Egypt. J. Agric. Res., 78 (4), 2000.

THE TRIANGULAR RELATIONSHIP BETWEEN COTTON TRANSPLANTING, PLANTING DATES AND THE POPULATION DENSITY OF SAP SUCKING PESTS

S.M. EL-FATEH RADWAN[1], Z.H. ABDEL-HAMID[2], G.B. EL-SADAANY[2], M.A. ROMEILAH[1]

1 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza,
2 Faculty of Agriculture, Ain-Shams University, Cairo, Egypt.

(Manuscript received 5 November, 1997)

Abstract

The present work was carried out to study the changes in the population dynamics of the sap sucking insects in the transplanted cotton and sown seed cotton during three successive cotton growing seasons (1993, 1994 and 1995) at Gharbia & Kafr El-Sheikh Governorates. To facilitate the presentation of data, each locality was discussed separately. The infestation by sap sucking insects, *Thrips tabaci, Aphis gossypii, Empoasca lybica* and *Bemisia Tabaci* in cotton plants were estimated during the whole period of investigation in the three localities. Cotton grown by seeds received the highest infestation level, while cotton cultivated by transplanting of cotton seedlings harbored the least level. However, sown seed cotton field gave more yield.

INTRODUCTION

Sap sucking insect pests, infested cotton plants cause a reliable portion of yield losses resulted from about one million feddans cultivated annually. Reliable official efforts are yearly adopted to achieve both high quality and quantity of yield. Cotton growers in Egypt showed obvious attention to transplanting of cotton as a cultural control method. The reason for trying this agricultural practice is to overcome the delaying of sowing cotton which is normally governed by preceding winter crops. Delaying cotton sowing date may affect the productivity and growth of cotton plants and consequently the coming infestation by the late season insect pests along with aphids, jassids and whiteflies. Therefore, considerable field investigations were carried out aiming to evaluate the role of two agricultural practices, transplanting of cotton seedlings and seed sowing method and the corresponding population activity of sap sucking insects.

MATERIALS AND METHODS

Three field experiments were carried out at Gemeiza Agricultural Research Station (ARS), Gharbia Governorate and Sakha Agricultural Research Station, Kafr El-Sheikh Governorate for three successive cotton growing seasons, 1993 1994 and 1995 to study the simultaneous effect of transplanting of cotton seedlings and cotton sown by seeds on the population dynamics of sap sucking insects. For Noubaria, Beheira Governorate, the field experiments were conducted, but for only two seasons; i.e. 1993 and 1994.

Dates of sowing by seeds and transplanting cotton seedlings: The dates of sowing cotton seeds in the nursery, fields and transplanting of cotton seedlings are shown in Table 1 along with the cultivated cotton varieties in every locality through the periods of experiments along with the dates of picking and corresponding yield weights.

Monitoring the infestation degree of sap sucking insects in cotton fields: For monitoring the changes in the population densities of sap sucking insects, namely thrips, aphids and jassids on cotton seedlings during the early season period; weekly numbers of either nymphs or/and adults of the three insect pests/25 seedlings were counted. The sampling period extended for 6 weeks, from the second week of sowing up to late season to study the changes in the population dynamics of the previous key sap sucking insect pests. Weekly samples were carried out as follows:

Aphis gossypii: weekly samples of 100 infested cotton leaves were picked from 100 plants starting from late May and continued during June, July, August and September. The number of aphids (nymphs and adults) on both surfaces of each leaf was counted and recorded.

Bemisia tabaci: Weekly samples of 100 cotton plant leaves were directly investigated early in the morning. The number of immature stages (larvae and pupae) were counted and recorded.

Empoasca lybica: The D-Vack suction machine was used for sampling of jassid individuals as follows:

The sampler walked slowly two 50 meters (the first cross with the second) holding the mouth of the D-Vack, so that it "scraped" along with the top of cotton canopy. The samples were collected into bags, be identified, counted and recorded in the same day.

The differences expressed as deviations from the general average for the sap sucking insects in the three tested localities during the investigation period were estimated.

RESULTS AND DISCUSSION

Gharbia Governorate

Thrips tabaci: For 1993 cotton growing season, the data presented in Table 2 show that thrips populations in sown seed cotton fields sowing by seeds dominated that of transplanted cotton seedlings. The infestation with thrips started heavily as soon as cotton seedlings were appeared. The maximum number of counted thrips was recorded on 2nd week of May, when the plant age was 43-50 days. The total number of thrips individuals increased again at the late season of 1993, Table 2. The data obtained indicate that infestation with thrips was quite low on transplanted cotton plant, while it was obviously high for sow-seed cotton.

For 1994 season, the population density of thrips reached to maximum in late April (two weeks earlier) with transplanting (Plant age was 29 days) and at early May (age was 36 days) for seed sowing treatment. The population then decreased gradually until the third week of June. The highest number of thrips individuals was found at seed sowing fields, while the lowest density was observed for the transplanting treatment. The data for 1995 revealed the same trend observed for 1993 and 1994 seasons. These results revealed the strong positive relationship between cotton plants sown by seeds and the corresponding reliable occurrence of thrips individuals.

In view of these results and apart from any other factors, the remarkable high level of infestation with *Thrips tabaci* in cotton fields sowing by seeds with an age ranged between 4-6 weeks is likely to affect the damage losses to the final yield.

Aphis gossypii: For 1993, as shown in Table 3, the individuals of winged aphid started to appear during early April in the TI by 54 individuals /25 cotton seedlings (15 days old) and increased gradually reaching the maximum in mid August, i.e. 827 individuals/100 cotton leaves, when the plant age reached 141 days, thus revealing that winged aphid forms were first observed in few numbers on cotton plants during the first half of April (plant age was 15-22 days). The number of aphids increased gradually from mid May reaching the maximum in early September. For 1993 season, the data revealed the presence of a considerable numbers of aphids [1003 individuals/100 cotton leaves when the plant age was 134 days] at the first week of August. The to-

tal number of aphid individuals counted for seed sowing exceeded transplanting. For the second season 1994, it appears that the first appearance of winged forms on early transplanting took place on the 2 nd half of April (plant age 15 days) and increased gradually reaching the maxiumum on the 2nd week of September.

Aphid began to infest cotton plants cultivated by seeds was in few numbers. The infestation then increased gradually reaching 912 individuals / 100 cotton leaves at late August (plant age, 148 days). The total number of aphids in sown seed treatment reached 7976 individuals at the late season and strongly exceeded the corresponding population density of aphids estimated for transplanted cotton . For 1995 season, the number of aphid individuals in T1 was obviously low (plant age, 15 days) and increased gradually up to early September (155 days old). The total number of aphid individuals reached 5247 at the end of the cotton growing season and confirmed again the previous obtained results that sow-seed plants harbored the highest population density of aphids during 1995 than both transplanting (T1 and T2) planting dates.

Empoasca lybica: Data in Table 4 show that jassid populations commonly occurred in cotton fields during the three planting dates of 1993 and 1994 seasons. The abundance of jassid populations fluctuated from the second half of April up to early October. The highest number of jassids population during 1994 was obsered in the sown fields on the second week of August. An unreliable presence of jassid individuals was detected on the transplanted cotton seedlings during the whole period of inspection.

Data in Table 4. show the changes in the population size of jassids during 1995 season. The occurrence of jassid populations started on the first half of May in low numbers when the plant age was 15 days.

Bemisia tabaci: For 1993, data in Table 5 indicate that the infestation of whitefly started with low numbers in the 2 nd week of April for the three planting dates. The population tend to increase gradually reaching a maximum on/in the 1st week of September. The highest numbers for 1994 were observed when the plant age was 155,148 and 162 days old for T1,T2 & S. treatments, repectively. As for 1995, the maximum occurred when the plant was 148 days old for T1,T2 and 141 days old for sowing by seeds methods.

As a general conclusion, it could be said that 1995 dominated both 1993 and 1994 cotton growing seasons. The whitefly infestations to cotton plants at season of the year are of significant importance. The low infestation in 1993 and 1994 may be due to the effect of the prevailing environmental conditions which were unfavorable.

The differences expressed as deviations from the general average during the tested seasons at Gharbia

Thrips tabaci: Data in Table 6 demonstrated the important role of planting data on the population density of *Thrips tabaci*. The deviation values from the general average during 1993 were -267, -146.3 and 413.7 for T1, T2 and S treatments, respectively, while reached-215,-157 and 363 during 1994. For 1995, they were -217.7,-31.7 and 249.3, respectively. In general, it appears that the occurrence of *Thrips tabaci* individuals was below the general average for transplanting, while it was above that level for sown plants, thus indicating the strong and positive relationship between the population density of thrips and cotton plants sown by seeds at Gharbia Governorate. It could be gathered from the above results that cotton plants sown by seeds within the age range between 8-16 weeks were likely to include the highest level of collective infestation.

Aphis gossypii: Table 6 shows that the statistical analysis revealed a significant differences between the aphid populations in transplanting and seeed sowing methods. It is obvious that when the deviations representing the population densities from the general average for the three treatments combined were considered, the seed sowing treatment again harbored the highest level of infestation.

Empoasca lybica: Table 6 shows that population density of jassids during both 1993 and 1994 was subequal, hence the deviations obtained were nearly the same. It could be concluded that the relationship between the activity of jassid population (negative deviations) and transplanting cotton confirm the strong and positive relationship between the abundance of jassid population in seed sowing plants and the general average deviations from the other .

Bemisia tabaci : Data in Table 6 indicate the presence of negative deviation values from the general average of whitefly populations in T1 during 1993 and the positive relationship with T2&S.The same trend of deviations was observed for the other two seasons. The positive figures revealed the strong relationship between the population activity of whitefly and seed sowing treatment.

Kafr El-Sheikh

Thrips tabaci: Data in Table 7 reveal that occurrence of thrips in cotton fields in 1993 started to appear in few numbers when the plant age was 21 days. The occurrence from that date onwards thus reached a peak on late April. Unreliable presence of

thrips on transplanting cotton plants was observed.

For 1994, a reliable numbers of infested seed-sown plants. The peak of infestation was reached at late May. The results of 1995 confirmed the results obtained before in 1993 and 1994 seasons. Regarding the triangular effect of planting date along with cultivation method on the average number of *Thrips tabaci* during 1993, 1994 and 1995, yielded a significant differences between the three treatments.

Aphis gossypii: Data presented in Table 8 show that the winged aphid forms were first appeared on cotton seedlings during the third week of April and thenafter fluctuated during the following months up to early October. The highest numbers of aphids during 1993 occurred on seeded plants followed by late transplanting. The early transplanting harbored the lowest infestation level. For 1994, the winged forms on transplanting cotton were observed with few numbers during mid April and increased upward after that, reaching a distinct peak at late August. In general, it appears that the strong tendency, in this pest level of occurrence to increase significantly in the seed sowing treatment than transplanting.

The population density for 1995 indicate that the infestation was hardly observed as early as mid April and increased gradually in the same trend observed before for the other tested localities. A peak of occurrence took place also during late August and early September.

Empoasca lybica: The occurrence of jassid individuals started to appear in low numbers in seed sowing and transplanting fields during 2nd half of April, when the plant age was 21 days for the three years, Table 9. As for 1993 and 1994, the highest number of jassid individuals was obtained in the 2nd half of August.

When the statistical analysis was worked out for the accumulated number of jassids, it yielded a significant "F" value for the combined effect of planting date and sowing method on the population density of jassid and clarified the trend of jassid individuals to attack sown-seed plants than transplanted cotton seedlings. The total number of counted jassids during the whole period of investigation in 1995 season indicated again the lowest presence of jassid individuals in transplanted cotton fields.

Bemisia tabaci: Table 10 indicates that the presence of *Bemisia tabaci* was found in scarce numbers up to the second half of April, for the three planting dates and increased gradually forming a peak when plant age was 161 days during late August and first week of September. For 1994, the total number of whitefly individuals in

sowing by seed treatment in general dominated that of transplanting during the three successive seasons.

The differences between sowing methods expressed as deviations from the general average (Kafr El-Sheikh) during the tested seasons

Thrips tabaci: Data in Table 11 indicate that the occurrence of *Thrips tabaci* nymphs on cotton plants was remarkably affected by planting date and plant age. The pattern of deviations of total number of thrips from the general average showed negative values for transplanting, while it was positive feed seed sowing method. As a general conclusion and in spite of the fact that *Thrips tabaci* infested the plants of the three treatments at a relatively low densities, yet its damage could hardly be of any economic importance.

Aphis gossypii: Regarding data on the infestation densities of *Aphis gossypii* on cotton plants showed signs of negative deviation for transplanting treatments, Table 11. The average level of *Aphis gossypii* in both 1993 and 1994 was rather high. The results further indicate the strong occurrence of aphid survivors on sowing by seeds. For transplanting, the infestation dropped considerably below the general average (equilibrium position) and being almost negligible.

Empoasca lybica: Data in Table 11 indicate the weak relationship between the population abundance of jassid in early transplanting expressed as negative values. The occurrence of *Empoasca lybica* in T1 and T2 is likely to be adversely proportionate to the planting date of cotton and sowing method.

Bemisia tabaci: Data in Table 11 indicate that negative values expressed the unreliable presence of whitefly populations in transplanting method in cotton fields. Seed sowing method demonstrated again the strong presence of whitefly populations.

Beheira Governorate

Thrips tabaci: Data in Table 12 demonstrate the obvious presence of thrips populations in the sown-seed cotton fields, thus exceeding transplanting seedling method during 1993 and 1994. The infestation with thrips started heavily as soon as cotton seedlings emerged in the field.

Although the total number of thrips nymph populations during 1993 and 1994 increased at the late season for transplanting and sowing seed treatments, yet the damage was negligible, hence the plants were not suitable enough as food source. The

data show that thrips infestation was first observed in a relatively high numbers for the tested planting dates when the plants were 16-30 days old.

Aphis gossypii: Data in Table 13 show that during 1993 and 1994, aphid forms were first observed on transplanted and sown-seed cotton plants on the second half of April and increased gradually reaching its maximum on the first week of September.

Empoasca lybica: Data in Table 14 reveal that the adults firstly occurred during the second half of April, 1993 and 1994 fluctuated up and down till the second week of October. Again, jassid individuals highly infested sown-seed cotton plants.

Bemisia tabaci: Data in Table 15 indicate that the appearance of whitefly populations occurred in a scarce numbers from the 2nd week of April 1993 and 1994. The abundance of *Bemisia tabaci* nymphs increased gradually reaching the maximum throughout the second half of August and late July for seed sowing treatment, i.e. three weeks earlier. The data again confirmed the result revealing the exceedence of sowing by seeds than transplanting of cotton seedlings.

The differences expressed as deviations from the general average during the tested seasons at Beheira

Thrips tabaci: From the previous results, it could be concluded however, that *Thrips tabaci* infested cotton plants allover the seasons. The statistical analysis revealed significant differences between thrips population densities throughout the two planting dates, indicating the positive strong relationship between the number of thrips populations and cotton plants sown by seeds and the adverse negative relationship between this insect attacking transplanting cotton seedlings.

Aphis gossypii: Data in Table 16 reveal the week presence of aphid populations on transplanting cotton seedlings and obvious positive relationship for the same insect pest when attacking cotton plants sown by seeds.

Empoasca lybica: The results obtained in Table 16 indicate the negative deviations between jassid popuations in transplanting cotton fields. The contrary was obtained for sowing by seed treatment.

Bemisia tabaci: A negative deviation values from the general average for whitefly populations in transplanting cotton during 1993 and 1994 were obtained. Again, these results reveal the strong presence of whitefly individuals on cotton plants

of sowing seed method.

It could be concluded from the results obtained that the changes in the population density of sap sucking insect pests in cotton fields regarding planting dates and cultivation methods were put under the following remarks:

- Cotton plants of sown seed method harbored the highest infestation levels nevertheless it produced the highest weigth of cotton yield, Table 1.

- In Delta region, cotton plants cultivated by transplanting of seedlings are likely to receive minimum infestation levels.

- From the economic point of view, the disadvantage of transplanting technique were confirmed by the findings of Radwan (1988), Imam (1991), El-Sayed (1992) and El-Agroudy (1994b).

On the other hand, many authors confirmed the advantages of transplanting of cotton, such as Rehab (1963), Helal (1986), El-Shazily (1992), Yassin (1992) in Argon.

- For the infestation with sap sucking insects, our results were in close agreement with the results of Watson *et al.* (1992), Nadihalli (1993), Slosser (1993) and El-Refai and Emam (1994).

Table 1. Date of sowing, transplanting-varieties and cotton yield at Gharbia, Kafr El-Sheik and Beheira Governorates, during 1993, 1994 and 1995 cotton growing seasons.

Locality	Year	Date of sowing in the nursery	Date of transplanting	Date of sowing seed in the field	Cotton varieties	Date of picking		Cotton yield (Kantar/feddan	
						Transplanting cotton	seed plants	Transplanting cotton	seed plants
Gharbia	1993	31Mar.	1 May	31 Mar.	Giza 75	27 Sept.	27 Sept.	7.6	11.3
		31Mar.	15 May			27 Sept.		7.1	
	1994	31Mar.	2 May	31 Mar.	Giza 75	30 Sept.	30 Sept.	7.8	11.4
		31Mar.	1 May			30 Sept.		7.2	
	1995	31Mar.	1 May	31 Mar.	Giza 75	30 Sept.	30 Sept.	8	12
		31Mar.	15 May			30 Sept.		7.2	
Kafr El Sheikh	1993	28 Mar.	1 Apr.	28 Mar.	Giza 76	20 Sept.	25 Sept.	3.4	6.2
		28 Mar.	1 May			9 Oct.		3.2	
	1994	31Mar.	1 Apr.	31 Mar.	Giza 84	20 Sept.	2 Oct.	3.5	5.9
		31Mar.	1 May			5 Oct.		3.3	
	1995	30 Mar.	1 Apr.	30 Mar.	Giza 86	22 Sept.	30 Sept.	3.6	6.2
		30 Mar.	1 May			5 Oct.		3.4	
Beheira	1993	30 Mar.	1 May	30 Mar.	Giza 75	25 Sept.	5 Oct.	3	5.5
	1994	28 Mar.	1 May	28 Mar.	Giza 75	26 Sept.	7 Oct.	3.1	5.3

Table 2. The fluctuations in the weekly numbers of *Thrips tabaci* in each of the tested treatments at Gemeiza cotton fields, Gharbia Governorate during 1993, 1994 and 1995.

Date of inspection	Plant age in days	Number of *Thrips tabaci*											
		1993				1994				1995			
		T1	T2	S.	Total	T1	T2	S.	Total	T1	T2	S.	Total
15/4	15	101	51	122	274	85	15	101	201	36	42	20	98
22	22	61	77	87	225	100	150	170	420	149	102	87	338
29	29	121	101	290	512	141	171	88	400	151	151	204	506
6/5	36	62	146	201	409	68	120	231	419	53	61	210	324
13	43	195	94	250	539	140	95	146	381	56	201	109	366
20	50	44	176	200	420	72	87	68	227	26	102	199	327
27	57	100	62	150	312	48	40	196	284	18	36	88	142
3/6	64	33	117	87	237	25	50	198	273	7	5	46	58
10	71	71	71	64	206	10	10	48	68	10	0	18	28
17	78	18	34	27	79	0	9	20	29	8	0	0	8
24	85	10	8	19	37	0	0	10	10	0	0	0	0
1/7	92	0	0	0	0	0	0	0	0	0	0	0	0
8	99	0	0	0	0	0	0	0	0	0	0	0	0
15	106	0	0	0	0	0	0	0	0	0	0	0	0
22	113	0	0	0	0	0	0	0	0	0	0	0	0
29	120	0	0	0	0	0	0	0	0	0	0	0	0
5/8	127	0	0	0	0	0	0	0	0	0	0	0	0
12	134	0	0	0	0	0	0	0	0	0	0	0	0
19	141	0	0	0	0	0	0	0	0	0	0	0	0
26	148	0	0	0	0	0	0	0	0	0	0	0	0
2/9	155	0	0	0	0	0	0	0	0	0	0	0	0
9	162	0	0	0	0	0	0	0	0	0	0	0	0
16	169	0	0	0	0	0	0	0	0	0	0	0	0
23	176	0	0	0	0	0	0	0	0	0	0	0	0
30	183	0	0	0	0	0	0	0	0	0	0	0	0
7/10	190	0	0	0	0	0	0	0	0	0	0	0	0
Total		816	937	1497	3250	689	747	1276	2712	514	700	981	2195
Mean		31.4	36	57.6	125	26.5	28.7	49.1	104.3	19.8	26.9	37.7	84.4
G.M.		1083.3				904				731.7			

G.M. = General mean.
T1 = 1st date of transplanting.
T2 = 2nd date of transplanting.
S. = seed sowing.

Table 3. The fluctuations in the weekly numbers of *Aphis gossypii* in each of the tested treatments at Gemeiza cotton fields, Gharbia Governorate during 1993, 1994 and 1995.

Date of inspection	Plant age in days	Number of *Aphis gossypii*											
		1993				1994				1995			
		T1	T2	S.	Total	T1	T2	S.	Total	T1	T2	S.	Total
15/4	15	54	30	25	109	15	10	28	53	44	30	98	172
22	22	101	61	43	205	25	15	81	121	101	115	291	507
29	29	180	201	96	477	54	120	140	314	290	240	150	680
6/5	36	161	130	102	393	98	200	91	389	103	151	351	605
13	43	170	180	151	501	196	57	162	415	42	46	246	334
20	50	110	252	48	410	61	150	402	613	98	50	151	299
27	57	72	296	260	628	10	192	301	503	51	189	141	381
3/6	64	146	215	310	671	32	33	100	165	33	101	66	200
10	71	101	116	221	438	98	90	45	233	140	300	44	484
17	78	10	92	142	244	141	17	160	318	18	35	30	83
24	85	15	227	200	442	220	150	291	661	97	102	101	300
1/7	92	65	107	203	375	91	212	215	518	401	41	60	502
8	99	100	110	110	320	82	341	200	623	113	103	180	396
15	106	261	300	345	906	188	51	305	544	42	50	81	173
22	113	187	440	121	748	240	690	480	1410	601	302	401	1304
29	120	301	413	301	1015	481	100	350	931	202	200	201	603
5/8	127	150	502	263	915	206	420	751	1377	306	401	531	1238
12	134	480	140	1003	1623	410	700	370	1480	82	480	141	703
19	141	827	829	461	2117	132	192	148	472	502	300	930	1732
26	148	160	190	262	612	301	890	912	2103	140	380	400	920
2/9	155	261	910	591	1762	371	216	480	1067	710	220	161	1091
9	162	640	502	395	1537	490	315	411	1216	298	750	752	1800
16	169	280	400	1101	1781	213	417	510	1140	214	205	200	619
23	176	200	560	302	1062	88	66	702	856	421	700	811	1932
30	183	85	120	400	605	45	30	260	335	105	206	51	362
7/10	190	22	60	280	362	18	8	81	107	93	75	153	321
Total		5139	7383	7736	20258	4306	5682	7976	17964	5247	5772	6722	17741
Mean		197.7	284	297.5	779.2	165.6	218.5	306.8	690.9	201.8	222	258.5	682.3
G.M.		6752.7				5988				5913.7			

G.M. = General mean.
T1 = 1st date of transplanting.
T2 = 2nd date of transplanting.
S. = seed sowing.

Table 4. The fluctuations in the weekly numbers of *Empoasca lybica* in each of the tested treatments at Gemeiza cotton fields, Gharbia Governorate during 1993, 1994 and 1995.

Date of inspection	Plant age in days	Number of *Empoasca lybica*											
		1993				1994				1995			
		T1	T2	S.	Total	T1	T2	S.	Total	T1	T2	S.	Total
15/4	15	50	30	25	105	55	50	71	176	8	18	40	66
22	22	80	43	64	187	85	80	68	233	51	36	159	246
29	29	161	120	68	349	80	109	101	290	50	76	220	346
6/5	36	144	100	199	443	160	180	105	445	12	88	221	321
13	43	120	151	290	561	100	171	251	522	14	131	149	294
20	50	150	201	214	565	150	200	182	532	6	178	120	304
27	57	96	113	200	409	45	101	281	427	17	110	32	159
3/6	64	50	98	145	293	45	20	102	167	42	64	46	152
10	71	15	46	52	113	13	17	41	71	53	15	72	140
17	78	20	30	28	78	10	15	26	51	59	18	51	128
24	85	18	27	16	61	15	41	319	375	99	14	40	153
1/7	92	62	61	27	150	95	188	46	329	152	21	57	230
8	99	130	101	98	329	129	121	122	372	104	36	64	204
15	106	161	390	210	761	50	195	161	406	60	45	190	295
22	113	110	220	240	570	150	277	477	904	48	101	141	290
29	120	46	451	110	607	240	520	302	1062	110	105	205	420
5/8	127	96	603	35	734	201	200	111	512	191	249	311	751
12	134	420	406	401	1227	320	500	401	1221	252	176	200	628
19	141	200	171	602	973	180	100	100	380	205	185	481	871
26	148	47	310	504	861	299	301	180	780	301	604	304	1209
2/9	155	120	205	226	551	150	401	510	1061	396	150	241	787
9	162	181	99	331	611	100	150	192	442	101	302	281	684
16	169	100	50	68	218	170	85	191	446	90	70	140	300
23	176	60	110	43	213	56	101	98	255	95	54	171	320
30	183	150	60	77	287	90	92	62	244	44	61	100	205
7/10	190	115	55	98	268	46	25	41	112	30	40	90	160
Total		2902	4251	4371	11524	3034	4240	4541	11815	2590	2947	4126	9663
Mean		111.6	163.5	168.1	443.2	116.7	163	174.7	454.4	99.6	113.3	158.7	371.6
G.M.		3841.3				3938.3				3221			

G.M. = General mean.
T1 = 1st date of transplanting.
T2 = 2nd date of transplanting.
S. = seed sowing.

Table 5. The fluctuations in the weekly numbers of *Bemisia tabaci* in each of the tested treatments at Gemeiza cotton fields, Gharbia Governorate during 1993, 1994 and 1995.

Date of inspection	Plant age in days	Number of *Bemisia tabaci*											
		1993				1994				1995			
		T1	T2	S.	Total	T1	T2	S.	Total	T1	T2	S.	Total
15/4	15	8	10	18	36	20	9	48	77	8	5	9	22
22	22	10	20	46	76	10	10	62	82	10	0	9	19
29	29	20	29	90	139	19	8	18	45	10	8	8	26
6/5	36	19	40	68	127	20	20	63	103	19	11	10	40
13	43	40	38	44	122	10	10	101	121	10	6	19	35
20	50	39	60	23	122	36	12	52	100	8	13	20	41
27	57	60	80	60	200	20	19	67	106	11	22	41	74
3/6	64	50	49	92	191	8	20	28	56	13	36	102	151
10	71	48	20	151	219	11	20	42	73	15	28	299	342
17	78	65	42	190	297	10	10	44	64	8	41	96	145
24	85	101	57	90	248	9	20	60	89	182	86	110	378
1/7	92	200	68	33	301	35	60	75	170	31	140	150	321
8	99	168	120	71	359	50	170	86	306	96	162	506	764
15	106	320	102	120	542	190	93	99	382	198	241	182	621
22	113	250	400	161	811	170	400	271	841	351	460	401	1212
29	120	390	235	101	726	300	88	342	730	499	403	649	1551
5/8	127	460	446	391	1297	201	280	421	902	180	705	362	1247
12	134	180	350	310	840	199	211	317	727	350	881	201	1432
19	141	250	421	221	892	391	501	182	1074	180	100	1007	1287
26	148	404	650	502	1556	71	760	321	1152	500	701	603	1804
2/9	155	601	710	766	2077	495	318	540	1353	301	650	281	1232
9	162	180	520	681	1381	200	470	724	1394	360	351	750	1461
16	169	146	370	398	914	451	301	310	1062	202	750	402	1354
23	176	128	201	500	829	300	250	380	930	101	220	200	521
30	183	95	351	301	747	160	157	212	529	92	101	261	454
7/10	190	48	201	200	449	78	52	110	240	35	53	57	145
Total		4280	5590	5628	15498	3464	4269	4975	12708	3770	6174	6735	16679
Mean		164.6	215	216.5	596.1	133.2	164.2	191.3	488.8	145	237.5	259	641.5
G.M.		5166				4236				5559.7			

G.M. = General mean.
T1 = 1st date of transplanting.
T2 = 2nd date of transplanting.
S. = seed sowing.

Table 6. Deviations of total number of sap sucking insects from the general average, at Gharbia Governorate, during 1993, 1994 and 1995.

Year		*Thrips tabaci*			*Aphis gossypii*			*Empoasca lybica*			*Bemisia tabaci*		
		T1	T2	S.	T1	T2	S.	T1	T2	S.	T1	T2	S.
1993	Total	816	937	1497	5139	7383	7736	2902	4251	4371	4280	5590	5628
	Mean	1083.3			6752.7			3841.3			5166		
	Deviation	-267.3	-146.3	413.7	-1613.7	630.3	983.3	-939.3	409.7	529.7	-878	424	462
1994	Total	689	747	1267	4306	5682	7976	3034	4240	4541	3464	4269	4975
	Mean	904			5988			3938.3			4236		
	Deviation	-215	-157	363	-1682	-306	1988	-904.3	301.7	602.7	-772	33	739
1995	Total	514	700	981	5247	5772	6722	2590	2947	4126	3770	6174	6735
	Mean	731.7			5913.7			3221			5559.7		
	Deviation	-217.7	-31.7	249.3	-666.7	-141.7	808.3	-631	-274	905	-1789.7	614.3	1175.3

T1 = 1st date of transplanting.
T2 = 2nd date of transplanting.
S. = seed sowing.

Table 7. The fluctuations in the weekly numbers of *Thrips tabaci* in each of the tested treatments, at Sakha cotton fields, Kafr El-Sheikh Governorate during 1993, 1994 and 1995.

Insect		Number of *Thrips tabaci*															
Date of inspection	Plant age in days	1993				Date of inspection	Plant age in days	1994				Date of inspection	Plant age in days	1995			
		T1	T2	S.	Total			T1	T2	S.	Total			T1	T2	S.	Total
19/4	21	30	48	45	123	11/4	12	10	36	24	70	12/4	13	10	51	30	91
26	28	97	88	148	333	18	19	41	92	132	265	19	20	42	170	92	304
3/5	35	86	171	112	369	25	26	8	88	151	247	26	27	51	299	197	547
10	42	92	46	251	389	2/5	33	52	83	146	281	3/5	34	51	170	298	519
17	49	54	102	253	409	9	40	33	41	72	146	10	41	8	64	290	362
24	56	19	105	149	273	16	47	88	25	210	323	17	48	46	181	146	373
31	63	45	49	72	166	23	54	11	42	71	124	24	55	43	58	150	251
7/6	70	14	30	51	95	30	61	18	16	18	52	31	62	13	20	78	111
14	77	0	10	8	18	6/6	68	17	18	10	45	7/6	96	10	9	12	31
21	84	0	0	0	0	13	75	8	10	0	18	14	76	0	0	8	8
28	91	0	0	0	0	20	82	0	0	0	0	21	83	0	0	0	0
5/7	98	0	0	0	0	27	89	0	0	0	0	28	90	0	0	0	0
12	105	0	0	0	0	4/7	96	0	0	0	0	5/7	97	0	0	0	0
19	112	0	0	0	0	11	103	0	0	0	0	12	104	0	0	0	0
26	119	0	0	0	0	18	110	0	0	0	0	19	111	0	0	0	0
2/8	126	0	0	0	0	25	117	0	0	0	0	26	118	0	0	0	0
9	133	0	0	0	0	1/8	124	0	0	0	0	2/8	125	0	0	0	0
16	140	0	0	0	0	8	131	0	0	0	0	9	132	0	0	0	0
23	147	0	0	0	0	15	138	0	0	0	0	16	139	0	0	0	0
30	154	0	0	0	0	22	145	0	0	0	0	23	146	0	0	0	0
6/9	161	0	0	0	0	29	152	0	0	0	0	30	153	0	0	0	0
13	168	0	0	0	0	5/9	159	0	0	0	0	6/9	160	0	0	0	0
20	175	0	0	0	0	12	166	0	0	0	0	13	167	0	0	0	0
27	182	0	0	0	0	19	173	0	0	0	0	20	174	0	0	0	0
4/10	189	0	0	0	0	26	180	0	0	0	0	27	181	0	0	0	0
11/10	196	0	0	0	0	3/10	187	0	0	0	0	6/10	188	0	0	0	0
Total		437	649	1089	2175	Total		286	451	834	1571	Total		274	1022	1301	2597
Mean		16.8	25	41.9	83.7	Mean		11	17.3	32.1	60.4	Mean		10.5	39.3	50	99.9
G.M.		725				G.M.		523.7				G.M.		865.7			

G.M. = General mean. T1 = 1st date of transplanting. T2 = 2nd date of transplanting. S. = seed sowing.

Table 8. The fluctuations in the weekly numbers of *Aphis gossypii* in each of the tested treatments at Sakha cotton fields, Kafr El-Sheikh Governorate during 1993, 1994 and 1995.

Insect		Number of *Aphis gossypii*															
Date of inspection	Plant age in days	1993				Date of inspection	Plant age in days	1994				Date of inspection	Plant age in days	1995			
		T1	T2	S.	Total			T1	T2	S.	Total			T1	T2	S.	Total
19/4	21	28	81	82	191	11/4	12	31	61	35	127	12/4	13	40	45	49	134
26	28	62	191	200	453	18	19	92	186	78	356	19	20	91	160	120	371
3/5	35	120	288	302	710	25	26	291	221	102	614	26	27	142	399	199	740
10	42	202	100	225	527	2/5	33	101	256	171	528	3/5	34	50	210	201	461
17	49	100	349	391	840	9	40	297	171	220	688	10	41	20	180	300	500
24	56	310	301	346	957	16	47	104	79	60	243	17	48	101	300	302	703
31	63	42	205	112	359	23	54	42	39	382	463	24	55	55	99	351	505
7/6	70	130	100	201	431	30	61	240	61	161	462	31	62	93	109	201	403
14	77	22	197	99	318	6/6	68	147	110	180	437	7/6	69	22	70	112	204
21	84	23	105	42	170	13	75	60	52	105	217	14	76	37	61	290	388
28	91	161	62	60	283	20	82	160	74	153	387	21	83	45	45	70	160
5/7	98	60	95	80	235	27	89	100	110	100	310	28	90	100	195	33	328
12	105	98	104	260	462	4/7	96	105	160	201	466	5/7	97	350	101	151	602
19	112	200	250	490	940	11	103	200	121	502	823	12	104	62	510	499	1071
26	119	151	410	402	963	18	110	170	399	201	770	19	111	105	200	211	516
2/8	126	511	299	660	1470	25	117	380	310	610	1300	26	118	480	251	601	1332
9	133	122	602	851	1575	1/8	124	38	660	302	1000	2/8	125	54	701	849	1604
16	140	652	101	300	1053	8	131	601	850	731	2182	9	132	540	320	401	1261
23	147	310	980	300	1590	15	138	92	450	161	703	16	139	149	1100	901	2150
30	154	590	500	399	1489	22	145	689	999	602	2290	23	146	36	210	400	646
6/9	161	900	1190	1100	3190	29	152	303	250	1002	1555	30	153	680	540	900	2120
13	168	111	221	1301	1633	5/9	159	38	511	507	1056	6/9	160	351	908	950	2209
20	175	400	690	200	1290	12	166	500	300	1290	2090	13	167	101	440	550	1091
27	182	385	790	701	1876	19	173	103	157	605	865	20	174	450	801	770	2021
4/10	189	164	399	205	768	26	180	650	111	304	1065	27	181	101	602	202	905
11/10	196	32	51	96	179	3/10	187	53	88	121	262	6/10	188	450	401	301	1152
Total		5886	8661	9405	23952	Total		5587	6786	8886	21259	Total		4705	8958	9914	23577
Mean		226.4	333.1	361.7	921.2	Mean		214.9	261	341.8	817.7	Mean		181	344.5	381.3	906.8
G.M.		7984				G.M.		7086.3				G.M.		7859			

G.M. = General mean. T1 = 1st date of transplanting. T2 = 2nd date of transplanting. S. = seed sowing.

Table 9. The fluctuations in the weekly numbers of *Empoasca lybica* in each of the tested treatments at Sakha cotton fields, Kafr El-Sheikh Governorate during 1993, 1994 and 1995.

Insect		Number of *Empoasca lybica*															
Date of inspection	Plant age in days	1993				Date of inspection	Plant age in days	1994				Date of inspection	Plant age in days	1995			
		T1	T2	S.	Total			T1	T2	S.	Total			T1	T2	S.	Total
19/4	21	18	47	35	100	11/4	12	20	18	24	62	12/4	13	10	25	5	40
26	28	21	85	75	181	18	19	42	62	102	206	19	20	30	80	51	161
3/5	35	33	92	100	225	25	26	24	60	43	127	26	27	31	90	50	171
10	42	62	64	198	324	2/5	33	18	64	141	223	3/5	34	11	101	104	216
17	49	30	28	55	113	9	40	15	36	144	195	10	41	45	41	156	242
24	56	28	37	151	216	16	47	51	97	101	249	17	48	10	32	170	212
31	63	15	100	97	212	23	54	17	22	99	138	24	55	32	51	181	264
7/6	70	20	48	33	101	30	61	22	24	189	235	31	62	29	60	96	185
14	77	71	18	25	114	6/6	68	48	25	94	167	7/6	69	32	81	127	240
21	84	142	24	18	184	13	75	20	77	55	152	14	76	127	101	88	316
28	91	28	99	77	204	20	82	19	40	200	259	21	83	45	50	35	130
5/7	98	197	49	80	326	27	89	101	105	260	466	28	90	96	52	240	388
12	105	27	20	95	142	4/7	96	163	180	203	546	5/7	97	100	199	60	359
19	112	68	56	201	325	11	103	92	241	241	574	12	104	149	121	77	347
26	119	102	102	313	517	18	110	100	221	301	622	19	111	45	50	170	265
2/8	126	191	450	190	831	25	117	151	260	399	810	26	118	45	301	190	536
9	133	74	350	308	732	1/8	124	110	317	400	827	2/8	125	48	183	298	529
16	140	199	101	402	702	8	131	88	251	202	541	9	132	102	180	210	492
23	147	295	401	200	896	15	138	171	400	610	1181	16	139	203	421	400	1024
30	154	71	598	640	1309	22	145	276	399	301	976	23	146	301	152	303	756
6/9	161	202	198	481	881	29	152	49	112	705	866	30	153	110	400	201	711
13	168	213	320	700	1233	5/9	159	146	107	403	656	6/9	160	350	502	260	1412
20	175	258	500	403	1161	12	166	88	188	460	736	13	167	160	260	340	760
27	182	117	499	215	831	19	173	90	102	305	497	20	174	97	399	200	696
4/10	189	128	200	118	446	26	180	63	99	202	364	27	181	100	150	260	510
11/10	196	46	59	42	147	3/10	187	48	37	110	195	6/10	188	60	100	178	338
Total		2656	4545	5252	12453	Total		2032	3544	6294	11870	Total		2368	4182	4750	11300
Mean		102.2	174.8	202	479	Mean		78.2	136.3	242.1	456.5	Mean		91.1	160.8	182.7	434.6
G.M.		4151				G.M.						G.M.		3766.7			

G.M. = General mean. T1 = 1st date of transplanting. T2 = 2nd date of transplanting. S. = seed sowing.

Table 10. The fluctuations in the weekly numbers of *Bemisia tabaci* in each of the tested treatments at Sakha cotton fields, Kafr El-Sheikh Governorate during 1993, 1994 and 1995.

Insect		Number of *Empoasca lybica*															
Date of inspection	Plant age in days	1993				Date of inspection	Plant age in days	1994				Date of inspection	Plant age in days	1995			
		T1	T2	S.	Total			T1	T2	S.	Total			T1	T2	S.	Total
19/4	21	2	0	0	2	11/4	12	0	0	0	0	12/4	13	0	0	0	0
26	28	5	0	0	5	18	19	0	0	0	0	19	20	0	0	0	0
3/5	35	4	0	8	12	25	26	0	5	10	15	26	27	0	0	0	0
10	42	6	6	9	21	2/5	33	9	8	9	26	3/5	34	0	0	0	0
17	49	8	5	9	22	9	40	10	14	10	34	10	41	3	10	9	22
24	56	10	11	4	25	16	47	10	8	13	31	17	48	5	13	10	28
31	63	5	8	7	20	23	54	8	5	6	19	24	55	0	6	17	23
7/6	70	10	14	11	35	30	61	2	7	4	13	31	62	2	12	11	25
14	77	8	17	20	45	6/6	68	5	16	20	41	7/6	69	5	10	25	40
21	84	7	90	35	132	13	75	30	10	90	130	14	76	8	8	201	217
28	91	71	150	101	322	20	82	41	37	550	628	21	83	11	33	410	454
5/7	98	160	249	190	599	27	89	50	91	380	521	28	90	10	50	675	735
12	105	105	401	350	856	4/7	96	70	161	100	331	5/7	97	30	80	220	330
19	112	70	300	401	771	11	103	131	232	670	1033	12	104	65	111	470	646
26	119	240	602	270	1112	18	110	136	281	200	617	19	111	181	340	861	1382
2/8	126	360	220	480	1060	25	117	251	442	510	1203	26	118	50	55	530	635
9	133	121	840	680	1641	1/8	124	400	601	601	1602	2/8	125	250	900	670	1820
16	140	500	302	570	1372	8	131	250	212	1202	1664	9	132	32	910	980	1922
23	147	61	201	740	1002	15	138	562	980	1030	2572	16	139	703	350	115	1168
30	154	420	290	880	2220	22	145	110	700	900	1710	23	146	180	700	350	1230
6/9	161	590	1100	981	2671	29	152	500	450	740	1690	30	153	340	450	901	1691
13	168	220	640	200	1060	5/9	159	740	651	801	2192	6/9	160	88	500	602	1190
20	175	113	410	702	1225	12	166	225	302	503	1030	13	167	370	201	240	811
27	182	167	220	260	647	19	173	360	286	210	856	20	174	48	508	803	1359
4/10	189	85	150	148	383	26	180	171	193	107	471	27	181	180	402	531	1113
11/10	196	39	71	92	202	3/10	187	94	110	66	270	6/10	188	97	50	300	447
Total		3387	6927	7148	17462	Total		4165	5802	8732	18699	Total		2658	5699	8931	17288
Mean		130.3	266.4	274.9	671.6	Mean		160.2	223.2	335.8	719.2	Mean		102.2	219.2	343.5	664.9
G.M.		5820.7				G.M.		6233				G.M.		5762.7			

G.M. = General mean. T1 = 1st date of transplanting. T2 = 2nd date of transplanting. S. = seed sowing.

Table 11. Deviations of total number of sucking insects from the general average at Kafr El-Sheikh Governorate, during 1993, 1994 and 1995.

Year		*Thrips tabaci*			*Aphis gossypii*			*Empoasca lybica*			*Bemisia tabaci*		
		T1	T2	S.	T1	T2	S.	T1	T2	S.	T1	T2	S.
1993	Total	437	649	1089	5886	8661	9405	2656	4545	5252	3387	6927	7148
	Mean	725			7984			4151			5820.7		
	Deviation	-288	-76	364	-2098	677	1421	-1495	394	1101	-2433.7	1106.3	1327.3
1994	Total	268	451	834	5587	6786	8886	2032	3544	6294	4165	5802	8732
	Mean	523.7			7086.3			3956.7			6233		
	Deviation	-237.7	-72.7	310.3	-1499.3	-300.3	1799.7	-1924.7	-412.7	2337.3	-2068	-431	2499
1995	Total	274	1022	1301	4705	8958	9914	2368	4182	4750	2658	5699	8931
	Mean	865.7			7859			3766.7			5762.7		
	Deviation	-591.7	156.3	435.3	-3154	1099	2055	-1398.7	415.3	983.3	-3104.7	-63.7	3168.3

Table 12. The fluctuations in the weekly numbers of *Thrips tabaci* in each of the tested treatments at Noubaria cotton fields, Beheira Governorate during 1993 and 1994.

Insect		*Thrips tabaci*							
Date of inspection	Plant age in days	1993			Date of inspection	Plant age in days	1994		
		T	S.	Total			T	S.	Total
17/4/1993	18	60	68	128	13/4/1994	16	110	117	227
24	25	86	112	198	20	23	180	146	326
1/5	32	70	288	358	27	30	96	181	277
8	39	75	150	225	4/5	37	48	34	82
15	46	32	113	145	11	44	94	231	325
22	53	97	12	109	18	51	72	73	145
29	60	41	110	151	25	58	30	96	126
5/6	67	32	8	40	1/6	65	91	41	132
12	74	9	12	21	8	72	22	22	44
19	81	0	3	3	15	79	5	6	11
26	88	0	0	0	22	86	0	0	0
3/7	95	0	0	0	29	93	0	0	0
10	102	0	0	0	6/7	100	0	0	0
17	109	0	0	0	13	107	0	0	0
24	116	0	0	0	20	114	0	0	0
31	123	0	0	0	27	121	0	0	0
7/8	130	0	0	0	3/8	128	0	0	0
14	137	0	0	0	10	135	0	0	0
21	144	0	0	0	17	142	0	0	0
28	151	0	0	0	24	149	0	0	0
4/9	158	0	0	0	31	156	0	0	0
11	165	0	0	0	7/9	163	0	0	0
18	172	0	0	0	14	170	0	0	0
25	179	0	0	0	21	177	0	0	0
2/10	186	0	0	0	28	184	0	0	0
9	193	0	0	0	5/10	191	0	0	0
Total		502	876	1378	Total		748	947	1695
Mean		19.3	33.7	53	Mean		28.8	36.4	65.2
G.M.		689			G.M.		847.5		

G.M. = General mean.
T = 1st date of transplanting.
S. = seed sown fields.

Table 13. The fluctuations in the weekly numbers of *Aphis gossypii* in each of the tested treatments, at Noubaria cotton fields, Beheira Governorate during 1993 and 1994.

Insect		*Aphis gossypii*							
Date of inspection	Plant age in days	1993			Date of inspection	Plant age in days	1994		
		T	S.	Total			T	S.	Total
17/4/1993	18	33	45	78	13/4/1994	16	67	121	188
24	25	46	102	148	20	23	146	97	243
1/5	32	100	131	231	27	30	32	192	224
8	39	102	98	200	4/5	37	201	180	381
15	46	23	64	87	11	44	220	146	366
22	53	85	49	134	18	51	51	201	252
29	60	121	153	274	25	58	150	101	251
5/6	67	98	161	259	1/6	65	110	103	213
12	74	32	171	203	8	72	191	198	389
19	81	77	110	187	15	79	100	121	221
26	88	68	79	147	22	86	48	180	228
3/7	95	50	110	160	29	93	298	400	698
10	102	160	108	268	6/7	100	61	520	581
17	109	101	501	602	13	107	400	205	605
24	116	198	200	398	20	114	499	270	769
31	123	351	350	701	27	121	68	550	618
7/8	130	206	857	1063	3/8	128	693	410	1103
14	137	103	300	403	10	135	131	910	1041
21	144	250	321	571	17	142	420	150	570
28	151	591	420	1011	24	149	540	851	1391
4/9	158	300	350	650	31	156	240	205	445
11	165	46	649	695	7/9	163	750	401	1151
18	172	496	350	846	14	170	121	302	423
25	179	165	231	396	21	177	280	101	381
2/10	186	251	210	461	28	184	111	92	203
9	193	49	47	96	5/10	191	68	105	173
Total		4102	6167	10269	Total		5996	7112	13108
Mean		157.8	237.2	395	Mean		230.6	273.6	504.2
G.M.		5134.5			G.M.		6554		

G.M. = General mean.
T = 1st date of transplanting.
S. = seed sown fields.

Table 14. The fluctuations in the weekly numbers of *Empoasca lybica* in each of the tested treatments at Noubaria, Beheira Governorate during 1993 and 1994.

Insect		*Empoasca lybica*							
Date of inspection	Plant age in days	1993			Date of inspection	Plant age in days	1994		
		T	S.	Total			T	S.	Total
17/4/1993	18	18	15	33	13/4/1994	16	25	23	48
24	25	73	20	93	20	23	46	21	67
1/5	32	40	32	72	27	30	18	42	60
8	39	46	41	87	4/5	37	16	71	87
15	46	49	12	61	11	44	41	22	63
22	53	22	49	71	18	51	62	53	115
29	60	36	50	86	25	58	80	80	160
5/6	67	35	52	87	1/6	65	61	33	94
12	74	91	121	212	8	72	40	44	84
19	81	100	92	192	15	79	80	61	141
26	88	32	93	125	22	86	100	65	165
3/7	95	35	160	195	29	93	120	36	156
10	102	51	250	301	6/7	100	180	90	270
17	109	70	271	341	13	107	51	147	198
24	116	41	296	337	20	114	48	97	145
31	123	150	200	350	27	121	49	172	221
7/8	130	156	160	316	3/8	128	131	290	421
14	137	99	220	319	10	135	160	346	506
21	144	160	110	270	17	142	190	310	500
28	151	171	76	247	24	149	161	241	402
4/9	158	96	53	149	31	156	183	306	489
11	165	30	41	71	7/9	163	200	175	375
18	172	56	33	89	14	170	101	130	231
25	179	101	46	147	21	177	100	101	201
2/10	186	82	38	120	28	184	60	92	152
9	193	33	20	53	5/10	191	41	75	116
Total		1873	2551	4424	Total		2344	3123	5467
Mean		72	98.1	170.2	Mean		90.2	120.1	210.3
G.M.		2212			G.M.		2733.5		

G.M. = General mean.
T = 1st date of transplanting.
S. = seed sown field.

Table 15. The fluctuations in the weekly numbers of *Bemisia tabaci*, in each of the tested treatments at Noubaria cotton fields, Beheira Governorate during 1993 and 1994.

Insect		*Bemisia tabaci*							
Date of inspection	Plant age in days	1993			Date of inspection	Plant age in days	1994		
		T	S.	Total			T	S.	Total
17/4/1993	18	15	19	34	13/4/1994	16	25	21	46
24	25	19	40	59	20	23	55	41	96
1/5	32	12	39	51	27	30	56	18	74
8	39	41	70	111	4/5	37	60	32	92
15	46	40	80	120	11	44	121	101	222
22	53	22	20	42	18	51	110	72	182
29	60	35	20	55	25	58	90	38	128
5/6	67	30	140	170	1/6	65	50	110	160
12	74	151	40	191	8	72	25	80	105
19	81	150	101	251	15	79	81	21	102
26	88	78	220	298	22	86	121	50	171
3/7	95	160	240	400	29	93	159	201	360
10	102	200	300	500	6/7	100	30	300	330
17	109	200	380	580	13	107	260	200	460
24	116	150	420	570	20	114	150	701	851
31	123	64	180	244	27	121	40	302	342
7/8	130	50	401	451	3/8	128	398	540	938
14	137	510	480	990	10	135	350	291	641
21	144	50	202	252	17	142	850	682	1532
28	151	160	657	817	24	149	61	502	563
4/9	158	270	350	620	31	156	180	161	341
11	165	330	62	392	7/9	163	320	351	671
18	172	231	200	431	14	170	240	203	443
25	179	165	291	456	21	177	160	161	321
2/10	186	180	130	310	28	184	250	210	460
9	193	105	37	142	5/10	191	149	91	240
Total		3418	5119	8537	Total		4391	5480	9871
Mean		131.5	196.9	328.3	Mean		168.9	210.8	379.7
G.M.		4268.5			G.M.		4935.5		

G.M. = General mean.
T = 1st date of transplanting.
S. = seed sown fields.

Table 16. Deviations of total number of sap sucking insects from the general average at Beheira Governorate during 1993 and 1994.

Year		*Thrips tabaci*		*Aphis gossypii*		*Empoasca lybica*		*Bemisia tabaci*	
		T	S.	T	S.	T	S.	T	S.
1993	Total	502	876	4102	6167	1873	2551	3418	5119
	Mean	689		5134.5		2212		4268.5	
	Deviation	-187	187	-1032.5	1032.5	-339	339	-850.5	850.5
1994	Total	748	947	5996	7112	2344	3123	4391	5480
	Mean	847.5		6554		2733.5		4935.5	
	Deviation	-99.5	99.5	-558	558	-389.5	389.5	-544.5	544.5

REFERENCES

1. El-Agroudy, M.H. and G.M.I. Imam. 1994b. Effect of preceding winter crops. Methods of planting and nitrogen level in late sowing data on cotton yield and yield component.J. Agric. Res. Tanta Univ., 20 (3) 389-405.

2. El-Refai, S.A. and A.K. Emam. 1994. some factors affecting cotton aphids, whitefly, bollworm infestations and cotton yield. Annals Agric. Sci. Ain-shams Univ., Cairo., Egypt.

3. El-Sayed, E.A. 1992. Effect of transplanting on growth and yield of cotton. M.Sc. Thesis, Fac. of Agric. Minuifya Univ., Egypt.

4. El-Shazily, W.M. 1992. Studies on cotton growing methods. Ph.D. Thesis, Fac. of Agric., Kafr El-Sheikh, Tanta Univ., Egypt.

5. Helal, S.H.M. 1986. Studies on transplanting of Egyptian cotton M.sc. Thesis, Fac. of Agric., Al-Azhar Univ., Egypt.

6. Imam, G.M.I. 1991. A study of some factors affecting yield and fiber properties in cotton. Ph.D. Thesis, Fac. of Agric., Ain shams Univ., Egypt.

7. Nadihalli, B.S., B.V. Patil and S.Lingappa. 1993. Population dynamics of cotton whitefly *Bemisia tabaci* (Gennadius). Karnataka Journal of Agricultural Science (1993) 6 (1) 25-29 [En, 7 ref.] University of Agricultural Science, Dharwad-580 005, India.

8. Radwan, F.E. 1988. Evaluation of some methods of cotton planting in relation to their effect on yield and quality. M.Sc. Thesis, Fac. of Agric., at Moushtohor, Zagazig Univ., Egypt.

9. Rehab, F.L. 1963. Physological studies on cotton plants. Ph.D. Thesis, Fac. of Agric. Alexandria Univ., Egypt.

10. Slosser, G.E. 1993. Influence of planting date and insecticide treatments on insect pest abundance in dry land cotton. J. Econ. Entomol. 86 (4): 1213-1222.

11. Watson, D.F., J.C. Silvertooth, A. Tellez and L. Lastra. 1992. Seasonal dynamics of sweet potato whitefly in Arizona. Southwestern Entomologist, 17 (2): 149-167. (c.f. R.A.E., 81 (5), Abst. No. 5075.

12. Yassin, A.I.H. 1992. Priliminary study on the possibility planting cotton after some winter crops. Annals Agric. Sci., Fac. Agric., Ain Shams Univ., Cairo, Egypt. 37 (1): 51-59.

تأثير موعد زراعة القطن بطريقة الشتل علي الكثافة العددية للحشرات الثاقبة الماصة

سمير محمد الفاتح رضوان[1]، زيدان هندي عبد الحميد[2]،
جميل برهان الدين السعدني[2]، محمد عبد الحميد روميله[1]

١ معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة.
٢ كلية الزراعة - جامعة عين شمس - القاهرة.

أجريت هذه الدراسة لمعرفة التغيرات التي تحدث في مجاميع الحشرات الثاقبة الماصة في كل من القطن الذي زرع بطريقة الشتل والقطن الذي زرع بطريقة البذرة (الطريقة العادية) - وذلك خلال ثلاثة مواسم زراعية (١٩٩٣ و ١٩٩٤ و ١٩٩٥) في محافظات الغربية وكفر الشيخ والبحيرة. هذا وقد نوقشت نتائج كل محافظة علي حده، حيث قدرت نسبة الاصابة بكل من التربس والمن والجاسيد والذبابة البيضاء علي نباتات القطن طوال مدة الفحص في المناطق الثلاث. وقد أظهرت النتائج أن القطن المنزرع بالطريقة العادية (بالبذرة) كان الاكثر اصابة بهذة الحشرات عن القطن المنزرع بطريقة الشتل الا أنه كان الاكثر محصولا.