The most common insect species in Alfalfa fields in Egypt

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Abstract. Alfalfa, *Medicago sativa*, is a superb forage, but it can be a shelter for a complex of insect pests, natural enemies and pollinators. Alfalfa insect populations vary significantly from field to field. Therefore, it is essential to check each alfalfa field frequently for the presence of insects. The survey of the insect fauna of alfalfa, was carried out in different areas of Egypt like Ismailia, Suez, Swia Oasis, and The New Valley. Some fields were sampled twice. The samples were taken from the alfalfa experimental fields of the university farm in the season 2003 and the different species were categorized into the following groups: pests, natural enemies, and pollinators.

Samenvatting. De meest gewone insectensoorten in luzernevelden in Egypte
Luzerne, *Medicago sativa*, is een prachtig veevoergewas, maar het kan ook een schuilplaats zijn voor een hele reeks schadelijke en nuttige insecten en voor bestuivers. De populaties variëren van veld tot veld en het is dus nodig om elk veld apart te bemonsteren. Dit onderzoek werd uitgevoerd in verschillende gebieden in Egypte, zoals Ismailia, Suez, Swia Oasis en de New Valley. Een groot aantal exemplaren werd verzameld in de experimentele velden van de universiteit gedurende 2003 en de gevonden soorten werden onderverdeeld in schadelijke insecten, natuurlijke vijanden en bestuivers.

Résumé. Les espèces d'insectes les plus communes dans les champs d'alfalfa en Egypte
La luzerne, *Medicago sativa*, est une plante fourragère utilisée pour l'alimentation du bétail, mais souvent elle héberge un grand nombre d'insectes. Les populations d'insectes varient beaucoup entre les champs et il est donc nécessaire de contrôler chaque champ individuellement. Des investigations furent faites dans différentes régions d'Egypte: Ismailia, Suez, l'oasis de Swia et la Nouvelle Vallée. Certains champs furent étudiés plusieurs fois. Un nombre important d'insectes furent collectés et les espèces furent divisées en trois catégories: insectes nuisibles, ennemies naturelles et pollinisatrices.

Key words: Alfalfa – *Medicago sativa* – pests – natural enemies – IPM – pollinators – ecosystem

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Introduction

Alfalfa, *Medicago sativa*, is a perennial plant which is native to South-West Asia. It has been cultivated for forage longer than any other crop. Not only does alfalfa have a very high yield potential, but it is also one of the most palatable and nutritious forage crops. Because of its high protein and vitamin content, alfalfa is a primary component in the diet of dairy cattle as well as beef cattle and horses. Alfalfa is among the most prized of forage and it is grown worldwide (Summers 1998). This green manure crop occurs in several varieties which have especially been bred so that they are well-adapted to reclaimed agricultural regions in Egypt. Currently 200–300,000 acres of alfalfa are planted in Egypt, and the area is rising each year.

Alfalfa provides shelter and food for a large number of arthropods. Some of them are pests but many have no effect on the crop (Alsuhaibani 1996). At least

1,000 species have been reported from alfalfa in the U.S., with perhaps 100–150 of these causing some degree of injury. Few of these, however, can be described as key pest species, the rest are of only local or sporadic importance, or are incidental herbivores, entomophagous species (parasites and predators), or pollinators (Flanders & Radcliffe 2000). Therefore, alfalfa fields are important contributors to the biodiversity of agricultural systems (Putnam *et al.* 2001). The contribution of alfalfa to the biological diversity and for the nurturing of beneficial insects often goes unrecognized. Incorporating alfalfa into a cropping system should be considered an important environmental benefit. While it is true that alfalfa production fields often represent a significant change from the naturally occurring flora and fauna of a region, it is not true that wildlife is automatically a loser in this tradeoff. Agricultural activities interact significantly with wildlife on several different levels, and many forms of wildlife adapt, adjust, or even thrive within and alongside agriculture (Putnam 1998). In extensive surveys conducted in the Sacramento Valley, California and in subsequent analysis by wildlife biologists, many species of wildlife were found to be present in alfalfa fields. Of the 643 regularly-occurring resident and migratory terrestrial wildlife (amphibians, reptiles, birds, and mammals), 162 species, or 25%, were considered regular users of alfalfa fields to varying degrees (Kuhn *et al*. 1996).

Correct identification and efficient sampling methods for beneficial and pest insects are two critical steps towards the implementation of integrated pest management (IPM) programs. IPM includes the use of all feasible control tactics (e.g. crop rotation, resistant hybrids, and chemical control) to manage pests within a profitable, yet environmentally sound production system. Current integrated pest management (IPM) programs use cultural, biological and chemical tactics for managing alfalfa pests. However, in many instances, IPM is not practiced by alfalfa growers because of the cost and time involved in implementing these tactics (Degooyer *et al*. 1999).

Efficient sampling methods are necessary for making an accurate and timely evaluation of the insect population (infestation) levels. These estimates can then be used for comparison with economic thresholds and consideration of appropriate management tactics. For production of high yielding, high quality alfalfa, the crop should be checked weekly. In cooler weather, sampling can be done less frequently. In hot weather, however, sampling frequency should be increased (insects develop, feed and reproduce faster under warmer conditions). Shorter sampling intervals are also necessary as insect populations and/or damage approach economically damaging levels. Therefore, it was very important to check the insect fauna of alfalfa agroecosytem in Egypt for improving IPM programs and for improving the alfalfa cultivation in Egypt.

Material and Methods

The survey of the insect fauna of alfalfa, *Medicago sativa*, was carried out in different areas of Egypt, like Ismailia, Suez, Swia Oasis, and The New Valley. In Suez, Swia Oasis, and The New Valley samples have been collected from

different fields during the summer season. In Ismailia samples have been collected from the university farm during the whole season of 2003. An area of one feddan (4,200 m²) was cultivated with alfalfa in early October. This area received usual agriculture practices, but no chemical control application was practiced. During the season 2003, the sampling technique was based on using a sweep net with which 50 full length, double net-strokes were practiced. The samples were taken by cross distribution of the field every two weeks. The catch was killed in an ordinary cyanide jar, then spread on a sheet of white paper for identification. This is currently the most convenient method of estimating the level of the pest and beneficial insect populations in alfalfa. Although it provides only a relative estimate of the insect density, it is sufficient and cost effective for most insect pests of alfalfa living above ground level. On the other hand, sweep net sampling is not recommended for determining absolute estimates of alfalfa weevil, cutworm, armyworm, grasshopper, or aphid populations. However, the sweep net is often useful for detecting initial low-density populations of alfalfa weevil larvae and pea aphids.

Results and Discussion

A high number of insects were collected from alfalfa fields. About 10 different orders were found: Coleoptera, Dictyoptera, Diptera, Hemiptera, Lepidoptera, Neuroptera, Odonata, and Orthoptera. The different species were categorized into the following groups, depending on their economic impact:

1.– Pests (table 1), 2.– Natural enemies (table 2), 3.– Pollinators (table 3)

Table 1. The most common pest species in alfalfa fields:

Order	Family	Species
Coleoptera	Curculionidae	*Hypera brunniepennis* *Sitona lividipes*
	Scarabaeidae	*Tropinota squalida* *Scarabus sacer*
Diptera	Agromyzidae Muscidae Calliphoridae	*Liriomyza trifolii* *Musca domestica* *Lucilia spp.*
Hemiptera	Pentatomidae Lygaeidae	*Nexara viridula*
Homoptera	Jassidae Aphididae	*Empoasca decipiens* *Acyrthosiphon pisum* *Therioaphis pisum*
Orthoptera	Acrididae Tettigonidae	*Eupropocnemis plorans* *Homorochryphus nitidudlus*
Lepidoptera	Lycaenidae Pieridae Noctuidae	*Lampides boeticus* *Pieris rapae* *Colias eurytheme* *Spodoptera littoralis* *Spodoptera exigua*

The most abundant pest species in alfalfa fields were *Lampides boeticus*, *Hypera brunneipennis*, and several aphid species. In general, the alfalfa weevil (*Hypera postica*) and the Egyptian alfalfa weevil (*H. brunneipennis*) are the most important insect pests of alfalfa. The pea aphid (*Acyrthosiphon pisum*), blue alfalfa aphid (*A. kondoi*), spotted alfalfa aphid (*Therioaphis maculata*), and cowpea aphid (*Aphis craccivora*) are the principal aphid species associated with alfalfa (Summer *et al*. 2007).

Table 2. The most common natural enemies associated with pests in alfalfa fields:

Order	Family	Species
Coleoptera	Coccinellidae	*Coccinella septempunctata* *Coccinella undecimpunctata* *Scymnus* spp.
	Staphylinidae	*Paederus alfierii*
Diptera	Syrphidae	*Syrphus* spp.
Hemiptera	Anthocoridae	*Orius* spp.
	Nabidae	*Nabis capsiformis*
Dictyoptera	Mantidae	*Sphodromatis bioculata* *Mantis savigyni* *Mantis religiosa*
Neuroptera	Chrysopidae	*Chrysoperla carnea*
	Myrmeleontidae	*Cueta variegata*
Odonata	Agrioniidae	*Ischnura senegalensis*
	Libelullidae	*Crocothemis erythraea*
Hymenoptera	Aphidiidae	*Syrphus* spp.

Different natural enemies (parasitoids and predators) have been found in the alfalfa agroecosytem associated with their hosts, like lady beetles, bugs, aphid lions and some hymenopteran parasitoids. The most abundant natural enemies are *Bathyplectes curculionis*, *Aphidius* spp., *Trichogramma* spp., *Coccinella* spp., *Orius* spp., *Nabis* spp., and *Chrysoperla* sp. (Summer *et al*. 2007).

Table 3. The most common pollinators in alfalfa fields:

Order	Family	Species
Hymenoptera	Andrenidae	*Andrena ovatula*
	Anthophoridae	*Anthophora* spp.
	Xylocopidae	*Xylocopa* spp.
		Ceratina spp.
	Halictidae	*Halictus* spp.
	Apidae	*Apis mellifera*
	Megachilidae	*Chalcidoma siculum*
		Osmia spp.
		Megachile submucida
		Megachile uniformis
		Megachile mintusemina

Different bee species have been collected from the alfalfa ecosystem belonging to 6 different families. The most common and abundant species were leafcutting bees (Megachilidae) followed by Halictidae, Anthophoridae and Colletidae, respectively. It was clear that the most abundant species visiting alfalfa flowers was *Megachile patellimana* (El-Badawy 1975). A total of 545 Hymenoptera species, belonging to 13 genera, were obtained at the 20 alfalfa sites. *Megachile*, a genus of solitary bees, was the most frequently collected, representing almost half of all collected bees. The social *Bombus* was second in frequency, and represented 20% of the collections (Brookes *et al*. 1994).

The insect fauna of alfalfa in Saudi Arabia has been studied using a standard 15" sweeping net. The identification of insects revealed the prevalence of 103 insect species belonging to 94 genera, 49 families and 10 orders of Insecta. Of these insects, 18 species were recorded for the first time in Saudi Arabia. The insect fauna of alfalfa was divided, according to their importance for the alfalfa grower, into the following categories: 48% phytophagous insects, 25.6% entomophagous insects, 21.6% pollinating insects and 4.8% other insects (saprophagous species, scavengers, etc.). Studying the entomofauna of alfalfa is important for developing integrated pest management programs for alfalfa and similar crops (Alsuhaibani 1996). A fieldside view of an alfalfa field may show little apparent activity; it is simply a mass of green. However, each successive regrowth of alfalfa creates an environment which teems with insect life. The numbers and species of insects that inhabit alfalfa have been described as "incredible" (Manglitz & Ratcliffe 1988). A count of 591 species was recorded in a field near Ithaca, NY (Pimental & Wheeler 1973). Insects are so abundant in alfalfa fields that university entomology classes can often be found sweeping in these fields to study the diversity of insects to be found there. Some of these insects, of course, feed on alfalfa as a primary source of food, but there are many beneficial insects as well. These 'beneficials' prey on herbivorous or sucking insect pests of alfalfa. Dozens of predacious and parasitic insects occur in alfalfa fields, and several "work horses" of biological control are especially abundant (Leigh 1991). The role of beneficial insects in helping to reduce crop damage in an alfalfa integrated pest management (IPM) program has been understood for some time. However, several of the species present in alfalfa also effect a number of other neighbouring crops where they may greatly reduce the threat of pest damage. Due to its reservoir of insects, planting alfalfa in strips with other crops has been proposed to help distribute and nurture beneficial insects (Leigh 1991).

Nearly 1,000 species of arthropods are associated with the alfalfa agro-ecosystem and play an integral role in various arthropod plant community complexes associated with the intensified agriculture (Summers 1976). More study should be carried out in the future to study the fauna and flora structure of alfalfa and other crops, plants, and trees as well. However, we should wonder about the effect of climate change and global warming on the fauna and flora structure of different plants, crops, trees, etc. Global warming and climate change are the most important conflicts for agricultural production in the world

right now. So, we need more answers to be ready for any change in the agricultural ecosystem.

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