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EFFECT OF SOME ABIOTIC FACTORS ON THE POPULATION FLUCTUATION OF SOME PESTS INFESTING OKRA PLANTS, WITH THE USING OF SOME COMPOUNDS IN THEIR CONTROLLING

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ABSTRACT

Field experiments were conducted at Qalyubiya Governorate during two successive seasons 2009 and 2010 to study the population fluctuation of some sap-sucking pests, *Bemisia tabaci* (Genn), *Thrips tabaci*, *Liriomyza trifolii* (Burgess) and *Tetranychus urtica* Koch on Okra plants, and controlling them by using of Azadirachtin (Neemazal 5% EC), the natural oil (Clove oil, 5% EC), Plant extract Damaseia 1% DC and Vertimec 1.8% EC. Also the effect of these compounds and pests on chlorophyll of the leaves during the two successive seasons. The mean number of *B. tabaci* firstly occurred on May 11th and increased gradually to reach the peak at August 31st during 2009 season. While the infestation rates of *T. tabaci*, *L. trifolii* and *T. urtica* increased gradually and reached its peak in 14th, 3rd and 10th August in 2009 season, respectively. The weather factors (maximum, minimum, mean temperature) and plant age had significant positive effect on population of *B. tabaci*, *T. tabaci*, *L. trifolii* and *T. urtica* while the relative humidity had negative significant effect on population of *B. tabaci*, *T. tabaci*, *L. trifolii* and *T. urticae* during the two studied seasons 2009 and 2010. The percentage of explained variance of the four tested factors during the two seasons were 91.50; 94.60% for *B. tabaci*, 88.10; 89.90% in case of *T. tabaci*, 73.40; 69.20% on *L. trifolii* and 82.10 and 84.70 % for *T. urticae* during the two seasons, respectively. The bioactivity of the four pesticides, the obtained results showed that Cloves oil, Damaseia and Neemazal seam to be closely similar in the order of mean reduction percentages of *T. tabaci*, *L. trifolii* and *T. urticae* (59.53, 59.33&60.30), (54.00, 55.90&55.10) and (76.20, 77.60&85.40, respectively) during the season 2009. On the other hand, Cloves oil caused 82.14 and 82.65 mortality of eggs and nymphal stages of whitefly followed by Damaseia (83.08&81.98) and Neemazal (75.50&73.30) during the two seasons. During 2009 season, the highest content of chlorophyll A in treated the okra leaves were obtained with using Cloves oil, Vertimec and Plant Extract Damaseia in which the leaves had significantly more chlorophyll content than in control. During 2010 seasons, the leaves sprayed with Cloves oil had the highest amount of chlorophyll content, while plants sprayed with Vertimec showed significantly lower chlorophyll content than in the control plants.

INTRODUCTION

Okra plants are liable to infestation by many phytophagous pests which the Sap-sucking ones such as the tomato whitefly *Bemisia tabaci* (Genn.), onion thrips *Thrips tabaci* (Lind), the red spider mite *Tetranychus urticae* Koch and *Liriomyza trifolii* (Burgess), they are considered the most common and important insect pests. In cases of heavy infestation, these pests cause serious damage to plants, leading to great reduction in the final yield (Basma, *et al.*, 2006). The cultivated area of okra estimated at 11526

feddans which produced about 66922 tons with an average of 6.0 tons /feddan, (Eid, 1985).

The whitefly, *Bemisia tabaci*, the two-spotted spider mite T. urticae were considered the main pests infesting okra plants during the plantation, and causes losses not only in quantity but also in quality of the yield. They feed on the plant sap and cause leaf drop and also may prevent the fruit maturity. Whiteflies also produce sticky honeydew, which cause crop damage (Perkins, 1983) and (Lentern Van and Noldus, 1984). Also, *T. urticae* is one the most important pests which it feeds on the plant sap and causing serious damage varying according to the degree of infestation (Abou-Zaid, 2003 and Park and Lee, 2007).

In the recent years, the environmental preferences of different vegetable crop pests have gained a significant importance in pest control research programs. However, some studies were carried out with regard to the effect of climatic factors in the population dynamics of damage, losses as well as controlling pests infesting vegetable crops which studied by many authors, (kumar and Sharma 1993; Kappoor *et al.*, 1997; El-Kawass, 2000 and Abou-Zaid 2003).

So, the present investigation was carried out to explain the changes in the population dynamics of some pests infesting okra plants, their relation with some weather factors and applying of some compounds against *T. tabaci*, *B. tabaci*, *L. trifolii* and *T. urticae* with reference to the yield.

MATERIALS AND METHODS

Population fluctuation of some sap-sucking pests infesting okra plants:

Experiments were carried out at the experimental farm of Kaha Research Station, Qalyubiya Governorate during the two successive seasons 2009 and 2010. An area of 1/4 feddan was sown of okra seeds (*Abelmoschus esculentus*. L), Eskandarani variety, on April 4th during 2009 and 2010 seasons. The planting area was divided into three plots.

After 37 days of sowing date and during the growth period (19 weeks), leaves from each replicate were kept in tightly closed paper bags and transferred to the laboratory where the observed studied pests were counted by aid of stereomicroscope. The total individual (nymphs + adults) of *T. tabaci*, (egg + nymphal stages) of *B. tabaci*, larvae of *L. trifolii* and (egg + immature + adults) of *T. urticae* were estimated by counting the total numbers/leaf on the underside surface of leaves.

Sample of 10 leaves/plot were collected from the chosen okra plants at the morning for counting the adults of whitefly before they tend to be more active, (Gameel, 1973).

The records of meteorological data, the daily mean of minimum, maximum temperature and daily mean relative humidity, were obtained from the meteorological records of Central Laboratory for Agriculture Climate, Agriculture Research Center at Dokki, (preventative Shebien El-Qanater). The daily records of these factors were recalculated to get the daily averages within one week before the sampling date.

Efficacy of some pesticides in reducing the population density of some sap-sucking pest on okra plants:

Field experiment was carried out throughout 2009 and 2010 seasons in Kaha Experimental Research Station, Qalyubiya Governorate. An area of about 525 m^2 cultivated by okra seeds (var. Eskandarani) on April, 4^{th}. The whole area was divided into 5 plots each of three replicates; all of them were arranged in a randomized complete block design.

Four compounds including; Azadirachtin 1500 ppm (Neemazal, 5% EC), the natural oil (Clove oil, 5% EC), Plant extract Damaseia 1% DC (*Ambrosia maritime*) and Vertimec 1.8% EC were used to evaluate them against the individuals of *T. tabaci* (nymphs + adults), *B. tabaci* (egg + nymphal stages), *L. trifolii* (nymphs) and *T. urticae* (egg +immature stages+ adults) infesting okra plants, (Table, 1).

Table (1): The environmentally safe compounds which used against different pests infesting okra plants.

Trade name	Active ingredient	Formulation	Scientific name	Concentration/ 100 lit. of water
Neemazal	5%	EC	*Azadirachta indica* A., Fam: Meliaceae	200
Cloves oil	5%	EC	*Syzyguim aromaticu*	250 ml
Damaseia	1%	DC	*Ambrosia maritime*	300 ml
Vertimec	1.8%	EC	Abemectin	40 ml

DC = Dissoluble concentration
EC = Emulsifiable concentration

For the efficacy of the tested compounds against the above mentioned pests, fifteen samples of 10 leaves /plot were collected before spraying and after 1, 3, 7, and 10 days.

Samples were transferred to the lab. and examined using stereomicroscope to recording the different stages of the pests.

Effects of applied treatments on chlorophyll content in okra leaves:

Leaf samples were taken after 1, 5 and 10 days of treatments for determination of chlorophyll content which estimated as chlorophyll unit using chlorophyll Meter Spad-502 (El-Lakwah *et al*, 2003).

Statistical analysis:

The statistical analysis (ANOVA, Simple correlation and partial regression) of the obtained data were performed by using SAS program (SAS Institute, 1988). Also the difference between means was conducted by using Duncan's multiple range tests in this program. The reduction percentages in the number of pests were calculated by using equation of Henderson and Tilton (1955).

RESULTES

Population dynamics of some sap-sucking pests infesting okra plants:

Data tabulated in Tables, 1&2 showed that, the rate of natural infestation of white fly *B. Tabaci*; *T. tabaci*; *L. trifolii* and *T. urticae* individuals to okra leaves during 2009 and 2010 seasons.

The plants of okra were liable for infestation with *B. tabaci* individuals throughout the whole period of plant growth that extended from the first week of May with averages of 4.70 &5.30 individuals/leaf during 2009 and 2010 seasons, respectively. The level of infestation increased gradually to reach its maximum (84.70 & 91.80 individuals/leaf) on August 31st. Then decreased to 79.80 &18.90 individuals by September 14th, during the two studied seasons, respectively, Tables 1&2.

Table (2): Population fluctuation of some economic pests infesting okra plants with the corresponding climatic factors during the plantation season 2009, at Qalyubiya Governorate.

Inspections date	Plant age (days)	Mean No. of pests/ leaf				Climatic factors			
		B. tabaci	*T. tabaci*	*L. trifolii*	*T. urtica*	Max. Temp.	Min. Temp.	Mean Temp.	Mean RH%
May, 11th	37	4.70	0.00	0.00	4.30	38.86	21.29	30.07	25.29
18th	44	7.90	0.00	0.00	6.50	38.57	19.71	29.14	30.36
25th	51	13.00	0.00	0.00	5.70	46.29	23.43	34.86	24.50
June, 1st	58	15.60	4.00	0.60	8.60	44.00	25.40	34.70	23.20
8th	65	19.30	1.00	0.40	10.60	35.06	22.80	28.93	63.79
15th	72	25.00	2.60	1.00	13.40	36.41	23.93	30.17	60.43
22nd	79	28.70	3.80	1.80	20.40	33.49	22.66	28.07	57.07
29th	86	32.30	3.20	1.20	18.90	35.59	22.93	29.26	55.93
July, 6th	93	39.70	5.70	1.60	21.00	34.37	22.37	28.37	57.71
13th	100	35.20	4.80	1.80	22.80	35.46	22.74	29.10	55.90
20th	107	36.20	3.40	1.50	17.30	35.11	23.54	29.33	57.50
27th	114	42.30	5.90	2.30	13.80	35.09	22.11	28.60	55.29
Aug., 3rd	121	38.40	7.60	2.80	25.70	34.64	21.89	28.26	57.36
10th	128	45.10	9.30	1.70	28.10	35.69	23.80	29.74	56.07
17th	135	58.60	13.20	1.10	23.40	32.91	19.94	26.29	55.79
24th	142	69.40	18.80	1.90	31.10	35.46	19.37	26.14	54.36
31st	149	84.70	16.30	1.20	28.60	34.80	21.80	28.63	53.21
Sept., 7th	156	83.20	21.20	1.30	25.90	29.77	21.40	28.10	53.14
14th	163	79.80	20.30	0.80	29.30	27.97	20.20	24.03	53.43
Total		759.10	141.10	23.00	355.40				
Mean± S.E.		39.95± 5.72	7.43± 1.62	1.21± 0.18	18.71± 1.98				

The first appearance of *T. tabaci* per leaf was 4.0&0.8 individuals/leaf on Jun 1st, then increased gradually to reach its peak on September 7th and August 24th (21.20 & 24.30 individuals/leaf), on both seasons 2009 and 2010, respectively. After that, the population decreased to reach (20.30& 5.80 individuals/leaf) at the end of the season, at the 2nd week of September, during two seasons, respectively.

Infestation of the plants by *L. trifolii* started with an average 0.60 & 0.40 individuals/leaf at the end of May. Then, the population increased gradually to reach its peak (2.80 & 2.30 individuals /leaf) on August 3rd and 24th, then decreased gradually by the time until the end of the growing seasons (0.80 &1.60 individuals/leaf), respectively.

Okra plants were infected with certain degree of *T. urticae* during 2009 seasons. As its first appearance occurred by an average 4.30 individuals/leaf on the 2nd week of May, while in the subsequent season the mite appears on 15th of June with an average 0.40 individuals/leaf. Then the population

increased gradually to reach its peak on August 24th and 10th (31.10 & 13.60 individuals/leaf) and slightly decreased by the end of the season to be 29.30 & 3.20 individuals/leaf for the two seasons, respectively (tables, 2&3).

Statistically, there is a significant difference in the population of *T. urticae* between the two seasons, where, population increased gradually with plant age during the two seasons, then decreased gradually to reach the lowest rate at the end of inspections. This result indicated clearly that young fresh plants are more suitable for *T. urticae*.

In this regard, Jaydeb *et al.*, (1999) determined the seasonal incidence of insect pests, yield loss, and to evaluate different okra varieties against insect pests and their management.

Table (3): Population fluctuation of some economic pests infesting okra plants with the corresponding climatic factors during the plantation season 2010, at Qalyubiya Governorate.

Inspections date	Plant age (days)	Mean No. of pests/ leaf				Climatic factors			
		B. tabaci	*T. tabaci*	*L. trifolii*	*T. urtica*	Max. Temp.	Min. Temp.	Mean Temp.	Mean RH%
May, 11th	37	5.30	0.00	0.00	0.00	17.00	31.00	24.00	44.00
18th	44	6.10	0.00	0.00	0.00	18.00	30.00	24.00	49.00
25th	51	15.30	0.00	0.40	0.00	17.00	30.00	23.50	45.00
June, 1st	58	18.60	0.80	0.50	0.00	18.00	29.00	23.50	48.00
8th	65	21.80	1.90	0.80	0.00	18.00	31.00	24.50	50.00
15th	72	25.60	3.20	0.90	0.40	20.00	32.00	26.00	46.00
22nd	79	29.20	4.10	1.20	2.50	21.00	34.00	27.50	47.00
29th	86	34.60	5.20	1.70	6.30	23.00	36.00	29.50	45.00
July, 6th	93	41.20	6.80	1.90	7.90	21.00	33.00	27.00	52.00
13th	100	34.00	3.20	1.50	8.20	23.00	36.00	29.50	50.00
20th	107	38.90	3.00	1.40	10.10	24.00	30.00	27.00	50.00
27th	114	45.10	6.90	1.20	10.90	31.00	21.00	26.00	53.00
Aug., 3rd	121	39.90	8.20	1.00	11.80	33.00	20.00	26.50	55.00
10th	128	48.20	11.10	1.10	13.60	32.00	20.00	26.00	53.00
17th	135	71.60	19.80	1.50	9.70	31.00	21.00	26.00	51.00
24th	142	84.90	24.30	2.30	9.20	30.00	18.00	24.00	54.00
31st	149	91.80	9.20	2.00	5.10	30.00	18.00	24.00	52.00
Sept., 7th	156	30.20	7.50	1.90	7.80	31.00	21.00	26.00	50.00
14th	163	18.90	5.80	1.60	3.20	25.00	21.00	23.00	50.00
Total		701.20	121.00	22.90	106.70				
Mean± S.E.		36.91± 5.49	6.37± 4.36	1.21± 4.36	5.62± 4.36				

The relation between some climatic factors and plant age on the population fluctuation of some sap-sucking pests infesting okra plants:

With regard to the effect of plant age on the occurrence of *B. tabaci* on okra, the simple correlation "r" indicated significant positive correlation between the plant age and the insect *B. tabaci* population during the two seasons, (r= 0.961 & 0.970) for 1st and 2nd seasons, respectively). The partial regression analysis for the effect of plant age on *B. tabaci* population revealed significant positive effect, (Table, 4).

Table (4): Effect of plant age and certain climatic factors on the population fluctuation of *B. tabaci* on okra plants at Qalyubiya Governorate.

Season	Factors	Simple correlation values			Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	b. reg.	S.E.	T	P	F	P	
2009	Plant age	0.961	0.183	0.033	9.60	0.148	5.64	0.01	39.85	0.01	91.5
	Mean max. temp.	0.704	0.734	0.680	2.94	0.328	2.08	0.03			
	Mean min. temp.	0.603	12.19	14.35	7.14	0.224	2.85	0.01			
	Mean RH%	-0.794	0.758	0.134	6.75	0.115	3.566	0.07			
2010	Plant age	0.970	0.99	0.274	10.16	0.207	4.18	0.01	63.62	0.01	94.6
	Mean max. temp.	0.627	-0.113	0.836	2.15	0.108	0.136	0.03			
	Mean min. temp.	0.624	-0.189	0.676	3.33	0.213	0.28	0.03			
	Mean RH%	-0.817	0.693	0.299	7.39	0.211	2.317	0.01			

Statistical analysis of the simple correlation indicated significant positive correlation between *B. tabaci* population and the mean of maximum temperature (r= 0.704 & 0.643) and also with the mean of minimum temperature (r= 0.603and 0.624).

The amount of variability that could be attributed to the combined effect of the tested plant age, weather factors on *B. tabaci* population were 91.50 and 94.60% for the two seasons 2009 and 2010, respectively.

These results are in the same direction of that obtained by Shalaby (2004) who found a significant correlation between weekly minimum temperature and the total of both adults and immature stages of *B. tabaci* population, while it was insignificant between weekly relative humidity and its population.

The simple correlation coefficient "r" indicated insignificant positive correlation between the plant age and the insect *T. tabaci* population during the two seasons, r = 0.917 and 0.936 during 2009 and 2010 seasons, respectively, (Table, 5).

Significant positive correlations between both daily mean maximum and minimum temperature and *T. tabaci* population were observed; while, significant negative one was recorded with mean relative humidity.

The obtained results revealed that, significant effect for the combined effect of the tested plant age, weather factors on the insect activity during the two seasons, as the amount of variability, attributed to the combined effect of the three factors on *T. tabaci* population was 88.10 and 89.90% during 2009and 2010 seasons, respectively, (Table, 5).

For *L. trifolii*, a significant positive correlation with the plant age and the insect population was detected during the two seasons (r = 0.570 and 0.635, respectively). While, insignificant positive correlation between both means of maximum & minimum temperature and the insect population during 2009 and 2010 seasons, (r= 0.462 and 0.181 and 0.400 & 0.203) (Table, 6).

A significant negative relation was noticed between mean of relative humidity and the above mentioned pests during the two seasons, respectively. For the partial regression analysis, significant positive effect

was recorded between the above mentioned pest populations and both of maximum and minimum temperature thorough 2009 and 2010 seasons. While, relative humidity had significant negative effect, (Tables, 4, 5 & 6).

Table (5): Effect of plant age and certain climatic factors on the population fluctuation of *T. tabaci* on okra plants at Qalyubiya Governorate.

Season	Factors	Simple correlation values			Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	b. reg.	S.E.	T	P	F	P	
2009	Plant age	0.917	0.038	0.035	9.71	0.112	9.332	0.01	27.5	0.01	88.1
	Mean max. temp.	0.643	0.663	0.735	3.11	0.248	3.090	0.02			
	Mean min. temp.	0.579	22.60	15.520	3.58	0.200	1.450	0.02			
	Mean RH%	-0.738	0.003	0.144	-2.99	0.153	3.262	0.03			
2010	Plant age	0.936	0.133	0.012	8.55	0.113	11.342	0.01	32.8	0. 01	89.9
	Mean max. temp.	0.500	0.015	0.016	4.55	0.059	4.044	0.01			
	Mean min. temp.	0.542	0.543	0.289	3.59	0.117	3.187	0.02			
	Mean RH%	-0.828	0.201	0.127	-2.75	0.116	3.150	0.03			

r: Simple correlation value. b. reg.: Partial regression coefficient value.

Table (6): Effect of plant age and certain climatic factors on the population fluctuation of *L. trifolii* on okra plants at Qalyubiya Governorate.

Season	Factors	Simple correlation values			Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	b. reg.	S.E.	T	P	F	P	
2009	Plant age	0.57	0.04	0.04	4.81	0.11	9.33	0.01	13.15	0.01	73.4
	Mean max. temp.	0.462	0.66	0.74	5.38	0.25	3.09	0.01			
	Mean min. temp.	0.181	22.60	15.52	2.49	0.20	1.45	0.02			
	Mean RH%	-0.659	0.00	0.14	-5.68	0.15	3.26	0.01			
2010	Plant age	0.635	0.13	0.01	11.27	0.11	11.34	0.01	12.61	0.001	69.2
	Mean max. temp.	0.400	0.02	0.02	7.15	0.06	4.04	0.01			
	Mean min. temp.	0.203	0.54	0.29	2.914	0.12	3.19	0.02			
	Mean RH%	-0.546	0.20	0.13	-2.99	0.12	3.15	0.02			

The average rate of changes in *L. trifolii* activity due to the changes in the combined effect of the tested factors (plant age, and weather factors), were 73.4 and 69.2 during 1st and 2nd seasons, respectively, (Table, 6). In this regard, Dimetry (1971) in Egypt stated that, the immature stages of *Liriomyza congesta* was determined mainly by temperature, 20°C appeared to be the optimum and at this temperature the maximum numbers of eggs were laid.

Shalaby (2004) found a significant correlation between minimum temperature and numbers of *L. trifolii;* while insignificant correlation was found between relative humidity and the population of *L. trifolii.*

The simple correlation coefficient "r" indicated that significant positive correlations between *T. urtica* population and both of the plant age (r = 0.913 and 0.910) and maximum temperature (r= 0.716 &0.624 during 1st and 2nd seasons, respectively). While minimum temperature had insignificant positive effect on the population (r= 0. 325& 0.351. A significant negative relation was noticed between the daily mean relative humidity and *T. urtica* population, (r=-0.683 & -0.789) during 2009 and 2010 seasons, respectively. The partial regression analysis for the effect of both maximum and minimum temperature on the *T. urtica* population revealed significant positive effect on both seasons; while, relative humidity had a significant positive effect during 2009, (Table, 7).

The amount of variability, attributed to the combined effect of the tested plant age, and weather factors on *T. urtica* population was 82.10 and 84.70 during 2009 and 2010 seasons, respectively, (Table, 7).

Table (7): Effect of plant age and certain climatic factors on the population fluctuation of *T.urticae* on okra Qalyubiya Governorate.

Season	Factors	Simple correlation values			Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	b. reg.	S.E.	T	P	F	P	
2009	Plant age	0.913	0.18	0.03	8.35	0.15	5.64	0.01	17.53	0.01	82..1
	Mean max. temp.	0.716	0.73	0.68	3.54	0.33	2.08	0.02			
	Mean min. temp.	0.325	12.19	14.35	14.35	0.22	2.85	0.01			
	Mean RH%	-0.683	0.76	0.13	4.51	0.12	3.57	0.02			
2010	Plant age	0.910	0.99	0.27	4.51	0.21	4.18	0.02	20.93	0.01	84.7
	Mean max. temp.	0.351	-0.11	0.84	5.97	0.11	0.14	0.01			
	Mean min. temp.	0.624	-0.19	0.68	1.40	0.21	0.28	0.01			
	Mean RH%	-0.789	0.69	0.30	4.90	0.21	2.32	0.02			

r: Simple correlation value. b. reg.: Partial regression coefficient value.

Efficacy of some pesticides in reducing the population density of some sap-sucking pests on okra plants:

Data concerning the various tested compounds; Neemazal 5% EC, Clove oil, 5% EC, Damaseia 1% DC and Vertimec 1.8% EC to evaluate their efficacy against the individuals of *T. tabaci* (nymphs + adults), *B. tabaci* (egg + nymphal stages), *L. trifolii* larvae and *T. urticae* (egg + immature stages+adults) infesting okra plants during the two seasons 2009 &2010 are shown in tables (8&9).

It is interest to notice that all tested compounds reached its maximum activety after three days of treatment then decreased gradually after 7 days post treatment. Data in table (8) showed that Vertimec exhibited the highest reduction percentages of whitefly, thrips, leafminer and *T. urticae*, during the

two seasons. Whereas, it eradicated (88.13&84.65%), (78.68&80.60%), (72.83&72.28%) and (87.95&85.14%) in population of the above mentioned pests at the same trend.

Table(8): Effect of various treatments against some pestes infesting okra plants at Qalyubiya Governorate during 2009 season.

Pests	Tested compounds	Pre-count/leaf	I.K. after one day	% Reduction after			% Residual effect	General reduction %
				3 days	7 days	10 days		
B. tabaci	Control	77.60						
	Cloves oil	69.40	70.05 c	96.30 a	84.70 a	77.50 a	86.17 a	82.14 b
	Damaseia		86.80 a	90.00 ab	80.30 b	75.20 bc	81.83 b	83.08 b
	Neemazal 5%EC		76.00 b	78.00 b	75.90 c	72.10 c	75.33 c	75.50 c
	Vertimec 1.8 %EC		90.00 a	98.00 a	86.20 a	78.30 b	87.50 a	88.13 a
	LSD		3.92	14.71	3.83	3.82	2.87	2.50
T. tabaci	Control	21.50						
	Cloves oil	18.80	58.70 b	67.70 b	51.40 c	60.30 b	59.80 b	59.53 b
	Damaseia		55.30 b	70.10 b	61.60 b	50.30 d	60.67 b	59.33 b
	Neemazal 5%EC		58.70 b	67.70 b	58.40 b	55.30 c	60.47 b	60.03 b
	Vertimec 1.8 %EC		65.10 a	90.10 a	84.40 a	75.10 a	83.20 a	78.68 a
	LSD		5.15	5.77	3.94	3.98	2.73	1.91
L. trifolii	Control	2.10						
	Cloves oil	1.90	50.40 c	63.20 b	51.20 c	51.20 b	55.20 c	54.00 b
	Damaseia		57.10 b	62.00 b	51.00 c	48.60 b	55.30 c	55.90. b
	Neemazal 5%EC		47.10 c	63.20 b	58.90 b	51.20 b	57.77 b	55.10 b
	Vertimec 1.8 %EC		80.10 a	78.00 a	74.30 a	58.90 a	70.40 a	72.83 a
	LSD		4.15	3.29	4.20	4.41	2.36	4.70
T. urtica	Control	20.15						
	Cloves oil	31.10	58.20 c	92.50 a	79.40 c	74.70 a	82.20 bc	76.20 b
	Damaseia		67.60 b	81.70 b	83.80 b	77.30 a	80.93 c	77.60 b
	Neemazal 5%EC		49.30 b	90.30 a	85.30 ab	80.60 a	85.40 ab	85.40 a
	Vertimec 1.8 %EC		93.50 a	92.60 a	88.20 a	77.50 a	86.10 a	87.95 a
	LSD		3.34	3.19	3.08	12.42	3.26	5.80

The means with the same letters at the same column for each pest are not significantly different at 0.05% level.
I.K. =Initial Kill

The obtained results showed that, Cloves oil, Damaseia and Neemazal seam to be closely similar in the order of mean reduction percentages of *T. tabaci*, *L. trifolii* and *T. urticae* (59.53, 59.33 &60.30), (54.00,55.90&55.10) and (76.20, 77.60 & 85.40, respectively) during the season 2009. On the other hand, Cloves oil caused 82.14 and 82.65 mortality

of eggs and nymphal stages of whitefly followed by Damaseia (83.08&81.98) and Neemazal (75.50&73.30) during the two seasons.

Regarding the initial and residual activates, it is clear from tables (8 & 9) that also Vertimec exhibited the highest initial and residual effect during the two seasons (2009&2010), while the lowest initial kill was obtained with Cloves oil on whitefly B. tabaci 70.05 and 73.00 at the same trend.

The residual activity could be arranged in descending orders as follows: 87.50 > 86.17 > 81.83 > 75.33 for Vertimec, Cloves oil, Damaseia and Neemazal on whitefly. While, on *T. urticae* obtained results were 86.10 > 85.40 > 82.20 > 80.93 for Vertimec, Neemazal, Cloves oil and Damaseia, respectively. (Tables 8 and 9).

The obtained data during 2010 season showed the same trend of initial activity for the tested compounds on whitefly and the two-spider mite, while it is differ on thrips and leafminers. (Table, 9).

Table(9): Effect of various treatments against some pestes infesting okra plants at Qalyubiya Governorate during 2010 season .

Pests	Tested compounds	Pre-count/ leaf	I.K. after one day	% Reduction after			% Residual effect	General reduction %
				3 days	7 days	10 days		
B. tabaci	Control	77.60						
	Cloves oil	69.40	73.00 d	98.80 a	89.60 a	96.30 a	85.87 a	82.65 a
	Damaseia		82.50 b	89.10 b	80.70 b	75.60 b	81.80 ab	81.98 a
	Neemazal 5%EC		76.20 c	76.60 c	71.70 c	67.50 c	71.93 c	73.00 b
	Vertimec 1.8 % EC		90.50 a	90.60 b	86.60 ab	78.80 b	78.80 b	84.65 a
	LSD		1.53	2.55	5.99	1.65	4.55	4.24
T. tabaci	Control	21.50						
	Cloves oil	18.80	56.00 d	71.80 b	57.50 c	53.60 a	60.97 b	59.73 b
	Damaseia		82.50 a	89.10 a	80.70 b	75.60 a	81.80 ab	81.98 a
	Neemazal 5%EC		60.00 c	65.80 c	59.40 c	55.50 a	60.23 b	60.17 b
	Vertimec 1.8 % EC		69.20 b	91.90 a	84.50 a	76.80 a	84.40 a	80.60 a
	LSD		2.58	3.84	3.05	29.40	3.65	3.36
L. trifolii	Control	2.10						
	Cloves oil	1.90	57.90 b	68.40 b	58.90 b	51.50 b	59.60 b	59.18 b
	Damaseia		51.50 c	68.50 b	52.00 c	48.50 b	56.33 c	55.13 c
	Neemazal 5%EC		48.30 d	52.70 c	48.00 d	48.50 b	49.73 d	49.38 d
	Vertimec 1.8 %EC		83.80 a	71.60 a	67.10 a	66.60 a	68.43 a	72.28 a
	LSD		2.90	2.63	1.85	3.02	2.47	2.94
T. urtica	Control	20.15						
	Cloves oil	31.10	50.00 c	91.40 a	79.80 b	77.40 b	82.87 b	74.65 b
	Damaseia		66.90 b	80.50 b	80.80 b	74.00 b	78.43 c	75.55 b
	Neemazal 5%EC		45.70 d	90.30 a	82.90 ab	81.90 a	85.03 a	75.20 b
	Vertimec 1.8 %EC		85.90 a	90.30 b	86.90 a	77.40 b	84.87 ab	85.13 b
	LSD		3.46	1.49	4.22	3.53	2.15	2.53

The means with the same letters at the same column for each pest are not significantly different at 0.05% level.
I.K. =Initial Kill

Effects of applied treatments on chlorophyll content in okra leaves:

By analyzing the chlorophyll A content in leaves of okra plant after spraying with Neemazal 5% EC, Clove oil, 5% EC, Damaseia 1% DC and Vertimec 1.8% EC, data in table (10) revealed that, there were no significant different in chlorophyll of the treated leaves with Clove oil and Neemazal as the corresponding amounts of chlorophyll A were 47.80 and 47.00 mg/100gm fresh wt., while the plants which kept free from any aplications had the lowest content (43.20 mg/100gm fresh wt.) in 2009 season. Also, there was a significant difference between the chlorophyll A content in leaves of the treated okra plants during 2010 season, as the leaves sprayed with Cloves oil hade the highest amount (50.60 mg/100gm fresh wt.) followed by those treated with Damaseia and Neemazal when compared with the leaves obtained from the control plots. Regarding chlorophyll A content in plants sprayed with Vertimec, they showed significantly lower chlorophyll A content than that of the control.

Table (10): Effect of spraying of some compounds on chlorophyll A content in leaves of okra plants (mg/100gm fresh wt.) during 2009 and 1010 seasons.

Season / Treatments	2009	2010
Cloves oil *(Syzygium aromaticum)*	47.80 a	50.60 a
Plant Extract damaseia	45.30 ab	45.10 b
Neemazal 5%EC	47.00 a	46.70 b
Vertimec 1.8 %EC	45.30 ab	42.70 c
Control	43.20 b	46.30 b
L.S.D.	3.42	1.76

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تأثير بعض العوا مل الغير حيوية على التذبذب العددى لبعض الآفات على نباتات البامية مع استخدام بعض المركبات فى مكافحتها

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أجريت تجربة حقلية في محافظة القليوبيه خلال موسمين متتالبين ٢٠٠٩، ٢٠١٠ لدراسة التذبذب العددي لبعض الآفات على نباتات الباميه (صنف اسكندرانى) ، وتأثير العوامل الجوية (متوسط درجة الحرارة العظمي والصغري ومتوسط الرطوبة النسبية) وعمر النبات علي بعض الافات (الذبابه البيضاء، تربس البصل ، صانعات الانفاق و العنكبون الاحمر ذو البقعتين) وكذلك مكافحتها ببعض المركبات ودراسه تأثير هذه المركبات على محتوى الاوراق من الكلوروفيل (أ). واظهرت النتائج ان بدايه الاصابه بالذبابه البيضاء على اوراق الباميه كانت فى ١١ مايو خلال موسمى الدراسه ، حيث اخذ التعداد فى الزياده التدريجيه مع تقدم عمر النبات حتى وصل الى ذروته (٨٤.٧٠ و ٩١.٨٠) فى اواخر اغسطس فى كلا الموسمين. اما بالنسبه لتربس البصل ، صانعات الانفاق و العنكبوت الاحمر العادى ذوالبقعتين فقد بدأت الاصابه بعد ثلاثه اسابيع من الفحص واخذت الكثافه العدديه فى الازدياد حتى وصلت الى ذروتها فى ١٤، ٣ و ١٠ اغسطس خلال ٢٠٠٩ وبعد ذلك اخذت فى الانخفاض حتى نهايه موسمى الدراسه.

اما بالنسبه لتأثير عمر النبات و بعض العوامل الجوية (الحرارة الكبرى والصغرى والرطوبه النسبية) على التذبذب العددى لهذه الآفات التى تصيب نباتات البامية فقد وجد ان العوامل المناخيه وكذلك عمر النبات كان لهما تأثير ايجابى ومعنوى على الآفات محل الدراسه ، بينما كان تأثير الرطوبه النسبية سلبى ومعنوى على هذه الآفات خلال عامى ٢٠٠٩ و٢٠١٠. حيث اوضحت الدراسه ان الكثافه العدديه لهذه الآفات قد أثرت في التعداد بنسبة ٩١.٥ و ٩٤.٦ % للذبابه البيضاء ، ٨٨.١ و ٨٩.٩ % لتربس البصل ، ٧٣.٤ و ٦٩.٢ % على صانعات الانفاق و ٧٣.٤ و ٦٩.٢% للعنكبوت الاحمر ذو البقعتين للموسمين ٢٠٠٩ و ٢٠١٠ على الترتيب.

ادى تقييم بعض المركبات لخفض تعداد الآفات محل الدراسه على الباميه حيث اعطى Vertimec اعلى نسبه اياده بينما اعطى الزيت النباتى Cloves أقل نسبه خفض ضد الذبابه البيضاء و مركب Damaseia الى اقل نسبه خفض فى تعداد حشرتى تربس البصل وصانعات الانفاق، فى حين ان Neemazal أعطى أقل نسبه خفض للحلم العنكبوتى خلال الدراسه. إحتوت الاوراق المعامله بمركبات Cloves، Vertimec و Damaseia الى زياده محتوى اوراق الباميه من الكلوروفيل (أ) مقارنه بالنباتات الغير معامله خلال موسم ٢٠٠٩. بينما الاوراق المعامله بزيت Cloves احتوت على اعلى كميه من الكلوروفيل (أ) فى موسم ٢٠١٠ وأحتوت الاوراق المعامله بمركب Vertimec أقل محتوى من الكلوروفيل (أ) مقارنه بالنباتات الغير معامله.

قام بتحكيم البحث

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