EFFECT OF PLANTING DATES ON INFESTATIONS WITH CERTAIN PESTS AND YIELD PARAMETERES OF SQUASH PLANTS

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(Manuscript received 20 March 2011)

Abstract

The effect of four planting dates of squash seeds (March, 15th, April, 1st, April, 15th and May, 1st) on levels of infestation with three pests, aphid, *Aphis gossypii* Glover, whitefly, *Bemisia tabaci* (Genn.) and thrips, *Thrips tabaci* Lind. and on yield of this plant, were studied during two successive seasons (2009 and 2010). The degree of infestation by these pests increased significantly by delaying planting date, as squash plants cultivated in the earliest planting date (March, 15th) were attacked by the fewest numbers with highest weight of squash fruits, while the plants of the latest planting date (May, 1st) were more liable to insects infestation with lowest weight of squash fruits. The results showed that, the mean rate of infestation with *A. gossypii* were (2.82, 4.07, 17.27 and 30.78 individuals/leaf) during 2009 season, (0.28, 3.35, 9.04 and 13.27 individuals/leaf) during 2010 season for the four dates, respectively. So, the earliest date (March, 15th) led to plants harboured the lowest population of *A. gossypii* (2.82 and 0.28 individuals/leaf in the two seasons, respectively), also, the highest weight of squash fruits (9.39 and 10.89 kg/plot in the two seasons, respectively) was obtained. The same trend were recorded for the populations of *B. tabaci* and *T. tabaci* on squash plants during the two seasons. Therefore, it was concluded that, the plant date was effective on the rate of infestation with pests and yield of squash plants and can be avoided by planting it as early as March, 15th.

INTRODUCTION

Cucurbits represent an important part of vegetable production and are considered very important in agricultural crops in Egypt. They are cultivated in wide areas either old lands or newly reclaimed lands. The high production of cucurbit vegetables especially squash (*Cucurbita pepo* L.) is of prime important aspect for local consumption and for export purposes. This crop is infested by many pests, which are causing a considerable damage in either quantity or quality. They have established attacking by many important insect pests such as aphid, *Aphis gossypii* Glover, whitefly, *Bemisia tabaci* (Genn.) and thrips, *Thrips tabaci* Lind. The nymphal and adult stages of these pests feed on phloem sap and excrete honeydew that hamper photosynthesis and render fruits unmarketable, and they are efficient vectors of plant

viruses Rizk and Ahmed (1981), Shetgar *et. al.* (1994), Jarosik *et. al.* (1997), Booij (2003), Efil (2003), Sahu *et. al.* (2005), Emam *et. al.* (2006) and Anuj Bhatnagar (2007).

The aim of this study is to avoid those injurious pests infesting squash without applying any chemical pesticides, which have some bad side effects on green pods and seeds, as well.

MATERIALS AND METHODS

This study was conducted in Toukh district, Qualubia Governorate during the summer plantation seasons (2009 and 2010). Seeds of squash plants, *Cucurbita pepo* Fam. Cucurbitaceae (variety Eskandrany) were sown in four different planting dates at 15 days intervals, March 15th, April, 1st, April, 15th and May, 1st. Normal agricultural practices were followed without insecticides treatments.

The experimental area about 480 m^2 was divided into 16 plots (each plots was 30 m^2). The experimental plots were laid out in a randomized complete block design and each planting date was represented by four plots. Sampling of squash plants started 15 days after sowing and were taken weekly until the end of experiment. In each sampling date, 25 leaves were picked randomly per plot, and the collected samples were kept in tight closed paper bags and transferred to the laboratory for investigation by stereomicroscope to count the number of *A. gossypii* nymphs and adults/ leaf, *T. tabaci* nymphs and adults/leaf and *B. tabaci* nymphs/inch^2. Resulted squash fruits of each planting date were collected and weighted to estimate the final yields.

Statistical treatments of data were analyzed according to Fisher (1950).

RESULTS AND DISCUSSION

Data in Tables (1 to 4) show the effect of four different sowing dates on the infestation of squash leaves by main leaf pests during two seasons of 2009 and 2010 and on yield:

1) *Aphis gossypii* (nymphs and adults):

Results in Table (1) revealed that the population density of *A. gossypii* (nymphs and adults) on squash plants differed significantly according to the sowing date during the two successive seasons 2009 and 2010. In the first season, the population density of *A. gossypii* individuals increased by delaying planting date. The squash plants were sown in the earliest planting date (March, 15th) infested significantly by the lowest mean number of *A. gossypii* (2.82 individuals/leaf). On the contrary, the plants of the last planting date (May, 1st) harboured highest numbers of *A. gossypii* (30.78 individuals/leaf).

Table 1. Mean number of *Aphis gossypii* Glover individuals/leaf on squash plants in different planting dates during the summer plantation seasons of 2009 and 2010.

Sampling schedule	Planting date							
	2009				2010			
	March, 15th	April, 1st	April, 15th	May, 1st	March, 15th	April, 1st	April, 15th	May, 1st
April, 1	0.00	-	-	-	0.00	-	-	-
8	0.08	-	-	-	0.05	-	-	-
15	0.17	0.00	-	-	0.08	0.00	-	-
22	0.44	0.09	-	-	0.20	0.07	-	-
29	0.96	0.22	0.09	-	0.33	0.20	0.04	-
May, 6	1.67	0.95	0.20	-	0.29	0.91	0.12	-
13	5.33	1.77	0.56	0.22	0.24	0.76	0.25	0.08
20	6.51	2.89	1.19	0.61	0.21	2.10	0.88	0.14
27	8.32	3.67	2.59	1.55	1.07	10.12	1.23	0.28
June, 3	6.11	10.21	10.92	4.39	0.67	10.16	8.76	0.81
10	3.17	18.43	26.32	16.72	0.23	12.83	19.65	12.55
17	1.02	5.76	35.70	28.45	0.00	2.01	22.11	10.62
24		3.11	57.93	43.92		1.00	31.63	21.93
July, 1		1.66	44.70	68.11		0.05	14.02	39.22
8			25.22	82.50			6.00	33.43
15			11.83	61.33			3.76	19.67
22				39.25				11.21
29				22.36				9.33
Mean/leaf /season	2.82	4.07	17.27	30.78	0.28	3.35	9.04	13.27
L.S.D. at 5%	0.22				0.34			

In the second season, results took the same trend as obtained in the first season despite the infestation rates by *A. gossypii* were lower than those recorded in the first season. The seasonal mean numbers of *A. gossypii* found in this season were (0.28, 3.35, 9.04 and 13.27 individuals/leaf) for the four tested planting dates, respectively.

The obtained data in the two studied seasons and their statistical analysis showed clearly that planting of squash seeds in the earliest planting date (March, 15th) escaped mostly from the infestation of *A. gossypii.*

The present results are in agreement with the findings of Helaly *et. al.* (1990) who reported that the population density of *Aphis craccivora* infesting cowpea varied

significantly according to the time of sowing during summer plantation season. Hassanein (1994) recorded that the population density of *A. craccivora* was significantly affected by the time of sowing. He added that sowing date is an important factor for crop production as well as aphid infestation level. Metwally *et. al.* (1994) indicated that the highest level of infestation by *A. gossypii, A. craccivora* and *Myzus persica* occurred in the late summer season than in winter, on common bean and squash. But it contrast with Shalaby (1998) stated that the lowest infestation by *A. craccivora* and *M. persicae* on common bean occurred during the latest planting date (March, 30th) while, the earlier planting date (March, 1st and 15th) harboured the highest number of aphids.

2) *Bemisia tabaci* nymphs:

Regarding the data recorded in Table (2), it is obviously clear that, the rates of infestation by *B. tabaci* nymphs to leaves of squash plants, planted in four different dates took the trend as that occurred in case of aphids, i.e., increasing infestation as the planting date was delayed. In 2009 and 2010 years, the heaviest infestation rates by *B. tabaci* nymphs were significantly, associated with planting on May, 1st (latest planting date), as the seasonal mean counts were 14.19 and 11.36 nymphs/inch^2, respectively. While the least mean number were 2.78 and 1.42 nymphs/ inch^2 for 2009 and 2010, respectively in the first date (March, 15th). During 2010 season, infestation rates by *B. tabaci* nymphs to squash were lower than those mentioned in the first season. The mean seasonal of whiteflies recorded in 2010 season were 1.42, 2.61, 5.87 and 11.36 nymphs/inch$^{2.}$

In a similar work on the population fluctuation of *B. tabaci,* Helaly *et. al.* (1990) found that numbers of *B. tabaci* immature individuals occurred differently in different summer sowing dates of cowpea crop. El-Sayed *et. al.* (1991) revealed that the high rate of *B. tabaci* infestation different vegetable host plants were generally oriented to summer plantation, while the early summer plantation manifested lowest rate of infestation. Foda *et. al.* (1994) detected that the highest population density of *B. tabaci* adults and nymphs was occurred on pepper during late summer season (3rd week of June), followed by summer (3rd week of Feb.). Metwally *et. al.* (1994) recorded that the late planting dates of squash (June, 15th) harboured the higher numbers of *B. tabaci* immature stages than the earliest planting dates (Feb., 15th and March, 15th). Emam *et. al.* (2006) on sweetpea plants in Egypt, as they reported that the infestation rate of *B. tabaci* increased by delaying planting date.

Table 2. Mean number of *Bemisia tabaci* (Genn.) nymphs/inch^2 on squash plants in different planting dates during the summer plantation seasons of 2009 and 2010.

Sampling schedule	Planting date							
	2009				2010			
	March, 15th	April, 1st	April, 15th	May, 1st	March, 15th	April, 1st	April, 15th	May, 1st
April, 1	0.00	-	-	-	0.00	-	-	-
8	0.52	-	-	-	0.19	-	-	-
15	0.96	0.04	-	-	0.65	0.02	-	-
22	1.49	0.73	-	-	0.71	0.56	-	-
29	2.25	0.99	0.93	-	2.00	0.84	0.67	-
May, 6	3.91	1.85	1.65	-	2.85	2.12	0.99	-
13	4.57	2.77	2.91	1.24	1.93	1.75	1.58	0.97
20	5.66	3.98	4.55	6.33	2.34	3.01	3.09	3.51
27	4.71	8.56	9.01	6.91	2.11	6.48	6.00	4.72
June, 3	3.52	11.34	11.22	5.83	1.67	5.97	8.93	4.77
10	3.67	5.21	10.57	16.25	1.52	3.01	12.51	11.85
17	2.11	4.57	11.93	18.44	1.05	3.42	10.12	15.23
24		3.11	6.21	29.73		2.76	7.05	17.11
July, 1		2.84	5.98	28.32		1.33	8.29	25.04
8			10.46	17.55			5.84	20.52
15			8.55	12.11			5.32	12.32
22				16.00				11.85
29				11.51				8.46
Mean/leaf /season	2.78	3.83	7.00	14.19	1.42	2.61	5.87	11.36
L.S.D. at 5%	0.49				0.94			

3) *Thrips tabaci* (nymphs and adults):

Data presented in Table (3) revealed that, the rate of infestation by *T. tabaci* (nymphs and adults) to squash plants during two successive seasons (2009 and 2010), increased by delaying planting date. As for the first planting date (March, 15th), squash leaves harboured the lowest seasonal mean count of *T. tabaci* (30.92 and 22.13 individuals/leaf, respectively). On the contrary, the latest date (May, 1st) recorded the highest infestation rate (61.51 and 47.80 individuals/leaf, respectively).

Table 3. Mean number of *Thrips tabaci* Lind. individuals/leaf on squash plants in different planting dates during the summer plantation seasons of 2009 and 2010.

Sampling schedule	Planting date							
	2009				2010			
	March, 15th	April, 1st	April, 15th	May, 1st	March, 15th	April, 1st	April, 15th	May, 1st
April, 1	5.11	-	-	-	2.06	-	-	-
8	12.71	-	-	-	11.00	-	-	-
15	37.35	7.85	-	-	21.31	4.81	-	-
22	49.43	19.62	-	-	32.51	24.33	-	-
29	65.24	39.95	9.55	-	29.67	30.00	6.45	-
May, 6	67.15	75.33	23.16	-	48.73	65.71	29.11	-
13	40.35	82.21	55.61	12.52	41.22	72.11	42.95	9.73
20	32.12	96.77	87.44	31.75	37.44	77.83	83.24	30.29
27	31.95	72.00	99.05	69.91	28.05	46.55	77.63	51.77
June, 3	17.33	65.41	108.97	94.63	9.11	39.74	99.37	88.45
10	10.25	41.22	90.22	111.05	3.54	20.33	63.91	90.34
17	2.01	22.01	82.11	115.88	0.88	8.70	45.21	107.92
24		18.54	59.34	90.12		2.94	28.45	74.56
July, 1		6.91	31.15	84.56		1.81	10.96	48.39
8			19.42	66.31			6.05	37.11
15			8.55	35.22			3.21	26.47
22				18.47				5.94
29				7.83				2.63
Mean/leaf /season	30.92	45.65	56.21	61.51	22.13	32.91	41.38	47.80
L.S.D. at 5%	0.19				0.97			

Sowing on (April, 1st and 15th) led to intermediate rate of infestation, as a leaf harboured a mean of (45.65 and 32.91 individuals/leaf) and (56.21 and 41.38 individuals/leaf), respectively. It was obvious that, the degree of infestation of *T. tabaci* was significantly affected by changing the time of sowing.

In similar work on the population density of *T. tabaci* Metwally *et. al.* (1994) recorded that the population density of *T. tabaci* increased in the summer than winter plantation of potato plants. The same authors indicated also that infestation increased by delaying planting date on squash and common bean.

The present results agree with those of Shetgar *et. al.* (1994), on groundnut, Wnuk and Wiech (1996), on pea plants, Salman and Abou-Elhagag (2001) on faba bean, Sahu *et. al.* (2005) on linseed crop and Emam *et. al.* (2006) on sweetpea plants, as all reported that there was significantly less thrips population on plants sown in the earliest planting date, while those sown in the latest planting date had the highest thrips population. But it contrast with Efil (2003) who stated that the late sowing date of cotton resulted in a very low *T. tabaci* population.

4) Effect of planting dates on yield:

In both studied seasons (2009 and 2010), as shown in Table (4), data indicated that the squash yield increased by early sowing date. The highest seasonal mean weight of squash fruits obtained from squash plants planted in the first planting date being 9.39 and 10.89 kg/plot with the highest number of fruits 108.25 and 116.00 fruits/plot in the two seasons, respectively.

On the contrary, squash plants planted in the latest planting date produced the lowest weight of squash fruits of 3.08 and 4.25 kg/plot with the lowest number of fruits 39.52 and 50.73 fruits/plot in the two seasons, respectively.

It could be concluded that the earliest planting date (March, 15^{th}) gave higher yield than the other three tested planting dates and this may be related to the lowest numbers of pests were present and convenience of dominated climatic factors during this planting date for growth of squash plants.

The present results agree with those of Shetgar *et. al.* (1994) and Bairwa *et. al.* (2005), they stated that earliest planting date produced significantly highest weight of yield.

Table 4. Average yield per plot of squash in different planting dates during the summer plantation seasons of 2009 and 2010.

Planting date	2009		2010		General mean	
	Yield (kg/plot)	No. of fruits/plot	Yield (kg/plot)	No. of fruits/plot	Yield (kg/plot)	No. of fruits/plot
March, 15th	9.39	108.25	10.89	116.00	10.14	112.13
April, 1st	7.11	91.35	8.75	100.50	7.93	95.93
April, 15th	5.18	72.14	7.59	98.02	6.39	85.08
May, 1st	3.08	39.52	4.25	50.73	3.67	45.13
L.S.D. at 5%	0.32	-	0.21	-	0.31	-

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تأثير مواعيد الزراعة علي الإصابة ببعض الآفات والمحصول الناتج من نبات الكوسة

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استهدف البحث دراسة تأثير أربعة مواعيد زراعة مختلفة لبذور الكوسة وهي (15 مارس، 1 أبريل، 15 أبريل، 1 مايو) علي معدلات الإصابة بحشرات المن والذبابة البيضاء والتربس خلال موسمي الدراسة (2009 و 2010).

أوضحت النتائج أن تأخير ميعاد الزراعة كان له تأثير معنوي في زيادة الإصابة بحشرات المن والذبابة البيضاء والتربس، حيث كان متوسط الإصابة بالمن هو (2,82 و 4,07 و 17,27و 30,78 فرد/ورقة) خلال موسم 2009 و(0,28 و 3,35 و9,04 و13,27 فرد/ورقة) خلال موسم 2010 لمواعيد الزراعة الأربعة علي التوالي. وبذلك أظهرت النتائج أن زراعة نبات الكوسة في الميعاد المبكر (15 مارس) أدي الي إصابتها بأقل عدد معنوي من حشرات المن (2,82 و0,28 فرد/ورقة للموسمين علي التوالي) وفي نفس الوقت أنتجت أعلي محصول من الثمار حيث كان متوسط الإنتاج (9,39 و10,89 كيلو جرام/قطعة تجريبية للموسمين علي الترتيب).

وإتفقت النتائج المتحصل عليها في حالة الإصابة بحشرة المن مع النتائج المتحصل عليها بالنسبة للإصابة بحشرات الذبابة البيضاء والتربس خلال موسمي الدراسة. أي أن ميعاد الزراعة يلعب دوراً كبيراً في معدلات إصابة نبات الكوسة بحشرات المن والذبابة البيضاء والتربس والمحصول الناتج.