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Impact of Biocide, Insecticides, Compost and Mineral Fertilizers Treatments on the Abundance of Parasitoid and Predator Insects in Rice Fields

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ABSTRACT

The present study was designed to investigate the effect of rice straw compost, recommended mineral fertilizers, Organic Insecticides and chemical Insecticides on the abundance pattern of natural enemies in rice ecosystems. To maximize rice productivity, rice growers tend to use chemical fertilizers and pesticides particularly to control different pest species, regardless of damage levels. Accordingly, rice fauna of natural enemies is severely impaired, leading to unbalanced rice ecosystems. The current investigation was carried out at the experimental farm of Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh during 2016 and 2017 rice seasons. Using both D–Vac machine and pit–fall traps, parasitoids and predator insects were surveyed. Twelve hymenopterous parasitoid species were surveyed. Most of the parasitoid species were found belonging to Mymaridae, Trichogrammatidae and Braconidae. Twenty insect predator species, related to 13 families and seven orders, were identified, most of which are belonging to Coleoptera and Hymenoptera. Also this study aimed to surveying natural enemies (parasitoids and predator insects) and the effect of compost as an organic fertilizer on population densities of such beneficial insects. Although the application of insecticides successfully controlled insect pests, these chemicals have almost eradicated (more than 90 % reduction) the natural enemies. Biocide applications, especially Achook (Neem) and Tracer, achieved a considerable insect pest control, with population reductions of 33.30-57.32 and 10-46.01%, respectively. Unfortunately, the evaluated biocides induced mortalities to the considered natural enemies, but with too much less levels than did the insecticides. The current results indicate that the biocides could be applied to control rice insects in case of moderate insect infestations, with taking into consideration that they are not completely safe to the beneficial insects.

Keywords: Rice field, Parasitoids, Predators, Compost, Biocide, Insecticides.

INTRODUCTION

Rice (*Oryza sativa*, L.) is considered as one of two most important cereal crops in the world. In Egypt, it contributes more than 20 percent of the cereal consumption. Organic fertilizers and insecticides are systems in which primarily aimed to eliminate environmental pollution and develop a more profitable and sustainable farming (YungYu, 2005, Heckman, 2006 and Badr, 2008).

Instead of burning of rice straw by farmers after harvesting, there are other economical ways to get rid of it as making compost and incorporation into the soil as a source of organic matter (Gotoh *et al.*1984).

Irrigated rice fields, being agronomically managed wetland ecosystems with a high degree of environmental heterogeneity operating on a short temporal scale, harbour a rich and varied fauna (Heckman, 1979). The fauna is dominated by micro, meso and macro invertebrates (especially arthropods) inhabiting the soil, water and vegetation sub-habitats of the rice fields. The terrestrial arthropod community in rice fields consists mainly of insects which largely inhabit the vegetation (rice plants and weeds), and the soil surface. The occurrence of terrestrial arthropods in the rice ecosystem is mainly influenced by the rice plants. The different communities of terrestrial arthropods in the rice field include rice pests, their natural enemies (predators and parasitoids) and other non-rice pest insects that inhabit or visit the vegetation. The composition of the arthropod communities is known to change with the growth of the rice crop (Heong *et al.*, 1991).

Parasitoids and predator insects have an important role in managing rice insect pests. Thus, these beneficial arthropods constitute an essential part of integrated pest management system.

Egg parasitoids such as *Trichogramma* spp. have been widely utilized as biocontrol agents (Bigler 1986, Abbas, 1998, Anonymous, 2002). In Egypt, release of *Trichogramma evanescens* West. achieved a good control to the rice stem borer, *Chilo agamemnon* Bles. (Soliman and Ewaise, 1997 and Sherif *et al.* 2008). The leaf and plant-hopper egg parasitoids; *Oligosita* sp. (Trichogrammatidae) and *Anagrus* sp. (Mymaridae) performed 29-91% control of brown planthoppes (Claridge *et al.* 1999) also these parasitoids attacked many leafhoppers and planthoppers eggs in Egypt (Hendawy, 2001). Insect predators, mainly *Ischnura senegalensis* Lambur and *Paederus alfierii* Koch were found to dominate rice fields at Kafr El-Sheikh region.

Because of the negative effect of insecticides on natural enemies populations it was pointed out that agriculture without insecticides, as in case of organic farming, has been considered to keep the natural balance, as well as preserve the native diversity in agroecosystem landscapes (Ponce et al., 2011).

The current study was carried out to: 1) survey natural enemies (parasitoids and predators) occurring in rice fields at Kafr El-Sheikh region, 2) study effect of compost adding in rice fields in enhance natural enemies and 3) monitor population densities of beneficial arthropods, as influenced by organic and chemical fertilizers, biocide and insecticides.

MATERIALS AND METHODS

The current study was carried out at the experimental farm of Rice Research and Training Center (RRTC), Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2016 and 2017 rice growing seasons.

1. General Procedures:

Rice nursery (about 200 m^2) was sown on May 5^{th}, 2016 and 2017 with the seeds of Egyptian Hybrid one rice cultivar, and transplanting was done in one- feddan area one month later (June 5^{th}) at 20x20 cm spacing between rows and hills, with 2-3 seedlings/hill. Hand weeding was applied for weed control (manually removed throughout the rice season). No other pesticides were used during the experimental period either in the experimental field or in the surrounding area, at least 10m-wide. All other cultural practices were adopted as recommended. The mineral fertilizer 69 kg N /fed as urea (46.5% N), and 2 tons composted rice straw /fed. All the recommended cultural practices were followed for seedbed preparation as well as for permanent field. The decomposed compost fertilizer was applied in dry soil, then incorporated well during tillage, mineral N fertilizer was applied before flooding and one third at panicle initiation stage.

2. Survey of Beneficial Arthropods:

Throughout the period extending from May up to September, 2016, both rice nursery and permanent field were sampled to collect occurring natural enemies, using D-vac (suction) machine and pitfall traps. At each sampling date, the D-vac machine was operated for two minutes in the whole area of the nursery, and five minutes in the paddy (permanent) field. In addition, five and fifteen pitfall traps were embedded in the dikes of nursery and paddy field, respectively. The pitfall trap catch was obtained three days after fixing the traps. Pitfall trap consists of a glass jar (about one liter volume), containing water for 2/3 volume of the jar, with 5 ml of formaldehyde to prevent specimen decomposition, and 5 ml of detergent substance to remove water surface tension, enforcing the captured arthropods to sink and be captured in the jar. One catch (by each of collecting tools) was taken from the nursery. Six samples were taken from the permanent field, beginning from two weeks after transplanting, and continued at 2-week interval up to three weeks prior to harvest. Captured arthropods were introduced into a wide - mouthed cyanide jar with a closed cap, and transferred to the laboratory. Specimens were sorted into parasitoids and predator insects and kept in glass vials containing 70% ethyl alcohol and few drops of glycerin. Three complementary ways were used to identify and confirm identifications of collected natural enemies ; 1) Barrion and Litsinger (1994), 2) identity of collected specimens with those kept at RRTC, previously identified or confirmed by Dr. Alberto Barrion, taxonomist of International Rice Research Institute (IRRI), and 3) taxonomists of Plant Protection Research Institute, Giza, Egypt, and the third author.

3- Effect of add compost or mineral fertilizers on the population densities of natural enemies:

Because the rice straw compost act as a refuge to soil arthropods, an experiment was conducted during 2016 and 2017 rice seasons to evaluate the effect of compost and mineral fertilizers on the population densities of arthropods in rice plots. mineral fertilizers and/ or compost add inside the plots. By the beginning of heading, about two months after transplanting, the D-vac machine was installed for 60 seconds in each of rice plots fertilized by compost and mineral. Only natural enemies of relatively high density were considered (Table 3). Numbers of natural enemies, captured by the D-vac, in rice plots fertilized by compost were compared with those in mineral fertilizers (adopted as recommended).

4- Influence of biocides and insecticides on target and non-target arthropods:

Six insecticides (Table 4) were field evaluated during 2017 season for their efficiencies on target and non-target arthropods. These treatments, as well as control, were tested in 5X5 m field plots, planted with Egyptian Hybrid one rice cultivar. Each treatment was replicated three times in a completely randomized block design. The treatments were applied on 18th August, 2017 coinciding with the high populations of most arthropods. Seven days after treatments, the rice plots, treated and untreated, were sampled using D-vac machine operated for 60 seconds per plot. The captured arthropods were categorized to insect pests, parasitoids and predator insects.

Analysis of variance was adopted, and means were compared using Duncan's Multiple Range Test (1955).

RESULTS AND DISCUSSION

1. Survey of Natural Enemies:

Parasitoids:

Twelve hymenopterous parasitoid species were surveyed from rice fields throughout 2016 and 2017 seasons (Table 1). The species were found belonging to Eight families; Braconidae, Dryinidae, Eulophidae, Ichneuomonidae, Mymaridae, Pteromalidae, Scelionidae and Trichgrammatidae. The latter family had the majority of surveyed parasitoids (3 species), followed by Braconidae and Mymaridae, each with two identified species. However, species related to Dryinidae, Eulophidae, Ichneuomonidae and Pteromalidae each with one identified species. Also, Claridge *et al.* (1999) recorded 29 – 91 % reduction in brown plant-hopper populations due to potentiality of the egg parasitoids, *Oligosita* sp and *Anagrus* sp. (Marub 1993) found that the parasitoid, *Trichogramma japonicum is* naturally occurring in rice fields, with parasitism levels of 7.11 – 14.03 % on eggs of yellow stem borer, *Scirpophaga incertulas* (Walker). In Egypt, Soliman and Ewaise (1997) and Sherif *et al.* (2008) recorded an efficient control (equivalent to carbofuran insecticide) of *Chilo agamemnon* Bles. due to the release of *Trichogramma evanescens* West. at the rate of 28,000 – 30,000 wasps / feddan. Also, Shawer *et al.* (2013) obtained about 63.00 – 65.00 % reduction in *Chilo agamemnon* infestation in rice due to release of *T. evanescens*.

Table 1. Survey, host preference and occurrence of Hymenopterous parasitoids from rice fields Sakha, Kafr El-Sheikh Governorate during 2016 and 2017 seasons

Family	Species	Host	Period of occurrence
Braconidae	*Bracon hebetor* Say	RSB larvae	Aug.- Sept.
	Opius hedqusti Fischer	RLM larvae / pupae parasitoid	Jun.- Jul.
Dryinidae	*Echthrodelphax migratorius* Benoit	*Sogatella* spp.	Jul.- Sept
Eulophidae	*Tetrastichus* sp.	Hyperparasitoid	May- Sept.
Ichneuomonidae	*Temelucha* sp.	RSB larvae	Aug.- Sept.
Mymaridae	*Anagrus* sp	LH & PH eggs	Jun.- Sept.
	Gonatocerus sp.	LH & PH eggs	
Pteromalidae	*Trichomalopsis* sp.	Hyperparasitoid	Aug.- Sept.
Scelionidae	*Trissolcus basalis* (Woollaston)	*Nezara viridula* eggs	Aug.- Sept.
Trichogrammatidae	*Paracentrobia* sp	LH & PH eggs	Jul.- Sept.
	Oligosita sp	LH & PH eggs	
	Trichogramma evanescens West.	RSB eggs	

RSB: rice stem borer RLM: rice leaf miner LH : leaf hopper PH : plant hopper

Insect predators:

Twenty insect predator species (Table 2), related to 13 families, were surveyed. The majority of species (8) are belonging to Coleoptera, three species belonging to order Hemiptera and four to order Odonata, while two species were belonging to Hymenoptera. Rest of Orders have one identified species for each.

In similar study, (Manley 1977) found that the rove beetle, *Paederus fuscipes* Curt in Malaysia rice fields as a one of the most common insect predators; the adults migrate to young rice plants shortly after transplanting and remain among the tillers throughout the growing season. Also, Pantu and Litsinger (1984) reported that up to 65 % of the yellow stem borer eggs were consumed by *Conocephalus longipennis* (de Hann).

2. Effect of fertilized by compost and recommended mineral fertilizers on population densities of natural enemies:

Data in Table (3) show that rice plots fertilized by compost contained higher populations of natural enemies than rice plots fertilized by mineral fertilizers.

Table 2. Survey and occurrence of insect predators from rice fields Sakha, Kafr El-Sheikh Governorate during 2016 and 2017 seasons

Order	Family	Species	Period of occurrence
Coleoptera	Carabidae	*Abacetus* sp., *Bimbidion* spp., *Microlestis* sp	May- Sept.
	Staphylinidae	*Paederus alfierii* Koch. *Paederus memnonius* Erichson , *Philonthus* spp.	May- Sept.
	Coccinellidae	*Scymnus interruptus* (Goeze)	Aug.- Sept.
	Dytiscidae	*Hydaticus leander Rossi*	Aug.- Sept.
Diptera	Syrphidae	*Sphorophoria scripta* L.	Aug.- Sept.
Hemiptera	Anthocoridae	*Orius albidipennis* (Reuter), *Orius laevigatus* (Fieber)	Aug.- Sept.
	Mesoveliidae	*Mesovelia vittigera* Horv	Aug.- Sept.
Odonata	Coenagrionidae	*Ischnura senegalensis* (Rambur)	May- Sept.
	Libellulidae	*Crocothemis erythraea* (Brullé) *Brachythemis leucosticta* (Burmeister)	May- Sept.
	Aeshnidae	*Hemianax ephippiger* (Burmeister)	May- Sept.
Hymenoptera	Formicidae	*Monomorium* sp., *Solenopsis lou* Forel	May- Aug.
Neuroptera	Chrysopidae	*Chrysoperla carnea* Steph.	Aug.- Sept.
Thysanoptera	Aelothripidae	*Aeolothrips* sp.	May- Jul.

Table 3. Population densities of natural enemies in rice plots fertilized by compost and recommended mineral fertilizers at Sakha, Kafr El-Sheikh Governorate during 2016 and 2017 seasons

Natural Enemies	Numbers in D-vac catch (operated for 60 seconds / plot)		
	Compost	Mineral	Mineral / Compost %
Parasitoids			
Bracon hebetor Say (Braconidae)	12.25	4.00	32.65
Oligosita sp. (Trichogrammatidae)	19.00	12.25	64.47
Paracentrobia sp. (Trichogrammatidae)	5.25	1.00	19.05
Opius spp. (Braconidae)	16.25	6.00	36.92
Trichogramma evanescens West (Trichogrammatidae)	65.50	28.50	40.46
Insect Predators			
Ischnura senegalensis Rambur (Coenagrionidae)	23.00	12.00	52.17
Paedrerus alfierii Koch (Staphylindae)	36.50	19.25	52.74
Philonthus spp (Staphylindae)	21.25	11.25	52.94
Bimbidion spp. (Carabidae)	18.50	9.50	51.35

The increase in parasitoid populations ranged between 19.05% (*Paracentrobia* sp.) and 64.47 % (*Oligosita* sp.). The insect predatory populations were increased from 51.35 % (*Bimbidion* spp., Carabidae) to 52.94 % (*Philonthus* spp., Staphylindae). These differences could be interpreted as rice plots fertilized by compost may cause rapid increase in the populations of detritivores (such as collembolans and ephydrid flies) and plankton feeders (such as mosquito larvae and chironomid midge larvae), which are important alternative prey for insect predators during early crop session when potential prey items are not present (Settle *et al.*, 1996). Also, Afun *et al.* (1999) indicated that staphylinid beetles were more abundant in rice plots with supplementary weed mulch than in plots with removed mulch.

3. Influence of bio and chemical insecticides on target and non-target insects:

Insect pests:

Data in Table (4) show the effectively of bio and chemical insecticides on insect pests common in rice fields. Achook (*Azadirachta indica*) (Neem) application reduced insect population from 33.30 to 57.32%. Satisfactory control was obtained concerning *Nezara viridula* and *Hydrellia prosternalis*, with values of 57.32 and 54.82 % population reductions, respectively. Dipel (*B. thuringiensis* var *kurstaki*) and Biofly (*Beauveria bassiana*) were relatively less effective against the considered insect pests compared to Achook, with reductions of 10.73 - 48.74% for the former biocide and 10.00 - 39.82% for the latter one. Tracer (Spinosad) gave poor results against leaf hopper, plant hopper, and *Chilo agamemnon*, but moderate results against the other insect pests. The two chemical insecticides; Radiant (spinetoram) and Furadan (carbofuran) were the highest effective compounds against insect pests; most population reductions exceeded 80.00 %, and were 100.00 % in some cases.

In another study, Abudulai *et al.*, (2004) reported that neem may not interfere with the predation on *Nezara viridula* eggs. Thus, neem could be an important component of integrated pest management. Also, (Sagheer *et al*. 2008) found that infestation of rice plants by the leaf folder was highest in the control plots, but reached minimum with application of *Bt* followed by neem.

Table 4. Effect of organic and chemical insecticides on populations of some rice insect pests, 2017 season

Trade name and Common name	Rate/ feddan	LH & P H* (adult & nymph)		*Chironomus* sp (adult)		*Hydrellia prostenalis* (adult)		*Nezara viridula* (adult & nymph)		*Chilo agamemnon* (adult)	
		No	Red %	No	Red %	No	Red %	No	Red %	No	Red %
Control	----	151.50 a	-	80.83 a	-	60.83 a	-	25.00 a	-	15.50	-
Achook0.15(Neem)EC *Azadirachta indica*	750 ml	75.83 d	51.83	50.50 c	40.26	30.50 b	54.82	16.17 c	57.32	12.17 ab	33.30
Dipel 6.4 DF *Bacillus thuringiensis*	300 g	135.83 b	10.73	65.50 b	20..35	30.50 b	48.74	20.83 bc	38.68	12.17 ab	33.30
Biofly *Beauveria bassiana*	250 ml	101.83c	39.02	50.83c	39.82	39.17b	35.53	24.17ab	25.32	14.50 a	10.00
Tracer 24 SC Spinosad	50 ml	115.50c	24.66	46.17c	46.01	39.17b	39.15	20.83bc	38.68	14.50 a	10.00
Radiant 12 SC Spinetoram	120 ml	36.83e	78.54	25.50d	73.45	15.50c	81.93	0.00d	100.00	7.50 c	80.00
Furadan 10 G Carbofuran	6 kg	45.83e	72.38	16.50e	85.40	16.50c	80.12	0.00d	100.00	8.53 bc	66.70

Means followed by the same letter are not significantly at the 5% level.
*** Leaf hoppers and plant hoppers**

Parasitoids:

Neem, Dipel and biofly were hazardous (52.64 - 93.18 % population reduction) to all parasitoids considered in the current investigation (Table 5). In most cases, they killed almost 80 % of different parasitoid species. Also, the two insecticides; Radiant and Furadan were highly toxic (84.21 - 100.00 %) to these parasitoids. Relatively, Tracer was less lethal (25.00-78.93 % population reduction) to the evaluated parasitoids.

(Raguraman and Singh 1999) found that antifeedancy of neem on parasitoids is clearly seen when these parasitoids were subjected to a substrate treated with neem products. Also, Biondi *et al.,* (2012) recommended caution in the use of spinosad because of its negative side effects to many non-target species, including hymenopterous parasitoids. Liu and Zhang (2012) reported that indoxacarb residues caused less than 20% mortality to adults of the hymenopteran parasitoids; *Trichogramma pretiosum* Riley and *Trichogramma brassicae* Bezdenko.

Table 5. Effect of organic and chemical insecticides on populations of common parasitoids in rice fields, 2017 season

Trade name and Common name	Rate/ feddan	*Anagrus* sp		*Bracon hebetor*		*Oligosita sp*		*Opius hedqusti*		*Trichogramma evanescens*	
		No	Red %	No	Red %	No	Red %	No	Red %	No	Red %
Control	----	16.00 a	-	13.77 a	-	27.10 a	-	19.67 a	-	61.67 a	-
Achook0.15(Neem)EC *Azadirachta indica*	750 ml	3.43 c	85.44	3.43 c	81.61	4.77 bc	85.88	3.00 c	86.37	11.67 b	81.17
Dipel 6.4 DF *Bacillus thuringiensis*	300 g	3.77 c	83.31	5.10 bc	68.43	4.77 bc	85.88	3.00 c	86.37	9.67 c	84.70
Biofly *Beauveria bassiana*	250 ml	0.00 c	100.00	7.10 b	52.64	4.10 bc	88.46	2.00 c	93.18	5.67 c	91.76
Tracer 24 SC Spinosad	50 ml	13.10 b	25.00	3.77 c	78.93	7.77 b	74.35	7.33 b	56.85	13.00 b	78.82
Radiant 12 SC Spinetoram	120 ml	3.43 c	85.44	3.10 c	84.21	0.00 c	100.00	3.00 c	86.37	3.33 d	95.89
Furadan 10 G Carbofuran	6 kg	0.00 c	100.00	3.10 c	84.21	0.00 c	100.00	0.00 c	100.00	3.00 d	96.47

Means followed by the same letter are not significantly at the 5% level.

Insect Predators:

The evaluated bio and chemical insecticides were always highly toxic to *Ischnura sensgalensis* (Table 6). Tracer was relatively less toxic to all predators, while both Dipel and Biofly were moderately hazardous. As in the case of insect pests and parasitoids, both chemical insecticides; Radiant and Furadan were the highest toxic compounds against the considered insect predators.

In other study, Galvan *et al.* (2006) reported that the conventional insecticide, indoxacarb caused close to 100% mortality to 3rd instar of the lady beetle *Harmonia axyridis* Pallas. Also, Thungrabeab and Tongma (2007) found that *Beauveria bassiana* (Balsamo) Vuillemin was non-pathogenic to natural enemies and beneficial soil insects while *Meterhizium anisopliae* Metsch had pathogenecity to *Chrysoperla carnea* and *Dicyphus tamaninii* (Hemiptera: Miridae).

The microorganism-derived insecticide, emamectin benzoate induced high motality to *Orius insidiosus* Say (Hemiptera: Anthocoridae) (Studebaker and Kring 2013). Martinou *et al*., (2014) studied the side effect of traditional insecticides compared to biopesticides on the predator, *Mcrolophus pygmaeus* (Hemiptera: miridae) attacking a variety of insect pests, from which is *Tuta absoluta* and whiteflies. The biocides caused 25-30% mortality to the predator, and were classified as harmless according to the international organization for biological control, while traditional insecticides caused 80-100% mortality to the predator, and were classified as harmful. Martinou *et al.*, (2014) suggested that the safety of microorganism derived biocide, emamectin benzoate seems to be species dependent, because this compound was harmful to the mirid predator, *M. pygmaeus* but harmless to the anthocorid predator, *O. insidiosus*.

Table 6. Effect of organic and chemical insecticides on populations of common insect predators in rice fields, 2017 season

Trade name and Common name	Rate/ feddan	*Ischnura sensgalensis*		*Scymnus interruptus*		*Paederus alfierii*		*Philonthus* spp		*Sphorophoria scripta*	
		No	Red %	No	Red %	No	Red %	No	Red %	No	Red %
Control	----	58.67 a	-	14.00 a	-	40.00 a	-	39.33 a	-	17.00 a	-
Achook0.15(Neem)EC *Azadirachta indica*	750 ml	24.00 b	65.82	10.33 bc	45.88	26.33 b	35.97	18.33 b	54.79	10.00 a	43.75
Dipel 6.4 DF *Bacillus thuringiensis*	300 g	20.33 bc	72.79	10.67 b	41.63	18.67 cd	56.13	5.67 c	33.66	4.00 a	81.25
Biofly *Beauveria bassiana*	250 ml	14.67 cd	83.54	9.67 bcd	54.13	16.00 de	63.16	3.67 c	93.03	6.33 a	66.69
Tracer 24 SC Spinosad	50 ml	18.0 bcd	77.22	9.33 bcd	58.38	21.33 c	49.13	24.33 d	39.13	6.67 a	64.56
Radiant 12 SC Spinetoram	120 ml	17.00 cd	79.11	8.00 cd	75.00	3.33 e	96.50	2.67 c	95.64	3.00 a	87.50
Furadan 10 G Carbofuran	6 kg	11.67 d	89.23	7.67 d	79.13	3.33 e	96.50	3.00 c	94.78	5.33 a	72.94

Means followed by the same letter are not significantly at the 5% level.

As a conclusion, the results of the current study revealed the occurrence of a diversified fauna of beneficial insects. Fortunately, add of rice straw compost enhance many natural enemies specially ground insects and in the other side unfortunately, these natural enemies are greatly impaired with insecticide application. An important topic should be intensively investigated, that is the adverse effects of biocides on these natural enemies, because the common theory is that biocides are usually safe to such enemies, which was not clear in this study.

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تأثير المبيدات الحيوية و المبيدات الحشرية و الكمبوست والأسمدة المعدنية على وفرة الطفيليات والمفترسات الحشرية في حقول الأرز

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أجريت هذه الدراسة لمعرفة تأثير الكمبوست المصنوع من قش الأرز، و الأسمدة المعدنية، والمبيدات الحشرية بنوعيها الكيماوية و الحيوية على نمط ووفرة الأعداء الطبيعية في زراعات الأرز. ولتعظيم إنتاجية محصول الأرز يحرص مزارعو الأرز على استخدام المبيدات لمكافحة الآفات المختلفة بغض النظر عن مستوى الضرر الاقتصادى. وعلى ذلك تتأثر فونا الأعداء الحيوية فى الأرز تأثرا شديدا الأمر الذى يؤدى إلى الإخلال بالتوازن البيئى. وقد أجرى هذا البحث فى مزرعة مركز البحوث والتدريب فى الأرز بسخا بمحافظة كفر الشيخ خلال موسمى 2016 ، 2017. حيث جمعت العينات الحشرية باستخدام آلة الشفط بالتفريغ D-Vac ومصائد الحفرة Pit-fall ومن خلالها تم حصر الطفيليات والمفترسات الحشرية. حيث تم تعريف اثني عشر من الطفيليات حتى مستوى النوع ينتموا لثلاث عائلات. أما بالنسبة للمفترسات الحشرية تم تعريف عشرون نوعا يتبعوا 13 عائلة و ينتمى أغلبها إلى عائلتى غمدية وغشائية الأجنحة. كما هدفت الدراسة لحصر الاعداء الحيوية (الطفيليات والمفترسات الحشرية) وتاثير الكمبوست والاسمدة المعدنية علي كثافة عشائر الحشرات النافعة. وعلى الرغم من أن المبيدات الكيميائية المستخدمة فى هذه الدراسة استطاعت بنجاح مكافحة الآفات الحشرية إلا أنها قضت على الأعداء الحيوية بنسبة كبيرة وصلت إلى 90% في بعض الأحيان. كما أوضحت الدراسة أن استخدام المبيدات الحشرية الحيوية لا سيما النيم والتريسر حققت نسبة مقبولة فى مكافحة الآفات الحشرية تراوحت بين 33.30-57.32 % و 10- 46.01% على التوالى كنسب خفض فى تعداد الآفات . كما أوضحت الدراسة أن المبيدات الحيوية المختبرة سببت موتا للأعداء الحيوية ولكن اقل من تلك التي أحدثتها المبيدات الكيميائية. وبناء على نتائج هذا البحث فإنه يمكن استخدام المبيدات الحيوية لمكافحة حشرات الأرز فى حالة الإصابات المتوسطة مع الأخذ فى الاعتبار أن هذه المبيدات الحيوية ليست آمنة بشكل مطلق على الحشرات النافعة.

كلمات مفتاحيه: حقول الأرز - الطفيليات - المفترسات - الكمبوست - المبيدات الحيوية - المبيدات الحشرية.