PREVALENCE OF SOME INSECT SPECIES ON THE PLANTATIONS OF MAIZE (*ZEA MAYS* L., 1753) IN MIN HLA TOWNSHIP,MAGWAY REGION

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Abstract

Maize is among the world's three most important cereal crops. It is Myanmar's second most important crop with more than one million acres planted annually. A total number of (3210) individuals was accounted for 18 species of insects, distributed among 17 genera 14 families, and six orders, and collected from maize plantations, Min Hla Township, Magway Region from January to December 2022. Among the recorded species, 13 species were identified as pests and the other five species as beneficial or predatory insects. In the present study, the maximum number of species recorded in order Hemiptera was represented by five species (33.33%) while, the minimum number of species Orthoptera, Neuroptera, and Hymenoptera recorded only one species (6.67%) respectively from study site I (Malun Village). In study site II (Pan Taw Pyin Village) the maximum number of species recorded in order Hemiptera was represented by seven species (38.88%), while the minimum number of species in Orthoptera, Neuroptera, and Hymenoptera recorded only one species (5.56%) respectively. In study site I, the maximum number of individuals was recorded in the order Lepidoptera represented by (739) individuals (51.71%), while the minimum number of individuals in Orthoptera (21) individuals (1.47%) were recorded during the study period. The maximum numbers of individuals were collected in order Lepidoptera was represented by (815) individuals (45.76%), the minimum number of individuals were collected in Orthoptera (8) individuals (0.45%) were recorded in study site II. During the study period, Lepidopterans species are predominant on maize plantations in two study sites.

Keywords: Maize, Insects, Beneficial, Pest species, Lepidopterans species

Introduction

Maize (Zea *mays* L.) has a tropical origin and is traditionally grown in monsoon. Maize, a kind of cereal crop (family: Poaceae) and commonly known as corn in Myanmar. Maize is the second most harvested crop in Myanmar after paddy. Maize is mostly grown in Shan State and other mountainous regions in the country. In Ayeyarwady, Mandalay, Magway, and Bago regions, which grow winter maize, and in Shan, Kachin, and Kayin States which grow monsoon maize. Among them, Shan state is the major maize growing area covered with 38%, and 44% of the total production comes from this state. Also, The Magway Region includes the major maize area (Chiang Mai University, 2021).

There are two purposes of maize production such as grain and fodder purpose. These grains are used for human consumption, Corn is sold as a fresh vegetable or is canned or frozen and is also used as dairy and poultry feed in Myanmar. On the other hand, maize is also grown as a fodder crop, which is used for cattle cake. The grain also is processed into a growing number of food products, including corn flour, corn oil, corn syrup, and many other by-products. It is a very important animal feed and is heavily used in the production of cellulosic ethanol, a biofuel. (Ferreira *et al*., 2002).

Maize grains have high nutritive value containing 66.2% starch, 11.1 protein, 7.12% oil, and 1.5 minerals. There are many insects, pests, and diseases of maize crop. It can cause damage to the yield of maize. Insect infestation is one of them. Insects are the most diverse group of animals; they include more than a million species and represent more than half of all known living organisms. The total number of extant species is estimated at between six and ten million,

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potentially over 90% of the animal life forms on earth are insects. Insects may be found in nearly all environments (Gullan and Cranston, 2010). Jordan and Verma (2010), opined that compared with beneficial insects, injurious insects are very numerous. People have been interested mainly in two categories of insects; harmful and beneficial species. These two categories comprise only a few thousand of the millions of insect species. The beneficial species are seen as friends by humans while the harmful species are seen as enemies.

Myanmar is an agricultural country, and agriculture is the backbone of its economy. The agriculture sector contributes to 37.8 percent of gross domestic product (GDP), accounts for 25 to 30 percent of total export earnings, and employs 70 percent of the labor force. For successful production of the crops, there is a need to investigate the insect pests that destroy crops at all growing stages (FAO, 2017).

In Magway Region, the economy is mainly based on agriculture. For successful production of the crops, there is a need to investigate the insect pests which destroy crops at all growing stages. There is no previously recorded insect species on maize plant in Min Hla Environs. Thus, the present study has been conducted on some insect species on maize plantations at Pan Taw Pyin and Malun villages, in Minhla Township, Magway Region.

Thus, the present study was conducted with the following objectives:

- to record and classify the insect species on maize plantation in the study area
- to examine the species composition and relative abundance of recorded insect species
- to determine the insects which are either pests or beneficial on maize plantations in the study area

Materials and Methods

Study Area

Min Hla Township is in Thayet District, Magway Region, of central Myanmar, on the West bank of the Irrawaddy. It has an area of 2371.4 square kilometers. Pan Taw Pyin and Malun are villages of Min Hla Township. It is situated between 19º57' 56.81" to 19º58' 14.53" N and 95º 01'47.10" to 95º02' 34.80" E (Fig-1).The plantation of maize in the study area was mentioned in plate 1.

Source: *Google Earth* (2022)

Figure 1. Map of the study area and location of study sites

Plate 1. The plantation of maize in the study areas

Study Period

The study was carried out from January 2022 to December 2022.

Collection of Specimens

Specimens were collected during the daytime, once a week for one year. Some were easily collected by hand-picked and others were by insect net. Photographic records of fresh specimens were taken.

Preparation of the specimens

The collected specimens were transferred into the killing bottle which contained cotton wool soaked with chloroform vapor. Some were preserved in small glass bottles, containing 70 percent alcohol with glycerin for later examination (Revel, 2017). Under each specimen, there is a label bearing the name of the species, locality, and date of capture and it is transferred into the insect box.

Identification of specimens

The identification was carried out according to Borror and Delong (2005), Gullan and Cranston (2010), Awasthi (2016), and Debbie (2018).

Data Analysis

$$\text{Species composition} = \frac{\text{Number of a species}}{\text{Total number of all species}} \times 100$$

$$\text{Dominance index} = \frac{\text{Number of individuals of each species}}{\text{Total number of individuals of all species}} \times 100$$

Abundance categories based on index value are: Rare species (0.1-2.0), Uncommon (2.1-4.0), Frequent (4.1-6.0), Common (6.1-8.0), Abundant (8.1-above) (Kumar and Sivaperuman (2005)

Results

A total of 18 insect species belonging to 17 genera, 14 families, and six orders were recorded from January 2022 to December 2022 (Table -1). The recorded species were shown in plate.2.

Order-wise species composition of insect recorded on maize plantation from study site I

Among the 15 insect species, the order Hemiptera was included five species (33.33%), followed by Coleoptera with four species (26.66%), three species (20%) in Lepidoptera while, Orthoptera, Neuroptera, and Hymenoptera were recorded only one species (6.67%) respectively.

Order-wise species composition of insect species recorded on maize plantation from the study site II

Among the 18 insect species, the highest number, seven species (38.88%) in the order Hemiptera, followed by Coleoptera with five species (27.78%), three species (16.66%) in Lepidoptera while Orthoptera, Neuroptera, and Hymenoptera were recorded only one species (5.56%) respectively (Fig.2).

Occurrence of insect species individuals on maize plantation in two study sites

Total number of (3210) individuals of insects were recorded from two study sites throughout the one-year survey.

During the study period, a total number of (**1429**) individuals was accounted for **15** species of insects, distributed among **14** genera, **11** families, and **six** orders and collected from maize plantation in study site I (Malun Village) (Table.4).

A total number of (**1781**) individuals accounted for **18** species of insects, distributed among **17** genera, **14** families, and **six** orders and collected from maize plantation in study site II (Pan Taw Pyin Village) (Table. 5).

Beneficial and pest insect species from the study sites

Among the total of 18 insect species recorded, five species were observed as beneficial insects while the other 13 species represented pests (Table .3) (Fig. 2).

Order-wise numbers and percentage of individuals were recorded in the study site I .

Out of six orders, the order Lepidoptera was represented by (739) individuals (51.71%), followed by Hemiptera (404) individuals (28.27%), Coleoptera (213) individuals (14.91%), Neuroptera (29) individuals (2.03%), Hymenoptera (23) individuals (1.61%), Orthoptera (21) individuals (1.47%) were recorded in study site I (Table .4) (Fig .3).

Order-wise numbers and percentage of individuals were recorded in the study site II.

Out of six orders, the order Lepidoptera was represented by (815) individuals (45.76%), followed by Hemiptera (498) individuals (27.96%), Coleoptera (393) individuals (22.07%), Hymenoptera (48) individuals (2.69%), Neuroptera (19) individuals (1.07%), Orthoptera (8) individuals (0.45%) were recorded in study site II (Table .5) (Fig .3).

Table. 1 Insect species on maize plantation recorded from the study area from January 2022 to December 2022

No	Order	Family	Species	Common name
1	Orthoptera	Acrididae	*Schistocera nitens*	Large gray bird grasshopper
2	Hemiptera	Alydidae	*Leptocorisa oratoria*	Rice ear bug
3		Coreidae	*Cletus punctiger*	Squash bug
4		Miridae	*Creontiades pallidus*	Sheddeer bug
5		Cercopidae	*Callitettix versicolor*	Sugarcane spittle bug
6		Aphididae	*Rhopalosiphum maidis*	Corn leaf aphids
7		Pentatomidae	*Nezara viridula*	Green stink bug
8		Pentatomidae	*Bagrada hilaris*	Bagrada bug
9	Neuroptera	Chrysopidae	*Chrysoperla carnea*	Green lacewing
10	Coleoptera	Chrysomelidae	*Aulacophora foveicollis*	Red pumpkin beetle
11		Coccinellidae	*Menochilus sexmaculatus*	Six spotted zigzag
12		Coccinellidae	*Micraspis discolor*	Ladybird beetle
13		Coccinellidae	*Henosepilachna sumbana*	Cucurbit ladybird
14		Anthicidae	*Anthelephila caeruleipennis*	Ant-like beetle
15	Lepidoptera	Crambidae	*Spoladea recurvalis*	Beet webworm moth
16		Noctuidae	*Spodoptera litura*	Cotton leafworm
17		Noctuidae	*Spodoptera frugiperda*	Fall armyworm moth
18	Hymenoptera	Apidae	*Apis florea*	Dwarf honey bee

Table 2. Order-wise distribution of species composition of insects on maize plantation in two study sites during the study period

No	Order	Number of Families	Number of Genera	Number of Species	Composition of species (%)
1	Orthoptera	1	1	1	5.56
2	Hemiptera	6	7	7	38.88
3	Neuroptera	1	1	1	5.56
4	Coleoptera	3	5	5	27.78
5	Lepidoptera	2	2	3	16.66
6	Hymenoptera	1	1	1	5.56

Table 3. Status of insect species from two study sites during the study period

No	Scientific name	Common name	Status
1	*Schistocera nitens*	Large gray bird grasshopper	Pest
2	*Leptocorisa oratoria*	Rice ear bug	Pest
3	*Cletus punctiger*	Squash bug	Pest
4	*Creontiades pallidus*	Sheddeer bug	Pest
5	*Callitettix versicolor*	Rice spittle bug	Pest
6	*Rhopalosiphum maidis*	Corn leaf aphid	Pest
7	*Nezara viridula*	Green stink bug	Pest
8	*Bagrada hilaris*	Bagrada bug	Pest
9	*Chrysoperla carnea*	Green lacewing	Beneficial
10	*Aulacophora foveicollis*	Red pumpkin beetle	Pest
11	*Menochilus sexmaculatus*	Six spotted zigzag	Beneficial
12	*Micraspis discolor*	Ladybird beetle	Beneficial
13	*Henosepilachna sumbana*	Cucurbit ladybird	Pest
14	*Anthelephila caeruleipennis*	Ant-like beetle	Beneficial
15	*Spoladea recurvalis*	Beet webworm moth	Pest
16	*Spodoptera litura*	Cotton leaf worm	Pest
17	*Spodoptera frugiperda*	Fall armyworm	Pest
18	*Apis florea*	Dwarf honey bee	Beneficial

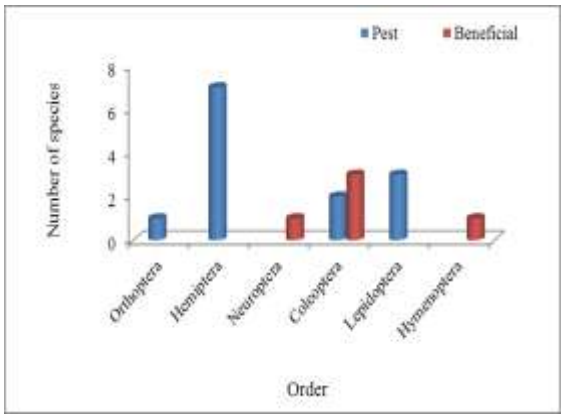


Figure. 2. Order-wise relative number of species on beneficial and pest species recorded

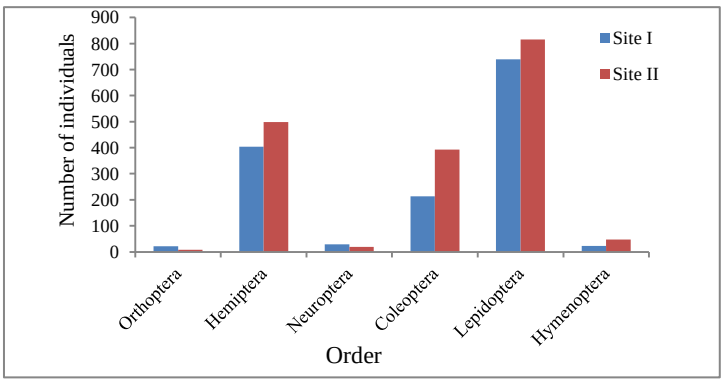


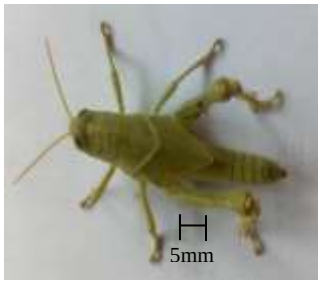
Figure. 3. Order-wise relative number of individuals of Site I and II .

Table 4. Monthly occurrence of insect species and number of individuals on maize plant recorded from the study site I during the study period

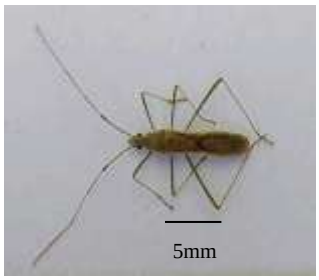
No	Scientific name	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep	Oct	Nov	Dec	TNI	DI	Categories
1	*Schistocera nitens*	**1**	**2**	**1**	**0**	**3**	**4**	**2**	**3**	**1**	**0**	**0**	**4**	21	1.469	Rare
2	*Creontiades pallidus*	**2**	**0**	**3**	**1**	**0**	**2**	**0**	**3**	**3**	**1**	**0**	**2**	17	1.189	Rare
3	*Callitettix versicolor*	**5**	**9**	**5**	**7**	**4**	**7**	**8**	**12**	**5**	**7**	**4**	**7**	80	5.598	Frequent
4	*Rhopalosiphum maidis*	**8**	**7**	**9**	**5**	**9**	**11**	**11**	**10**	**13**	**8**	**11**	**12**	114	7.977	common
5	*Nezara viridula*	**1**	**0**	**0**	**6**	**15**	**9**	**4**	**6**	**0**	**6**	**15**	**9**	71	4.968	Frequent
6	*Bagrada hilaris*	**4**	**6**	**10**	**13**	**14**	**5**	**9**	**11**	**13**	**10**	**13**	**14**	122	8.537	Abundant
7	*Chrysoperla carnea*	**2**	**2**	**5**	**1**	**0**	**4**	**2**	**2**	**4**	**1**	**0**	**6**	29	2.029	uncommon
8	*Menochilus sexmaculatus*	**2**	**12**	**11**	**6**	**7**	**7**	**5**	**7**	**9**	**9**	**8**	**7**	90	6.298	common
9	*Micraspis discolor*	**2**	**0**	**3**	**0**	**2**	**0**	**2**	**3**	**4**	**0**	**1**	**0**	17	1.189	Rare
10	*Henosepilachna sumbana*	**0**	**1**	**2**	**1**	**0**	**2**	**2**	**4**	**6**	**1**	**0**	**2**	21	1.469	Rare
11	*Anthelephila caeruleipennis*	**11**	**5**	**11**	**8**	**7**	**6**	**9**	**8**	**5**	**3**	**8**	**4**	85	5.948	Frequent
12	*Spoladea recurvalis*	**2**	**5**	**3**	**1**	**8**	**7**	**10**	**11**	**13**	**11**	**12**	**14**	97	6.787	common
13	*Spodoptera litura*	**16**	**14**	**17**	**13**	**15**	**16**	**8**	**12**	**13**	**13**	**15**	**16**	168	11.756	Abundant
14	*Spodoptera frugiperda*	**25**	**36**	**45**	**37**	**42**	**49**	**35**	**39**	**46**	**37**	**38**	**45**	474	33.170	Abundant
15	*Apis florea*	**1**	**1**	**2**	**0**	**2**	**3**	**2**	**3**	**4**	**0**	**2**	**3**	23	1.609	Rare
		82	100	127	99	128	132	109	134	139	107	127	145	1429		

Table 5. Monthly occurrence of insect species and number of individuals on maize plant recorded from the study site II during the study period

No	Scientific name	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep	Oct	Nov	Dec	TNI	DI	Categories
1	*Schistocera nitens*	1	1	1	0	1	0	1	1	1	0	1	0	8	0.4491	Rare
2	*Leptocorisa oratoria*	2	4	2	3	4	3	5	2	2	3	6	3	39	2.189	Uncommon
3	*Cletus punctiger*	0	1	0	2	4	7	0	2	8	2	5	7	38	2.133	Uncommon
4	*Creontiades pallidus*	2	0	3	1	2	2	0	3	3	1	0	2	19	1.066	Rare
5	*Callitettix versicolor*	4	6	10	6	8	8	6	8	11	8	7	12	94	5.277	Frequent
6	*Rhopalosiphum maidis*	7	8	9	11	13	17	12	9	17	11	13	17	144	8.085	Abundant
7	*Nezara viridula*	1	0	0	6	9	13	4	6	0	6	5	9	59	3.312	Uncommon
8	*Bagrada hilaris*	3	7	9	10	7	10	9	8	16	10	6	10	105	5.895	Frequent
9	*Chrysoperla carnea*	0	2	3	0	3	2	0	2	3	3	0	1	19	1.066	Rare
10	*Aulacophora foveicollis*	4	3	6	6	8	7	8	5	11	6	9	7	80	4.491	Frequent
11	*Menochilus sexmaculatus*	8	11	13	9	12	7	9	7	10	9	12	7	114	6.401	Common
12	*Micraspis discolor*	3	0	3	0	2	0	2	3	3	0	2	0	18	1.011	Rare
13	*Henosepilachna sumbana*	2	3	5	2	4	6	4	6	2	2	5	6	47	2.639	Uncommon
14	*Anthelephila caeruleipennis*	9	6	12	9	10	17	11	12	13	8	10	17	134	7.524	Common
15	*Spoladea recurvalis*	4	6	9	5	7	9	6	8	10	6	8	9	87	4.885	Frequent
16	*Spodoptera litura*	10	14	19	12	11	13	11	12	14	8	9	16	149	8.366	Abundant
17	*Spodoptera frugiperda*	45	43	53	50	46	54	45	51	55	40	45	52	579	32.509	Abundant
18	*Apis florea*	2	3	5	3	4	6	4	3	5	3	4	6	48	2.695	Uncommon
		107	118	162	135	155	181	137	148	184	126	147	181	1781		



A. *Schistocera nitens*

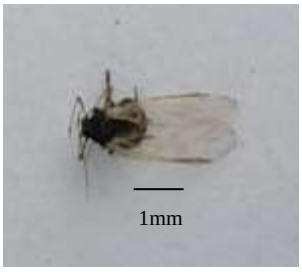


B. *Leptocorisa oratoria*

C. *Cletus punctiger*

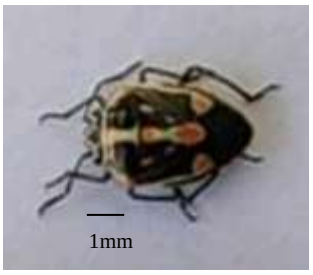
D. *Creontiades pallidus*

E. *Callitettix versicolor*

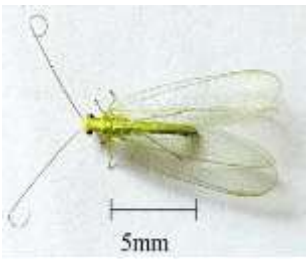


F. *Rhopalosiphum maidis*

G. *Nezara viridula*



H. *Bagrada hilaris*



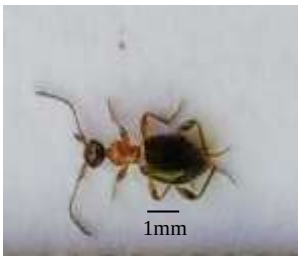
I. *Chrysoperla carnea*

J. *Aulacophora foveicollis*

K *Menochilus sexmaculatus*

L. *Micraspis discolar*

M. *Henosepilachna sumbana*



N. *Anthelephila caeruleipennis*

O. *Spoladea recurvalis*

P. *Spodoptera litura*

Q. *Spodoptera frugiperda*

R. *Apis florea*

Plate 4. Recorded insect species of Order Orthoptera, Hemiptera, Neuroptera, Coleoptera, Lepidoptera and Hymenoptera

Discussion

Ferreira *et al*., (2002) observed that maize plants were attacked by 140 species of insect pests causing a varying degree of damage. However, only about a dozen are quite serious. In the present study, 13 species of pest were identified on maize plants at Pan Taw Pyin and Malun Villages in Minhla Township during study period.

Braley, (2021) concluded that maize crops often have high levels of beneficial insects (predators and parasitoids) that may be harmed by insecticide applications. Beneficial organisms should be one tool used in integrated pest management (IPM) program. In the present study, five species of beneficial species were recorded on maize plantations during study period. Utilizing multiple pest management options can also help farmers save money, as they rely less on pesticides, which is especially important in the face of pesticide resistance.

Chowdhury, (2015) described that coccinellids (*Menochilus sexmaculatus* and *Micraspis discolor*) are key predators that are conserved and augmented in agricultural ecosystems, to achieve biological control of pests. In the present study, these two species are recorded from two study sites during study period.

Alam *et al*., (2014) discussed that the abundance of several insect pests was influenced by different growth stages of maize. The insect pest species, cutworm, maize stem borer, corn leaf aphid, maize borer, earworm and birds differed significantly at different growth stages of maize.

Khan *et al*., (2022) stated that pests occur at levels of economic injury including: *Ostrinia fiirnacalis, Spodoptera exigua, Spodoptera litura,* and *Helicoverpa armigera*. In the present study, pests occur at levels of economic injury including: *Nezara viridula, Spodoptera litura, Spoladea recurvalis,* and *Spodoptera frugiperda.* It is similar mentioned Liao *et al*., 2010. The pests that rarely occur at economic injury levels included: *Cletus punctiger, Aulacophora foveicollis, Bagrada hilaris, Rhopalosiphum maidis,* and *Henosepilachna sumbana.*

El-Heneidy and Abbas (2005) described that lady beetles mainly occurred in September and October in maize fields of Sindh Agriculture University, Tandojam. But in the present study *Menochelus sexmaculatus,* and *Micraspis discolor* mainly occurred in nearly throughout the years.

Maureen *et al*, (2006) described those seed corn maggots, seed corn beetles, corn flea beetle, billbugs, armyworm, corn leaf aphid and fall armyworms are fully occurring in maize plantations in the United States of America. In the present study, Rice ear bug, Green stink bug, Red pumpkin beetle, Beet webworm moth, corn leaf aphid, cotton leaf worm and fall armyworm are recorded. Therefore, these insect pests are similar occurrences in maize plantations during the study period.

Liao *et al*., 2010 mentioned that many hemipterans species are economically significant pests of important agricultural crops. *Callitettix versicolor* is one of the species harmful to agricultural crops and causes severe economic damage to rice and maize in China, India, Malaysia, Myanmar, Thailand and Vietnam. In the present study, this species was recorded on maize plantations during the study period.

Pannuti *et al*., 2015 described that *Spodoptera frugiperda* (Fall Armyworm) is a new pest in Africa, attacking maize, but can also feed on other crops. This species seemingly displays a very wide host range, with over 80 plants recorded. Due to its polyphagous behavior, high voracity, ability to form large populations, and high dispersion rate, this species is considered a cosmopolitan pest, one of the most destructive in America.

The most frequently consumed plants are maize and sweet corn. In the present work, fall armyworms damaged maize plantations in the study sites throughout the study period. Many factors limit maize production; insects and mites being among the most important. Lepidopteran pests are the most damaging insects of maize worldwide.

Thus, there is a need to control the pests to safeguard the crop yield. It is therefore suggested that, awareness should be given to the cultivators on the chemical method of controlling pests by

using pesticides have an effect on not only the pests but also the beneficial insects that thrive in the area and the health of human beings as well, so that cultivators should avert to more eco-friendly biological means of controlling insect pests to maintain successful harvest.

So In the present study, insects on maize plantations are classified as either pests or beneficial insect species during the study period. The present topic could be touched upon fulfilling the gap in Entomological research.

Conclusion

A total of 18 insect species belonging to 17 genera, 14 families, and six orders were recorded on maize plantation of Min Hla Environs. Thirteen species of insects were recorded as the insect pests and five species of insects were collected as the beneficial insects. Total number of (3210) individuals of insects were recorded from the study area throughout the one-year survey. Hemipterans species and Lepidopterans individuals are predominant on maize plantations in two study sites. Since Lepidopteran species inhabit agricultural lands, they are of economic importance. This research will contribute some information concerning pests and beneficial species observed in maize fields and improve the way of biological control of insect pests in agriculture.

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