Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2021; 9(5): 24-28

Received: 06-06-2021
Accepted: 09-08-2021

M Kandibane
Department of Agricultural Entomology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T of Puducherry, India

R Ashoke
Department of Agricultural Entomology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T of Puducherry, India

V Amsagowri
Department of Agricultural Entomology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T of Puducherry, India

Corresponding Author:
M Kandibane
Department of Agricultural Entomology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U.T of Puducherry, India

Diversity of parasitic fauna in mango ecosystem, PAJANCOA and RI, Karaikal, U.T. of Puducherry

M Kandibane, R Ashoke and V Amsagowri

Abstract
The present investigation was carried out to study the parasitic fauna in rice ecosystem during *Kharif* 2017 and *Rabi* 2017-18 at Pandit Jawaharlal Nehru College of Agriculture and Research Institute (PAJANCOA and RI), Karaikal, U. T. of Puducherry. A total of 3414 parasitoids were collected in mango ecosystem during *Kharif* 2017and *Rabi* 2017-18 represented eight superfamilies namely Chalcidoidea (2061), Platygastroidea (407), Ichneumonoidea (465), Chrysidoidea (33), Cynipoidea (62), Evanoidea (7), Diaprioidea (280) and Ceraphronoidea (99). In mango ecosystem there were twenty two families during *Kharif* 2017and *Rabi* 2017-18 representing Chalcididae (60), Aphelinidae (73), Mymaridae (307), Encyrtidae (153), Trichogrammtidae (31), Eulophidae (27), Eurytomidae (52), Eupelmidae (1167), Torymidae (1), Pteromalidae (131), Agonidae (3), Elasmidae (14), Tetracampidae (42), Platygastridae (407), Ichneumonidae (152), Braconidae (313), Bethylidae (27), Dryinidae (6), Cynipidae (62), Evaniidae (7), Diapriidae (280) and Ceraphronidae (99). It was found that all the families of parasitic fauna showed different level of correlations with maximum and minimum temperature and relative humidity.

Keywords: Survey, parasitic fauna, Hymenoptera, mango ecosystem and correlation studies

Introduction
Mango is an important fruit crop grown in India. Pests of lepidopteran, hemipteran, coleopteran and dipteran groups cause economic damage in mango. The biology of parasitic fauna are synchronized with the population of phytophagous insects. The parasitoid groups have always interactions with herbivore groups and establish them well during the season in order to maintain the biotic balance in the mango ecosystem. A total of 436 parasitoids are recorded in mango (Vayssieres *et al.*, 2002) [10] which comprised of eight species. Chalcidoidea, Platygastroidea and Ichneumonoidea are the dominant superfamilies in mango ecosystem. The dominant families are Platygastridae, Chalcididae and Ichneumonidae. There were no records of superfamily, family and genera of parasitic fauna in mango ecosystem of Karaikal. Hence, the present investigation was undertaken to study the parasitic fauna in mango ecosystem of PAJANCOA and RI, Karaikal, U.T. of Puducherry.

Methods of collection
Collection of parasitic Hymenoptera was done with different traps in both the seasons of mango ecosystem.

Yellow pan trap
This was an excellent method used to collect parasitoids notably small insects as well as other group of insects. It worked on the principles that many insects were attracted to yellow colour (Noyes, 1982) [6]. The yellow pan trap measured about 60-70 mm deep and 30 cm square. The yellow pan trap consisted of yellow coloured shallow plastic plate. The yellow pan was placed in a rice ecosystem at weekly intervals, and it was filled with water in which a few drops of detergent was added to break the surface tension. A total of 25 traps were placed in the mango ecosystem (western farm) of PAJANCOA and RI, Karaikal, U.T. of Puducherry during *Kharif* 2017 and *Rabi* 2017 -18, at random for effective sampling and kept for two days in a place. The yellow pan traps were emptied every 48 hrs, by carefully filtering through fine mesh sieve 10-15cm. The collected specimens of parasitic fauna were washed with clean water to prevent the formation of detergent and salt deposition over the trapped specimens.

The specimens that were available in the sieve were transferred to a petriplate with a little quantity of water. Then, the specimens from the petriplate were transferred to a cavity block which was placed under the stereo zoom microscope in order to separate the specimens to different family level. The segregated specimens were housed in vials with 80 per cent alcohol until the specimens were carded.

Sweep net

Sweeping was done to collect parasitoids in the canopy of rice. The sweep net was made of white nylon cloth with fine mesh to avoid escape of parasitoids. It had a hoop of 30-40 cm diameter with a long handle of 100 cm. The diameter of the hoop and depth of the bag was in the proportion of 1:2 (Noyes and Valentine, 1989) [7].

Light trap

Solar insect light trap, manufactured by the SAFS Organic Enterprises, Puducherry, was placed in the mango field to collect the parasitoids. The light trap in a darkened area was placed with strong light coming from one direction, so that small insects were collected. The specimens trapped in the receptacle pan containing water were collected on the next day morning and individual species were sorted for identification.

Preservation

Two categories of permanent preservations *viz*., liquid preservation and dry preservation were carried out in this study, as described by Noyes (1982) [6].

Results and discussion

The results on the diversity of parasitic fauna in mango ecosystem during *Kharif* 2017 exhibited that a total of 1243 parasitoids were collected and was constituted by eight superfamilies (Table 1and fig 1). Among the all parasitic superfamilies, Chalcidoidea (472) was the dominant, followed by Platygastroidea (285), Ichneumonoidea (211), and Diaprioidea (145). The lowest number of parasitoids was registered in the superfamily Evanoidea (6). Among the 17 standard week from 27th-43rd, the highest number of 108 parasitoids was recorded at 28th standard week followed by 27th (106), 39th (100), 43rd (97), 40th (89), 32nd (87), 29th (83), 31st (82), 35th (79) and 34th (78). The lowest number of 29 parasitoids was recorded at 42nd standard week. Singh and Manickavasagam (2014) studied the parasitic fauna from Manipur and reported eight superfamilies namely Ichneumonoidea, Chalcidoidea, Platygastroidea, Proctotrupoidea, Ceraphronoidea, Cynipoidea, Evanoidea and Chrysidoidea. Instead of Diaprioidea, Proctotrupoidea was the additional superfamilies in the earlier finding.

During *Rabi* 2017-18 a total of 2171 parasitoids were collected and was constituted by eight superfamilies (Table 2 and fig 2). Among the all parasitic superfamilies, Chalcidoidea (1589) was dominant, followed by Ichneumonoidea (254), Diaprioidea (135) and Platygastroidea (122). The lowest number of parasitoids were registered in the superfamily Evanioidea (1). In mango ecosystem, parasitoids were collected from 44th to 6th standard week during *Rabi* 2017-18. Among the 15 standard week from 44th to 6th, the highest number of 213 parasitoids was recorded at 52nd standard week, followed by 4th (205), 44th (188), 1st (182), 5th (179), 3rd (172), 6th (158), 2nd (149) and 45th (139). The lowest number of 83 parasitoids was recorded at 50th standard week. Gibson (1993) [2] reported that Chalcidoidea had a wide range of hosts, such as insects and spiders. The parasitoids that emerged from the host insects in the 2nd and 3rd week of August. Chalcidoidea was the richest and most abundant superfamily due to their land use and ecosystem maintenance. The above findings are in conformity with the present study

The studies on the families of parasitic fauna in mango ecosystem during *Kharif* 2017 registered A total of 1243 parasitoids were collected in mango ecosystem and was constituted by twenty two families during *Kharif* 2017 (Table 3). Among the all families, Platygastridae (285) was the dominant, followed by Diapriidae (145), Braconidae (127), Encyrtidae (98), Eupelmidae (96), Mymaridae (86), Ichneumonidae (84), Pteromalidae and Ceraphronidae (66). The lowest number of parasitoids were registered in the family of Torymidae (1). In the mango ecosystem, the parasitoids were collected from 27th standard week to 43rd standard week during *Kharif* 2017. Among the 17 standard week from 27th-43rd, the highest number of 108 parasitoids was recorded at 28th standard week followed by 27th (106), 39th (100), 43rd (97), 40th (89), 32nd (87), 29th (83), 31st (82), 35th (79) and 34th (78). The lowest number of 29 parasitoids was recorded at 42nd standard week. Platygastridae abundance was high in the *Kharif* season from July to mid-August due to the host of Hemipteran bug in rice ecosystem (Knight, 2017). Farhat *et al.* (2011) [1] reported that *Telenomus remus* of Platygastridae showed good parasitism potential in egg of Lepidopteran larvae. The above findings are in corroborate with the present study.

During *Rabi* 2017-18, a total of 2171 parasitoids were collected in mango ecosystem which was constituted by twenty two families during *Rabi* 2017 (Table 4). Among the all families, Eupelmidae (1071) was the dominant, followed by Mymaridae (221), Braconidae (186), Diapriidae (135), and Platygastridae (122). Among the 15 standard week from 44th to 6th, the highest number of 213 parasitoids was recorded at 52nd standard week, followed by 4th (205), 44th (188), 1st (182), 5th (179), 3rd (172), 6th (158), 2nd (149) and 45th (139). The lowest number of 83 parasitoids was recorded at 50th standard week. Monge and Huignard (1991) [4] reported that Eupelmidae had more abundance due to the Bruchids host in the month of September to October. This leads to increase in the population of parasitoids. The reason for more abundance of parasitoids at 52nd standard week may be due presence of more species of host insects and conducive climate in mango ecosystem. The above findings are in accordance with the present study.

Influence of meteorological parameters on the parasitic fauna of mango ecosystem showed that that Chalcididae, Aphelinidae, Mymaridae, Encyrtidae, Ichneumonidae, Platygastridae and Dryinidae registered a significant positive correlation (0.17, 0.11, 0.12, 0.06) with and a significant negative correlation (-0.09, -0.12) with maximum temperature (Table 5). Chalcididae, Aphelinidae, Encyrtidae and Ichneumonidae recorded a significant positive correlation with minimum temperature (0.06, 0.04, 0.04, 0.12, 0.03) and Platygastridae registered a significant negative correlation with minimum temperature (-0.22). A negative correlation was observed between relative humidity (-0.33) and Chalcididae and Encyrtidae. A positive correlation was observed with relative humidity (0.04, 0.05, 0.11, 0.23) and Aphelinidae, Mymaridae, Ichneumonidae and Platygastridae. Sandanayaka and Ramankutty (2007) [8] reported that the development period of *Platygaster* in soil increased by

increasing temperature and emerged at 11 and 27 °C, there will be a significant difference between the development and emergence of the parasitoids. Nechols *et al.* (1989) [5] reported that encyrtid wasp had lower survivorship at extreme temperatures at 18 and 32.7 °C and had high fecundity, net reproductive rate and intrinsic rate of increase at 27 °C. The present study are in conformity with the earlier findings.

Table 1: Parasitoids collected in mango ecosystem during *Kharif* 2017

Sl. No.	Superfamily	Number of parasitoids collected*																	
		27th std week	28th std week	29th std week	30th std week	31st std week	32nd std week	33rd std week	34th std week	35th std week	36th std week	37th std week	38th std week	39th std week	40th std week	41st std week	42nd std week	43rd std week	Total
1	Chalcidoidea	40	51	50	27	16	34	10	22	16	18	12	11	38	35	12	29	51	472
2	Platygastroidea	19	13	10	6	39	26	31	21	14	9	7	11	19	15	29	--	16	285
3	Ichneumonoidea	7	11	22	3	6	2	3	33	44	16	12	16	9	4	2	--	21	211
4	Chrysidoidea	1	1	--	--	--	2	--	1	--	3	--	1	4	3	2	--	--	18
5	Cynipoidea	9	4	1	--	3	6	3	--	4	7	--	--	1	1	--	--	1	40
6	Evanioidea	1	--	--	--	1	--	--	--	1	--	--	--	2	1	--	--	--	6
7	Diaprioidea	18	15	--	--	11	8	2	1	--	12	5	7	24	26	10	--	6	145
8	Ceraphronoidea	11	13	--	--	6	9	5	--	--	--	--	--	3	4	13	--	2	66
	Total	106	108	83	36	82	87	54	78	79	65	36	46	100	89	68	29	97	1243

***** Collections from net sweeping, yellow pan trap and light trap.

Table 2: Parasitoids collected in mango ecosystem during *Rabi* 2017-18

Sl. No.	Superfamily	Number of parasitoids collected*															
		44th std week	45th std week	46th std week	47th std week	48th std week	49th std week	50th std week	51st std week	52nd std week	1st std week	2nd std week	3rd std week	4th std week	5th std week	6th std week	Total
1	Chalcidoidea	138	88	46	59	55	75	53	87	170	162	110	152	162	130	102	1589
2	Platygastroidea	2	12	5	4	13	11	6	12	17	8	1	1	4	11	15	122
3	Ichneumonoidea	40	28	25	13	4	3	6	9	10	6	25	6	30	21	28	254
4	Chrysidoidea	--	--	--	2	2	2	3	--	--	--	--	--	2	1	3	15
5	Cynipoidea	5	1	--	8	--	4	--	2	--	1	--	1	--	--	--	22
6	Evanioidea	--	--	--	--	--	--	--	-	--	--	--	--	--	--	1	1
7	Diaprioidea	2	8	14	12	10	7	8	17	13	4	9	5	4	15	7	135
8	Ceraphronoidea	1	2	--	2	--	--	7	--	3	1	4	7	3	1	2	33
	Total	188	139	90	100	84	102	83	127	213	182	149	172	205	179	158	2171

***** Collections from net sweeping, yellow pan trap and light trap

Table 3: Families of Parasitoids collected in mango ecosystem during *Kharif* 2017

Sl. No.	Family	Number of parasitoids collected*																	
		27th std week	28th std week	29th std week	30th std week	31st std week	32nd std week	33rd std week	34th std week	35th std week	36th std week	37th std week	38th std week	39th std week	40th std week	41st std week	42nd std week	43rd std week	Total
1	Chalcididae	5	3	6	--	1	2	--	2	--	4	6	3	2	1	--	--	--	35
2	Aphelinidae	1	--	5	4	--	8	--	--	--	--	--	--	6	1	--	--	8	33
3	Mymaridae	8	12	--	4	2	11	--	--	--	--	--	--	13	7	2	27	--	86
4	Encyrtidae	3	1	9	--	7	6	4	8	14	7	--	--	12	16	5	--	6	98
5	Trichogrammatidae	--	--	6	4	--	--	1	3	--	2	--	--	--	1	3	--	1	21
6	Eulopidae	1	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7
7	Eurytomidae	4	2		5	1	1	--	--	1	3	--	--	--	1	--	--	1	19
8	Eupelmidae	7	12	17	8	3	2	--	2	--	1	--	8	1	4	2	--	29	96
9	Torymidae	--	--	--	--	--	--		1	--	--	--	--			--	--	--	1
10	Pteromalidae	11	14	7	1	2	4	3	6	1	1	5	--	3	2	--		6	66
11	Agonidae	--	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	2
12	Elasmidae	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	Tetracampidae	--	1	--	1	--	--	1	--	--	--	1	--	--	2		2	--	8
14	Platygastridae	19	13	10	6	39	26	31	21	14	9	7	11	19	15	29	--	16	285
15	Ichneumonidae	6	4	3	1	2	1	2	14	17	2	4	1	6	--	--	--	21	84
16	Braconidae	1	7	19	2	4	1	1	19	27	14	8	15	3	4	2	--	--	127
17	Bethylidae	1	1	--	--	--	2	--	1	--	3	--	1	4	3	2	--	--	18
18	Dryinidae	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	Cynipidae	9	4	1	--	3	6	3	--	4	7	--	--	1	1	--	--	1	40
20	Evaniidae	1	--	--	--	1	--	--	--	1	--	--		2	1	--	--	--	6
21	Diapriidae	18	15	--	--	11	8	2	1	--	12	5	7	24	26	10	--	6	145
22	Ceraphronidae	11	13	--	--	6	9	5	--	--	--	--	--	3	4	13	--	2	66
	Total	106	108	83	36	82	87	54	78	79	65	36	46	100	89	68	29	97	1243

***** Collections from net sweeping, yellow pan trap and light trap.

Table 4: Families of Parasitoids collected in mango ecosystem during *Rabi* 2017-18

Sl. No.	Family	Number of parasitoids collected*															
		44th std week	45th std week	46th std week	47th std week	48th std week	49th std week	50th std week	51st std week	52nd std week	1st std week	2nd std week	3rd std week	4th std week	5th std week	6th std week	Total
1	Chalcididae	3	2	2	--	1	1	--	1	3	2	--	2	1	3	4	25
2	Aphelinidae	2	11	--	1	--	--	1	8	2	1	--	1	8	--	5	40
3	Mymaridae	31	21	5	9	14	19	13	21	27	16	5	15	17	6	2	221
4	Encyrtidae	9	7	12	2	1	5	1	3	9	--	2	3	--	1	--	55
5	Trichogrammatidae	1	2	1	--	--	--	3	--	2	--	--	--	--	--	1	10
6	Eulopidae	3	4	1	--	--	1	--	3	--	1	--	1	3	2	1	20
7	Eurytomidae	9	4	1	--	--	3	--	3	4	3	--	--	--	3	3	33
8	Eupelmidae	64	29	21	44	37	41	35	39	112	128	97	115	126	107	76	1071
9	Torymidae	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10	Pteromalidae	12	6	3	3	2	5	--	7	4	6	5	4	1	3	4	65
11	Agonidae	--	--	--	--	--	--	--	1	--	--	--	---	--	--	--	1
12	Elasmidae	--	--	--	--	--	--	--	1	1	2	1	3	1	2	3	14
13	Tetracampidae	4	2	--	--	--	--	--	--	6	3		8	5	3	3	34
14	Platygastridae	2	12	5	4	13	11	6	12	17	8	1	1	4	11	15	122
15	Ichneumonidae	8	10	13	6		1	1		3	4	5	2	9	4	2	68
16	Braconidae	32	18	12	7	4	2	5	9	7	2	20	4	21	17	26	186
17	Bethylidae	--	--	--	1	--	--	2	--	--	--	--	--	2	1	3	9
18	Dryinidae	--	--	--	1	2	2	1	--	--	--	--	--	--	--	--	6
19	Cynipidae	5	1	--	8	--	4	--	2	--	1	--	1	--	--	--	22
20	Evaniidae	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1
21	Diapriidae	2	8	14	12	10	7	8	17	13	4	9	5	4	15	7	135
22	Ceraphronidae	1	2	--	2	--	--	7	--	3	1	4	7	3	1	2	33
	Total	188	139	90	100	84	102	83	127	213	182	149	172	205	179	158	2171

***** Collections from net sweeping, yellow pan trap and light trap.

Table 5: Correlation between weather parameters and parasitic family of Hymenoptera in mango

Weather parameters	Chalcididae	Aphelinidae	Mymaridae	Encyrtidae	Ichneumonidae	Platygastridae	Dryinidae
Maximum temperature	0.17	0.11	-0.09	0.12	-0.12	0.06	0
Minimum Temperature	0.06	0.04	0.04	0.12	0.03	-0.22	0
Relative Humidity	-0.33	0.04	0.05	-0.03	0.11	0.23	0

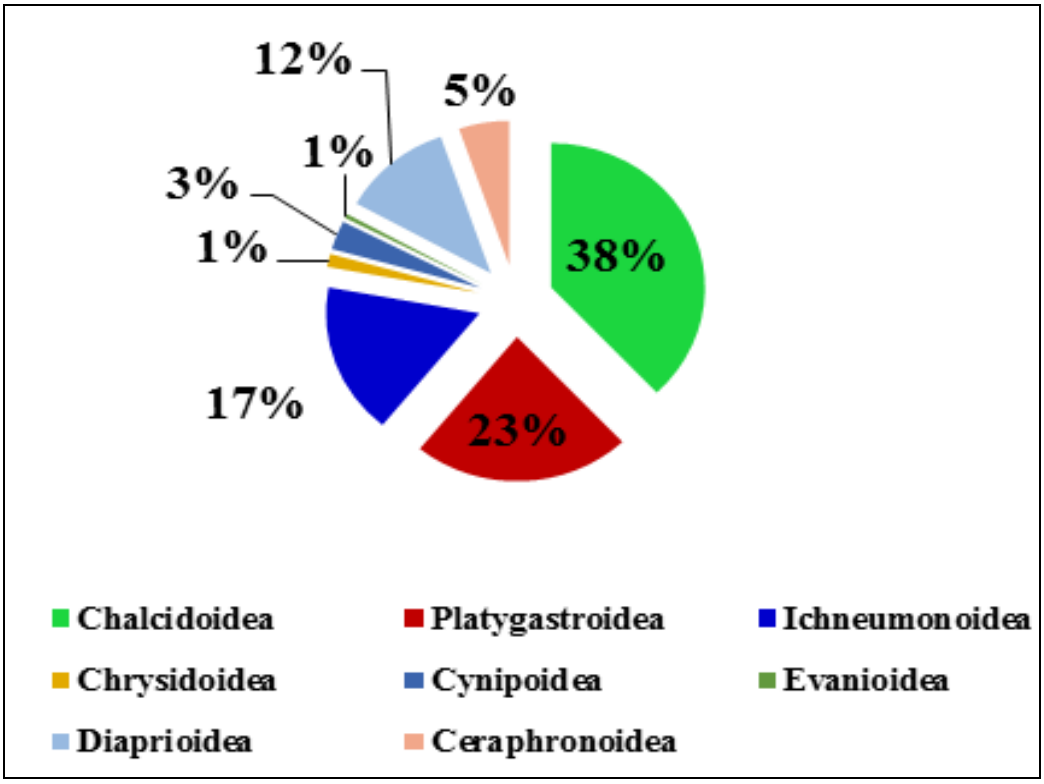

Fig 1: Superfamilies of parasitoids in mango ecosystem during *kharif* 2017

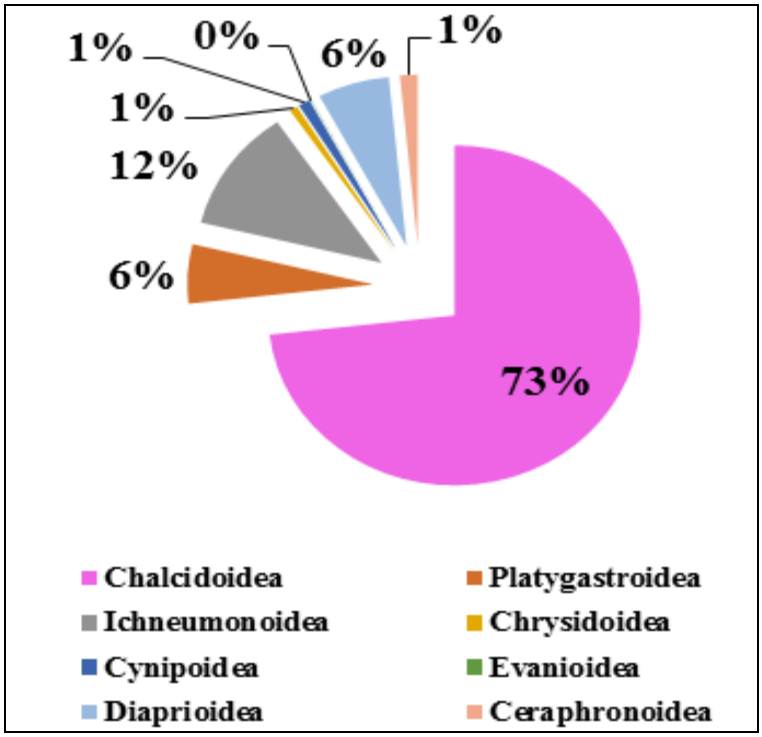

Fig 2: Superfamilies of parasitoids in mango ecosystem during *rabi* 2017

Conclusion

The result of the present study depicted that a total of 3414 parasitoids collected in mango ecosystem during *Kharif* and *Rabi* 2017 represented eight superfamilies and twenty two families representing Chalcididae (60), Aphelinidae (73), Mymaridae (307), Encyrtidae (153), Trichogrammtidae (31), Eulophidae (27), Eurytomidae (52), Eupelmidae (1167), Torymidae (1), Pteromalidae (131), Agonidae (3), Elasmidae (14), Tetracampidae (42), Platygastridae (407), Ichneumonidae (152), Braconidae (313), Bethylidae (27), Dryinidae (6), Cynipidae (62), Evaniidae (7), Diapriidae (280) and Ceraphronidae (99). It was found that all the families of parasitic fauna showed different level of correlations was observed with maximum and minimum temperature and relative humidity.

References

1. Farhat AF, Bueno ADF, Bueno RCO, Menezes A. Biological characteristics of the biological control agent *Telenomus remus* (Hymenoptera: Platygastridae) reared on eggs of different species of the genus *Spodoptera* (Lepidoptera: Noctuidae). Annual Entomological Society of America 2011**;**105(1):73-81.
2. Gibson GAP. Superfamily Chalcidoidea. In: Hymenoptera of the world: An identification guide to families. Henri Goulet and John T Huber 1993, 634.
3. Knight IA. Spatial Distribution of *Megacopta cribraria* (Hemiptera: Plataspidae) Adults, Eggs and Parasitism by *Paratelenomus saccharalis* (Hymenoptera: Platygastridae) in Soybean. Environmental Entomology 2017**;**46(6):1292-1298.
4. Monge JP, Huignard J. Population fluctuations of two bruchid species *Callosobruchus maculatus* (F.) and *Bruchidius atrolineatus* (Coleoptera Bruchidae) and their parasitoids *Dinarmus basalis* (Rondani) and *Eupelmus vuilleti* (Crawford) (Hymenoptera, Pteromalidae, Eupelmidae) in a storage situation in Niger. African Entomology 1991;105(3):187-196.
5. Nechols JR, Tracy JL, Vogt EA. Comparative ecological studies of indigenous egg parasitoids (Hymenoptera: Scelionidae, Encyrtidae) of the squash bug, *Anasa trista* (Hemiptera: Coreidae). Kansas Journal of Entomological Society 1989;62(2):177-188.
6. Noyes JS. Collecting and Preserving Chalcid Wasps. Journal of Natural History 1982;16:315-334.
7. Noyes JS, Valentine EW. Mymaridae (Insecta: Hymenoptera) introduction and review of genera. Fauna of New Zealand 1989;18:1-96.
8. Sandanayaka WRM, Ramankutty P. Temperature dependent emergence and survival of *Platygaster demades* (Hymenoptera: Platygastridae), parasitoid of apple leaf curling midge. Journal of Biological Control 2007;42:41-47.
9. Singh KHS, Manickavasagam S. Additional fauna of hymenopterous parasitoids (Insecta: Hymenoptera) from Manipur, India. Journal of Biological Control 2014;28(3):132-136.
10. Vayssieres JF, Wharton R, Delvare G, Sanogo F. Diversity and pest control potential of hymenopteran parasitoids of *Ceratitis* spp. on mangos in Mali. Proceedings of 6th International Fruit Fly Symposium 2002;12(3):461-464.