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## 6. SUMMARY

This study was carried out at two locations; the farm of Rice Research and Training Center, Sakha Agricultural Research Station , Kafr El-Sheikh governorate and at El-Sabein village, Seidy Salem District, Kafr El-Sheikh governorate. The experiment was conducted for 2014 and 2015 for the following objectives:

- 1-Survey the main insect pests attacking the rice crop and their associated predators in rice nursery and fields.
- 2- Study the population abundance of the main insect pests and their associated predators.
- 3- Survey the spiders at rice nursery.
- 4- Evaluate the efficacy of sampling methods for survey insect pests and their associated predators.
- 5- Evaluate of three insecticides against the bloodworms, *Chironomus* spp. larvae at rice nursery.

### 1. The main insect pests attacking rice plants:-

In 2014season, eleven insect pest specie were recorded. The bloodworm, *Chironomus* spp. was the most abundant insect pest and represented by 2095 indivi.( 56.85% ) and 3795 indivi.(55.42%) followed by the brown plant hopper, *Sogatella* sp. 426 indivi. (12.54%) and 989 indivi. (14.44%), while the lowest abundant insect specis was the mole cricket, *G. bimaculatus* 32 indivi. (0.87%) and 35 indivi. (0.51%) during the two successive seasons 2014 and 2015 respectively.

## **2. The Population abundance of the main insect pests attacking rice plants:-**

### **2.1. The blood worm, *Chironomus* spp.:**

The highest peaks were recorded on 14 and 28<sup>th</sup> of June 2014 and represented by 415 and 340 individuals. In 2015 season, the highest peaks were detected on 5 and 19<sup>th</sup> of July and represented by 449 and 383 individuals respectively. The highest monthly average numbers of *Chironomus* sp. were recorded in June with averages of  $162.67 \pm 68.98$  individuals, during the first season. In 2015, the highest averages were recorded in July with  $316.25 \pm 69.52$  individuals. The annual average number of *Chironomus* sp., collected by different traps from nursery and paddy fields, during 2014 and 2015 were  $88.08 \pm 19.02$  and  $145.96 \pm 23.21$  individuals, respectively.

### **2.2. The rice leaf miner, *Hydrellia prosternalis* Deem.:**

The highest peak was recorded on 19<sup>th</sup> of July and represented by 26 individuals during 2014. In 2015, the highest peak was recorded on 26<sup>th</sup> of July and represented by 141 individuals. The highest monthly average numbers of *H. prosternalis* were  $19.00 \pm 2.74$  and  $93.50 \pm 10.68$  individuals in July 2014 and 2015, respectively. The annual average number of *H. prosternalis* collected by different traps from nursery and paddy fields during 2014 and 2015 were  $11.71 \pm 2.17$  and  $56.78 \pm 12.11$  individuals, respectively.

### **2.3. The brown plant hopper, *Sogatella* sp.:**

The highest peak was recorded on 12<sup>th</sup> of July 2014 and represented by 50 individuals. In 2015, the highest peak was recorded on 10<sup>th</sup> of September with a population density of 149 individuals. The highest monthly average numbers of *Sogatella* sp. were  $34.25 \pm 5.79$

individuals in July 2014 and  $97.66 \pm 25.77$  individuals in September 2015, annual average number of *Sogatella* sp. in 2014 and 2015 were  $20.03 \pm 3.49$  and  $56.79 \pm 11.42$  individuals, respectively.

#### **2.4. The rice stem borer, *Chilo agamemnon* Bles. :**

The highest peak was recorded on 24<sup>th</sup> of August 2014 with 16 individuals. In 2015, the highest peak was recorded on 10<sup>th</sup> of September and represented by 16 individuals. In 2015, the highest monthly average numbers of *C. agamemnon* were  $10.00 \pm 2.68$  individuals in August 2014 and  $11.00 \pm 2.65$  individuals in September 2015. The annual average numbers of *C. agamemnon* in 2014 and 2015 were  $4.31 \pm 0.86$  and  $5.00 \pm 0.85$  individuals, respectively.

#### **2.5. *Nephotettix* sp.:**

The highest peak was recorded on 24<sup>th</sup> of August 2014 with a population density of 28 individuals. In 2015, the highest peak was recorded on 2<sup>nd</sup> of September with a population density of 28 individuals. The highest monthly average numbers of *Nephotettix* sp. were  $20.25 \pm 2.78$  individuals recorded in July 2014 and  $23.33 \pm 2.60$  individuals in September 2015. The annual average number of *Nephotettix* sp. in 2014 and 2015 were  $14.07 \pm 2.29$  and  $15.00 \pm 1.94$  individuals, respectively.

### **3. The main predators associated with insect pests attacking the rice plants:-**

*Philonthus* spp. was the most abundant insect predators (543 indiv. = 29.78%) and (1796 indiv. = 33.55%), followed by the ground beetle, *Bembidion* sp. (104 indiv. = 5.70%) and (670 indiv. = 12.52%), *Hemianax ephippiger* (108 indiv. = 5.92%) and (599 indiv. = 11.20%) and *Microvelia* sp. (122 indiv. = 6.69%) and (350 indiv. = 6.54%), during the two seasons, respectively. Meanwhile, the lowest abundant was *Polistes*

*gallica* (22 indiv. =1.21%) during the first season 2014. Sphecidae ranked the last category and was represented by 35 indiv. (0.65%) during the second season 2015.

#### **4: The population abundance of the main predators associated with the insect pests attacking rice plants:-**

##### **4.1. The rove beetle, *Paederus alfieri* Koch:**

The highest peak was recorded on 26<sup>th</sup> of July 2014 and represented by 18 individuals during the first season. In 2015, the highest peak was recorded on 19<sup>th</sup> of June and represented by 16 individuals. The highest average numbers of *P. alfieri* were  $8.33 \pm 1.57$  in June 2014 and  $10.50 \pm 2.50$  individuals in July 2015. The annual average numbers of *P. alfieri* in 2014 and 2015 were  $4.82 \pm 1.56$  and  $7.11 \pm 1.52$  individuals, respectively.

##### **4.2. *Philonthus* spp. :**

The highest peak was detected on 1<sup>st</sup> of June 2014 and represented by 32 individuals. In 2015, the highest peak was recorded on 14<sup>th</sup> of June and represented by 235 individuals. The highest average numbers of *Philonthus* spp. were  $33.25 \pm 3.97$  individuals in July 2014 and  $137.50 \pm 28.60$  individuals in June 2015. The annual average number of *Philonthus* spp. collected by different traps from nursery and paddy fields in 2014 and 2015 were  $22.56 \pm 4.90$  and  $70.63 \pm 12.67$  individuals, respectively.

##### **4.3. The ground beetle, *Bembidion* sp.:**

The highest peak was recorded on 19<sup>th</sup> of July 2014, represented by 22 individuals during the first season. In the second season, the highest peak was recorded on 12<sup>th</sup> of July and represented by 115 individuals.

The highest monthly average numbers of *Bembidion* sp. were  $13.75 \pm 3.50$  and  $77.50 \pm 16.52$  individuals in July during 2014 and 2015, respectively. The annual average numbers of *Bembidion* sp. collected by different traps from nursery and paddy fields during the two successive seasons 2014 and 2015 were  $7.61 \pm 1.75$  and  $40.00 \pm 8.69$  individuals, respectively.

#### **4.4. *Ischnura senegalensis* Ramb.:**

The highest peak was recorded on 10<sup>th</sup> of August 2014 and represented by 18 individuals. In 2015, the highest peak was detected on 24<sup>th</sup> of August and represented by 34 individuals. The highest monthly average numbers of *I. senegalensis* were  $14.5 \pm 1.94$  and  $14.00 \pm 6.82$  individuals recorded in August during the two seasons, respectively. The annual average numbers of *I. senegalensis* collected by different traps from nursery and paddy fields during 2014 and 2015 were  $6.69 \pm 1.58$  and  $8.45 \pm 2.95$  individuals, respectively.

#### **4.5. *Microvelia* sp.:**

The highest peak was recorded on 10<sup>th</sup> of September 2014 and represented by 17 individuals. In 2015, the highest peak was recorded on 10<sup>th</sup> of September and represented by 52 individuals. The highest monthly average numbers of *Microvelia* sp. were  $8.50 \pm 3.07$  individuals in August 2014 and  $43.67 \pm 4.18$  individuals September 2015. The annual average numbers of *Microvelia* sp. in 2014 and 2015 were  $5.62 \pm 2.35$  and  $18.03 \pm 4.31$  individuals, respectively.

#### **4.6. *Hemianax ephippiger* Burm. :**

The highest peak was recorded on 26<sup>ed</sup> of July 2014 and represented by 15 individuals. During 2015, the highest peak was recorded on 17<sup>th</sup> of August with population density of 122 individuals. The highest monthly average numbers of *H. ephippiger* were  $11.00 \pm 1.58$

individuals in July 2014 and  $53.00 \pm 24.16$  individuals in August 2015. The annual average numbers of *H. ephippiger* collected by different traps from nursery and paddy fields during 2014 and 2015 were  $5.02 \pm 1.09$  and  $28.52 \pm 9.84$  individuals, respectively.

### 5.1. Spiders at rice nursery:-

In 2014, 58 spiders were collected belonging to seven families. Family Tetragnathidae contained three species; *Tetragnatha* sp., *Tetragnatha javana* and Tetragnathidae (spiderling). While family Lycosidae contained two species; *Lycosa* sp. and *Pardosa* sp. Families Araneidae, Linyphiidae, Philodromidae, Salticidae and Theridiidae were represented by one spider for each; *Larinia* sp., linyphiidae (spiderling), *Thanatus* sp., *Ballus* sp. and Theridiidae (spiderling) respectively. The population density of family Tetragnathidae was found highest (28 individuals) followed by family linyphiidae (20 individuals).

In 2015 season, 289 spider individuals were collected belonging to six families. Family Linyphiidae contained three species; *Bathypantes* sp., *Erigone* sp. and Linyphiidae (spiderling). While the family Araneidae contained one species; *Larinia* sp. So that family Lycosidae contained two species; *Lycosa* sp., *Wdicosa* sp. and *Pardosa* sp. Families Philodromidae, Dyctinidae and Salticidae were represented by one species for each; *Thanatus* sp., *Dyctina* sp. and *Ballus* sp. respectively. The population density of family Linyphiidae was found highest (248 individuals) followed by family Lycosidae (29 individuals). Two spider species; *Bathypantes* sp. and *Erigone* sp. are recorded for the first time in rice fields in Egypt.

## **6. The relationship between the insect pests and the activity of their associated predators during two successive seasons.**

There is a highly positive significant correlation coefficient between beetles *P. alferii* and *Philonthus* spp. and the insect pests except *C. agamemnon* during the first season. Also, the relationship between *I. senegalensis* and the insect pests were positively significantly except with *Chironomus* spp. during the first season. While the correlation coefficient between beetles *P. alferii* and the insect pests except *Chironomus* spp. and *Sogatella* sp. were positively and highly significantly Also, the relationship between *Philonthus* spp. and the insect pests were positively significantly except with *Sogatella* sp., *C. agamemnon* and *Nephotettix* sp. during the second season. On the other hand, the correlation coefficient between *Bembidion* sp. and the insect pests were insignificantly except *H. prosternatis* during the two seasons 2014 and 2015.

## **7. Evaluation the efficacy of sampling methods:-**

### **7.1. Insect pests:**

The water pan trap the highest efficacy trap proved to be the most efficient with 52.44% out of catch, followed by pitfall trap with 30.43%, while, sweep net ranked the last category and represented by 17.13% during 2014 season. In 2015, the water pan trap was the most effective and trapped 38.33% followed by pit fall trap with 31.64% and sweep net and represented by 19.47%. While D-Vac came in the last category and represented by 10.56%.

### **7.2. Insect predators:-**

The water pan trap was the highest efficacy trap and trapped 47.53 % followed by pitfall trap and represented by 32.68%, while sweep net



trap ranked the last category and represented by 19.79% during the first season. During the second season (2015), the water pan trap was the most efficient and collected 39.17%, followed by pitfall trap and represented by 34.77% and sweep net and represented by 17.19%. On the other hand, D- Vac came in the last category and represented by 8.87%.

### **7.3. Spiders:**

The water pan trap trapped 51.47% followed by pitfall trap 27.94% and then sweep net that trap ranked the last category and represented by 20.58% during 2014 season. During 2015 season, the pitfall trap was the highest efficacy trap and trapped (45.87%) followed by water pan trap (40.26%), while sweep net trap came in the last category with 13.86%.

## **8 - Evaluation of three insecticides against the bloodworms, *Chironomus* spp. larvae at rice nursery.**

Diazinon was the most potent compound in reducing the population density of *Chironomus* spp. in 2014 and 2015 seasons after one day (88.62 and 89.85% reductions, respectively), after 7 days, the reductions were 87.14 and 89.42% in the two seasons with overall average of 87.88 and 89.63%, respectively. Lambda resulted in *Chironomus* spp. population reductions of 85.18 and 85.96 % one day after treatment in first and second seasons, respectively. Seven days after treatments, the reductions were 82.73 and 84.27% in 2014 and 2015 seasons, respectively. Emamcetin benzoate was the least effective insecticide recording 77.56 and 82.94% after one day and 76.48 and 79.09% after 7 days from treatment in 2014 and 2015 seasons, respectively.