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EFFECT OF PLANTING SPACE AND DATE ON THE POPULATION DENSITIES OF CERTAIN INSECT PESTS INFESTING SWEET PEA PLANTS AT QALYOUBIA GOVERNORATE

BY

Azza K. Emam,*; Hegab, M.F.A.H., and Maha A. M. Tantawy ****

* Plant Protection Department, Faculty of Agriculture, Ain Shams University.

** Plant Protection Research Institute, Agricultural Research Center. Dokki, Giza, Egypt.

ABSTRACT

Four planting spaces of sweetpea seeds (10,20,30 and 40 cm) and four planting dates (Oct., 30th, Nov., 15th, Dec., 1st, and Dec., 15th) were evaluated throughout 2001 and 2002 seasons in experimental farm at Kaha Agricultural Research Station at Qalubiya Governorate to determine their effect on the population densities of certain sweetpea insect pests, *i.e.*, thrips (*Thrips tabaci* Lind.), aphids (mainly *Aphis craccivora* Koch, *Acyrthosiphon pisum* Harris and *Myzus persicae* Sulzer), leafminers (*Liriomyza trifolii* (Burg.) and *Chromatomyia horticola* (Goureau)) and whitefly (*Bemisia tabaci* Genn.) infesting leaves or flowers. The largest planting space and earliest planting date harboured significantly the lowest seasonal mean numbers of all studied pests. The average numbers of the population densities of thrips, aphids, leafminers and eggs and nymphs of whitefly were 2.50, 1.05, 1.92, 4.05 and 4.26 individuals/ leaflet/ season and 1.24 and 0.82 individuals/ flower/ season for thrips and aphids infesting flowers, respectively for the largest distance (40 cm.). Meanwhile, the average numbers of the respective previous insects on the leaves were 5.84, 1.51, 1.29, 3.07 and 2.14 individuals/ leaflet/ season and 2.11 and 0.70 individuals/ flower/ season for thrips and aphids infesting flowers, respectively for the earliest planting date (October, 30th) in the first season (season 2001). On the contrary, the heaviest infestations were recorded on the sweetpea plants planted at closest planting space and latest planting date in the two tested season. The average numbers of thrips, aphids, leafminers and eggs and nymphs of whitefly infesting leaves were 9.18, 2.65, 4.47, 21.18 and 13.25 individuals/ leaflet/ season and 3.54 and 1.61 individuals/ flower/ season for thrips and aphids infesting flowers, respectively for the closest distance. For the latest date of planting, the average numbers of the respective insects infesting leaves were 23.15, 10.04, 3.49, 12.46 and 6.45 individuals/leaflet/season and 7.12 and 1.91 individuals/ flower/ season for thrips and aphids infesting flowers, respectively for the first season. The same trend was obtained in the second season 2002.

INTRODUCTION

The sweet pea plants, (*Pisum sativm* L.) is one of the most important economic leguminous vegetables cultivated in Egypt and many countries of the world, as a main source of protein. According to the report of the Department of Agricultural Economics, Ministry of Agriculture, the cultivated area was about 55

thousand feddans, it is cultivated in many governorates, especially, in the new reclaimed areas, mainly, for exportation and for local consumption. Some insect species inhabiting sweetpea cause great economic injury to all stages of the plant. Numerous investigators have studied the effect of planting spaces and dates on the level of infestation by different pests infesting leguminous plants. Delucchi *et al.*, 1983; Wnuk and Wiech, 1987 and 1996; Honda, 1989; Kumar *et al.*, 1989 and 1991; Mohite and Uthamasamy 1997; Byers *et al.*, 1999; Solman and Abou-Elhagag, 2001 and Wale, 2002.

The objective of this work was to study the effect of different planting spaces and dates on the degree of infestation of the occurred insect pests aiming to determine the optimum planting date and space which due to low number of pests hoping to achieved high crop yield.

MATERIAL AND METHODS

This work was carried out in the experimental farm of Kaha Agricultural Research Stations, Qalyoubia Governorate for two successive seasons, 2001-2002 and 2002-2003.

To determine the effect of different planting spaces on the population density of some pests attacking sweetpea plants. An area of about 192m^2 was sown with seeds of sweetpea variety " Toledo sugar" in both seasons on the mid of November. The tested planting spaces, 10, 20, 30 and 40 cm were chosen between the sown seeds. The experimental area was divided into 12 plots. Each planting space was represented by three plots. All plots were distributed in a complete randomized block design.

To study the effect of different sowing dates on insect infestation, another experimental field was used in a complete randomized block design with three replicates for each planting date. Each plot had an area of about 16m^2. The tested planting dates were Oct., 30th; Nov., 15th; Dec., 1st and Dec., 15th. For both experiments, all agricultural practices were done and no pesticidal treatments were applied.

Fifteen days after sowing date and during the growth period (14 week), weekly randomized samples of 10 sweetpea leaflet from each plot (30 leaflets from each planting space or date) were inspected. Early in the morning, visual count of the pests was made and recorded, then the leaflets from each plot were kept in tightly closed paper bags and transferred to the laboratory where the observed pests were isolated and counted by the aid of stereomicroscope. The main studied insects were thrips, aphids, whitefly and leafminers. The numbers of studied insects were estimated by calculating the mean total number of each insect species / leaflet/season. In addition, 10 flowers per plot were weekly chosen at random and examined during the flowering period by aid of stereomicroscope to evaluate the population of insects attacking sweetpea flowers. The main insect pests were thrips and aphids. The mean number of each species was calculated /flower /season.

Data were analyzed according to SAS program (1988) which was run under WIN computer system and mean separation was conducted by using Duncan's multiple rang in this program

RESULTS AND DISCUSSION

In this study, the recorded insects infesting the leaves of sweetpea plants were thrips (*Thrips tabaci* Lind), aphids (*Aphis craccivora* Koch, *Acyrthosiphon pisum* Harris and *Myzus persicae* Sluzer), whitefly (*Bemisia tabaci* Genn.) and leaf miners (*Liriomyza trifolii* (Burg) and *Chromatomyia horticola* (Goureau) while, only thrips (*T. tabaci*) and aphids (*M. persicae* and *A. pisum*) were recorded on sweetpea flowers.

1- Effect of planting spaces (Table, 1):

A- Pests infesting sweetpea leaves:

1-*Thrips tabaci* (nymphs + adults):

In both 2001 and 2002 seasons, the heaviest infestation with *T. tabaci* (9.18 and 16.49 individuals/leaflet in both seasons, respectively) was recorded on plants sown at 10 cm distance.. On the contrary, sweetpea plants planted at 40 cm harboured the lowest number of insects, showing the average numbers of 2.50 and 3.76 individuals/leaflet in both seasons, respectively.

2- Aphids (nymphs + adults):

Increasing the distance between plants decreased the population density of aphids. The least infestation of aphids was associated with the distance of 30 and 40 cm between plants (1.45 and 1.05 individuals /leaflet in the first season and 1.26 and 0.62 individuals /leaflet in the second season, respectively.

3-*B. tabaci* (eggs):

As observed in cases of thrips and aphid insects, the heaviest infestation of *B. tabaci* eggs was recorded on leaves picked up from plants planted at the least distance (10 cm). The seasonal mean numbers of eggs were 21.18 and 11.91/leaflet in both studied seasons, respectively. Few number of eggs was recorded on plants planted at 40 cm. The average seasonal numbers of eggs were 4.05 and 3.57 eggs/leaflet during the two seasons, respectively.

4-*B. tabaci* (nymphs):

As in the case of eggs, plants sown at 10 cm harboured the highest number of *B. tabaci* (13.25 and 11.43 nymphs/leaflet/season in the two seasons, respectively), while those planted at 40 cm had the lowest number of insect (4.26 and 4.23 nymphs/leaflet in the two seasons, respectively).

5-Leaf miners:

Similar results of those pests mentioned before was obtained in case of leafminers. The infestation with leafminers insects decreased as the planting spaces between sweetpea plants increased. The mean number of leafminers (larvae & pupae) recorded per leaflet of plants sown at the four planting spaces 10,20,30 and 40 cm were 4.47, 3.91, 2.31 and 1.92 for the first season and 3.54, 2.47, 1.99 and 1.26 for the second season, respectively.

Table (1): The seasonal average of insect pests infesting sweetpea plants at different planting space, throughout 2001 and 2002 seasons at Qalyoubia Governorate.

Planting space	Mean number/leaflet					Mean number/flower	
	Thrips	Aphids	whitefly		Leafminers	Thrips	Aphids
			Eggs	Nymphs			
2001							
10cm	9.18±1.38a	2.65±0.71a	21.18±5.97a	13.25±3.97a	4.47±0.68a	3.54±0.82a	1.61±0.38a
20cm	7.18±1.32b	2.45±0.66a	17.83±4.59b	10.61±2.48ab	3.91±0.50a	2.60±0.33b	1.06±0.19b
30cm	3.44±0.47c	1.45±0.32b	7.56±1.88c	7.56±1.79bc	2.31±0.40b	1.52±0.36c	1.24±0.35ab
40cm	2.50±0.36c	1.05±0.24b	4.05±0.97c	4.26±0.85c	1.92±0.24b	1.24±0.21c	0.82±0.18b
F	33.27	9.21	17.13	14.87	8.23	14.47	4.36
L.S.D.	**1.52**	**0.71**	**0.83**	**5.91**	**3.78**	**0.78**	**0.44**
2002							
10cm	16.49±2.23a	2.08±0.57a	11.91±3.94a	11.43±2.09a	3.54±0.64a	6.10±0.73a	2.36±0.26a
20cm	10.82±1.74b	2.45±0.88a	8.11±2.67ab	7.57±1.41b	2.47±0.44b	4.26±0.60b	2.01±0.44a
30cm	6.04±1.04c	1.26±0.39b	5.11±1.05bc	4.37±1.02c	1.99±0.35b	2.14±0.33c	1.30±0.19b
40cm	3.76±0.60d	0.62±0.16b	3.57±0.83c	4.23±0.65c	1.26±0.25c	1.37±0.23d	0.25±0.11c
F	52.25	9.47	5.28	11.44	29.44	86.9	20.79
L.S.D.	**2.18**	**0.75**	**4.47**	**2.8**	**0.49**	**0.64**	**0.57**

B- Pests infesting sweetpea flowers:

1-*Thrips tabaci* (nymphs + adults):

The highest infestation with thrips (nymphs + adults) was occurred at distance 10 cm. The mean number of insect was 3.54 and 6.10 individuals/flower/season, while flowers of sweetpea plants planted at 40 cm distance were less infested (1.24 and 1.37 individuals/flower/season) in the two studied seasons, respectively. Plants sown at 20 and 30 cm in between had moderate infestation of *T. tabaci*.

2-Aphids:

Again the short distance (10 cm) between plants led to the highest density of aphids in both seasons. The mean number of insects/season was 1.61 and 2.36 individuals/flower of the tested seasons, respectively. On the other hand, the least mean number of aphids/flower was found on the plant of 40 cm distance in both seasons. The mean number of aphids/flower was 0.82 and 0.25 individuals/flower, respectively.

From the previous results, it can be concluded that, the planting at large distance decreases the population density of the various pests of sweetpea. These results were in agreement with Wnuk and Wiech (1987 and 1996) on pea plants. They observed that, by increasing the space between plants, the number of aphids (*Acyrothosiphon pisum*) and thrips (*Kakothrips pisivorus*) decreased; the population of *B. tabaci* was higher at the closer planting space of cotton (Mohit and Uthamasamy, 1997).

2- Effect of planting date (Table, 2):

A- Pests infesting sweetpea leaves:

1-*T. tabaci*:

The heaviest infestation with thrips was recorded on the plants of the latest planting date (23.51 and 13.56 individuals/leaflet/ season in the two studied seasons respectively), followed significantly by those planted two weeks earlier (Dec., 1st) (15.85 and 7.49 individuals/leaflet/season, respectively). Plants of the early planting date (Oct., 30th) harboured significantly the lightest seasonal mean counts of *T. tabaci* (5.84 and 4.21 individuals/leaflet in the two tested seasons, respectively).

2-Aphids:

In the respective seasons of study, the heaviest infestation (10.04 and 9.36 individuals/leaflet) was recorded on leaves of sweetpea plants, which were planted in the last date (Dec.,15th). On the other hand, the first and second planting dates (Oct., 30th & Nov., 15th) occupied the lightest infestation group. At the first date, the plants infested by 1.51 and 1.06 individuals/leaflet during two seasons, respectively, and the second one, the infestation of the plant was 2.96 and 2.77 individuals /leaflet, respectively.

Table (2): Seasonal mean numbers of insect pests infesting sweetpea plants at 4 planting dates throughout 2001 and 2002 seasons at Qalyoubia Governorate.

Planting dates	Mean number/ leaflet					Mean number/flower	
	Thrips	Aphids	whitefly		Leafminers	Thrips	Aphids
			Eggs	Nymphs			
2001							
Oct., 30th	5.84±0.88d	1.51±0.40c	3.07±0.69d	2.14±0.32c	1.29±0.23d	2.11±0.32d	0.70±0.15c
Nov., 15th	8.85±1.16c	2.96±0.54c	5.69±1.45c	2.80±0.47c	1.86±0.22c	3.79±0.39c	1.15±0.24b
Dec., 1st	15.85±2.57b	6.27±0.83b	8.09±1.54b	4.32±0.75b	2.83±0.41b	5.42±0.64b	1.06±0.20bc
Dec., 15th	23.51±2.45a	10.04±1.60a	12.46±1.87a	6.45±0.96a	3.49±0.41a	7.12±0.76a	1.91±0.34a
F	91.16	48.19	29.41	22.34	41.63	45.17	10.98
L.S.D.	2.3	1.53	2.06	1.13	0.42	0.9	0.43
2002							
Oct., 30th	4.21±1.19c	1.06±0.36d	7.91±1.74c	2.37±0.49d	1.24±0.27d	2.09±0.24d	1.32±0.32b
Nov., 15th	5.53±1.29c	2.77±0.62c	10.89±1.67bc	4.10±0.62c	2.13±0.26c	2.89±0.17c	2.29±0.40a
Dec., 1st	7.49±1.12b	6.06±1.51b	12.52±2.34b	6.15±1.06b	3.22±0.37b	4.59±0.45b	2.56±0.33a
Dec., 15th	13.6±1.62a	9.36±1.72a	16.95±2.49a	8.59±2.49a	4.08±0.47a	5.99±0.57a	2.62±0.36a
F	36.76	45.33	8.81	8.81	66.11	51.42	11.43
L.S.D.	1.91	1.53	3.51	3.51	0.43	0.86	0.5

3-*B. tabaci* eggs:

The susceptibility of the sweetpea plants to the infestation of *B.tabaci* eggs were significantly differ by changing the sowing date of the plant in both studied seasons. In the first season, the infestation of sweetpea plants by eggs of whitefly during the four studied planting dates could be arranged descendingly as following: 12.26, 8.09, 5.69 and 3.07 eggs/ leaflet for 4th,3rd 2nd, and 1st planting dates, respectively. In the second season, the same trend of heaviest infestation by eggs was observed on sweetpea plants at late planting date.

4-*B. tabaci* nymphs:

It is worth to mention that sweetpea plants sown in the latest planting date (Dec., 15th) were attacked by high numbers of *B. tabaci*, nymphs more than those cultivated in the other three sowing dates. The recorded average number of 6.45 and 8.95 nymphs/leaflet was found in the two tested seasons at the last date, respectively. The lowest infestation was, significantly, associated with earliest planting date, Oct., 30th . The seasonal mean numbers were 2.14 and 2.37 nymphs/leaflet in the two seasons, respectively.

5-Leafminers:

During the two years of investigation, it was clear that the sweetpea planted on (Oct., 30th) harboured the lowest counts of leafminers (larvae + pupae) showing 1.29 and 1.24 individuals/leaflet in the two studied seasons, respectively. On the contrary, those planted in (Dec., 15th) suffered from the highest infestation of leafminers (3.49 and 4.08 larvae + pupae/leaflet) for the two studied seasons, respectively, being significantly higher than counts of the early planting date (Oct., 30th).

B- Pests infesting sweetpea flowers (Table, 2):

1-*Thrips tabaci*:

The mean number of *T. tabaci* infesting sweetpea flowers was found to be increased, significantly, as the planting date was delayed. The flowers harboured the highest infestation rates of insects (7.12 and 5.99 individuals/flowers) in the two studied seasons, respectively when the plants planted at Dec., 15th), followed by those planted at Dec., 1st and Nov., 15th. While those planted at the earliest sowing date (Oct., 30th), the flowers had low infestation of *T. tabaci*, being 2.11 and 2.09 individuals/flower in the two successive seasons.

2-Aphids:

The infestation of sweetpea flowers by aphids could be classified into three groups during 2001. The heaviest infestation of aphid group represented by the plants planted at the last planting date (1.91 individuals/flower), moderately infested group consisted of plants planted at the second and third planting dates (1.15 and 1.06 individuals/flower) and the lowest infested group represented by plants planted at the earliest planting date (0.70 individual/flower). In the second season, the statistical analysis indicated that there was no significant differences among the infestation of aphids to sweetpea flowers in the 2nd, 3rd, and 4th planting dates, as all of them was classified as one group. From other side, there

was a significant difference between them and earliest planting date. Generally, the flowers of sweetpea plants planted at the earliest planting date (Oct., 30th) had the lowest infestation of aphids. The mean numbers of aphid were 1.32, 2.29, 2.56 and 2.62 aphids/flower at the respective planting dates at season 2002.

The fore- mentioned explained results are generally in harmony with those obtained by Helaly *et al.*, 1982 who found that, the infestation of *Aphis craccivora* to common bean cultivated varieties(Fetrial and Azmerly) was too high in summer plantation than with nili one. The infestation rates of *Thrips tabaci* on *Faba bean* v. Giza2 plant increased by delaying planting date from 20th Oct. to 5th December (Solman and Abou- Elhagag, 2001). The seasonal total of aphids *Acyrothosiphon pisum* increased as planting date was delayed (Wale, 2002). In addition, Mittlal and Ujagir (2005) on *Pisum sativum* found that, the incidence of leafminer, *Chromatomyia horticola* was high at late sowing date (2nd week of November) than earlier one (1st week of October), but it in contrast with those obtained by Galal, 1989 and Shalaby, 1998.

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تأثير مسافات ومواعيد الزراعة على الكثافة العددية لبعض الآفات الحشرية التي تصيب نباتات البسلة السكرية في محافظة القليوبية

عزة كمال إمام *، محمد فهمي عبد الله حجاب، مها أحمد محمود طنطاوي****

* قسم وقاية النبات- كلية الزراعة- جامعة عين شمس.

** معهد بحوث وقاية النباتات- مركز البحوث الزراعية- دقى-جيزة.

أجريت هذه الدراسة في محطة بحوث وزارة الزراعة بقها بالقليوبية حيث تم إجراء تجربتين على نباتات البسلة السكرية صنف توليدو شوجر خلال موسمي ٢٠٠١ و٢٠٠٢ وكانت التجربة الأولى خاصة بمسافات الزراعة حيث تم زراعة البسلة في ١٥ نوفمبر على مسافات زراعة مختلفة (١٠، ٢٠، ٣٠و ٤٠ سم) أما التجربة الثانية فكانت خاصة بمواعيد الزراعة وتم زراعة البسلة على مسافة ٢٥ سم في مواعيد زراعة مختلفة هي ٣٠ أكتوبر، ١٥ نوفمبر، ١ ديسمبر و ١٥ ديسمبر وذلك لمعرفة تأثير كل من العاملين منفردا على الكثافة العددية لحشرات التربس (تربس القطن)، المّن (مّن البقوليات، مّن البسلة و مّن الخوخ)، صانعات الانفاق (ذبابة الفول وذبابة الفاصوليا) وبيض و حوريات الذباب الأبيض (ذبابة القطن البيضاء) على أوراق نبات البسلة وكذلك تأثيرهما على حشرات التربس والمّن على أزهار نبات البسلة وقد أوضحت الدراسة أن الكثافة العددية للآفات السابقة تقل معنويا على كل من أوراق وأزهار نبات البسلة السكرية بزيادة مسافة الزراعة بين النباتات. فكان متوسط الكثافة العددية على أوراق النبات لكل مّن التربس، المّن، صانعات الأنفاق، بيض وحوريات الذباب الأبيض على التوالي ٢,٥ ، ١,٠٥ ، ١,٩٢ ، ٤,٠٥ و ٤,٢٦ فردا/وريقة/موسم زراعة على مسافة زراعة ٤٠ سم بموسم ٢٠٠١ بينما كانت بمتوسط ٩,١٨، ٢,٦٥ ،

٤,٤٧ ، ٢١,١٨ و١٣,٢٥ فردا/ وريقة/ موسم زراعة على التوالي لنفس الآفات السابقة على مسافة زراعة ١٠ سم بنفس الموسم وسُجل نفس اتجاه النتائج في موسم ٢٠٠٢. أما على أزهار نبات البسلة فكان متوسط أعداد كل من حشرات التربس والمَن على مسافة ٤٠ سم هي ١,٢٤ و٠,٨٢ فردا/ زهرة/ موسم زراعة بينما كانت ٣,٥٤ و١,٦١ فردا/ زهرة/ موسم زراعة على مسافة ١٠ سم على التوالي وقد تحصل على نفس النتائج في موسم ٢٠٠٢.

كما أوضحت الدراسة أن تأخير ميعاد الزراعة كان له تأثير معنوي في زيادة الإصابة للآفات السابقة بينما كان الميعاد المبكر أقل تعرضا للإصابة. فكان متوسط الكثافة العددية على أوراق نبات البسلة الحلوة في ميعاد الزراعة المبكر (٣٠ أكتوبر ٢٠٠١) هو ٥,٨٤ ، ١,٥١، ١,٢٩ ، ٣,٠٧ ، ٢,١٤ فردا/ وريقة/ موسم زراعة لكل من التربس، المَن، صانعات الأنفاق وبين حوريات الذباب الأبيض على التوالي.

وعلى أزهار نبات البسلة الحلوة ٢,١١ و٧٠ فردا/ زهرة/ موسم زراعة لكل من حشرات التربس والمَن على التوالي. وبالنسبة لميعاد الزراعة المتأخر (١٥ ديسمبر) فكان متوسط أعداد الحشرات السابقة على الترتيب هو ٢٣,٥١ ، ١٠,٠٤ ، ٣,٤٩ ، ١٢,٤٦ و٦,٤٥ فردا/ وريقة/ موسم زراعة على أوراق النبات بينما كانت على الأزهار ٧,١٢ و١,٩١ فردا/ زهرة/ موسم زراعة لكل من التربس والمَن على التوالي في موسم الزراعة الأول ٢٠٠١ وكانت نفس النتائج في موسم الزراعة الثاني ٢٠٠٢.