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SURVEY OF PREDACEOUS INSECTS ASSOCIATED WITH FOUR MEDICINAL PLANTS

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ABSTRACT

The present work was conducted during 2008/2009 and 2009/2010 seasons to survey the predaceous insect species inhabiting certain medicinal plants chamomile,(*Matricaria chamomilla*) coriander,(*Coriandrum sativum* L) Fennel, (*Foeniculum vulgare* Miller) and caraway,(*Carum carvi*, L) The predaceous insects were collected by using the sweeping net and yellow sticky traps. Results showed that the sweeping net proved to be the best method to collect all the tested predaceous insect species. Yellow sticky traps have a remarkable selectivity for attracting certain predaceous species.

A survey of the insect predators inhabiting, coriander, chamomile, fennel and caraway plantations assured that the most dominant predators were *Syrphus corollae, Coccinella. undecimpunctata, Chrysoperla . carnea* and *P aederus. alfierii.*

The insect predators showed different degree of preferability toward the different host plants. However, the collected hoverfly, *Syrphus corollae* exhibited high preferrability to chamomile in comparison with coriander, fennel and caraway plants., while, coccinellid, *C. undecimpunctata* showed the highest preferability to coriander. The chrysopid species, *Chry. carnea* exhibited high preferrability to fennel and caraway plants in comparison with the other tested host plants. In addition, the stapheilind, *P. alfieri* showed prferrability to fennel plants. The seasonal abundance of the predators population revealed that *S. corollae, C. undecimpunctata* and *Chry. carnea* exhibited 2-3 peaks, while, *P. alfierii.* showed only one peak of seasonal abundance,. during the season of investigation

INTRODUCTION

The performance of natural enemies in agricultural system is often limited by the absence or scarcity of essential resources. For example many parasitic wasps need a source of sugar to realize their maximum longevity and fecundity (Jervis *et al.*, 1996).

Beneficial insectary planting is a form of conservation biological control that involves introducing flowering plants into agricultural and horticultural systems to increase nectar and pollen resources required by some natural enemies of insect pests (Landis *et al.*, 2000).

Several flowering plants have been evaluated by many researchers as insectary plants. In the current study, some medicinal plants were evaluated for their ability to attract insect parasitoids during winter season.

Conservation biological control is the least studied of all biological control approaches (Dent, 1995). Other than, with holding the pesticides which may adversely affect population. of natural enemies So, conservation also makes use of habitat manipulations to favour predators and parasitoids. These include provision of shelter, alternative hosts on prey or food plants

from which nectar and pollen may be obtained. The later technique has been relatively widely used (Hickman & Wratten, 1996).

A number of workers have sought to maximize the benefit from providing food plants by screening to quantify the benefit to natural enemies of access to different flower types (Patt *et al.*, 1997a) and Orr & Plesants, 1996).

Generally, plants with exposed nectarines such as are common in the family Apiaceae are recommended.

Floral nectar and pollen also are highly attractive to a diversity of predaceous insects such as syrphids (White *et al.*, 1995), coccinellids (Pemberton & Vandenberg, 1993) and lacewings (Freeman *et al.*, 1998). Some flowering plant species also are highly attractive to natural enemies (Carreck & Williams, 1997 and Tooker & Hanks, 2000) and can enhance predatism rate of herbivorous pests.

More research is still needed to identify which plants have the greatest potential as beneficial insectary plants are not attracted to all flowers equally. Rather they exhibit selectivity for the flowers from which they feed (Cowgill *et al.*, 1993).

The present study aims to evaluate the relative attractiveness of the selected plants to predaceous insects. To identify which plant species that was preferred by predaceous inscet species. So, plants which attractive to certain predator may be act as inectary plants

MATERIALS AND METHODS

Field experiments were conducted in the Experimental Farm, Faculty of Agriculture, Mansoura University at Mansoura region.

An area of 1500 m^2 (500 m^2 / host plant) was prepared and divided into suitable plots for growing chamomile, *Matricaria chamomilla*; coriander, *Coriandrum sativum* L; Fennel, *Foeniculum vulgare* Miller and caraway Carum carvi, L were sown on 10^{th} and 18^{th} October 2008 and 2009 years, respectively..

The cultivated area received normal agricultural practices and not subjected to any chemical control applications.

Sampling techniques

Two methods have been used to survey predaceous insects inhabiting fennel, chamomile, coriander and caraway plantations throughout two successive growing seasons (2008/2009 and 2009/2010). These methods included yellow sticky traps and sweep net . Sampling was started from 18/12/2008 (in the first season) and from 23/12/2009(in the second season till harvesting.

Sweeping net :

A standard sweep net (0.35 m.diam.) as described by Borror and Delong (1981) was used. Fifteen douple sweeps per plot (12 x 14 metre) were taken weekly. Each collected sample was emptied into a labeled collecting muslin bag and transferred to the laboratory, specimens were killed by chloroform in tight chamber and examined under stereomicroscope.

Number of individuals and species composition of each sample was determined. The strokes conducted throughout plantation accounted 675 (45 double strokes x 15 collections)

Yellow sticky traps :

Sticky traps were made of yellow, opaque polyvinyl material measured 20 by 10 cm, covered with strongly diluted, sticky past base (poly isobutene), so the surface was tacky, but not thicky, as recommended by Gerling and Horowitz (1984). The trap was placed vertically on the top of wooden stalks 10 cm above the plants, fitted by wooden large clips in the center of each plot. Traps were collected weekly and examined in the laboratory by using stereomicroscope. Specimens collected were counted and preserved for identification. Number of individuals and species composition of each sample was determined. Total catches of each plantation accounted 45 ones (3 traps x 15 collections)

RESULTS AND DISCUSSION

Sweep net and yellow sticky traps were used to survey predaceous insects inhibiting chamomile, coriander, fennel and caraway plantations in Mansoura region at the Experimental Farm , Faculty of Agriculture Mansoura University during 2008/2009 and 2009/2010 seasons.

Relative abundance of predaceous insects inhibiting medicinal plants.

Data revealed the presence of 8 predator insect species belonged to 8 genera under 7 families were recorded by using sweep net method, meanwhile 6 insect predator species were collected using yellow sticky traps belonged to 6 genera under 5 families.

Yellow stick trap

As shown in Table 1 and 2, the collected predators by using yellow sticky traps was relatively low in comparison with those collected by using sweep net. However, the total captured predators in all tested plants by using sticky traps were approximately half in comparison with those collected by sweeping net. However, in the first season 2008/2009, the total number of collected predators by using yellow sticky traps was 116, 112, 99 and 78 individuals (Table 1) in comparison with 268, 210, 183 and 140 individuals collected by using sweep net (Table 3) on chamomile, coriander, fennel and caraway plants., respectively.

Tabel (1): Relative abundance of predaceous insect species dominant in Chamomile, Caraway, Coriander and fennel plantations collected by Sticky traps during 2008 / 2009 season.

Predator species	Chamomile		Coriander		Fennel		Caraway	
	No.	%	No.	%	No.	%	No.	%
Chrysoperla carnea	30	25.86	25	22.32	20	20.20	17	21.79
Coccinella undecimpunctata	26	22.41	35	31.25	19	16.10	15	19.23
Syrphus corollae	34	29.31	21	18.75	38	38.38	25	32.05
Paederus alfierii (Koch)	14	12.07	22	19.64	18	17.82	15	19.23
Other species Scymnus sp Orius sp.	12	10.34	9	8.04	4	4.04	6	7.69
Total	116		112		99		78	

Tabel (2): Relative abundance of predaceous insect species dominant in Chamomile, Caraway, Coriander and fennel plantations collected by Sticky traps during 2009 / 2010 seasons.

Predator species	Chamomile		Coriander		Fennel		Caraway	
	No.	%	No.	%	No.	%	No.	%
Chrysoperla carnea	23	18.40	24	26.67	30	27.78	24	26.97
Coccinella undecimpunctata	19	15.20	19	21.11	19	17.95	19	21.35
Syrphus corollae	49	39.20	22	24.44	31	28.70	22	24.72
Paederus alfierii (Koch)	19	15.20	21	23.33	22	20.37	14	15.73
Other species *Scymnus* sp Orius sp.	15	12.00	4	4.44	6	0.56	10	1.12
Total	125		90		134		89	

While, in the second season the total number of collected predators by using yellow traps was (Table, 2) was 125, 90, 134 and 89 individuals in comparison with 259, 213, 232 and 141 individuals by using sweep net, respectively (Table, 4).

Sweep net

During the course of the present study, four insect predators were recorded with relatively high numbers by using sweeping net on chamomile, coriander, fennel and caraway plants throughout the period of investigation (2008/2009 and 2009/20010 seasons), (Table 3and 4) These species namely *Crysoperlla carnea* Steph., *Coccinella undecimpunctata* L. *Syrphus corollae*, and *Paederus alfierii* (Koch). In addition to five predaceous species were recorded with few numbers, namely, *Scymnus* sp., *Orius* sp., *Maintis religiosa*, *Polistes gallica* L.and *Chilocorus bipustulatus* .

On coriander plants.

Weekly samples taken by sweeping net on coriander plants indicated the existence of four predaceous insect species (*S. corollae, C. undecimpunctata*, *Chry. carnea* and *P. alfierii*). belong to four families.

As shown in Table (3 and 4), *C. undecimpunctata* was the most numerous species on coriander plants represented by 31.90% and 28.17% of the total number of predaceous insects during the first and second seasons, followed by *Syrphus corolla*(20.48 &23.00 %) , *Chry. Carnea* (20.95 &21.60 %) and *P. alfierii* (19.05 &17.84 %), respectively.

Table (3): Relative abundance of predaceous insect species dominant in Chamomile, Caraway, Coriander and fennel plantations collected by sweeping net during 2008 / 2009 season.

Predator species	Chamomile		Coriander		Fennel		Caraway	
	No..	%	No..	%	No..	%	No..	%
Chrysoperla carnea	60	22.39	44	20.95	46	25.14	48	34.29
Coccinella undecimpunctata	62	23.13	67	31.90	38	20.77	35	25.00
Syrphus corollae	78	29.10	43	20.48	37	20.22	38	27.14
Paederus alfierii (Koch)	50	18.66	40	19.05	41	22.40	12	8.57
Other species *Scymnus* sp *Orius* sp. *Maintis religiosa* *Spilostethus pandurus*	18	6.72	16	7.62	21	11.48	7	5.00
Total	268		210		183		140	

Tabel (4): Total Relative abundance of predaceous insect species dominant in Chamomile, Caraway, Coriander and fennel plantations collected by sweeping net during 2009 / 2010 season.

Predator species	Chamomile		Coriander		Fennel		Caraway	
	No.	%	No.	%	No.	%	No.	%
Chrysoperla carnea	58	22.39	46	21.60	57	24.57	51	36.17
Coccinella undecimpunctata	52	20.08	60	28.17	55	23.71	45	31.91
Syrphus corollae	88	33.98	49	23.00	62	26.72	34	24.11
Paederus alfierii (Koch)	46	17.76	38	17.84	41	17.67	7	4.96
Other species *Scymnus* sp *Orius* sp. *Maintis religiosa* *Spilostethus pandurus*	15	5.79	20	9.39	17	7.33	4	2.84
Total	259		213		232		141	

On chamomile plants,

The occurrence percentages of the total collected predaceous insects associated with *M. chamomile* during 2008/2009 and 2009/2010 seasons are presented in Table (3 and 4). The occurrence percentages of the total collected predaceous insects by using sweep net (in the first season) were 29.10, 23.13, 22.39 and 18.66 % for *Syrphus corollae, C. undecimpunctata*, *Chry. carnea* and *P. alfierii* , respectively. Also, in the second season (2009/2010) *S. corollae* proved to be the most dominant insect predator on chamomile plants, followed by *Chry. carnea* , *C. undecimpunctata*, and *P. alfierii*, respectively. he respect occurrence percentages were 33.98, 22.39, 20.08 and 17.76, respectively.

On fennel plants

Chry. Carnea was the most numerous species on fennel plants represented by 25.14% of the total collected predators followed by , *P. alfierii* (22.40%), *C. undecimpunctata* (20.77%) and *S corolla* (20.22%) respectively. Otherwise, during season 2009/2010, *S. corolla* was the most numerous one (26.72%), followed by *Chry. Carnea* (24.57%), *C. undecimpunctata* (23.71%) and *P. alfierii* (17.67%),.

On caraway plants:

The obtained results indicated that the total number of collected predators on caraway plants was relatively low in both seasons (Table 3 and 4). The total collected predators on caraway plants were 140 and 141 in all the first and second seasons. *Chry. Carnea* was the most numerous species on caraway plants represented by 34.29 and 36.17% of the total collected predators., during the two seasons ,respectively .

Seasonal abundance of the main predaceous insects:

On Coriander:

In the first season (2008/2009) ,*C. undecimpunctata* proved to be the most dominant insect predator on coriander plants. It exhibited two periods of seasonal abundance with two peaks. recorded on the 11th of February (10 individuals) and 18th of March 2009 (8 individuals/ sample), as shown in (Fig. 1 a.)

In the second season (2009/2010), *C. undecimpunctata* also was the most dominant predator on coriander plants. It showed three peaks of seasonal activity recorded on the 27th of January, 17th of February and 10th of March 2010, represented by 7, 6 and 7 individuals/ sample, respectively. (Fig. 1b)

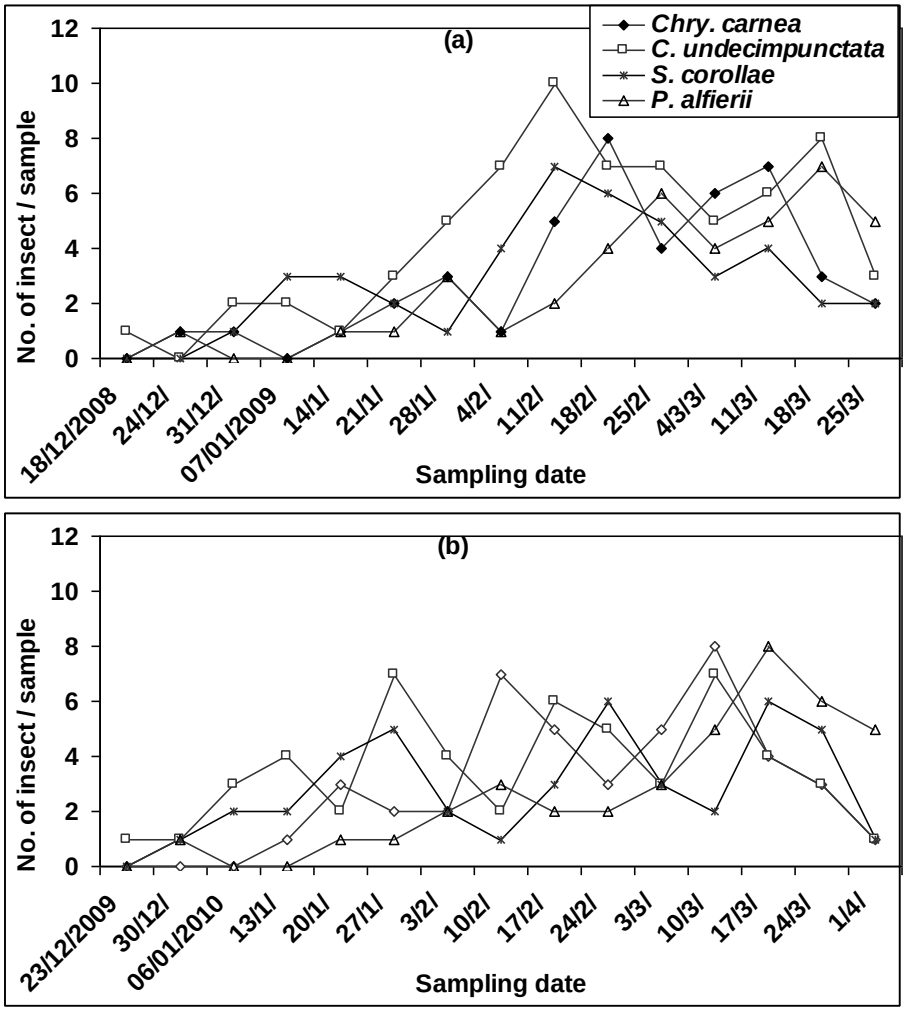

Fig. 1: Seasonal abundance of predacious insects (number of each species /45 double stocks) collected with sweeping net from coriander plants during 2008/2009(a) and 2009/2010 (b) seasons.

Concerning *S. corolla* in the first season, its population showed two periods of seasonal abundance with two peaks. the first occurred from the end of December 2008 till the end of January 2009, the highest occurrence was on 14th of January (3 individuals). The second period lasted from the end of January till March 25th 2009, the highest abundance represented by 7 individuals/ sample on the 11th of February (Fig .1a) In the second season

(2009/2010) the predator showed three peaks of abundance on the 27th of January, 24th of February and 17th of March 2009, with a total number of 5, 6 and 6 individuals/ sample, repectively. (Fig.1b)

Chry. Carnea population started to visit coriander plants on the 24th of December 2008.After that the population tended to increase showing two peaks of abundance on the 18th of February and the 11th of March 2009 represented by 8and 7 individuals/ sample (Fig 1a). In the second season the predator exhibited similar trend of abundance with two peaks. These peaks were recorded on the 10th of February and 10th of March 2010, with a total number of 7 and 8 individuals/ sample (Fig 1b).

As shown in Figures (1a and b), in both seasons *P. alfierii* was presented in low numbers, with one period of seasonal abundance on coriander plants with the highest abundance 8 and 7 individuals/sample in the first and second seasons.

On chamomile plants

Population fluctuations of the main insect predators on chamomile plants in the first and second year were illustrated in Fig. 2 (a and b). The hoverfly, *S. corolla* was the main numerous predator on chamomile plants. In the first season 2008/2009 *S. corolla* population was firstly recorded on chamomile plants with relatively low number (one individual/sample) on the 31st December 2008. The population then increased gradually and showed two peaks of seasonal abundance. These peaks were recorded on the 14th January (5 individuals) and 11th March 2009 (12 individuals/sample). In the second season. *S. corolla* population visited chamomile plants during the period from 30th of December 2009 till the 1st of April 2010 with relatively high abundance. Data in Figure 2 further indicated that two peaks of *S. corolla* were detected. The first one occurred on the 13th of January, with a total number of 5 individuals / sample. The second peak was represented on 24th of March 2010 with a total numbers of 15 individuals/ sample.

In respect to *Chry. Carnea* the population of the chrysopid species was firstly detected on chamomile plants (in the first season) on the 31 th of December 2008. The population then increased gradually reaching the first peak of 4 individuals on the 21st of January 2009. After that, the population decreased gradually recorded the lowest abundance (one individuals/ sample) on the 4th of February. Then, the population increased again and showed the second peak of abundance on the 25th of March 2009 (12 individuals). In the second season (2009/2010): The predator showed similar trend of changes with two peaks of abundance on the 3rd of February and 10th of March 2010 with a total number of 6 and 9 individuals/ sample, respectively.

As shown in Figure 2 (a and b) *C. undecimpunctata* population exhibited two periods of seasonal abundance with two peaks. in the first season, recorded on the 11th of February (8 individuals) and 18th of March 2009 (8 individuals/ sample)., while, in the second season, these peaks were recorded on the 17th of February and 17th of March with a total number of 8 and 7 individuals/ sample, respectively.

As shown in Figure 2(a and b), in both seasons *P. alfierii* was presented in low numbers on chamomile plants, with one peak of abundance

8 (25 th of February) and 10 (17 th of March) individuals/sample in the first and second seasons., respectively.

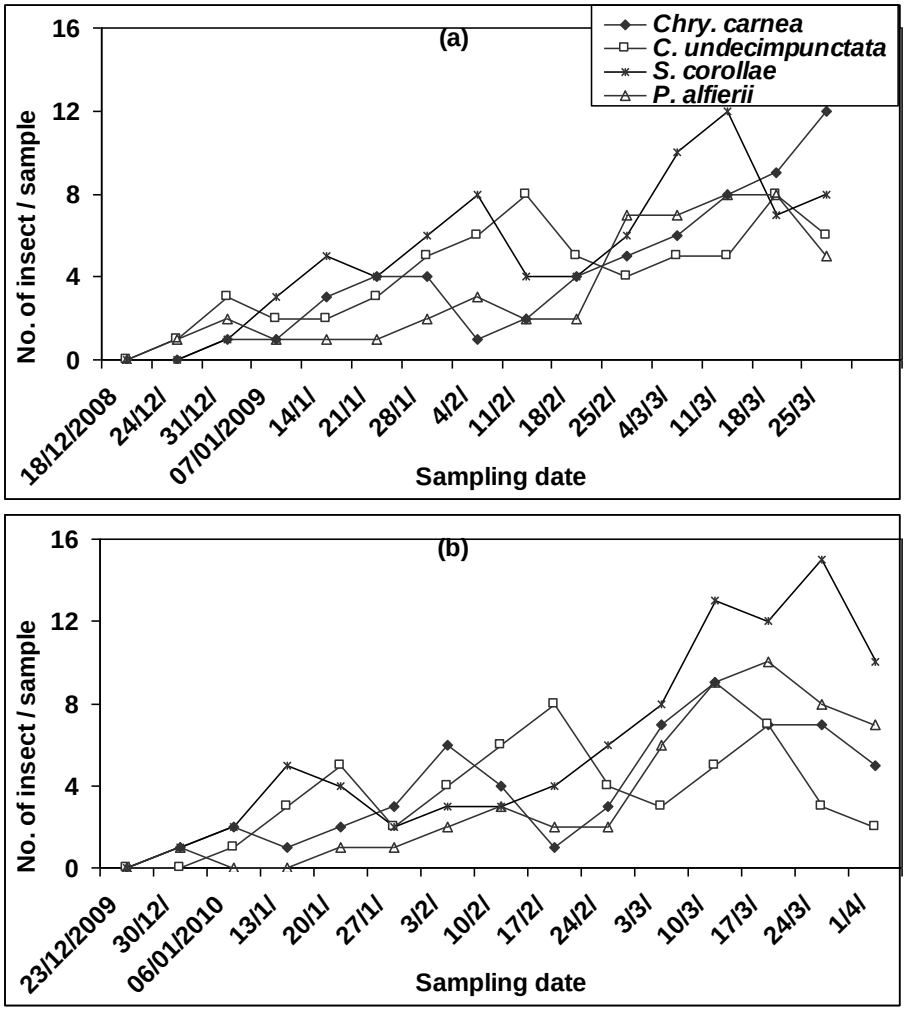

Fig. 2: Seasonal abundance of predacious insects (number of each species /45 double strokes) collected with sweeping net from Chamomle plants during 2008/2009(a) and 2009/2010 (b) seasons.

On fennel plants

The obtained data clearly indicted that in the first season *Chry. carnea* was the main numerous predator on fennel plants. *Chry. carnea* population was firstly recorded on fennel plants on the 31st December 2008. The population then increased gradually and showed two peaks of seasonal abundance. These peaks were recorded on the 11th of February (5 individuals) and 11th March 2009 (9 individuals/sample). In the second season *Chry. carnea* population showed similar trend of changes and

exhibited two slight peaks The first one occurred on the 27th of January, with a total number of 5 individuals / sample., while the second peak was represented on 3rd of March 2010 with a total number of 7 individuals/ sample.

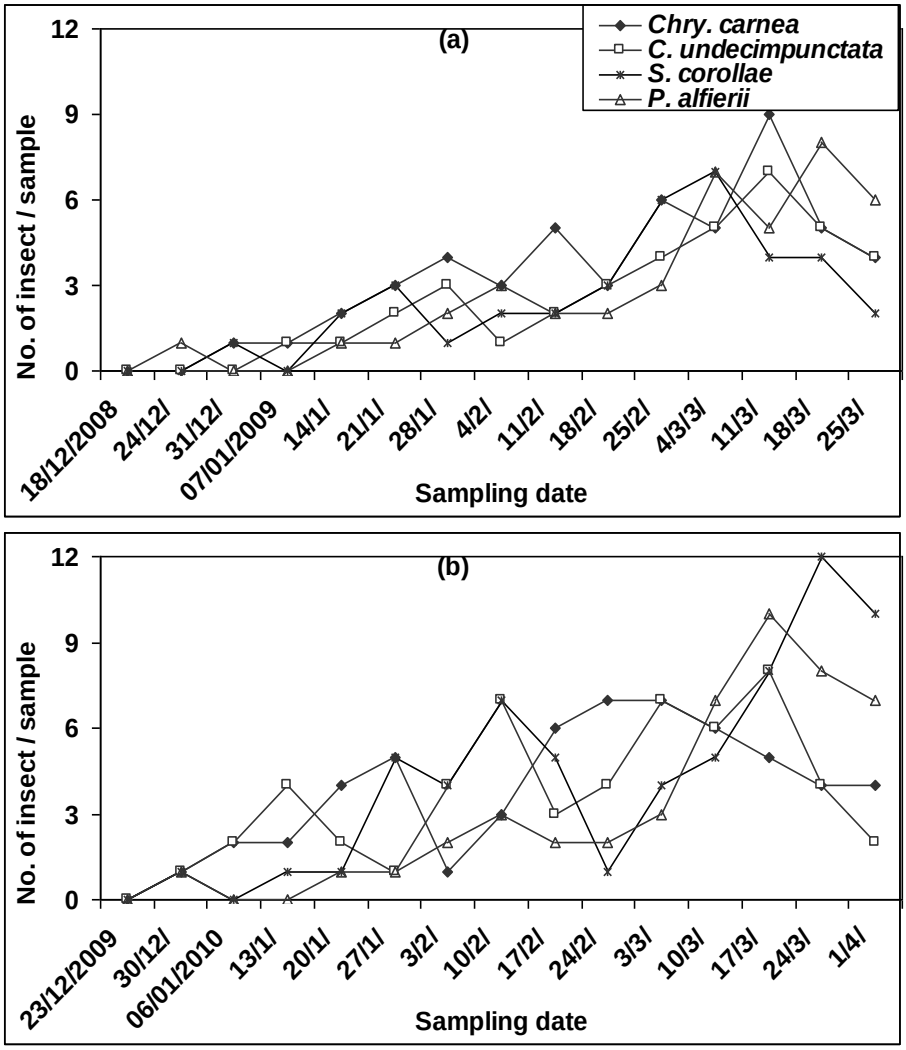

Fig. 3(a and b): Seasonal abundance of predacious insects (number of each species /40 double strokes) collected with sweeping net from fennel plants during 2008/2009(a) and 2009/2010 (b) seasons.

The coccenellid (*C. undecimpunctata*) and syrphid species (*S. corolla*) population showed similar trends of changes on both seasons on fennel plants. In the first season both. Population recorded one peak of seasonal abundance with a total number of 7 individuals/ sample on the 4th of March and 11th of March 2009 for *S. corolla* and *C. undecimpunctata*., respectively.

Also, in the second season *S. corolla* and *C. undecimpunctata* populations were firstly recorded on fennel plants on the 30th of December 2009. The population then increased gradually and showed two peaks of seasonal abundance ,.the first peak of both predator occurred on 10th of February and represented by 7 individuals/ sample. While, the second peak of C. *undecimpunctata* and *S. corolla* populations was recorded on the 17th of March (8 individuals) and 24th March 2009 (12 individuals/sample)., respectively.

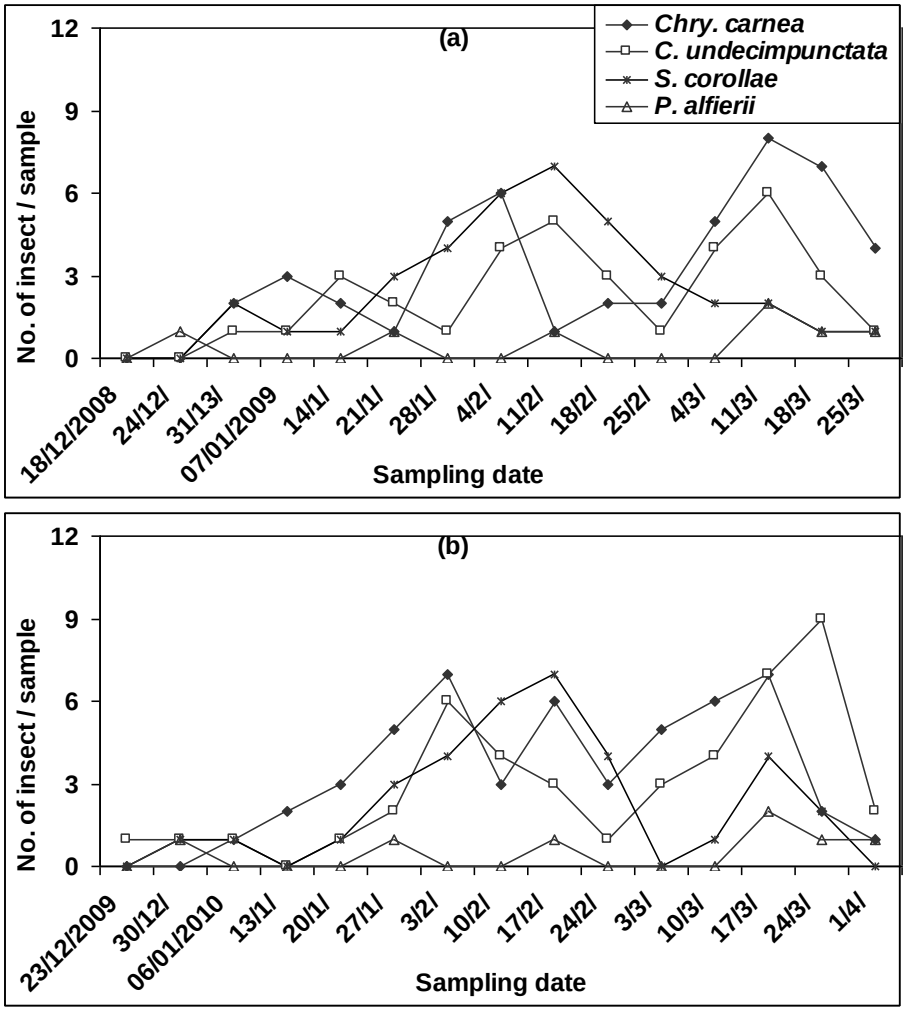

Fig. 4 (a and b): Seasonal abundance of predacious insects (number of each species /40 double strokes) collected with sweeping net from Caraway plants during 2008/2009(a) and 2009/2010 (b) seasons.

Data illustrated in Figure 3(a and b), obviously indicted that *P. alfierii* population had one period of seasonal activity on fennel plants with one peak

of abundance, on the 18th March 2009 (in the first season) and the 17th of March 2010 (in the second season). These peaks represented by 8 and 10 individuals/sample in the first and second seasons., respectively.

On caraway plants

As shown in Figure (4 a), both C*. undecimpunctata* and *Chry. carnea* started to visit caraway plants in the first season at the end of December 2008 and 2009. Both predator populations exhibited approximately similar trend of changes during the first and second seasons with two peaks of abundance/ season. In the first season, the first and second peaks recorded on the 4th of February and 11th of March 2009 for both species with a total number of 6 and 8 individuals/ sample for *Chry. carnea* and 4 and 6 individuals/sample for C*. undecimpunctata* population. With respect to the second season (Figure, 4 b); *Chry. Carnea* and C*. undecimpunctata* populations exhibited the first peak on the 3rd of February which represented by 7 and 6 individuals/ sample (for *Chry. Carnea* and C*. undecimpunctata*)., while the second peak occurred on 17th and 24th of March 7 and 9 individuals/ sample, respectively.

DISCUSSION

Surveying insect predators associated with coriander, chamomile, fennel and caraway plants assured that the most dominant predators were *Syrphus corollae, C. undecimpunctata*, *Chry. carnea* and *P. alfierii*. As mentioned by other authors, these predators were recorded as important natural enemies associated with coriander, chamomile, fennel and caraway plants (El-Gendi, 1988 , Colley and Luna, 2000 and Hammad, 2006) as well as on 23 species of aromatic and medicinal plants belonging to 10 families (Afsah, 2005).

The present investigation indicated that seasonal abundance of predaceous insects showed differences in their response to host plant species. However, the collected hoverfly, *S. corollae* exhibited high preferrability to chamomile in comparison with coriander, fennel and caraway plants., while, the coccinellid, *C. undecimpunctata* showed the highest preferrability to coriander. The chrysopid species, *Chry. carnea* exhibited high preferrability to fennel and caraway plants in comparison with marjoram plants. In addition, the stapheilind, *P. alfieri* showed approximately similar response to coriander, chamomile and fennel.

Ahmad *et al*. (2004) demonstrated that some semiochemicals attract the carnivores and mediate interaction among them, while on the other hand some repel them. Colley and Luna (2000) demonstrated that natural enemies are selective in their flower feeding, however, and show preferences for certain plant species. According to alyssum and coriander were more preferred by hoverflies, while, coccinellid beetles preferred both buch wheat and coriander than alyssum and phacelia. So, difference in predator response to the tested host plants may be attributed to physical or chemical stimulants (kairomone) produced by the plant species and may explain variation of predators preferrability. Volatile kairomones are known to be

used as attractants by selected insect predators. For some predatory species a blend of compounds, including volatiles from the plants in the habitat as well as prey volatiles, are involved (Hagen, 1986). The predators of *R. cardinalis*, *C. bipustulatus* and *C. motrouzari* also exhibited different response to different host plants (Cardosa, 1990; Heidari *et al*., 1999 and Abdel-Mageed, 2005). Plant volatiles are derived from complex biochemical processes and some of these compounds appear to be common to different plant species (Arab and Bento, 2006).

Seasonal abundance curves for *Syrphus* spp., *C. undecimpunctata* and *C. carnea* indicated that the predators exhibited positive and negative responses to the increase of temperature and relative humidity. Similar findings were reported by Hammad (2006).

So, the use of plant volatiles technology as an additional tool in integrated pest management programs offer a new and environmentally sound approach to crop protection. This technique involves the development of baits that attract beneficial organisms and the manipulation of biochemical processes that induce and regulate plant defense, are key factors in the improvement of control program against economically important pests (Arab and Bento, 2006).

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حصر للمفترسات الحشرية المرتبطة بأربعة نباتات طبية

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تعتبر النباتات الطبيه المزهره من أهم محاصيل النباتات الطبيه والعطريه، حيث تعتبر مأوى للعديد من المفترسات الحشريه والتى يمكن أن تستخدم كنباتات آويه للأعداء الحيويه.

ولهذا هدفت هذه الدراسة إلى حصر المفترسات الحشريه المرتبطه ببعض النباتات الطبية (الكزبره، شيح البابونج، الشمر و الكراويه) باستخدام المصائد اللاصقه الصفراء وشبكة الجمع بغرض معرفة أنواع وتعداد هذه المفترسات.، وقد أجريت هذه الدراسة بالمزرعة البحثيه بكلية الزراعة – جامعة المنصورة.

وقد أوضحت نتائج الدراسه أن استخدام شبكة الجمع فى حصر تعداد هذه المفترسات كان أفضل بالمقارنه بالمصائد الصفراء وكما أثبتت الدراسه وجود أربع مفترسات حشريه تستخدم هذه النباتات كمأوى لها خاصة خلال فترة التزهير وهذه المفترسات هى (ذبابة السرفس، أبو العيد 11 نقطه، أسد المن والحشره الرواغه).

ولقد أثبتت الدراسة أن المفترسات أبدت درجات مختلفه من التفضيل تجاه هذه النباتات.حيث أبدت ذبابة السرفس درجه عالية من التفضيل لنبات البابونج بينما أظهر أبو العيد 11نقطة درجه عالية من التفضيل للكزبره بينما كان كل من الشمر والكراوية الأفضل لدى أسد المن.

ولقد أثبتت دراسة التذبذبات العدديه وجود من 2 -3 ذروات للتعداد فى الموسم للمفترسات الثلاثه (أسد المن – أبو العيد 11 نقطه – ذبابة السرفس) بينما لم يبدى تعداد الحشره الرواغه سوى ذروه واحده خلال الموسم.

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