

MONITORING OF GREEN STINK BUG (*NEZARA VIRIDULA* L.) POPULATION IN MAIZE FIELDS AND ITS CONTROL BY SOME MISCELLANEOUS INSECTICIDES IN SHARKIA GOVERNORATE

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ABSTRACT

Monitoring of insect population in fields is one of the essential demands for the integrated pest management programs. Therefore, the experiments were carried out at EL-Zarkia village, Zagazig district, Sharkia Governorate to monitor the population of green stink bug *Nezara viridula* L. infesting two varieties of maize (*Zea mays* L.) for two consecutive growing seasons 2008 and 2009. The study aimed to investigate the effect of maize sowing date, varieties (Triple hybrid and Balady), cardinal directions and adjacent crops on *N. viridula* infestation. Also, the control of this pest using some conventional insecticides comparing with certain alternatives was also studied and the results could be summarized as: 1. Triple hybrid variety was more suitable for the insect than the Balady variety. 2. The early sown plants were more suitable to infest with the pest than the late ones. 3. The population of insect existed in lower numbers in the south direction of the field than the other three sides. 4. The insect population existed in higher numbers at the edge and the middle area of the field. 5. The maize plants when sown alone harbored the reliable occurrence of the insect. 6. Dursban, Sumithion and Kendo showed a high efficiency against nymphs and adults while Detergent was the least effective. Bio-neem took intermediate position. 7. Plots treated with Sumithion, Dursban and Marshal produced the highest yield followed by that of Marsal, Aphox and Malathiomix. Generally, these results are important in the integrated pest management programs of this pest in maize fields to direct the suitable control measure to the infested spots, thereby, the environmental hazards and costs are minimized.

Keywords: Maize (*Zea mays*), monitoring, *Nezara viridula* L., time of sowing, cardinal directions, horizontal distribution, adjacent crops, control.

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INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crop in Egypt and in most countries of the world. It is used in animal and poultry feeding and also in several industries. Under Egyptian field conditions, maize plants are subjected to attack by several insect pests. Among these serious pests is the green stink bug, *Nezara viridula* L. during vegetative and heading stages. The appearance of this pest on maize plants in relatively high levels, occurred during July to September (Boarae *et al.*, 1993). Field based monitoring involves estimate of pest infestation levels within crop and/or aerial population above and around the crop (Dent, 1991).

However, field based monitoring strategy aims to follow up the progress of population development up to a pre-defined number of insects or action threshold and the information gained are used to make decisions about the implementations of control measures (Dent, 1991). Monitoring strategies can be classified as a survey, fixed position and field based monitoring. A survey may be carried out to study the distribution and abundance of pest species. Fixed

position monitoring is usually use samples of insects over a number of seasons and years. This method also can be used to identify the pest insects present at given location, and to compare relative changes in pest numbers between seasons. (Panizzi, 2000) studied the feeding behavior of *N. viridula* on several uncultivated-wild, and on cultivated plants, which are less preferred, the pest changes its feeding behavior from a typical seed/fruit sucking habit to leaf / stem feeding, with consequences for its nymphal and adult performance. Other seed suckers, also change their feeding behavior from seeds to vegetative tissues (leaf, stems) when feeding on less preferred food plants. Direct damage occurs when *N. viridula* feeds on the kernel spot of pecan (Mitchell and Manu, 1969), more than one feeding puncture causes of the kernel to be downgraded (Hawaii Board of Agriculture, 1991). Control of this pest was based largely on the intensive use of carbamates, organophosphorus and some pyrethroids (Panizzi *et al.*, 2000). The aim of the present work was to study the following points:

1. Effect of maize varieties, cardinal directions (north, south, east and west), horizontal distribution (edge, middle and

center), adjacent crops and sowing dates on the population of *N. viridula*.

2. Chemical control of the bugs using some conventional insecticides and their alternatives.

MATERIALS AND METHODS

These experiments were conducted at EL-Zarkia village, Zagazig district, Sharkia Governorate during 2008 and 2009 seasons as follows:

Effect of Maize Varieties

Two varieties of maize were tested (Triple hybrid and Balady varieties). An area of about one feddan was sown with each variety at June 10th in the two seasons to study the effect of variety on the population density of the insect.

Effect of Sowing Dates

Triple hybrid and Balady varieties were sown at June 10th and July 10th in the first season as well at June 7th and July 7th in the second season to compare the effect of sowing dates. All plants received the usual recommended agricultural practices through the whole seasons. Samples of 10 plants from each plot for each variety were chosen randomly and

examined at weekly interval during the whole growing season to count the population density of insect and recorded.

Effect of Cardinal Directions (North, South, East and West)

An area of about three feddans cultivated with Triple hybrid variety was chosen for studying the effect of four cardinal sides (north, south, east and west) on the insect population density. All plants received the usual recommended agricultural practices without any insecticide application through the whole season and divided into four plots (replicates). To monitor bug population in the field, weekly samples of 20 plants were chosen at random from each plot and number of bugs were counted directly in the field.

Effect of Horizontal Distribution (Edge, Middle and Center)

The previous area of Triple hybrid (three feddans) was divided into three areas beginning from the outer edge of the field going towards the center (edge, middle and center) at four cardinal directions (Abdallah *et al.*, 2003), each consists of three replicates. Nymphs and adults of the bug were weekly counted on the plant

samples of each block during the whole growing period to study the horizontal distribution of the bug.

Effect of Adjacent Crops on Maize Infestation with the Bug

To monitor bug population in the maize field adjacent cabbage or cucumber, 3 areas of quarter feddan each cultivated with maize were chosen. One of which was adjacent cabbage and the second area was adjacent cucumber and the third area was adjacent the rest of maize field. Weekly samples of 20 plants were chosen at random from each of the experimental areas and examined directly in the field to record the numbers of bugs.

Evaluation of some Miscellaneous Insecticides

To evaluate the efficiency of certain compounds against this insect, an area of half feddan cultivated with maize (Triple hybrid) was chosen and divided into 11 experimental blocks, each block was divided to plots of $6 \times 7 \text{m}^2$ each. Three plots were chosen randomly for each tested compound and sprayed one time using knapsack sprayer with one nozzle (Mode cp₃) with 200 liters of water per feddan.

The tested insecticides and their rates of application per feddan were as follows:

1. Dursban 48% E.C. (chlorpyrifos) at the rate of 480 g.
2. Kendo 5% E.C. (fenpyroximate) at the rate of 375 ml.
3. Sumithion 48% E.C. (fenitrothion) at the rate of 900 ml.
4. Aphox 50% D.G. (Pirimicarb) at the rate of 300 g.
5. Malathion 57% E.C. (malathiomix) at the rate of 1.5 litre.
6. Marsal 57% E.C. (malathion) at the rate 1.5 litre.
7. Marshal 25% W.P. (carbosulfan) at the rate of 600 g.
8. Bio-neem (bio-neem) at the rate of 600 ml.
9. Detergent (detergent) at the rate of 4.5 litre.
10. Chemisol (mineral oil, KZ) at the rate of 1.5 litre.

Counts of nymphs and adults of the bug were carried out immediately before spray (pre-count) and 2, 5, 8, 11 and 14 days post - treatment. Samples of 10 plants/replicate were examined randomly in the field. Post-treatment reductions were calculated according to Henderson and Telton (1955) where initial effect = percent reduction after two days from spray and residual effect = mean of percent reduction at (5+8+11 and 14 days) from spray while general effect = mean of percent reduction at (2+5+ 8+11+ 14 days) from spray. Analysis of

variance and (F-test) was computed and the differences between means were tested by Duncan's multiple range tests (1955).

Determining the Yield

At the end of each growing season, the yield was determined for each treatment and expressed as Kg / (plot = 1/100 Feddan).

RESULTS AND DISCUSSION

Relative Susceptibility of Maize Cultivars to Infestation

The results presented in Table 1 show clearly that the population density of the bug was low on the Balady cultivar, while it was increased on the Triple hybrid cultivar in both seasons. The population density of the bug infesting Balady and Triple hybrid varieties recorded the highest numbers in the 1st season than the 2nd season. On the other hand, the peak of insect population was occurred at the 3rd week of August for Triple hybrid variety and at the 2nd week of August for Balady variety in both seasons, respectively.

In generally, Triple hybrid variety was more susceptible to infest with the bug than the Balady variety.

Effect of Sowing Date on Infestation Rate

Data in Table 2 reveal that earlier sowing date of the Triple hybrid was more suitable to infestation with the insects than the late one. The total numbers of insects at the end of both seasons 2008 and 2009 at early sowing date were 187 and 132 individuals/ 10 plants, while it was 118 and 99 individuals /10 plants for late sowing date, respectively. Also, in 2008 season the plants of the late sowing date were started to be infested by the bug at the 1st week of August (after 28 days from sowing) while the early sown plants were started to be infested at the 2nd week of July (after 35 days from sowing). These results indicate that the early sown plants were more susceptible to infest with the bug than the late ones. Therefore, the procedure of the pest control should be taken in consideration early for the earlier plantations when the population of the pest reaches up to the economic threshold level. The results indicated that, later sown maize was least preferable to bug infestation than maize plants sown early. Peaks of the bug density was coincident with the favorable weather conditions on the second

Table 1. Numbers of *Nezara viridula* L. (nymphs and adults) per 10 infest in 10 plants of maize at two sowing dates

Sampling date	2008			2009		
	Balady	Triple hybrid	L.S.D. 0.05	Balady	Triple hybrid	L.S.D. 0.05
July, 1 st week	0.0	0.0	0.0	0.0	0.0	0.0
July, 2 nd week	7	5	0.358	2	4	0.227
July, 3 rd week	10	12	0.864	5	7	0.358
July, 4 th week	15	25	1.252	9	10	0.453
Aug., 1 st week	28	31	2.157	13	18	0.863
Aug., 2 nd week	24	38	2.267	19	25	1.611
Aug., 3 rd week	18	44	1.792	16	32	0.863
Aug., 4 th week	12	33	1.957	10	22	0.802
Sep., 1 st week	0.0	17	0.802	5	14	0.506
Sep., 2 nd week	0.0	0.0	0.0	0.0	0.0	0.0
Sep., 3 rd week	0.0	0.0	0.0	0.0	0.0	0.0
Total	114	205	10.264	79	132	3.584

Table 2. Numbers of *Nezara viridula* L. (nymphs and adults) per 10 plants infesting Triple hybridcult cultivar at two sowing dates

Sampling date	2008			2009		
	10/6	10/7	L.S.D. 0.05	10/6	10/7	L.S.D. 0.05
July, 1 st week	0.0	0.0	0.16	0.0	0.0	0.0
July, 2 nd week	4	0.0	0.85	3	0.0	0.16
July, 3 rd week	9	0.0	0.48	5	0.0	0.16
July, 4 th week	15	0.0	0.58	9	0.0	0.16
Aug., 1 st week	24	8	0.45	15	6	0.36
Aug., 2 nd week	38	10	0.94	20	8	1.64
Aug., 3 rd week	42	19	1.51	24	15	0.36
Aug., 4 th week	36	28	0.36	37	27	1.13
Sep., 1 st week	19	21	0.32	19	20	1.13
Sep., 2 nd week	0.0	15	0.48	0.0	14	0.32
Sep., 3 rd week	0.0	0.0	0.0	0.0	9	0.32
Total	187	118	2.27	132	99	2.27

half of August and started to decrease sharply by the first week of September.

Effect of Cardinal Directions (North, South, East and West)

The weekly means of bugs at the four directions of the field cultivated with Triple hybrid cultivar during 2008 and 2009 seasons are given in Table 3. The insects appeared with lower numbers in all directions of the field then the population increased to reach maximum at the second and the third weeks of August then decreased again to reach zero at the end of season. Based on the seasonal mean of bugs, the data indicated that in the 1st and 2nd seasons, the highest infestation was occurred in the north side with a totals of 236 and 173 individuals /10 plants, respectively. These results are in contradiction with those obtained by Greene and Capps (2003), who found that predominant phytophagous (plant feeding) including *N. viridula* was present in the south east and much of the mid-south. These results may be due to weather conditions mainly temperature, sun shine and wind speed which play an important role on the activity of bug where is interrupted by high

temperature. This phenomena agree with those obtained by Karam *et al.* (1996) who found that population of the pubescent rose chafer, *Tropinota squalida* Scop. was affected with the weather conditions especially temperature and rainfall.

Horizontal Distribution of Bugs Infestation

In the experimental area of the four cardinal points (north, south, east and west), the sampling area of each direction was extended for a depth of 30 meters which divided to three bands of 10 meters each. The outer is called edge, the second is the middle, and the third is the center. The mean numbers of bugs (nymphs and adults) existed in edge, middle and center at the four cardinal points of the field during 2008 and 2009 seasons are recorded in the Table 4. In the 1st and 2nd seasons, the bug populations recorded the highest numbers at the outer area (edge) then the middle area followed by the interior area (center) which differed significantly from each other.

Field observations showed that *N. viridula* is a diurnal insect. Therefore, its flight activity seemed to be markedly affected by sunshine direction.

Table 3. Numbers of *N. viridula* L. (nymphs and adults)/10 plants infesting maize plants at four cardinal directions

Sampling date	2008						2009							
	South	West	North	East	Total	Mean	L.S.D	South	West	North	East	Total	Mean	L.S.D
	No.					*05		No.					*05	
July, 1 st week	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
July, 2 nd week	5	7	8	7	27	6.75	1.63	9	2	10	6	22	2.2	1.12
July, 3 rd week	10	14	16	9	49	12.3	2.49	6	8	10	7	31	3.1	0.94
July, 4 th week	14	21	23	11	69	17.3	3.39	8	12	12	10	42	4.2	1.57
Aug., 1 st week	24	32	36	20	112	28	4.52	8	22	28	14	72	7.2	1.49
Aug., 2 nd week	22	32	40	28	122	30.5	3.99	10	26	32	16	84	8.4	1.85
Aug., 3 rd week	20	28	44	24	116	29	3.65	14	24	40	18	96	9.6	1.85
Aug., 4 th week	17	30	40	22	109	27.3	4.42	12	32	17	21	82	8.2	1.85
Sep., 1 st week	10	21	29	13	73	18.3	1.88	10	25	24	12	71	7.1	2.44
Sep., 2 nd week	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.32
Total	122	185	236	134	677	169.3	10.0	72	151	173	104	500	125	4.32

Table 4. Horizontal distribution of *Nezara viridula* L. (nymphs and adults) numbers/10 plants infesting maize plants (Triple hybrid cultivar)

Sampling date	2008				2009			
	Edge	Middle	Center	L.S.D ₀₋₀₅	Edge	Middle	Center	L.S.D ₀₋₀₅
July, 1 st week	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July, 2 nd week	5	4	5	0.283	6	2	3	0.2
July, 3 rd week	9	6	6	0.4	8	7	7	0.346
July, 4 th week	19	8	9	0.663	10	9	8	0.4
Aug., 1 st week	24	12	10	0.663	14	13	10	0.4
Aug., 2 nd week	36	15	12	1.199	17	15	12	0.326
Aug., 3 rd week	40	17	10	0.958	23	17	13	0.346
Aug., 4 th week	32	11	8	1.199	19	14	10	0.346
Sep., 1 st week	0.0	0.0	3	0.155	15	5	4	0.346
Sep., 2 nd week	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	165	73	63	6.824	112	82	67	3.461

Effect of the Adjacent Crop on the Rate of Maize Plant Infestation with Bugs

Results in Table 5 show the populations of bugs infesting maize plants in three fields of maize (Triple hybrid cultivar). Maize fields adjacent cabbage and cucumber fields significantly less infested with the bug than the maize plants sown alone (far from cabbage or cucumber) which exhibited a high level of infestation with the bug recording total numbers of 171 and 124 individuals/20 plants at the end of 2008 and 2009 seasons, respectively. Maize plants adjacent cucumber recorded 83 and 66 bugs in both seasons, respectively. The fields of maize adjacent cabbage recorded the least level of infestation in both season (Table 5).

Efficiency of the Tested Insecticides against the Bugs and their Effects on the Yield

Data presented in Tables 6 and 7 indicate the efficacy of some insecticides belonging to different chemical groups against the tested insect. Based on the reduction percentages the all tested insecticides have a good effect against the infestation of *N. viridula* except Detergent, Mineral oil and Marsal were less effective. The percentage

of reduction as a general effect ranged between 70.22 for Detergent and 93.81 for Dursban of both seasons. On the other hand, Dursban, Sumithion (organophosphorus compounds) and Kendo (pyrethroid compound) showed the highest effect recording 91.85, 91.86 and 90.22 & 93.81, 91.69 and 89.98% reductions at the 1st and 2nd seasons, respectively. It was noticed that there were significant differences between all tested insecticides reduced significantly the population of insects comparing with the control. Three of the tested insecticide namely, Dursban, Kendo, Sumithion recorded 100% mortality as initial effect in both seasons and approximately more than 90% reduction as means of residual effect in both seasons. So, these three compounds could be recommend for the control of this pest on maize plants in this region. On contrary, Detergent exhibited lowest efficiency.

The present results are in agreement with those of Greene and Capps(2003) who reported that the pyrethroid insecticide (bythroid) when applied alone provided good control of *N. viridula* (97% cumulative mortality), Bidrin and methyl parathion provided an excellent control (94-100% cumulative mortality) of adults and nymphs of

Table 5. Numbers of *Nezara viridula* L. (nymphs and adults)/20 plants infesting Triple hybrid cultivar adjacent cabbage or cucumber fields

Sampling dates	2008				2009			
	Maize alone	Maize adjacent cucumber	Maize adjacent cabbage	L.S.D. _{0.05}	Maize alone	Maize adjacent cucumber	Maize adjacent cabbage	L.S.D. _{0.05}
July, 1 st week	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July, 2 nd week	4	5	0.0	0.26	2	1	0.0	0.163
July, 3 rd week	10	6	3	0.432	8	4	0.0	0.326
July, 4 th week	17	10	6	0.4	13	7	3	0.4
Aug., 1 st week	24	15	8	1.335	17	11	6	0.4
Aug., 2 nd week	32	22	10	1.31	25	20	8	1.195
Aug., 3 rd week	41	15	6	1.31	29	12	5	1.112
Aug., 4 th week	28	10	4	1.112	19	9	3	0.663
Sep., 1 st week	15	0.0	0.0	0.231	11	2	0.0	0.163
Sep., 2 nd week	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	171	83	37	6.824	124	66	25	5.286

Table 6. Total numbers (per 10 plants) and %reductions of *Nezara viridula* L. (adults and nymphs) infesting maize plants as influenced by the tested compounds during 2008 season

Compounds	Rate/Fed.	Pre-count	Initial effect		Mean of residual effect		General effect		Yield Kg/plot (1/100 Fed)
			No.	%R.	No.	%R.	No.	%R.	
Dursban	480 g.	28	0.0	100 a	3.5	89.81 a	2.8	91.85 a	28.75 a
Kendo	375ml.	30	0.0	100 a	4.5	87.77ab	3.6	90.22ab	27.89abc
Sumithion	900ml.	30	0.0	100 a	3.75	89.82 a	3	91.86 a	28.1 ab
Aphox	300g.	31	4.0	88.02c	5.0	86.74ab	4.3	87.0 cd	26.38bcd
Malathion	1.5L.	32	4.0	88.39c	5.5	85.87ab	5.2	86.37 d	26.9abcd
Marsal	1.5L.	28	6.0	76.79e	7.75	77.13bc	7.4	77.06 f	25.4 de
Marshal	600g.	29	1.0	96.8 b	3.75	89.47 a	3.2	90.94 a	28.47 ab
Bio-neem	600ML	32	7.0	79.69d	7.0	81.83 c	7	81.4 e	25.7 cde
Detergent	4.5L.	31	10.0	70.05g	11.0	70.63 c	10.8	70.51 g	24.02 e
Mineral oil	1.5L.	29	8.0	74.38 f	8.25	76.43bc	8.2	76.02 f	24.85 e
Control	Water	26	28.0		31.25		30.6		20.64 f
L.S.D. _{0.05}				1.843		10.645		2.015	2.015

By Duncan's Multiple Range Test, reduction percentages followed by the same letters are not significant at 5 % level of probability. No.=Number of insect, %R= Percent reduction in population

Table 7. Total numbers (per 10 plants) and %reductions of *Nezara viridula* L. (adults and nymphs) infesting maize plants as influenced by the tested compounds during 2009 season

Compounds	Rate/ Fed.	Pre- Initial effect		Mean of residual effect		General effect		Yield Kg/plot (1/100 Fed)	
		No.	%R.	No.	%R.	No.	%R.		
Dursban	480 g.	29	0.0	100 a	3	92.26 a	2.4	93.81a	29.75 a
Kendo	375ml.	24	0.0	100 a	4	87.48 b	3.2	89.98b	29.06 ab
Sumithion	900ml.	24	0.0	100 a	3.5	89.61 ab	2.8	91.69b	29.9 a
Aphox	300g.	26	4	88.85c	5	85.1abc	4.8	85.25c	26.9 c
Malathiomix	1.5L.	23	3	80b	3.75	85.83abc	3.6	86.27c	26.45 cd
Marsal	1.5L.	25	6	77.92e	6.25	80.66 a	6.2	80.11d	27.18 c
Marshal	600g.	29	0.0	100 a	3	92.24 bc	2.4	93.79a	29.17 ab
Bio-neem	600ml.	27	5	82.96d	6.75	80.65 c	6.4	81.11d	25.85 cd
Detergent	4.5L.	26	10	64.62g	9.5	71.62 bc	9.6	70.22f	23.12 e
mineral oil	1.5L.	25	7	74.24f	7.25	77.59 bc	7.2	76.92e	24.74 de
Control	Water	23	25		29.25		28.4		19.62 f
L.S.D. _{0.05}				1.639		12.175		2.015	1.771

By Duncan's Multiple Range Test, reduction percentages followed by the same letters are not significant at 5 % level of probability. No.=Number of insect, %R= Percent reduction in population

the bug while chlorpyrifos caused 91% cumulative mortality. Baptista *et al.* (1995) found that the pyrethroid insecticide lambda-cyhalothrin acted more rapidly than monocrotophos against *N. viridula*. Also, these results agree with those obtained by Durmusoglu *et al.* (2003), who found that both neem products have an insecticidal efficiency (approximately 66%) against nymphs of *N. viridula* at recommended concentration by manufactures. Finally, Rea *et al.* (2003) found that lambda-cyhalothrin and caused a good control against nymphs of *N. viridula* infesting maize plants.

Results in Tables 6 and 7 indicated generally that Sumithion,

Dursban and Kendo recorded the highest yield averaging of 29.9, 29.75 and 29.06 Kg/plot for 2008 season. Dursban and Marshal yielded 28.75 and 28.47Kg/plot, respectively in 2009 season.

From the previous results, it was evident that the seed yield was higher in the second season than the first one.

However, the gained results help in prediction the preferred field sides, variety tolerance to infestation, suitable time for sowing and horizontal distribution of insect in the maize fields for insect aggregation to use a suitable control measure with less environmental hazards and also costs.

REFERENCES

- Abdalla, Y.E.Y., M.A. Dauoud and G.B. El-Saadany (2003). Seasonal abundance and special distribution pattern of *Myzus persica* Sulzer in potato field. *Adv. Agric. Res.*, 5(3):1557-1574.
- Baptista, G.C.D.E., J.R.P.L. Parra and M.DE. Haddod (1995). Comparative toxicity of lambda-cyhalothrin to the velvet bean caterpillar, *Anticarsia gemmatatis* Hueb., 1818 (Lepidoptera, Noctuidae) and to the green stink bug *Nezara viridula* (L.) (Hemiptera, Pentatomidae), *R. of Agric. Entomol.*, 52 (1):83 - 88.
- Boraei, H.A., S.M.I. Metwally, Shenishen and A.H. Mesbah (1993). Insect fauna of Clover, sugar-beet, cotton and maize plants at Kafr El-Sheikh Governorate. *J. Agric. Res., Tanta Univ.*, 19 (4): 822 - 832.
- Dent, D. (1991). Insect pest management. C.A.B. International, 603.
- Duncan, D.B. (1955). Multiple range and multiple F tests. *Biometric*, 511 : 1-42.
- Durmusoglu, E., Y. Karsavuran, I. Ozegen and A. Guncan (2003). Effect of two different neem products on different stages of *Nezara viridula* (L.) (Heteroptera, Pentatomidae). *J. of Pest Sci.*, 76 (6): 4758 - 4766.
- Greene, J.K. and C.D. Capps (2003). Efficiency of selected insecticides for control of stink bug. Summaries of selected of Arkansas, Cotton Research, AAES Research Series, 521.
- Hawaii Board of Agriculture (1991). Hawaii administrative rules. Standard for Fresh Fruit and vegetables. Hawaii Board of Agriculture, Honolulu, 169.
- Henderson, C.E. and E.T. Tilton (1955). Tests with acaricides against the brown wheat time. *J. Econ. Entmol.*, 48: 157 - 161.
- Karam, H.H., A.M. El-Menshawy, A.A. Al-Fazairy and R.A. Hedy (1996). Bionomic of the pubescent rose chafer *Tropinota squalid* Scop. (Coleoptera, Scarabaeidae Cetonanae). *J. Agric. Sci., Mansoura Univ.*, 21 (10): 3661 - 3669.
- Mitchell, W.C. and R.F.L. Manu (1969). Sexual activity and longevity of the southern green stink bug, *Nezara viridula* (L.). *Ann. Entomol. Sec. Ann.*, 62: 1246 - 1247.
- Panizzi, A.R. (2000). Subtropical nutrition and feeding behavior of hemiptera on less preferred plant food sources. *R. of Agric. Entomol.*, 88 (1) : 1 - 12.

Panizzi, A.R., J.E. Mc Person, D.G. James, M. Javahery and M. Me Pherson (2000). Chapter 13: Stink bug (Pentatomidae), pp. 421-474. In C.W. Schaeffen and A.F. Panizzi (eds.), Heteroptera of Economic Importance. CRC Press, Boca Roton, FL.: 828.

Rea, J.H., P.J. Cameron, S.D. Wratten, S.I. Davis, J.R. Sedcole and R.B. Chapman (2003). Evaluation of insecticides for the control of green stink bug, *Nezara viridula* (L.) in New Zeland. I. J. of Pest Manag., 49 (2):105-108.

مراقبة تعداد حشرة البقعة الخضراء في حقول الذرة و مكافحتها كيمائياً في محافظة الشرقية

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إن مراقبة الحشرات في الحقل من المكونات الأساسية في برنامج مكافحة المتكاملة، لذا أجريت عدة تجارب بقرية الزرقية - مركز الزقازيق - محافظة الشرقية لتقدير تعداد حشرة البقعة الخضراء التي تصيب الذرة في أربعة أماكن من الحقل وهي الجهة الشمالية الجنوبية والشرقية والغربية، بالإضافة إلى التوزيع الأفقي للإصابة بالحقل والذي يشمل الحافة، المنطقة التي تليها (الوسط) ثم مركز الحقل، أيضاً دراسة تأثير مواعيد الزراعة وقابلية صنفين من نباتات الذرة (هجين ثلاثي وبيدي) للقابلية للإصابة بحشرة البقعة الخضراء، وتم دراسة أثر تجاور كل من الكرنب والخيار على تعداد البقعة الخضراء على الذرة، وأخيراً تم دراسة تقييم لفاعلية بعض المبيدات الكيماوية مقارنة ببعض البدائل والمبيدات الحيوية في مكافحة الآفة وتأثير ذلك على الإنتاجية وكانت النتائج كالتالي: ١- أظهر الصنف هجين ثلاثي قابلية أعلى للإصابة بالبقعة الخضراء عن الصنف بيدي. ٢- كان الميعاد المبكر لزراعة الذرة أكثر ملاءمة للإصابة بالآفة من الميعاد المتأخر. ٣- كانت الجهة الجنوبية من حقل الذرة هي الأقل ملوئاً لحشرة البقعة الخضراء تليها الجهة الشرقية ثم الجهة الغربية بينما كانت الجهة الشمالية من الحقل هي الأكثر تعداداً للآفة. ٤- كانت حافة الحقل هي الأكثر ملاءمة لتواجد الآفة ثم للمنطقة التي تليها ثم كان مركز الحقل هو الأقل تعداداً للآفة. ٥- كانت زراعات الذرة الغير مجاورة للكرنب أو الخيار هي الأكثر ملاءمة لتواجد تعداد الآفة. ٦- أظهرت المركبات كلوربيريفوس، فينيتروثيون وفينبيروكسيمات أعلى فاعلية ضد الحوريات والحشرة الكاملة للبقعة الخضراء ثم تلاها كل من ملاثيون (مارسال)، بيريميكلرب وملاثيون (ملاثيومكس). ٧- كان أعلى محصول ناتج عن القطع التجريبية المعاملة بكل من كلوربيريفوس، فينيتروثيون وفينبيروكسيمات. وبصفة عامة فإن هذه النتائج لها أهمية كبيرة في برامج مكافحة المتكاملة للحشرة في حقول الذرة للتنبؤ بجوانب الحقل المفضلة لتجمع الحشرات وبالتالي الأماكن والبؤر الشديدة الإصابة كي يتسنى استخدام طريقة مناسبة للمكافحة في هذه الأماكن لتقليل درجة التلوث البيئي وأيضاً التكاليف.