

Original Research Article

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Relative Abundance and Species Composition of Different Predatory Ant Fauna at Sprayed and Unsprayed Areas in Brinjal Crop

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ABSTRACT

Keywords

Brinjal, Sprayed areas, Unsprayed area, Ants, Seasons, Relative abundance, Species composition.

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The population of total predatory fauna of ants occurring in brinjal crop, during the course of investigation revealed that, during *Kharif* season, the maximum number of ants recorded were in case of *Camponotus sericeus* (28.42 ants/10 plants), followed by *Solenopsis geminata* (23 ants/10 plants), in *rabi* and summer similar result was found at Attur farm (unsprayed area) and at sprayed areas *Kharif* season were *C. sericeus* (16.25 ants/10 plants), followed by *C. compressus* (11.58 ants/10 plants) and *C. parius* (8.92 ants/10 plants), in *rabi* and summer similar result was found at Chikkaballapur and Doddaballapur areas. The maximum relative abundance was found in case of *C. sericeus* (11.93 %), followed by *S. geminata* (9.66 %), *C. compressus* (8.40 %) during *Kharif* season and similar result was observed during *rabi* and summer season at unsprayed condition, *i.e.*, Bengaluru (Attur Farm) and at sprayed area *C. sericeus* (23 %), followed by *C. compressus* (16.67 %) and *C. parius* (12.83 %) while *Monomorium* sp. had least species composition (2.88 %) at Chikkaballapur during *Kharif* season and similar result was observed during *rabi* and summer season and also at Doddaballapur areas during different seasons.

Introduction

Arthropods are important components of ecosystems occupying vital positions in food webs, dynamics of populations and communities. They play various roles in ecosystems acting as herbivores, predators, decomposers, parasitoids and pollinators (Weaver, 1995). Added advantage is that they can be sampled quickly and reliably using various survey methods (New, 1998). Thus, arthropods are often used as biological indicators of ecosystem integrity (Tscharntke *et al.*, 1998) and could be used reliably to infer ecosystem function and

habitat condition (McGeoch, 1998; Weisser and Siemann, 2004). Population ecologists discussed diversity of arthropods in two aspects, species richness (*i.e.* the number of species in a set of samples) and equitability *e.g.*, the number of individuals of each species in a sample (Disney, 1999). Brinjal, *Solanum melongena* L., is one of the three most important vegetables in many South Asian countries like India, Bangladesh, Nepal and Sri Lanka accounting for almost 50 per cent of the world's area under cultivation (Alam *et al.*, 2003). In the brinjal field, various

arthropod species both pests and natural enemies prevail from seedling to harvesting stage.

Materials and Methods

The documentation of natural enemy diversity was carried out in two systems, one unsprayed for which crop was raised at research farm of NBAIR, Bengaluru, at their Yelahanka Campus, Attur Farm and another at sprayed situation at farmers field at Doddaballapur and Chikkaballapur. The crop was raised/ observed from June, 2013 to June, 2014, for one year. At NBAIR research farm, plot was prepared by ploughing and cross-ploughing followed by laddering. All the plots were prepared with proper proportions of manure and fertilizers. The plot size was prepared 8 × 8 m having 75 × 60 cm plant spacing as control plot. The variety which we have used for experimentation was MAHYCO-11 throughout the year. For comparison from control plot, farmer fields were selected at Doddaballapur and Chikkaballapur districts. At farmers' field, the crop stage selected was 35 days after transplanting of the crop and plot size was 8 × 8 m was selected irrespective of the plant spacing and variety grown by the farmers. The counting of predatory diversity, individuals were counted by using absolute methods like visual searching method by recording on plants as well as collection of various stages of predators. After collection, specimens were identified with the help of specialists. The sampling was done once in 10 days in both unsprayed and sprayed fields, thus 36 observations were recorded in a year.

Results and Discussion

During *Kharif* season at Bengaluru (Attur Farm) unsprayed area, the maximum number of ants recorded were in case of *Camponotus sericeus* (28.42 ants/10 plants), followed by

Solenopsis geminata (23 ants/10 plants), other major species recorded were *C. compressus* (20 ants/10 plants), *Monomorium indicum* (17.25 ants/10 plants), *Myrmecaria brunnea* (17.00 ants/10 plants), *Monomorium* sp. (16.92 ants/10 plants), *M. criniceps* (16.00 ants/10 plants), *Crematogaster* sp. (15.50 ants/ 10 plants), while in other species mean number ranged from 9.92 to 13.92, whereas in minor species, mean number of ants recorded were 6.33 ants/10 plants (Table 1). Among the different ant species, maximum relative abundance was found in case of *C. sericeus* (11.93 %), followed by *S. geminata* (9.66 %), *C. compressus* (8.40 %), whereas in case of major species per cent composition ranged from 4.16 to 7.14, however in minor species per cent composition was 2.66 of total diversity (Table 1).

Similarly, during *rabi* 2013-14, maximum number of ants recorded species-wise were *C. sericeus* (17.25 ants/10 plants), followed by *M. indicum* (11.67 ants/10 plants), *C. compressus* (11.25 ants/10 plants), *L. processionalis* (10.17 ants/10 plants), while in other species mean number ranged from 3.33 to 9.92 ants/10 plants in the decreasing order (Table 1). Among the ant species, maximum relative abundance was found in case of *C. sericeus* (12.03 %), followed by *M. indicum* (8.14 %), *C. compressus* (7.85 %), *L. processionalis* (7.09 %), *P. exercita*, *L. chinensis* (6.92 %), *M. criniceps* (6.57 %), *C. parius* (6.51 %), *M. bicolor* (6.16 %) and *Technomyrmex* sp. which had least species composition (2.33 %) (Table 1). The maximum number of ants recorded species-wise during summer 2013-14 was for *C. sericeus* (22.42 ants/10 plants) followed by *C. parius* (17.67 ants/10 plants), *C. compressus* (14.58 ants/10 plants), *M. brunnea* (14.25 ants/10 plants), *S. geminata* (13.08 ants/10 plants), *M. indicum* (11.92 ants/10 plants), *M. bicolor* (11.33 ants/10 plants), *L. processionalis* (10.58 ants/10 plants), *P.*

exercita (10.33 ants/10 plants), *M. criniceps* (10.25 ants/10 plants) and *Technomyrmex* sp. (5.92 ants/10 plants) in that decreasing order (Table 1). Among the ant species maximum relative abundance was recorded in case of *C. sericeus* (12.14 %) followed by *C. parius* (9.57 %), *C. compressus* (7.90 %), *M. brunnea* (7.72 %), followed by *S. geminata* (7.08 %), *M. indicum* (6.45 %), *M. bicolor* (6.14 %), while *Technomyrmex* sp. was the least recorded species (3.20 %) (Table 1).

At Chikkaballapur sprayed area, maximum number of ant recorded species-wise in decreasing order during *Kharif* season were *C. sericeus* (16.25 ants/10 plants), followed by *C. compressus* (11.58 ants/10 plants) and *C. parius* (8.92 ants/10 plants) while *Monomorium* sp. was recorded in least numbers recorded (2.00 ants/10 plants) (Table 2). Among the ant species, maximum relative abundance was recorded in case of *C. sericeus* (23 %), followed by *C. compressus* (16.67 %) and *C. parius* (12.83 %) while *Monomorium* sp. had least species composition (2.88 %) (Table 2).

During *rabi* season, maximum number of ants recorded species-wise was in case of *C. sericeus* (10.17 ants/10 plants), followed by *C. compressus* (6.17 ants/10 plants), *C. parius* (6.08 ants/10 plants) and lowest number of ants recorded was in case of *Technomyrmex* sp. (1.25 ants/10plants) (Table 2). Among the ant species maximum species composition was found in case of *C. sericeus* (22 %), followed by *C. compressus* (13.43 %), *C. parius* (13.25 %) and the lowest species composition was observed in case of *Technomyrmex* sp. (2.72 %) (Table 2).

Maximum mean number of ant species was recorded during summer season, *C. sericeus* was recorded in significantly highest numbers (15.33 ants/10 plants), followed by *C. compressus* (9.25 ants/10 plants), *C. parius* (7.25 ants/10 plants), other ants (6.00 ants/10

plants), while *Technomyrmex* sp. had least mean number (2.50 ants/10 plants) (Table 2). Among the ant species maximum species composition was recorded in case of *C. sericeus* (23.41 %), followed by *C. compressus* (14.12 %), *C. parius* (11.07 %), other ants (9.16 %), while *Technomyrmex* sp. had lowest species composition (3.82 %) (Table 2).

At Doddaballapur sprayed area, during *Kharif* season, the composition of ant species recorded was *C. sericeus* (13.08 ants/10 plants), followed by *C. compressus* (10.42 ants/10 plants), *C. parius* (7.17 ants/10 plants), *M. brunnea* (5.75 ants/10 plants), while *Technomyrmex* sp. had lowest composition of ants mean (1.83 ants/10 plants) (Table 3). Further relative abundance of ant species was as follows *C. sericeus* (21.33 %), followed by *C. compressus* (16.98 %), *C. parius* (11.68 %), *M. brunnea* (9.38 %), whereas *Technomyrmex* sp. had least composition (2.99 %) (Table 3).

Species-wise mean number of ants recorded during *rabi* crop was as follows *C. sericeus* (11.00 ants/10 plants) followed by *C. compressus* (7.08 ants/10 plants), *C. parius* (5.42 ants/10 plants) and *Monomorium* sp. which showed lowest mean number of ants (2.42 ants/10 plants) (Table 3). Among the ant species maximum relative abundance was recorded in case of *C. sericeus* (20.92 %), followed by *C. compressus* (13.47 %), *C. parius* (10.30 %) and *Monomorium* sp. was recorded as having least abundance (4.60 %) (Table 3). During summer season, maximum mean number of ant species recorded were *C. sericeus* (14.42 ants/10 plants), followed by *C. compressus* (10.17 ants/10 plants), *M. brunnea* (7.25 ants/10 plants), *C. parius* (6.75 ants/10 plants), *C. irritans* (5.08 ants/10 plants) and lowest mean number of ants was found in case of *Crematogaster* sp. (2.58 ants/10 plants) (Table 3).

Table.1 Relative abundance of different predatory ants in unsprayed area of brinjal crop at Attur Farm

Ant species	Kharif			Rabi			Summer		
	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition
<i>Camponotus compressus</i>	240.00	20.00±5.26	8.40	135.00	11.25±2.53	7.85	175.00	14.58±2.15	7.90
<i>Camponotus irritans</i>	146.00	12.17±3.69	5.11	102.00	8.50±2.68	5.93	118.00	9.83±4.61	5.32
<i>Camponotus parius</i>	167.00	13.92±2.68	5.84	112.00	9.33±3.63	6.51	212.00	17.67±6.08	9.57
<i>Camponotus sericeus</i>	341.00	28.42±10.26	11.93	207.00	17.25±6.20	12.03	269.00	22.42±5.28	12.14
<i>Crematogaster sp.</i>	186.00	15.50±5.45	6.51	70.00	5.83±2.12	4.07	82.00	6.83±1.95	3.70
<i>Leptogenys chinensis</i>	119.00	9.92±3.03	4.16	119.00	9.92±3.03	6.92	116.00	9.67±2.57	5.23
<i>Leptogenys processionalis</i>	122.00	10.17±3.35	4.27	122.00	10.17±3.35	7.09	127.00	10.58±2.87	5.73
<i>Meranoplus bicolor</i>	138.00	11.50±2.50	4.83	106.00	8.83±2.52	6.16	136.00	11.33±2.74	6.14
<i>Monomorium criniceps</i>	192.00	16.00±3.46	6.72	113.00	9.42±2.50	6.57	123.00	10.25±3.67	5.55
<i>Monomorium indicum</i>	207.00	17.25±6.20	7.24	140.00	11.67±4.19	8.14	143.00	11.92±3.90	6.45
<i>Monomorium sp.</i>	203.00	16.92±4.44	7.10	76.00	6.33±1.56	4.42	108.00	9.00±2.13	4.87
<i>Myrmecaria brunnea</i>	204.00	17.00±4.31	7.14	87.00	7.25±1.48	5.06	171.00	14.25±3.36	7.72
<i>Polyrhachis exercita</i>	119.00	9.92±2.94	4.16	119.00	9.92±2.94	6.92	124.00	10.33±2.46	5.60
<i>Solenopsis geminata</i>	276.00	23.00±4.99	9.66	96.00	8.00±2.73	5.58	157.00	13.08±3.63	7.08
<i>Technomyrmex sp.</i>	122.00	10.17±3.21	4.27	40.00	3.33±2.06	2.33	71.00	5.92±2.97	3.20
Others	76.00	6.33±1.56	2.66	76.00	6.33±1.56	4.42	84.00	7.00±1.21	3.79
Total	2858.00	238.17±36.79	100.00	1720.00	143.33±20.39	100.00	2216.00	184.67±24.18	100.00

Table.2 Relative abundance of different predatory ants in sprayed area of brinjal crop at Chikkaballapur

Ant species	<i>Kharif</i>			<i>Rabi</i>			Summer		
	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition
<i>Camponotus compressus</i>	139.00	11.58±4.38	16.67	74.00	6.17±1.27	13.43	111	9.25±3.22	14.12
<i>Camponotus irritans</i>	38.00	3.17±0.94	4.56	35.00	2.92±0.79	6.35	48	4.00±0.95	6.11
<i>Camponotus parius</i>	107.00	8.92±3.00	12.83	73.00	6.08±1.78	13.25	87	7.25±2.80	11.07
<i>Camponotus sericeus</i>	195.00	16.25±4.25	23.38	122.00	10.17±2.55	22.14	184	15.33±3.52	23.41
<i>Crematogaster sp.</i>	40.00	3.33±1.07	4.80	26.00	2.17±0.58	4.72	54	4.50±1.51	6.87
<i>Meranoplus bicolor</i>	50.00	4.17±1.19	6.00	22.00	1.83±0.83	3.99	36	3.00±1.48	4.58
<i>Monomorium criniceps</i>	48.00	4.00±1.71	5.76	38.00	3.17±0.83	6.90	39	3.25±0.87	4.96
<i>Monomorium sp.</i>	24.00	2.00±0.85	2.88	22.00	1.83±0.83	3.99	32	2.67±1.44	4.07
<i>Myrmecaria brunnea</i>	62.00	5.17±1.19	7.43	40.00	3.33±0.65	7.26	41	3.42±0.67	5.22
<i>Solenopsis geminata</i>	52.00	4.33±1.23	6.24	42.00	3.50±0.52	7.62	52	4.33±1.37	6.62
<i>Technomyrmex sp.</i>	38.00	3.17±1.59	4.56	15.00	1.25±0.45	2.72	30	2.50±0.80	3.82
Others	41.00	3.42±1.08	4.92	42.00	3.50±1.09	7.62	72	6.00±1.28	9.16
Total	834.00	69.50±11.04	100.00	551.00	45.92±4.52	100.00	786	65.50±8.46	100

Table.3 Relative abundance of different predatory ants in sprayed area of brinjal crop at Doddaballapur

Ant species	<i>Kharif</i>			<i>Rabi</i>			Summer		
	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition	Total	Mean ± SD	% species composition
<i>Camponotus compressus</i>	125.00	10.42±3.40	16.98	85.00	7.08±1.16	13.47	122.00	10.17±1.90	14.63
<i>Camponotus irritans</i>	49.00	4.08±1.51	6.66	44.00	3.67±1.30	6.97	61.00	5.08±2.02	7.31
<i>Camponotus parius</i>	86.00	7.17±3.16	11.68	65.00	5.42±1.44	10.30	81.00	6.75±2.86	9.71
<i>Camponotus sericeus</i>	157.00	13.08±1.88	21.33	132.00	11.00±2.49	20.92	173.00	14.42±3.42	20.74
<i>Crematogaster sp.</i>	28.00	2.33±0.49	3.80	32.00	2.67±1.23	5.07	31.00	2.58±0.90	3.72
<i>Meranoplus bicolor</i>	36.00	3.00±0.74	4.89	33.00	2.75±1.14	5.23	40.00	3.33±1.50	4.80
<i>Monomorium criniceps</i>	42.00	3.50±1.24	5.71	42.00	3.50±0.90	6.66	46.00	3.83±1.19	5.52
<i>Monomorium sp.</i>	24.00	2.00±0.85	3.26	29.00	2.42±1.08	4.60	43.00	3.58±1.16	5.16
<i>Myrmicaria brunnea</i>	69.00	5.75±1.76	9.38	54.00	4.50±1.62	8.56	87.00	7.25±2.01	10.43
<i>Solenopsis geminata</i>	47.00	3.92±1.00	6.39	48.00	4.00±0.74	7.61	53.00	4.42±1.44	6.35
<i>Technomyrmex sp.</i>	22.00	1.83±0.72	2.99	31.00	2.58±1.16	4.91	44.00	3.67±0.78	5.28
Others	51.00	4.25±1.76	6.93	36.00	3.00±1.21	5.71	53.00	4.42±1.16	6.35
Total	736.00	61.33±8.53	100.00	631.00	52.58±5.11	100.00	834.00	69.50±9.65	100.00

Among the ant species, maximum relative abundance was found in case of *C. sericeus* (20.74 %), followed by *C. compressus* (14.63 %), *M. brunnea* (10.43 %), *C. parius* (9.71 %), *C. irritans* (7.31 %) and lowest abundance recorded was in case of *Creumatogaster* sp. (3.72 %) (Table 3).

The results of the plant dwelling predaceous and other insects in the present study suggest that ants, spiders and coleopterans are the most important predators on brinjal crop. The present findings closely agree with the findings of El-Shafie (2001), who observed 28 species of insect pests under seven different insect orders and coleopteran and ants as major predaceous insects, while Nayar *et al.*, (1995) reported 53 species of insect pests of brinjal. Assessment of parasitoid community is one of the key steps of understanding pest dynamics. Successful biological control program requires detailed studies on biology and behaviour of the host and their natural enemies, interaction among hosts, natural enemies and environment. Although, several researchers published reports on pest of brinjal elsewhere however, information about total arthropods community in the brinjal agro-ecosystem is limited. So, our objective was to observe the arthropod biodiversity in the brinjal agro-ecosystem both under unsprayed and sprayed conditions.

The population of the total predatory fauna occurring in brinjal crop, *viz.*, ants, spiders, coccinellids, green lacewing, assassin bugs, wasps, praying mantis, earwigs and others were recorded during the course of this investigation. Twenty-one species of ants were found to occur in the brinjal crop, in which *M. brunnea*, *S. geminata* and *M. criniceps* were recorded as the dominant species both under unsprayed and sprayed conditions. Present investigation is in agreement with earlier report of Latif *et al.*, (2009), who recorded 17 species of ants,

among them 7 families were identified as predators, while El-Shafie (2001) observed 28 species of insect pests under seven different insect orders from the brinjal ecosystem and Nayar *et al.*, (1995) reported 53 species of insect pests of brinjal.

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