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SURVEY OF INSECTS AND MITES ASSOCIATED WITH SOYBEAN AND MAIZE IN VARIOUS INTERCROPPING SYSTEMS.

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ABSTRACT

The surveyed arthropods on soybean plants and polyculture of soybean and maize at two locations representing Middle Egypt revealed the presence of 117 insect species belonging to 58 families from 11 orders (of which 9 species of order Orthoptera belonging to 4 families), classified as 44 phytophagous species of economic importance (37.0%) and 33 insect species as visitors, pollinators, non-pest and saprophagous (28.0%). However, natural enemies (predators and parasites) were presented by 40 species (35.0%) and Acarina by 4 species (2 of them were classified as phytophagous mites and the others as predators). In maize/soybean intercropping systems, maize is infested mostly with the same pests, where a partial taxonomic list shows that the insect fauna consists of 43 families from 11 orders in addition to mites (3 families); pest species were classified as: 9 species as foliage feeders, 3 as stem borers, 2 as root feeders, 5 as ear feeders, 1 as leaf miner, 10 as sap-suckers and 22 as natural enemies (13 predators and 9 parasites). Four species of Acarina belonging to 3 families (2 phytophagous and 2 predators).

INTROCUCTION

Soybean is one of the most important seed-oil crops in Egypt and great attention has rapidly paid to increase its total productivity by growing cultivars of high yielding and application of the proper agronomic practices as well as providing an effective and environmentally-safe integrated pest management program to minimize the crop losses that caused by insect and mite pests. Arthropods associated with soybean were surveyed in Middle and Upper Egypt by several investigators (Hamid, 1977; Sawires, 1978; Karaman *et al.*, 1986; Abdel-Alim, 1989). Accordingly, the development of an effective integrated program for pest management is the meaningful and main goal of Egyptian national program. Intercropping maize with soybean is a method to increase the land productivity.

The present study was conducted as a part of a project funded by "The Regional Council For Research And Extension" to study the incidence of arthropods associated with soybean and/or maize in various intercropping systems.

MATERIALS AND METHODS

A field study was conducted at two locations representing Middle Egypt, one in the most northern part of El-Minia Governorate (El-Edwa / El-Fashn) between Beni Swief and El-Minia, and the other location in the most southern part of El-Minia (Dir moas / Dirout) between El-Minia and Assiut. A cultivated area of 2 feddans was chosen in each location for the survey of arthropods associated with soybean.

Sampling techniques:

Three sampling methods were adopted for survey:

1- Direct field count:

One hundred soybean leaflets were collected randomly at weekly intervals and number of identified insects and mites were counted.

2- Sweep net technique:

Fifty double sweeps repeated four times were performed weekly as a standard sample size. Each collected sample was emptied into labeled cage and transferred to the laboratory. Specimens were anaesthetized by chloroform and examined under stereomicroscope. Number of individuals of each species was recorded and the unidentified species were kept in vials containing 75% ethyl alcohol for later identification.

3- Pit fall trap:

This technique was used for surveying soil-inhabiting fauna. Traps were prepared by embedding wide-mouth glass jar (8x15 cm.) in soil. The tops of the jars were adjusted to be parallel to the soil surface. The jars were partially filled with crude alcohol, and kerosene was added to form a thin layer in order to reduce the evaporation. Twenty pit fall traps were randomly placed in each location. The jars were picked and transferred to the laboratory where specimens were removed from traps and presented in 95% ethyl alcohol after being washed several times with acetone. The recovered species were identified and counted.

Intercropping systems:

A randomized complete block design was applied, with 5 treatments and 4 replicates for each. Treatments consisted of alternative rows of soybean with maize in the ratio of 1:1, 2:2 and 4:2, respectively.

RESULTS AND DISCUSSION

The surveyed arthropods on soybean plants and polyculture of soybean and maize at two locations representing Middle Egypt as indicated in table 1 and table 2 revealed the presence of 117 insect species belonging to 58 families from 11 orders, classified as 44 phytophagous species of economic importance (37.0%) and 33 insect species as visitors, pollinators, non-pest and saprophagous (28.0%). However, natural enemies (predators and parasites) were presented by 40 species (35.0%) and Acarina by 4 species (2 of them were classified as phytophagous mites and the others as predators).

In maize/soybean intercropping systems, maize is infested mostly with the same pests, where a partial taxonomic list (table 1 and table 2) shows that the insect fauna consists of 43 families from 11 orders in addition to mites (3 families); pest species were classified as: 9 species as foliage feeders, 3 as stem borers, 2 as root feeders, 5 as ear feeders, 1 as leaf miner, 10 as sap-suckers and 22 as natural enemies (13 predators and 9 parasites). Four species of Acarina belonging to 3 families (2 phytophagous and 2 predators).

Hamid (1977), surveyed arthropods associated with soybean in Sids and Mallawi, where he found 37 species of insects and mites belonging to 17 families and eight orders were recorded as harmful insects, include leaf miners, leafhoppers, *Bemisia tabaci* (Gennadius) and *Etiella zinkenella* (Treitschke). Thirty-six species of slightly harmful, visiting and beneficial insects. Six hymenopterous parasites from 4 families were noticed to emerge from the puparia of *melanagromyza sajae* Zehatner.

Table 1: Incidence of insect and mite species associated with soybean and maize plants in agricultural intercropping systems.

Order	Family	Species	Status	Stage	Frequency	
					Soy-bean	Maize
Neuroptera	Chrysopidae	*Chrysopa carnea* Stephens	Predator	Larva	+++	++
	Myrmeleonidae	*Cueta varigata* Klug.	Predator	Adult	++	++
		Palpares cephalotes Klug.	Predator	Adult	++	++
Lepidoptera	*Gelechiidae*	*Sitotroga cerealella* (Olivier)	Pest	Adult		+
		Aproaerema anthyllidella Hb.	Pest	Larva		++
	Lycaenidae	*Cosmlyca baeticus* L.	Pest	Adult	++	
	Nymphalidae	*Vanessa cardui* (L.)	Visitor	L / A	+	
	Pieridae	*Pieris rapae* L.	Visitor	Adult	+	
	Agrotidae	*Earias insulana* Boisd.	Visitor	Larva	+	
	Hesperiidae	*Gengenes nostrodamus* F.	Pest	Adult	+	
	Noctuidae	*Sesamia cretica* Led.	Pest	L / A		++
		Spodoptera littoralis Boisd.	Pest	Larva	++	++
		Spodoptera exigua Hb.	Pest	Larva	+	+
		Autographa gamma L.	Pest	Larva	+	+
		Agrotis ypsilon Rott.	Pest	Larva	+	+
		Heliothis zea (Boddie)	Pest	Larva	+	
		Leucania loreyi Dup.	Pest	Larva		++
	Pyralidae	*Chilo Agamemnon* Bles.	Pest	Larva		+
		Etiella zinkenella (Treitschke)	Pest	Larva	+++	
	Pyraustidae	*Ostrinia nubilalis* Hb.	Pest	Larva		++
	Geometridae	*Gymnoscelis pumillata* Hb.	Pest	Larva		+
	Cosmopterigidae	*Pyroderces simplex* Wlsm.	Pest	Larva	+	+

Coleoptera	*Carabidae*	*Calosoma chloristictum* Klug.	Predator	Adult	+	+
	Coccinellidae	*Coccinella undecmpunctata* L.	Predator	A/L	+++	++
		Coccinella septumpunctata L.	Predator	Adult	++	++
		Cydonia vicina var. *isis* Cr.	Predator	Adult	++	+
		Cydonia vicina *var.* nilotica *Muls.*	Predator	Adult	++	+
		Scymnus syriacus Mars.	Predator	Adult	++	+
		Scymnus punctillum Weise.	Predator	Adult	++	+
	Staphylinidae	*Paederus alfierii* Koch	Predator	Adult	+++	++
	Bostrychidae	*Rhizopertha dominica* (F.)	Visitor	Adult	+	+
	Curculionidae	*Phytonomus brunneipennis* Boh.	Pest	Adult	++	
		Sitona lividipes Fahraeus	Visitor	Adult	+	
		Lixus anguinus L.	Pest	Adult	++	
		Lixus junci *Boheman*	Visitor	Adult	+	++
	Chrysomidae	***Cassida vittata* Viller**	Pest	Adult	+	
		Phyllotreta crucifera Goeze	Pest	Adult		+
Diptera	*Agromizidae*	*Melanagromyza sojae* Zehatner	Pest	Larva	++	
		Melanagromyza phaseoli Tryon	Pest	Larva	++	
		Pseudonapomyza spictata Malloch	Pest Non	Larva	+	+
		Liriomyza trifolii (Bu s rgess)	Pest	L/A		++
	Muscidae	*Atherigona soccata* (Rondani)	Pest	L/A		++
		Atherigona humeralis Wied	Parasite	Adult	+	
		Atherigona laevigata *L.*	Visitor	Adult	+	+
		Musca crassirostris Stein	Visitor	Adult	+	
		Lisp pectinipes Becker	Predator	Adult	++	
		Lisp kowarzi Becker	Predator	Adult	+	+
	Syrphidae	*Syrphus corolla* F.	Visitor	Adult	+	+
	Tachinidae	*Tachina larvarum* L.	Parasite	Adult	+	+
		Gonia capitata Degeer	Parasite	Adult	+	+
	Sarchophagidae	*Sarcophaga* sp.	Saproph.	Adult	+	+
	Calliphoridae	*Pollenia* sp.	Saproph.	Adult	+	+

Hymenoptera	Aphelinidae	Aphidius sp.	Parasite	Adult	++	++
	Apidae	Apis mellifera L.	Pollinator	Adult	++	
	Braconidae	Apanteles sp.	Parasite	Adult	++	
		Microgaster rufiventris Kok.	Parasite	Adult	+	
		Meteorus sp.	Parasite	Adult	+	
	Trichogramm-atidae	Trichogramma evanescens West.	Parasite	Adult	+	+
	Chalcididae	Brachymeria sp.	Parasite	Adult	++	
		Eretmocerus sp.	Parasite	Adult	++	
	Sphogidae	Tachysphex aegyptiacus Morice	Visitor	Adult	+	
		Ammophila tydei Guill	Visitor	Adult	+	
	Vespidae	Polistrs gallica L.	Predator	Adult	+	
		Vespa orientalis F.	Parasite	Adult	+	
	Eulophidae	Pediobius sp.	Parasite	Adult	++	
	Ichneumonidae	Pimpla roborator F.	Parasite	Adult	+++	+
	Eumenidae	Eumenes maxillosa F.	Parasite	Adult	+	
	Mutilidae	Trogaspidia floralis Klug	Pest Non	Adult	++	++
	Megachilidae	Megachile submucida (Alfk.)	Pollinator	Adult	++	
	Pteromalidae	Conomorium sp.		Adult	+	+
		Halicoptera sp.	Parasite	Adult	+	
		Pteromalus sp.	Parasite	Adult	+	+
			Parasite			
	Halictidae	Halictus sp.		Adult	+	+
		Lasioglossum sp.	Pollinator	Adult	+	+
			Pollinator			
	Cynipidae	Xylaphora sp.		Adult	+	+
		Kleidotoma sp.	Visitor	Adult	+	+
			Visitor			
Orthoptera	Acrididae	Locusta domenicus L.	Pest	N/A	+	+
		Aiolopus strepens Latr.	Non Pest	N/A	+	+
		Euprepocnemis plorans Charp	Pest	N/A	+	+
		Anacridium aegyptiacum L.	Pest	Adult	+	+
	Gryllotalpidae	Gryllotalpa gryllotalpa L.	Pest	Adult	+	+
	Gryllidae	Gryllus domesticus (L.)	Pest	Adult	+	
		Gryllus burdigalensis Latr.	Pest	Adult	+	+
		Liagryllus bimaculatus (DeGeer)	Pest	Adult	+	+
						+
	Tettigoniidae	Conocephalus sp.	Pest	N/A	+	
Odonata	Agrionidae	Ischnura senegalensis Ramb.	Predator	Adult	++	+
	Aeschnidae	Hemianax ephippiger Burm.	Predator	Adult	+	+
Dermaptera	Labiduridae	Labidura reparia Pallas	Predator	Adult	+	+
		Labia minora L.	Predator	Adult	+	+

Thysanoptera	*Thripidae*	*Thrips tabaci* Lindeman	Pest	N/A	++	+
		Frankliniella schultzei (Try bom)	Pest	N/A	+++	
		Anaphothrips sudanensis Try bom	Pest	N/A	+	
		Scolothrips longicornis Priesner	Predator	N/A		+
		Scolothrips latipennis Priesner	Predator	N/A	++	+
		Limothrips cerealium (Haliday)	Pest	N/A	++	+
Mantodea	*Mantidae*	*Mantis religiosa* L.	Predator	Adult	+	+
		Calidommantis savignyi Sauss.	Predator	Adult	+	+
Hemiptera	*Lygaeidae*	*Oxycarinus hyalinipennis* (Costa)	Pest	Adult	++	
		Nysius spp.	Pest	Adult		+
Heteroptera		*Geocoris megacephalus* (Rossi)	Predator	N/A	+	+
		Graptostethus servus F.	Pest Non	Adult	+	
	Nabidae	*Nabis* spp.	Predator	Adult		+
	Miridae	*Deraeocoris* sp.	Pest	Adult	+	++
		Creontiades pallidus Rmb.	Pest Non	Adult	++	
		Calocoris sp.	Pest	N/A		++
	Pentatomidae	*Nezara viridula* (L.)	Pest	N/A	+++	+
		Eusarcoris inconspicuous H.S.	Pest	N/A	++	
		Eurydema ornate L.	Pest	N/A	+	++
	Anthocoridae	*Orius albidipennis* (Reuter)	Predator	Adult	++	
	Aleyrodidae	*Bemisia tabaci* (Gennadius)	Pest	N/A	+++	
	Aphididae	*Aphis cracivora* Koch	Pest	N/A		++
Homoptera		*Aphis gossypii* Glov.	Pest	N/A	++	+++
		Rhopalosiphum maidis Fitch	Pest	N/A	++	+++
		Rhopalosiphum padi L.	Pest	N/A		+
	Cicadellidae	*Emoasca decipiens* Paoli	Pest	N/A	+++	
		Emoasca faba (Harris)	Pest	N/A	+++	+
		Emoasca destinguenda (Paoli)	Pest	N/A		++
Acarina	Tetaranychidae	*Tetranychus arabicus* Attiah	Pest	L/N/A	++	+
		Tetranychus cucurbitacearum (Sayed)	Pest	L/N/A	+	+
	Stigmaeidae	*Agistemus exertus* Gonzales	Predator	L/N/A	+	+
	Phytoseiidae	*Amblyseius swirskii* (Athias-Henriot)	Predator	L/N/A	+	+

Two phytophagous mite species, *Tetranychus arabicus* Attiah and *T. cucurbitacearum* (Sayed), were found in soybean fields and about 24.5% reduction of soybean yield was caused by mite infestation (Sawires, 1978).

Mohamed and Abd El-Hafez (1981), surveyed 52 species of arthropods associated with soybean plants in Shandaweel, Upper Egypt and he found that a large number of species was considered as foraging species and not persistent inhabitants of soybean fields. However, certain species were definitely associated with this crop, *Ishnura sengalensis* Ramb., *Aiolopus strepens* Latr., *Anacridium aegyptiacum* L., *Scolothrips* spp., *Orius* spp., *Oxycarenus hyalinipennis* Costa, *Nezara viridula* (L.), *Bemisia tabaci* (Gennadius), *Aphis cracivora* Koch, *Empoasca* sp., *Coccinella undecimpunctata* L., *Scymnus syriacus* Mars., *Sitona lividipes* F., *Paederus*

alfierii Koch, *Spedoptera littoralis* Biosd., *Syrphus* sp., *Halyctus* sp., and *Tetranychus arabicus* Attiah.

Table(2): Number of insect and mite species, families and orders composing insect and mite fauna in soybean/maize polyculture.

Order	No. of		Insect or mite status			Insect or mite species				Total	% of total popul.
	Families	Species	Pest	Predetor or Parasite	Visitor or Pollinator	on maize		on soybean			
						No.	%	No.	%		
Orthoptera	4	9	1	0	8	8	10.1	9	8.5	17	9.2
Odonata	2	2	0	2	0	2	2.5	2	1.9	4	2.2
Dermaptera	1	2	0	2	0	2	2.5	2	1.9	4	2.2
Thysanoptera	1	6	4	2	0	4	5.1	5	4.7	9	4.9
Mantodea	1	2	0	2	0	2	2.5	2	1.9	4	2.2
Hemiptera	8	20	15	3	2	13	15.2	14	15.1	27	15.1
Neuroptera	2	3	0	3	0	3	3.8	3	2.8	6	3.2
Lepidoptera	12	19	16	0	3	13	15.2	12	11.3	25	13.0
Coleoptera	6	15	4	8	3	11	13.9	14	13.2	25	13.5
Diptera	6	15	4	5	6	9	11.4	12	11.4	21	11.4
Hymenoptera	15	24	0	13	11	9	13.9	24	23.6	33	19.5
Acarina	3	4	2	2	0	3	3.8	4	3.8	7	3.8
Total	61	121	46	42	33	79		103		182	

Karaman *et al.* (1986), in El-Minia region studied the prevalence of certain sucking pests i.e. Empoasca spp., Aphis cracivora Koch and Nizara viridula L., and their associated predators i.e. *Coccinella undecimpunctata* L., Chrysopa vulgaris, and Syrphus rapalus on different soybean varieties.

In Middle Egypt El-Minia region), Abdel Alim (1989) found 80 species related to 41 families, belonging to 12 orders. Phytophagous species were presented by 12 insect species of economic importance (15%)and 15 insect species as non- pest (18,75%). 18 species (22.5%) were classified as pollinators, visitors and saprophagous. Natural enemies (parasites and predators) were presented by 35 species (43.75%). He found that soybean is subjected to be attacked by large number of insects of which *Thrips tabaci* Lindeman, *Aphis cracivora* Koch, *Empoasca decipiens* Paoli., *Spedoptera littoralis* Biosd. and *Etiella zinkenella* (Treitschke).

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حصر للحشرات والاكاروسات المرتبطة بفول الصويا والذرة الشامية فى أنظمة تحميل مختلفة

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أظهرت دراسات حصر مفصليات الأرجل المتواجدة على نباتات فول الصويا وأيضا فى أنظمة تحميل فول الصويا والذرة الشامية فى منطقتين يمثلان مصر الوسطى تواجد ١١٧ نوعا حشريا تنتمى إلى ٥٨ فصيلة من ١١ رتبة، مصنفة إلى ٤٤ نوعا نباتى التغذية ذات أهمية اقتصادية (٣٧%) ، ٣٣ نوعا كحشرات زائرة وملقحة وغير ضارة وكانسة (٢٨%). بينما تواجد ٤٠ نوعا (٣٥%) من الأعداء الحيوية (مفترسات وطفيليات) ، وأربعة أنواع من الأكاروسات (٢ كأكاروسات نباتية التغذية، ٢ كمفترسات). وقد أصيبت الذرة الشامية فى أنظمة تحميل فول الصويا/الذرة الشامية غالبا بنفس الآفات حيث تظهر القائمة التقسيمية أن المجتمع الحشرى يحتوى على ٤٣ فصيلة تابعة لإحدى عشر رتبة بالإضافة إلى الأكاروسات (٣ فصائل). وقد تم تصنيف الأنواع الضارة إلى : ٩ أنواع متغذية على المجموع الخضرى، ٣ أنواع كثاقبات، ٢ كأنواع متغذية على الجذور، ٥ كأنواع متغذية على الكيزان، نوعا واحدا كصانعات أنفاق، ١٠ أنواع تمتص العصارة النباتية، ٢٢ نوعا كأعداء حيوية (١٣ مفترسا، ٩ طفيليات). وتنتمى ٤ أنواعا من الأكاروسات إلى ٣ فصائل (٢ نباتية التغذية، ٢ مفترسات).