Spider (un-identified)	45	318	167	210.9 HS
Total	476	2889	891	2345.5HS

M1 = Cotton Sweep net Method  
M2 = Alfalfa Sweep net Method  
M3 = Alfalfa Direct Count Method (per 5 sq. ft) on Alfalfa Crop

**Khuhro et al.:** Population Abundance of Predators in Alfalfa and Cotton Fields at Tandojam

**Table 6:** Weekly Meteorological Record from June to September 2000

Month	Week	Average Temperature °C	Average Relative Humidity %
June	3rd	33.81	62.25
	4th	32.07	68.57
July	1st	32.34	72.06
	2nd	32.57	73.14
	3rd	32.37	74.31
	4th	31.38	73.06
August	1st	31.03	74.57
	2nd	29.45	73.68
	3rd	29.18	79.15
	4th	30.41	72.12
September	1st	29.64	78.78
	2nd	31.34	74.12
	3rd	30.19	71.87

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