

INSECT PESTS AND THEIR PREDATORS ON POMELO PLANT IN HMAWBI TOWNSHIP

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Abstract

Insect pests are the major enemies for the agriculture sector. This research was thus conducted at the pomelo private farm of Let Pan Tan Su village located in Hmawbi Township, Yangon Region from November, 2016 to October, 2017. Biweekly sampling was focused on 30 trees in 10 acres. A total of 18 species of insect pests belonging to 17 genera under 13 families of 7 orders and 12 species of the predators belonging to 11 genera under 4 families of 3 orders were recorded on the pomelo plants. The highest pest species composition was found in *Pseudococcus citriculus* (58738 individuals) while the lowest as *Chiridopsis saclaris* (22 individuals). The study insect pest was most infested in the month of November. *Oecophyllas maradina*, was observed as dominant predator species (125196 individuals) while *Coecinellass septempunctataas* least predator species with only one individual during the study periods. The research could be investigated not only the incident and population of insect pest but also the pest seasonal and peak of outbreak time.

Keywords: Insect pests, predators, population, pomelo plant

Introduction

Insect diversity is the highest in the living world. Most are infected in all plant species, the storage grains and seeds as pest Smithsonian Information, (2016). Major pests are called serious pests of a crop (or crops) in a restricted locality, or are economic pests over a large part of the distributional range of the crop plant. Insect pests can destroy any parts of the plants and fruit loss. Due to their wide spread, frequent occurrence, biological interest, wide range of host plants and other aspects of academic interest, insect species can be recognized as major pests.

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The farm owners in Southeast Asia lost at least 300 million USD per year due to pests.

According to FAO, (1991) mentioned that this is one of the most important factors of economic aspects owing to fruit loss by insect pests. Predators are carnivores feed only on living prey and some feed on insects. Wise, (1993) also stated that predator are important role in the control of pest ecological balance.

Pomelo is very important plant for economic aspects because of its nutrition value and high demand in the world. In Southeast Asia, pomelo is grown in home gardens, in mixed citrus orchards and in pure pomelo orchards. Aung Soe, (1999) mentioned that 18,211 hectares of pomelo plantation in Myanmar. Hmawbi Township is one of the main agricultural Township in Yangon Region, Myanmar. Due to the high demand of pomelo fruit, most of the orchards farm owners in Hmawbi Township are desired to plant them. Flowering season of pomelo plants is from January to February. Fruiting season takes for five months (March to July), harvest time is October to December and the yield rate is 80-150 fruits per plant.

Casey Ng, (2015) recorded more than 74 insect pest species on pomelo trees. Hence, Insect pests are important for the yield of pomelo fruits. Because of insect pests, pomelo farm owners in Hmawbi Township faced reducing in pomelo yield in every year. Fruit loss is about 100-200 fruits per day. According to interview, about 30,000 fruits were lost in one crop season. Main cause of fruit loss is due to insect pests. Thus, the supply of demand is inadequate. No one had been conducted on the study of insect pests of pomelo plants in Myanmar and also in Hmawbi Township as yet. Thus the present study has been addressed to this issue and conducted at the pomelo private farm in Let Pan Tan Su Village, Hmawbi Township with the following objectives:

- To record the occurrence of insect pest species and their predators
- To evaluate the populations of insect pest and their predators

Materials and Methods

Study area

In Let Pan Tan Su Village, Hmawbi Township between latitude $17^{\circ} 12' 58''$ and $17^{\circ} 13' 4''$ and longitude $96^{\circ} 2' 58''$ and $96^{\circ} 3' 7''$ was chosen as the study area.

Study site

Pomelo private farm is Let Pan Tan Su Village was chosen as study site about ten acres. A total of 1200 trees is planted in 6 plots and 20 ft apart the plants in each plot have 17 rows and 15 trees in each row (Figure. 1).

Study design

Research design was targeted to the corner and center of pomelo plots in the farm. Five plants were chosen in each plot (one in each corner and one plant in the center of each plot). A total of 30 plants were studied as sample in study area (Fig. 2).

Study period and Sample collection

The study period lasted from November, 2016 to October, 2017. Biweekly data collection on the pest population was done from 7:00 am to 5:00 pm. The population of infested species on five selected plants was counted and recorded.

Identification

Identification was followed after Bland and Jaques (1978), Davidson and Lyon (1979), Hill (1983) and McGavin, (2000).

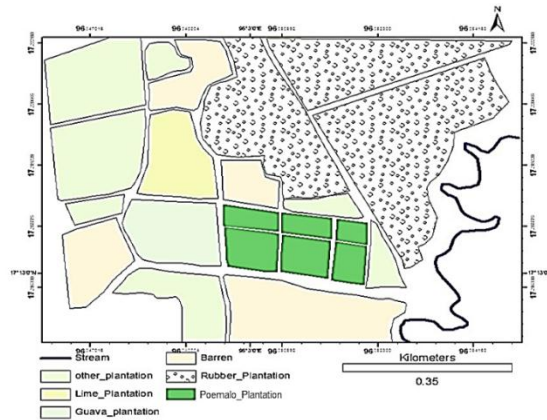


Figure 1. Layout plan of study sites in pomelo orchard farm

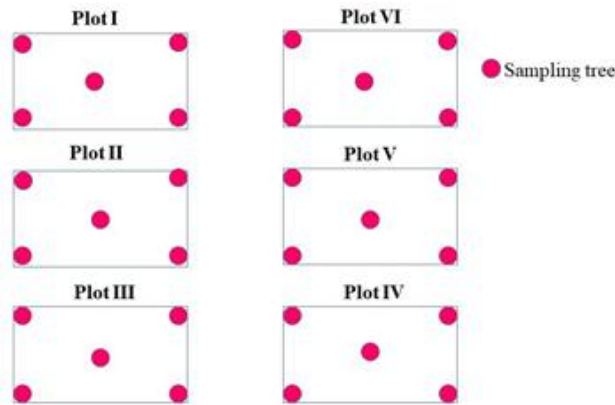


Figure 2. Flow chart of research design

Results

A total of 18 species of insect pests belonging to 17 genera under 13 families of 7 orders was recorded on studied plants. Order wise contribution of the recorded insect pest species were Order Homoptera (5 species, 28%); Lepidoptera and Coleoptera (3 species each, 17%); Hemiptera, Heteroptera and Hymenoptera (2 species each, 11%) and, Diptera with only one species (5%). Of the recorded families, Pseudococcidae was highest species composition (17%, 3 species) (Table 1, Fig. 3, 4 and Plate 1).

With respect to monthly fluctuation in occurrence, insect pest species were more recorded in October (15 species) while less in March (6 species). Among the species, *Aleurocanthus woglumi*, *Coccus hesoerdium* and *Phyllocnistis citrella* were observed throughout the studied months except November and *Pseudococcus citriculus* was not in September while *Holotrichia serrata* was found only in May and June (Table 2, Fig. 6).

Concerning with infestation rate, the peak infestation rate was observed in November with the population number (31332 individuals) while bottom in April (988 individuals). Regardless of the studied months and plots, the upper most abundance species was *Pseudococcus citriculus* (58738 individuals) while the lowermost as *Chiridosis saclaris* (22 individuals). Moreover, *Holotrichia serrata* had the noticeable number of population (4738 individuals) appeared only in May and June during the study periods.

Comparison among the study plots, Plot I had the highest population (33430 individuals) while the lowest in Plot IV (22001 individuals). *Pseudococcus citriculus* was dominant in Plot I, III, IV and VI with (18981, 6788, 10469 and 7163 individuals), respectively. *Pseudococcus longispinus* was dominant in Plot II and V with (9885 and 8615 individuals), respectively (Table 2, Fig. 5).

Regarding to the predators, 12 species of the predators belonging to 11 genera under 24 families of 3 orders were recorded during the study period (Table 3, Plate 2). Of the recorded orders, Order Hymenoptera represented with 2 predator species, Coleoptera with 4 species and Aranea with 6 species. From the point of families wise, the highest species composition was found in the family Araneidae (42%, 5 predator species) and followed by Coccinellidae (33%, 4 species), Formicidae (17%, 2species) and then Oxyopidae (8%, only one species). The occurrence of highest predator species was found in February (12 species) while lowest in April and May (3 species each). Among the recorded predator species, *Oecophylla maradina* and *Camponotus* species

were found throughout the study periods but *Coecinella septempunctata* was found only in February (Table 3, Plate 2 and Fig. 4).

The predator infestation was peak in May (23395 individuals) while bottom in April (3893 individuals). *Oecophyllas maradina*, *Camponotus* species and *Eriovixia laglaisei* were regarded as dominant species with (125196, 15352 and 1217 individuals) respectively in all study plots. Only one individual *Coecinella septempunctata* was recorded during the study periods (Table 3, 4, Plate 2).

Discussion

Total record of (18 insect pest species) and 12 predator species in the present study was less than those reported by Casey Ng, (2015) who reported 74 species in SEA (except Myanmar). Thormann *et al*, (2016) mentioned that insect are extremely richness and unexplored species in every country because of difficult in sorting and identifying and; existing of methodological challenge Achieving less recorded pest species may be due to experience, time duration or different environmental condition. Having more experience and longer study time may achieve more species recorded.

In addition, only five species (*P. longispinus*, *P.citriculus*, *C.hesperidum*, *D. citri*, and *B. dorsalis*) among the recorded species were corresponded to the previous research by Mi Zin Mar Khine, (2015). Therefore, a total of thirteen insect pest species was reported as new record for pomelo plant which grown in Myanmar. The first step of Integrated Pest Management (IPM) in controlling a problem, whether it is an insect, disease or weed, is to identify it correctly Barkley, (2011).

According to the guide to crop protection (2016), control pests were achieved by implementing agronomic practices. It will help to manage to reduce certain insect species, as well as the levels of some disease organisms. The regular water supply is important before flowering and until after harvesting of pomelo fruits. Loquias, (2006) also mentioned that regular supply of water is need to sustain new shoot growth and development of

flowers and fruits. The present study was noted that lesser insect's population level or extent of crop damage in plot III and IV may be related to delay irrigation and culture practices.

Hill, (1983) and Ahmed *et. al.*, (2014) reported that the list of major pests (including *A. woglumi*, *P. citriculus*, *P. demoleus* and *B. dorsali*) at citrus farms including pomelo in South East Asia and in Bangladesh with their infestation rate and active months which were accorded with the present study.

Thus the present study could be revealed the major pest species of the post-harvest time of pomelo plant in the present study area owing to noticeable population number and highest damage by these mention insect pest species especially in the months of November.

Ghosh, (1940) stated that predator can properly manage the infestation of insect. Spiders are predators of invertebrates, especially insects. They immobilized the prey them with venom inserted through their jaws ('fangs'). Natural predators may also be used in the control the pest. Barkley, (2011) also reviewed that biological controls are natural enemies of pests such as predatory and parasitic insects as well as birds.

The present study was supported above the statements as the predator species of *C.septempunctata* and *O.smaradina* were observed feeding on insect pest species *P. longispinus*, *P. citriculus* and *C. hesoerdium* during the study periods.

Moreover, as for suggestion the weaver ant species, *O. smaradina* can be used as control agent since they were recorded in highest number of population of in study farm throughout the study months.

Table 1. Recorded insect pest species on pomelo plants in study farm

No	Order	Family	Species	Common name	Plot I	Plot II	Plot III	Plot IV	Plot V	Plot VI	Total
1	Hemiptera	Aleyrodidae	<i>Aleyrocanthus vogliani</i>	Citrus black fly	4208	3422	1617	646	3392	4653	17938
2			<i>Dialeuro descurvi</i>	Citrus white fly	207	186	39	123	33	100	688
3	Homoptera	Pseudococcidae	<i>Ferrisia virgata</i>	Striped mealybug	906	465	691	187	544	923	3716
4			<i>Pseudococcus longispinus</i>	Longtail mealybug	4393	9885	3202	1595	8615	4317	32207
5			<i>P. citriculus</i>	Longtail citrus mealybug	18981	7761	6788	10469	7576	7163	58738
6		Diaspididae	<i>Aonidiella aurantii</i>	California red scale	476	801	2565	1307	1385	1249	7783
7		Coccidae	<i>Coccus hesperidum</i>	Brown soft scale	726	884	2563	1322	323	1802	7620
8	Heteroptera	Coreidae	<i>Leptocoris acuta</i>	Rice seed bug	231	178	123	185	147	161	1025
9		Pentatomidae	<i>Halyomorpha halys</i>	Brown marmorated stink bug	215	357	258	207	247	216	1500
10	Lepidoptera	Phyllocnistidae	<i>Phyllocnistis citrella</i>	Leaf minor	1854	2316	2993	3772	2168	1836	14959
11		Arctiidae	<i>Cyana coccinea</i>	Moth	33	25	15	12	18	24	127
12		Papilionidae	<i>Papilio demoleus</i>	Citrus butterfly	63	64	79	65	44	43	358
13	Diptera	Tephritidae	<i>Bactrocera dorsalis</i>	Fruit fly	295	552	133	165	629	484	2258
14	Coleoptera	Coccinellidae	<i>Holotrichia serrata</i>	White grub	518	650	960	1584	520	506	4738
15		Chrysomelidae	<i>Alicaly thri</i>	Beetle green	25	45	29	22	9	14	144
16			<i>Chiridopsis saclarii</i>	Golden beetle	0	12	4	1	2	3	22
17	Hymenoptera	Curculionidae	<i>Hypomeces squamous</i>	Gold-dust weevil	87	152	71	56	95	49	510
18			<i>Nematocerus spp.</i>	Shiny cereal weevil	12	323	346	283	145	47	1158
					33430	28080	22476	22001	25892	23610	155489

Table 2. Monthly insect pest populations on pomelo plant

No.	Species	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Total
1	<i>A. woglumi</i>	0	263	436	9869	422	241	3491	1294	199	768	351	604	17938
2	<i>D. citrifolii</i>	0	0	0	0	0	0	263	24	105	85	78	131	688
3	<i>F. virgata</i>	0	0	0	0	0	0	810	806	878	234	131	857	3716
4	<i>P. longipennis</i>	11616	3326	4590	5162	114	21	4953	966	185	0	0	1274	32207
5	<i>P. citricolus</i>	17747	24881	4294	7543	174	22	2556	546	252	37	0	686	58738
6	<i>A. aurantii</i>	0	0	0	0	0	0	12	0	0	2988	2226	2357	7783
7	<i>C. hesperidum</i>	0	112	402	1716	153	125	2463	1948	236	147	37	281	7620
8	<i>L. acuta</i>	206	117	207	1	0	0	255	123	9	1	0	106	1025
9	<i>H. lebus</i>	283	314	231	0	0	1	159	73	64	49	106	200	1500
10	<i>P. citrifolia</i>	0	29	164	335	173	563	8335	2645	137	691	1327	560	14959
11	<i>C. coccinea</i>	27	12	45	43	0	0	0	0	0	0	0	0	127
12	<i>P. demoleus</i>	59	30	37	38	0	2	0	1	24	62	82	23	358
13	<i>B. dozyalis</i>	1349	30	0	0	0	0	0	0	0	237	352	290	2258
14	<i>H. sericea</i>	0	0	0	0	0	0	3035	1703	0	0	0	0	4738
15	<i>Altica bibori</i>	0	0	0	0	0	4	96	34	4	0	0	6	144
16	<i>C. aceris</i>	0	0	0	1	1	0	0	0	8	0	0	12	22
17	<i>H. squamous</i>	45	76	34	26	0	9	135	50	22	22	16	75	510
18	<i>Vernatococcus</i> sp.	0	0	0	0	0	0	631	326	80	49	72	0	1158
	TOTAL	31332	29190	10460	24734	1037	988	27196	10539	2203	5370	4778	7662	155489



(A) *Aleurocanthus woglumi*



(B) *Dialeurodescitri*



(C) *Ferrisiavirgata*



(D) *Pseudococcus longispinus*



(E) *Pseudococcus citriculus*



(F) *Aonidiella aurantii*



(G) *Coccus hesperidum*



(H) *Leptocoris acuta*



(I) *Halyomorpha halys*



(J) *Phyllocnistis citrella*

Plate 1. Recorded insect pest species on Pomelo plants



(K) *Cyana coccinea*



(L) *Papillodemoleus*



(M) *Bactrocera dorsali*



(N) *Holotrichia serrata*



(O) *Alticaly thri*



(P) *Chiridopsis saclaris*



(Q) *Hypomeces squamous*



(R) *Nematocerus spp.*

Plate 1. Continued: Recorded insect pest species on Pomelo plants

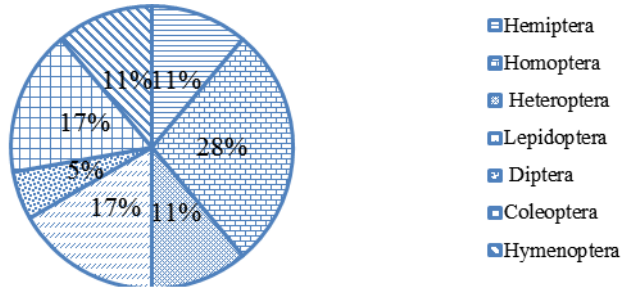


Figure 3. Insect species composition in recorded Order

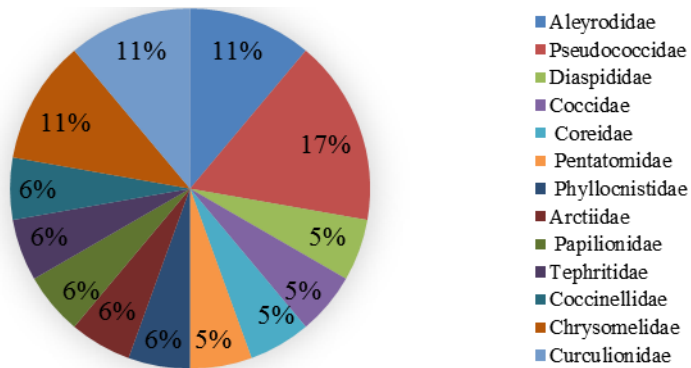


Figure 4. Insect species composition in recorded Families

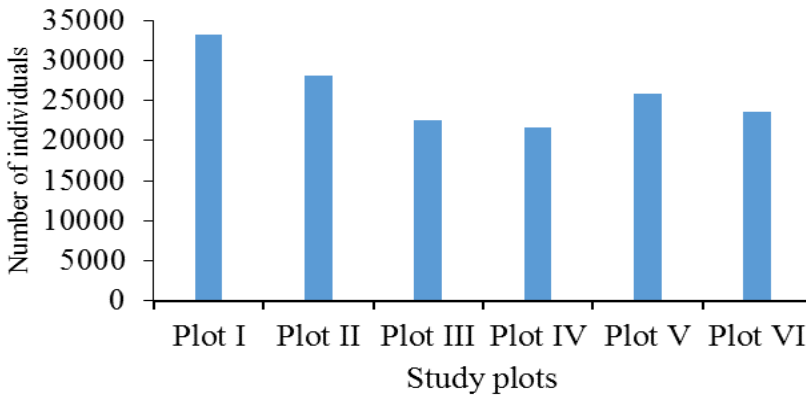


Figure 5. Populations of insect pest species among study plots during the study period

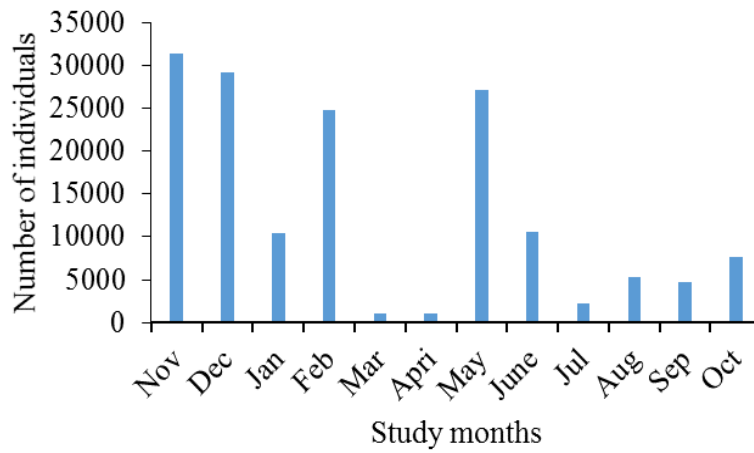


Figure6. Comparison of monthly populations of insect pest in study farm

Table 3. Recorded predator species on pomelo plants in study farm

No.	Order	Family	Species	Common name	Plot I	Plot II	Plot III	Plot IV	Plot V	Plot VI
1	Hymenoptera	Formicidae	<i>Oecophylla smaragdina</i>	Weaver ant	34078	16725	12673	17564	21531	22626
2			<i>Camponotus</i> sp.	Carpenter ant	1579	4398	4290	1784	1934	1331
3	Coleoptera	Coccinellidae	<i>Coccinella transversalis</i>	Transverse ladybird beetle	27	6	4	5	10	8
4			<i>Chilomeniscus maculata</i>	Six-spotted ladybird	3	9	8	3	6	2
5			<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle	6	9	3	2	1	14
6			<i>Coccinella septempunctata</i>	Beetle seven spots	0	0	0	0	0	1
7	Araneae	Araneidae	<i>Argiope varicolor</i>	Multi-coloured St. Andrew's cross spider	11	14	4	71	77	12
8			<i>Gasteracantha hasseltii</i>	Hasselt's spiny spider	5	10	5	1	14	3
9			<i>G. khuli</i>	Black and white spiny spider	7	7	11	6	4	7
10			<i>Erioxira laglaisei</i>	Laglaise's garden spider	1101	209	357	203	144	335
11			<i>Telamonia adimidiata</i>	five spot head spider	36	16	407	20	39	34
12		Oxyopidae	<i>Oxyopes shweta</i>	Black and white spider	9	7	10	75	6	15

Table 4. Monthly predator species on pomelo plants in the study farm

No.	Species	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Total
1	<i>O. smaradina</i>	12190	14479	14191	14056	4484	4542	21878	17737	6930	6678	3649	4382	125196
2	<i>Camponotus</i> species	1340	354	2458	3587	1249	717	1508	2940	468	429	169	133	15352
3	<i>C. transversalis</i>	18	16	5	26	0	0	0	0	0	0	0	0	65
4	<i>C. sexmaculata</i>	11	12	5	3	0	0	0	0	0	0	0	0	31
5	<i>C. stigma</i>	14	7	15	3	1	0	0	0	0	0	0	0	40
6	<i>C. septempunctata</i>	0	0	0	1	0	0	0	0	0	0	0	0	1
7	<i>A. versicolor</i>	0	0	0	5	0	0	0	1	0	125	1	1	133
8	<i>G. hasseltii</i>	0	0	0	3	0	0	0	0	0	0	0	11	14
9	<i>G. Khuli</i>	0	0	0	5	0	0	0	2	0	2	0	5	14
10	<i>E. Laglaise's</i>	0	0	0	1119	1	0	0	1	5	22	41	28	1217
11	<i>T. dimidiata</i>	0	0	0	18	1	2	9	0	9	25	14	39	117
12	<i>Oxyopesschweta</i>	0	0	0	1	0	0	0	0	2	91	19	9	122
	TOTAL	13573	14868	16674	18827	5736	5261	23395	20681	7414	7372	3893	4608	142302

(A) *Oecophylla maradina*(B) *Camponotus* sp.(C) *Chilomenes transversalis*(D) *Chilomenes sexmaculata*(E) *Chilocorous stigma*(F) *Coccinella septempunctata*(G) *Argiope versicolour*(H) *Gasteracantha hasseltii*(I) *Gasteracantha khuli*(J) *Eriovixia laglasei*(G) *Telamonia dimidiata*(H) *Oxyopes shweta***Plate 2.** Recorded predator species on Pomelo plants

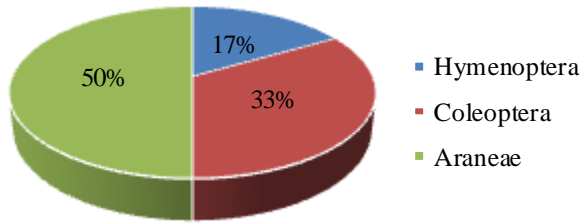


Figure 7. Predator species composition in recorded Orders

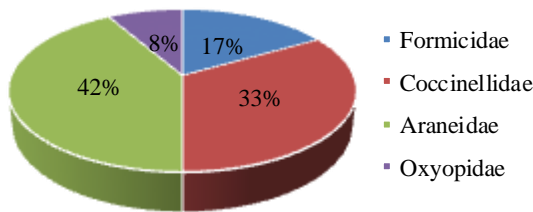


Figure 8. Predator species composition in recorded families

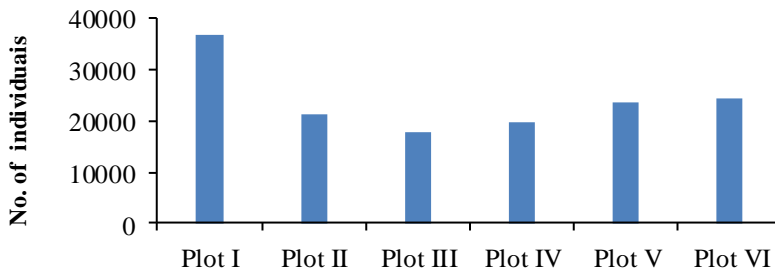


Figure 9. Occurrence of predator species among study plots during the study area

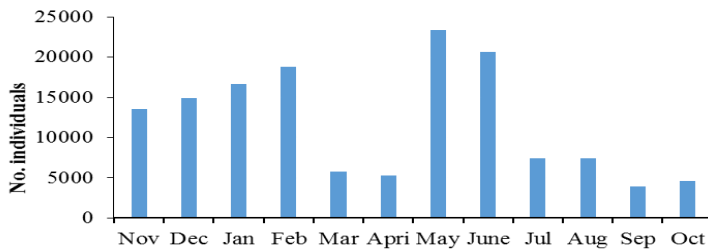


Figure 10. Comparison of monthly occurrence of predator species in study area

Conclusions

The present research was conducted at the pomelo private farm of Let Pan Tan Su Village, Hmawbi Township, Yangon Region to record the occurrence of insect pest species and their predators on pomelo plant. Biweekly data of insect pests and predators were identified and counted the population number to roughly predict when and which insects infected on pomelo plants. A total of 18 insect pest species and 12 predators were recorded. Predation was observed. Pest populations could identify in studied farm at risk from various pests. To carry out management of pest problems on pomelo plants, regular checking is needed on the targeted plants in the orchard for the presence of pests throughout the entire growing season.

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