A BIOTIC AND BIOTIC FACTORS INFLUNECE ON MAJOR OKRA PESTS WITH ASOCCIATED PREDATORS AND OKRA CROP YIELD

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Abstract

A field experiment was carried out at Qaha experimental station, Qalubia Governorate in order to study the effect of planting spaces on Okra sap sucking pests and asocciated predators included each of Aphids (*Aphis gossypoii)*,White fly,(*Bemisia tabaci Genn.*), Jassid (*Empoasca decipiens (*paoli) and Red spider mite, (*Tetranychus urticae* koch) and the associated predators Coccinellidae family and *Chrysoperla carnea* , in addition to estimate Okra yield during 2013 & 2014 seasons. The obtained results recorded that a relationship between incidence of these pests in control and planting spaces 50, 60 and 70 cm. the highest population abundance of these pests increase by decreasing planting space, also, the predators increased by decreasing the planting space. On the other hand, the crop yield of Okra increases by increasing planting spaces. The highest yield was obtained in case of 70 cm. space, where the mean yield was 74.2, 83.1 Kg. in 2013 and 2014, opposite to 69.6 & 62.07 Kg. in control treatment, causing percent increase 42.48 & 33.88% than control in 2013 and 2014, respectively.

INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is originated in Asia and Africa and it is an important vegetable grown in tropical and subtropical parts of the world Absar and Siddique ،1992, Baloch 1994, Okra also known as Lady`s finger is considered economically important in Nigeria (Farinde *et al.*2 007Okra is solely grown for its immature pods which can be harvested over a long period of time if well managed Maurya *et al* ،.2013 .The pods are harvested regularly for best yields and leaving the pods to mature on the plant will reduce the flowering as well as to reduce further pod productionEkwu and Nwokwu . 2012 ،The importance of Okra is the potential to improve due to increase in vegetable consumption due to health concerns around the world. Okra is nutritionally rich in Carbohydrates, Vitamins A, B and C Lee *et al.* ، 2000 Ekwu and Nwokwu, 2012, calcium, potassium and dietary fiber, Rashwan. 2011 On the other hand, planting of inappropriate plant densities in fluted pumpkin is also common among commercial vegetable farmers who may erroneously believe that high plant populations can increase crop yield indefinitely. Optimum plant population depends primarily on the morphology of the crop previous studies on Okra production have highlighted sowing time Talukder *et al.*, 2003, sowing depth Ijoyah *et al.,* 2012 and plant spacing, among others as factors affecting the productivity and quality of the crop among which plant density plays a significant role Maurya *et al.*, 2013. However, in Zimbabwe planting of Okra seeds is done by randomly hand digging holes without paying attention to plant spacing. This has an implication of yield and fruit quality of Okra Yadev and Dhankhar, 2005., also highlighted the importance of plant density in the production and yield of okra. Incorrect plant spacing results in low yield and poor quality fruits Moniruzzaman *et al.*, 2007. Furthermore, high plant densities may lead to rigorous growth, poor quality fruits and low yield due to intra specific competition Talukder *et al.*, 2003. In addition, a significant decrease in pod yield was also observed as a result of increased plant density Dikwahal *et al.*, 2007, Gupta, 1990. Increasing plant density generally increases yield per unit area till a certain limit) Weiner, 1990. The Okra cultivars planted at close spacing of 60 × 50 cm and 60 × 40 cm had a significantly ($P < 0.05$) lower pods length and High mean leaf area damage. The highest mean number of flea beetles (24.50 and 23.17) was from the Okra cultivars Jokoso and NH-Ae 47- 4 planted at the closest (Osipitan et.al. 2007).

The present study was carried out to shed light on effectiveness of planting spaces on the population density of either plants or insect pests or associated predators under climatic factors temperature (Temp. & Relative Humidity R.H.) during two successive seasons of 2013 and 2014.

MATERIALS AND METHODS

Effect of agricultural plant distance on Okra yield crop and major population pests with its associated predators in Okra plants:

The field experimental trials were conducted during spring planting during both2013and 2014 seasons at Agricultural Research Qaha Station Qalubia Governorate.

Area of four kerats (each 175m$^{2)}$. were chosen. Each one was divided into three replicates. Three kerats were planted on the spaces of 50, 60 and 70 cm between plants while the fourth kerate planted with space of 40 cm between plants in lines.

The spaces between lines in all treatments was100 cm. Twenty five plants in each treatment were chosen weekly randomly for direct counting to insect pests and its associated predators in early morning, on Okra leaves. At the end of season, picked all pods up in each treatments weighted and recorded.

All treatments were laid-out in randomized complete block design with three replicates.

Statistical analysis of data collected was carried out using standard analysis of variance. The significance of the treatments was determined using F–test .To determine the significance of the differences between the means of the treatments, Duncan Multiple was used in this study.

RESULTS AND DISUSSION

1-Population abundance of some major Okra pests in Table (1) during season, 2013.

A- Population abundance of *Aphis gossypii* Glover:-

The highest number was obtained (193 adults) in control treatment, followed by (133) adults in case of planting at 50 cm. space, (68adults) in 60 cm. space and 36 adults in 70 cm. space.

Statistical analysis showed significant differences between the untreated (check) and the other three treatments, but there were non significant differences among the other three spaces.

B - Population abundance of Jassid *Empoasca decipiens* paoli:-

The highest number of Jassid was noticed in control treatment (46adults), followed by 30 adults (in 50 cm space.), 19 adults in 60 cm. space and 15 adults in 70 cm.space. There were significant differences between the untreated treatment check and the other three treatments, but there were non significant differences between the other three spaces.

C- Population abundance of *Bemisia tabaci* Genn.: -

The highest numbers of ***Bemisia tabaci*** was occurred in check treatment 77 adults, followed by 48 adults in50 cm. space, 33 adults in 60cm. space and finally 18 adults in70cm.space. There were significant differences between the untreated treatment (check) and the other three treatments, but there were no significant amang between three spaces.

D- Population abundance of *Tetranychus urticae* Koch:-

Results illustrated in Table (1) indicated that the highest number of *Tetranychus urticae* was 93 adults in control treatment ، followed by space of 50 cm 79 adults, 11adults in the 60 cm spaces and5 adults) in 70 cm space . There are significant differences between control treatment and the other three treatments, but there were no significant differences between 50, 60 and 70 cm. spaces.

2-Population abundance of some major Okra pests in Table(2). during season 2014.

A- Population abundance of (*Aphis grossypii* Glover):-

The highest number of aphis 93 adults in control treatment, followed by 144 adults in 50 cm. space, 77adults in 60 cm. space and 36 adults in 70 cm. space There were significant differences between the untreated treatment (check) and the other three treatments, but there were non significant differences among the other three spaces (50, 60, and 70 cm.). with R.H. average of (57.66%) and Max .and Min, Temperature were 32.5 & 22.4 °C, respectively.

B- Population abundance of Jassid *(Empoasca decipiens paoli)* :-

The highest number of Jassid was accessed control 49 adults, followed by, 29 adults in50 cm space, 11 adults in 60 cm. space and 5 adults in 70 cm.space. There were significant differences between the untreated check and the other three treatments ،but there were non significant differences among the other three spaces 50, 60, and 70cm,.

C- Population abundance of *Bemisia tabaci:* –

The highest numbers of *Bemisia tabaci* were occurred in check treatment 77 adults, followed by, 33 adults in50 cm. space, 33 adults in 60cm.space and finally 27 adults in70cm.space. There were significant differences between the untreated treatment check and the other three treatments, but there were no significant differences among the other three spaces 50, 60, and 70 cm .

D – Population abundance of *Tetranychus urticae* Koch.:-

The highest number 51 adults was found in control treatment, followed by, 27 adults in 50 cm., 20adults in 60 cm pace, and 19 adults in 70 cm. space. There were significant differences among the untreated treatment (check) and the other three treatments, but there were no significant differences among the other three spaces. It could be concluded that the highest numbers of *Aphis grossypii* Glover The highest number obtained 193 adults in control treatment, followed by, 133 adults in 50 cm. space, 68adults in 60 cm. space and 36 adults in 70 cm. space. In the first season of 2013 where the R.H. average of 54.6% ,and Max. & Min. temperature were 32.66&22.15°C, respectively . While, in the second season 2014 the highest number 93 adults was observed in control treatment, followed by, 144 adults in 50 cm. space, 77adults in 60 cm. space, and 36 adults in 70 cm. space. Also, in 46adults case of the population abundance of *Jassid* ***Empoasca decipiens paoli*** the highest number of Jassid was accorded in control, followed by , 30 adults (in 50 cm space., 19 adults in 60 cm. space and 15 adults in 70 cm.space. In the first season of 2013 with R.H. average of 54.6%, and Max. & Min. temperature of 32.66 & 22.15 °C, respectively .

While, in the second season of 2014 the highest number obtained of 49 adults Jassid was notice at control, followed by, 29 adults in50 cm. space, 11 adults in 60 cm. space, and 5 adults in 70 cm.space. with R.H. average of 57.66% و and Max .and Min. temperature were 32.5 & 22.4 °C, respectively. The highest number obtained of Jassid at control 49 adults followed by 29 adults in50 cm space, 11 adults in 60 cm. space and 5 adults in 70 cm.space. with R. H. average of 57.66% and Max .and Min .temperature of 32.5 & 22.4 °C, respectively.

For population abundance of *Bemisia tabaci* The highest numbers of *Bemisia tabaci* 77 adults was occurred in check treatment, followed by, 48 adults in50 cm. space, 33 adultsin 60cm.space and finally, 18 adults in70cm.space. In 2013 the first season with R.H. average of 54.6%, and Max. & Min .temperature were 32.66 & 22.15 °C, respectively . While, in the second season 2014 the highest numbers of *Bemisia tabaci* was occurred on check treatment 77 adults, followed by, 33 adults in50 cm. space, 33 adults in 60cm.space and finally, 27 adults in70cm.space. with R.H. average of 57.66%, and Max .and Min. Temperature were 32.5 & 22.4 °C, respectively. Finally, the highest population abundance of *Tetranychus urticae* Koch.was (93 adults) in control treatment, followed by, 79 adults in space 50 cm, 11adults in the 60 cm. and 5 adults in 70 cm. space . In 2013 the first season with R. H. average of (54.6%, and Max. & Min .temperature were 32.66 & 22.15°C, respectively . While, in the second season 2014 the highest number was 51 adults in control treatment, 27 adults in 50 cm. space, 20 adults in 60 cm. space and 19 adults) in 70 cm. space. with R.H. average of 57.66% and Max .and Min .Temperature was 32.5 & 22.4 °C, respectively.

These results are in agreement with Arshad *et al.* (2012) who mentioned that the maximum temperature and maximum relative humidity are the key factors responsible in reducing the population of 3.06 and 5.00 %, respectively. On evaluation of biotic factors, Aphid *L. erysimi* population exhibited a positive correlation with *C.septempunctata*, *C.transversalis*, *M.sexmaculatus* and *I. scutellaris.*

Also, Temperature has a great influence on the whitefly population dynamics as recommended by (Horowitz *et al.*, 1984, Horowitz, 1986).

The incidence of leafhopper was observed during third week of February on third weeks old crop and acquired its peak incidence (9.30 individual /3 leaves) was observed in second week of March on six weeks old crop. The population of leafhoppers was high during initial stage of crop growth with two peak population during 10th (9.30 individual /3 leaves) and 16th (8.20 individual /3 leaves) standard weeks. The population of leafhoppers was maximum (9.30 individual /3 leaves) during initial stages of crop growth with maximum temperature ranged from 31 to 33°C and minimum temperature ranged from 21 to 24°C, morning relative humidity 82 to 90 percent and evening relative humidity ranged from 55 to 66 percent The present findings are in agreement with those of Prasad et al., (2008) and Kaur et al., (2009) who reported the maximum and minimum temperature ranged from 30.5 to 32.5°C and 20 to 23.5°C, respectively.

3-Population dynamics of predators in Okra2013 and 2014 seasons:

1- *Chrysoperlla carnea. Stephens-* :

Data illustrated in Tables (3 & 4) indicated that the peak of the generation take place on 25th July where control treatment harbored the highest numbers 24 adults in 50cm. space , followed by, 22 adults in 60cm., and 19 adults in 70cm. which occurred in the first season of 2013 with R.H. average of 54.6%, Max. & Min. temp. of 32.66 and 22.15°C, respectively. While, in the second season of 2014 the peak was appeared on the 25 th July which 25 adults in the control, treatment followed by spaces of 50, 60 and finally 70cm., respectively with R. H. average of 57.66%, Max. & Min. Temp. of 32.5 and 21.83°C, respectively.

2- Coccinellidae family:

The peak of the generation was taken place on 23rd August where control treatment harbored showed highest numbers of 26 adults, followed by, 24 adults in 50 cm. space, 19 adults in 60 cm space. and 15 adults in 70 cm. space. Which was occurred in the first season of 2013 with R.H. average of 54.6% , Max. & Min . temp. of 32.66 and 22.15°C, respectively. While, in the second season of 2014 the peak 28 adults was detected on the 8th August in the control, followed by, 26 adults, in 50cm. space, 20 adults in 60 cm. space, and finally, 17 adults in 70cm., respectively with R.H. average 57.66% , Max .and Min .temperature were 32 .5 & 22.4°C, respectively.

These findings are agree with those recorded by Abd-ElMalak and Salem (2002) they found that The general mean counts of *B. tabaci* nymphs for the two seasons together indicated that the closest planting space (20 cm) associated with the heaviest infestation rate (21.97 nymphs/in.^{2}), while cucumber plants in the largest space (40 cm) were infested by the highest rate of *B. tabaci* (6.86 nymphs/in.^{2}), on sweet potato, who stated that the sucking pest, *B. tabaci* was abundant in the narrow spacing (20 cm) than the larger spaces (25 and 30 cm). Emam *et al.,* (2006) in regard to sweet pea plants in Egypt recorded that the largest sowing space (40 cm) harbored significantly the lowest seasonal mean number of *B.*

tabaci. The results are going in line with those published by Mohamed, (2012) found that Cucumber plants cultivated at the longest planting space (40 cm) were infested by the highest rate of *B. tabaci* nymphs (7.50 and 6.21 nymphs/in.^{2}) in 2010 & 2011 seasons, respectively. The tested cucumber varieties showed significant differences in the infestation rates by *B. tabaci* nymphs. The lowest seasonal mean of infestation was 2.13 and 1.33 nymphs/in.^{2} during the two tested seasons, respectively on cucumber plant sown at the largest space (40 cm) while the highest infestation levels (39.58 and 36.22 nymphs/in.^{2} in the two seasons, respectively) occurred on cucumber plants planted at the closest planting space (20 cm) .The rate of infestation by *B. tabaci* nymphs increased by decreasing planting space in the two investigated seasons regardless of the effect of planting dates. The highest mean numbers of *B. tabaci* nymphs (23.11 and 20.82 nymphs/in.^{2}) were recorded on cucumber plants planted at the shortest space (20 cm between hills) in the two seasons, respectively. On the other extreme, the lowest level of infestation with *B. tabaci* nymphs on cucumber plants occurred on the plants sown at the longest space (40 cm), recording 7.50 and 6.21 nymphs/in.^{2} for the two seasons, respectively.

For the planting space (30 cm) between plants, an intermediate infestation was recorded, as the whole seasonal mean numbers were 14.25 and 12.33 nymphs/in.^{2} in the two seasons, respectively

The general mean counts of *B. tabaci* nymphs for the two seasons together indicated that the closest planting space (20 cm) associated with the heaviest infestation rate (21.97 nymphs/in.^{2}), while cucumber plants in the largest space (40 cm) were infested by the highest rate of *B. tabaci* (6.86 nymphs/in.^{2}).

Influence of a biotic (Temperature & Relative Humidity) and biotic (predators) factors and planting spaces on Okra crop production.

Data represented in Table (5). indicated that the highest mean of Okra crop yield was 74.2 & 83.1 K. g. / Karat was determined at 70 cm. space, followed by 73.5 &76.0 K. g. at 60 cm. space and finally, 70.6 &69.5 K. g. at 50 cm. space opposite 69.6 & 62.07 K. g. in control treatment.

The planting spaces causing percent increase over control of 42.88 & 33.88 at 70 cm. space, followed by 26.16 & 22.4 at 60 cm. space and 13.93 & 11.97 at 50 cm. space) during 2013 & 2014 seasons, respectively.

Statistical analysis showed that there is no significant between control and both 50 & 60 cm. space, but , there are significant difference between 70 cm. space and the others treatments. Also, there is significant between control and the other three treatments, while, there are no significant differences between 50 and 60 cm. space. The closest narrow spaces produced the lowest weight, while the wide spaces produced high yield.

The obtained results are accordance with those recorded by Abd El-Malak and Salem (2002) on sweet potato, who stated that the sucking pest, *B. tabaci* was abundant in the narrow spacing (20 cm) than the larger spaces (25 and 30 cm). Emam *et al.*, (2006) in regard to sweet pea plants in Egypt recorded that the largest sowing space (40 cm) harbored significantly the lowest seasonal mean number of *B. tabaci*.

CONCLUSION

The study has provide useful information on the effect of spacing on the growth and yield of Okra. It could be concluded that the okra can perform well under different spacing of, especially, 70cm. gave the highest yield. It is from the results appeared optimum for maximum growth and yield of Okra.

Table 1 . Effect of planting spaces under Abiotic and biotic enviromental factors on major Okra pests and their in the field during 2013.

Inspection date	Insect																R. H.	Temperature	
	A. gossypii				*A. decipiens* (paoli)				*B. tabaci* Genn.)				*T. urticae* koch						
	50	60	70	Control	50	60	70	Control	50	60	70	Control	50	60	70	Control		Max.	Mani
30/5//2013	70	55	9	36	30	16	9	42	20	15	9	49	16	14	10	30	38.7	36.7	22.6
6/6/2013	101	70	17	165	27	19	15	46	25	18	9	65	47	22	17	51	39.9	32.3	22.6
13/6/2013	132	86	36	193	20	15	10	27	48	33	18	77	56	41	34	63	39.9	31.4	20.7
20/6/2013	88	55	44	106	12	10	7	20	10	0	33	33	70	30	15	90	39.9	31.1	17.4
27/6//2013	80	36	20	100	10	0	0	13	0	0	0	20	73	11	5	93	57.3	32.3	22.4
4/6/2013	45	32	19	30	9	0	0	9	0	0	0	11	79	5	1	77	58.9	32.3	22
11/6//2013	37	27	10	27	5	0	0	7	0	0	0	3	55	1	1	47	60.6	32.7	22
18/7/2013	29	16	10	0	4	0	0	7	0	0	0	1	40	0	0	41	60.9	32.9	22.4
25/7//2013	11	11	10	10	2	0	0	4	8	0	0	0	33	0	0	39	61.3	32.9	22.9
1/8/2013	9	7	7	6	1	0	0	4	0	0	0	1	23	0	1	29	60.6	31.7	22.7
8/8/2013	7	3	7	0	1	0	0	4	5	0	0	17	15	0	1	17	59.6	31.3	22.7
15/8//2013	4	1	1	13	1	0	0	6	11	0	0	12	11	3	3	12	59.6	32	23.3
23/8//2013	3	1	1	13	12	0	0	9	20	0	0	5	0	1	1	5	58	32.7	23
30/8//2013	1	1	1	36	1	0	0	15	2	0	0	3	0	6	1	3	58.4	33.6	22.7
6/9/2013	9	7	6	71	11	0	0	20	2	0	0	3	0	1	1	3	56.3	32.7	22.9
Total	626	408	198	806	146	60	41	235	143	67	37	300	518	2	91	600	845.6	488.6	341.3
Mean	42	27.2	132	53.7	9.7	4	2.7	16	9.5	4.47	2.5	20	34.53	9.2	6.1	40	56.4	35.6	22.8
LSD	12.26				14.88				19.13				14.29						

Table 2. Effect of planting spaces under A biotic and biotic environmental factors on major Okra pests and their in the field during 2013.

Inspection date	Predators								R. H. (%)	Temperature	
	Chrysoperlla carnea				Coccinellidae family						
	50	60	70	Control	50	60	70	Control		Max	Mani
30/5//2013	3	3	2	5	1	0	0	3	38.7	36.7	22.6
6/6/2013	4	3	3	5	2	1	0	3	39.9	32.3	22.6
13/6/2013	4	4	3	6	4	2	0	4	39.9	31.4	20.7
20/6/2013	9	8	7	9	8	5	2	10	39.9	31.1	17.4
27/6//2013	11	9	7	13	10	7	5	14	57.3	32.3	22.4
4/6/2013	11	9	8	13	11	7	6	16	58.9	32.3	22
11/6//2013	16	12	10	18	13	8	6	19	60.6	32.7	22
18/7/2013	16	13	10	19	14	9	7	17	60.9	32.9	22.4
25/7//2013	19	17	13	20	22	19	7	24	61.3	32.9	22.9
1/8/2013	20	17	15	24	17	13	11	20	60.6	31.7	22.7
8/8/2013	22	19	15	24	11	8	5	14	59.6	31.3	22.7
15/8//2013	24	19	11	26	4	3	3	8	59.6	32	23.3
23/8//2013	20	15	10	21	2	2	1	2	58	32.7	23
30/8//2013	11	8	5	14	1	0	0	3	58.4	33.6	22.7
6/9/2013	9	6	4	11	1	0	0	3	56.3	32.7	22.9
Total	199	162	123	228	122	84	61	162	845.6	488.6	341.3
Mean	13	11	8.2	15	8.1	5.6	4.1	11	56.4	35.6	22.8
LSD	0.356				1.019						

Table 3. Effect of planting spaces on major Okra pests and their in the field during 2014.

	Insect																R. H. (%)	Temperature	
	A. gossypii				*A. decipiens* (paoli)				*B. tabaci* Genn.)				*T. urticae* koch						
	50	60	70	Control	50		50	60	70	Control	50		50	60	70	Control			
30/5/2014	60	55	12	30	20	11	7	36	10	10	9	23	10	9	5	16	43.7	30.7	19.6
6/6/2014	100	60	33	51	19	16	10	21	19	19	12	31	19	13	12	46	48.9	30.9	19.6
13/6/2014	144	77	36	69	11	11	5	21	33	33	27	77	27	20	19	51	49.9	31.4	20.7
20/6/2014	80	36	19	90	26	0	0	49	23	23	12	50	19	17	5	36	41.2	31.7	22
27/6/2014	35	20	10	93	29	0	0	52	0	0	0	20	9	5	4	17	51.3	31.7	22.4
4/7/2014	17	0	0	77	35	0	0	40	0	0	0	7	5	5	1	29	55.9	32.3	22.3
11/7/2014	11	0	0	47	20	0	0	36	0	0	0	7	5	3	1	27	58.6	32.7	20
18/7/2014	6	0	0	41	16	0	0	31	0	0	0	3	3	1	1	21	60.9	33.2	20.4
25/7/2014	3	0	0	39	10	0	0	22	0	0	0	3	0	0	0	20	64.3	33.9	21
1/8/2014	1	0	0	29	4	0	0	20	0	0	0	3	1	0	0	17	62.6	31.7	21.9
8/8/2014	0	0	0	17	1	0	0	47	0	0	0	1	5	0	0	17	66.6	31.3	22.7
15/8/2014	13	0	0	15	17	5	1	55	0	0	0	1	5	0	0	15	66.6	32.3	22.9
23/8/2014	13	0	0	12	21	10	3	59	0	0	0	0	4	0	1	15	65.9	32.7	23
30/8/2014	16	0	0	3	39	26	16	73	0	0	0	0	2	1	2	15	64	35	24
6/9/2014	19	19	10	2	49	30	18	73	0	0	0	0	2	4	4	17	63.1	36	24.9
Total	518	267	120	615	317	111	60	636	85	85	60	229	129	92	55	405	863.5	487.5	336.4
Mean	34.53	17.8	8	41	21.13	7.4	4	42.4	5.7	5.7	4	15.27	8.6	6.13	3.67	27	57.6	32.5	22.4
LSD	12.26				6.15				4.09				0.74						

Table 4. Effect of planting spaces under A biotic and biotic environmental factors on major Okra pests and their in the field during 2014.

	Predators								R.H. (%)	Temperatures	
	Chrysoperlla carnea				Coccinellidae family						
	50		50	60	70	Control	50			Max.	Mani.
30/5/2014	2	2	2	3	1	1	0	1	43.7	30.7	19.6
6/6/2014	2	2	2	2	2	1	0	4	48.9	30.9	19.6
13/6/2014	3	2	2	3	3	2	1	6	49.9	31.4	20.7
20/6/2014	8	8	7	8	6	3	2	7	41.2	31.7	22.0
27/6/2014	9	8	7	10	11	6	5	13	51.3	31.7	22.4
4/7/2014	11	9	7	12	13	10	7	15	55.9	32.3	22.3
11/7/2014	13	10	9	14	17	14	9	19	58.6	32.7	20.0
18/7/2014	14	11	9	14	22	20	7	23	60.9	33.2	20.4
25/7/2014	19	16	12	21	24	21	9	25	64.3	33.9	21.0
1/8/2014	22	17	14	19	19	20	17	24	62.6	31.7	21.9
8/8/2014	26	20	17	22	14	16	17	20	66.6	31.3	22.7
15/8/2014	16	13	10	19	7	10	17	16	66.6	32.3	22.9
23/8/2014	11	8	5	14	5	4	11	10	65.9	32.7	23.0
30/8/2014	7	4	1	9	2	3	6	8	64	35.0	24.0
6/9/2014	5	4	1	6	1	0	2	1	63.1	36.0	24.9
Total	168	134	105	176	184	111	110	193	863.5	487.5	336.4
Mean	11.2	8.93	7	11.73	9.87	7.4	7.3	12.87	57.6	32.5	22.4
LSD	1.367				0.8						

Table 5. Effect of three planting spaces on Okra plant during season 2013 and 2014.

	2013						2014					
	Weights of (K. gm.)					Incr. over Cont.	Weights of (K. gm.)					Incr. over Cont.
	R1	R2	R3	Σ	$\bar{X}$		R1	R2	R3	Σ	$\bar{X}$	
Control	69.4	64.5	74.9	208.8	69.6 [a]	----	64.2	63.8	58.2	186.2	62.07 [a]	------
50 Cm.	70.8	65.6	75.3	211.7	70.6 [a]	13.96	67.3	64.5	76.7	208.5	69.5 [b]	11.97
60 Cm.	73.2	70.9	76.3	220.4	73.5 [a]	26.16	80.2	68.9	78.9	228.0	76.0 [b]	22.44
70 Cm.	73.9	78.7	70.00	222.6	74.2 [ab]	42.88	86.3	72.8	90.2	249.3	83.1 [c]	33.88
Σ	286.3	279.7	296.5	863.5			298	270	304	872		
L. S. D.	2.447						7.1					

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تأثير مسافات الزراعه تحت الظروف البيئيه من العوامل الحيويه وغير الحيويه على اهم أفات البامية والمفترسات المصاحبه لها خلال موسمى ٢٠١٣ و ٢٠١٤

عريان شحاتة منصور، إدريس عبدالوهاب سلام ، عفاف محمد صالح الروبي ، امل عبد الحليم عبد الله ، حسنية عبدالفتاح عفيفي

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – جيزة

أجريت دراسات حقلية في محطة البحوث الزراعية بقها محافظة القليوبية لدراسة تأثير مسافات الزراعة علي الاصابة الحشرية لبعض الافات الثاقبه الماصة وكذلك المفترسات المصاحبة لها علي محصول البامية خلال موسم زراعة البامية ٢٠١٣ &٢٠١٤ تحت تأثير العوامل الجوية من حرارة ورطوبة وكذلك المفترسات وأثر ذلك علي محصول البامية وأظهرت النتائج أن الاصابة بالآفات تزداد في المسافات الضيقة التى تشمل مساحه ٥٠ ، ٦٠سم عن المسافات الأوسع ٧٠سم و أثارت النتائج أن المفترسات تزداد بتواجد الآفات و كان أعلي إنتاج للمسافة ٧٠ سم يليها ٦٠ ثم ٥٠سم وكانت الزيادة عن الكنترول في مسافة ٧٠سم هى 42.88 & 33.88 خلال موسمى ٢٠١٣& ٢٠١٤.