EFFECT OF SOWING DATES ON THE INSECT PESTS OF FENUGREEK PLANTS IN RELATION TO ACCUMULATED HEAT UNITS AT QALUBYIA GOVERNORATE, EGYPT

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ABSTRACT

The present work was conducted for two seasons (2010/2011-2011/2012) in the Plant Protection Research Station at Qaha, Qalubiya Governorate to study the effect of different sowing dates (Oct.30th ; Nov.15thand Nov.30th) on the infestation of fenugreek plants (*Trigonella foenum graecum*) with insect pests and find models for the relationship between the accumulated heat units and seasonal populations of fenugreek pests. The obtained results revealed seven insect pests infesting fenugreek plants, two species on the leaves (*Liriomyza* spp. and *Bemisia tabaci*) and five species on the terminal buds (*Acyrthosiphon pisum ; Aphis gossypii ; Aphis craccivora ; Thrips tabaci* and *Phytonomus brunneipennis*) in different sowing dates and seasons. The seasonal populations of insect pests on fenugreek plants had varied in the three sowing dates and seasons. In addition, results showed that sowing fenugreek by mid-November received lower infestation with insect pests than early and lately sowing dates (Oct.30th & Nov.30th) and the proper date for sowing fenugreek must be in the second half of November. On the other hand, results showed varied relations for accumulated heat units (Degree-Days Units) and the mean numbers of seasonal populations of fenugreek pests. Calculation the accumulated heat units for the fenugreek insect pests confirmed the variability of seasonal populations in different sowing dates and seasons. The 1st season has highly accumulated heat units for most insect pests than the 2nd ones and differences in the accumulated heat units ranged 7.5 -19.9% in the two seasons. The larvae of leaf miner, *Liriomyza* spp. have varied accumulated heat units mostly increased with 13.8% in 1st season than the second ones. The accumulated heat units for *B. tabaci* were varied (435- 542.7 D°) in the two seasons and the difference reached 19.9%. There for, the insect don't occur during the season if the accumulated heat units below than 435 D°. The aphid species have highly accumulated heat units in the three sowing dates ranged 1003.3-1188.7 D° in the 1st season and 901.0 - 1099.3 D° in the 2nd one with differences ranged 7.5 - 10.2%. Cotton thrips, *T. tabaci* has varied accumulated heat units (782.7 - 891.7 D°) in the two seasons; the 1st season has highly Degree-Days Units (DDD) than the 2nd one with difference 12.2%. The clover leaf weevil *P. brunneipennis* has varied accumulated heat units (603 - 715 D°) in the two seasons with

difference 15.7%. The obtained results created beneficial methodological developments for designing ecological zones maps for distribution the insect pests over the country and designing dynamic program for integrated pest management (IPM) under different ecological conditions in Egypt.

Keywords: Fenugreek, Sowing dates, Insect pests, acuminated heat units, Seasonal population.

INTRODUCTION

Fenugreek plants, *Trigonella foenum graecum* [Family Fabaceae (Leguminosae)] commonly known as Helba and cultivated worldwide as a semi-arid crop, its important medicinal plants and used in different forms either eaten directly as leaves or boiled as drinks. Cultivation and preservation of fenugreek plants needs protection from pest infestation without application of pesticides. Plants infested with many insect and mite pests reduce crop quantity and quality. There for, agricultural practices are considered the most important safe methods for pest control and play significant role in increasing the quantity and quality of the crop. In Nigeria, Ogah (2011) studied the effect of sowing dates of African yam bean on the flower thrips, *Megalurothrips sjostedti* Hochst. and found that the flowering and podding stages of these plants sown in July coincided with the population peaks of *M. sjostedti* resulting considerable reduction in grain yields.

The effect of certain agricultural practices such as fertilization, irrigation; planting date and planting spaces on crop production as well on the incidence of some important pests received attention by some authors such as Meena *et al.* (1984), Brar *et al.* (1994) and Singh *et al.* (1995). Abou-Zeid *et al.* (2003) studied the effect of planting dates on the injury and infection with some legumes diseases for faba bean, lentil, and chickpea.

Climate conditions are playing an important role in population dynamics of insect pests. So, studying the effect of climatic condition on the activity of insect pests and correlated their dynamics with accumulated heat units is very important to predict the occurrence of insect pests in cultivation localities specially the new reclaimed lands when their plant hosts are available. The scope of the present work is to study the effect of different sowing dates on the infestation of fenugreek plants with insect pests and find models for the relationship between the seasonal populations of fenugreek pests and the accumulated heat units (Degree - Days Units).

MATERIALS AND METHODS

The Fenugreek seeds (Cultivar. Giza30) were obtained from Department of Medicinal and Aromatic Plants, Horticulture Research Institute, A.R.C. and sown at different sowing dates (Oct.30th, Nov.15th and Nov.30th) in Plant Protection Research Station at Qaha, Qalubiya Governorate for two successive seasons (2010/2011 - 2011/2012). The experimental area of each

sowing date (525m^2) was divided into three replicates (175m^2/ each replicate) in Randomized Complete Blocks Design (RCBD). The agricultural practices were carried out without using any chemical control measures during the studying period.

Weekly samples from the leaves (20 leaves/replicate) and terminal buds (20 terminal buds/ replicate) of fenugreek plants were picked up at random from each replicate/ each sowing date, started from emergence of newly plants till complete plant growth. The collected samples were kept in paper bags and preserved in polyethylene bags then transferred to the laboratory for further examination by using a stereoscopic-microscope. The insect pests of fenugreek plants were collected and identified at the Plant Protection Research Institute (PPRI).The population of each insect pest per each sample was counted and sorted into nymphs or larvae and adults. The climate data for both studied years were obtained from the Central Laboratory for Agricultural Climate as daily mean maximum and minimum temperatures of Qalubiya Governorate. The statistical analyses of the obtained data were carried out by using Minitab program (Minitab Inc. © 2009).

RESULTS AND DISCUSSION

1.Effect of sowing dates on the infestation with insect pests Data in Table (1) revealed that, leaves and terminal buds of the fenugreek plants are infested with many insect pests during its growth stages in the field in the three different sowing dates (Oct.30th; Nov.15th and Nov.30th). The fenugreek leaves infested with leaf miner, *Liriomyza* spp. and cotton white fly, *Bemisia tabaci* (Genn.) whereas the terminal buds infested with three aphid species (*Acyrthosiphon pisum* (Harris); *Aphis gossypii* Glover; *Aphis craccivora* Koch.) as well as cotton thrips, *Thrips tabaci* Lind. and clover leaf weevil, *Phytonomus brunneipennis* Boh. The obtained results of each insect could be discussed as follows:

1.1. Leaf miner, *Liriomyza* spp.

Data presented in Table (1) showed varied infestation in the fenugreek leaves with larvae of *Liriomyza* spp. in the three sowing dates. In the 1st season (2010/2011), the highest infestation with larvae of *Liriomyza* spp. was 22.63 larvae/ 20 leaves in the 1st sowing date (Oct.30th). In the 2ndsowing date (Nov.15th) the infestation reduced to 12.73 (larvae/ 20 leaves) whereas the less infestation (5.78 larvae/ 20 leaves) occurred in the 3rd sowing date (Nov.30th).The statistical analyses revealed that the infestation of fenugreek leaves with *Liriomyza* spp. affected greatly with the sowing dates, the less infestation occurred by sowing in late November and the highest ones occurred by sowing in late October whereas the medium infestation occurred by sowing in mid-November.

In the 2ndseason (2011/2012), the infestation with *Liriomyza* spp. has similar results except the 3rd sowing date. The highest infestation occurred in the 3rd and 1st sowing dates (13.49 - 11.49 larvae/ 20 leaves) without differences means. The infestation reduced to minimum (7.88 larvae/ 20

leaves) in the 2nd sowing date (Nov.15th). The above-mentioned results stated that sowing the fenugreek by the 2nd half of November minimizes its infestation with the *Liriomyza* spp.

Table (1): Mean numbers of seasonal populations of insect pests infesting fenugreek plants sowing in three different dates at Qaha, Qalubiya Governorate during two successive seasons (2010/2011-2011/2012).

Insect pests / Sowing dates		On leaves		On terminal buds					
		Liriomyza spp.	*B. tabaci*	*A. pisum*	*A. gossypii*	*A. Craccivora*	Aphid species	*T. tabaci*	*P. brunneipennis*
1st season 2010/2011	1st date (Oct. 3oth)	22.63 A	0.80 A	2.00 A	1.33 A	0.49 A	3.82 A	7.29 A	4.02 A
	2nd date (Nov.15th)	12.73 B	0.20 B	1.00 B	0.25 B	0.41 A	1.66 B	4.49 B	2.27 B
	3rd date (Nov.30th)	5.78 C	0.00 B	0.80 B	0.18 B	0.0 B	0.98 B	3.29B	0.43 C
Mean		13.71	0.33	1.26	0.59	0.30	2.15	5.02	2.24
F value		28.1**	11.4**	4.4**	12.6**	5.1 **	14 **	8.6**	12.5**
LSD value at 0.5%		4.47	0.35	0.86	0.51	0.33	1.11	1.96	1.42
2nd season 2011/20122	1st date (Oct. 3oth)	11.49A	0.0	4.51 A	1.31 A	0.20 A	6.02 A	4.94 A	1.43 A
	2nd date (Nov.15th)	7.88 B	0.0	2.04 B	0.00 B	0.12 A	2.16 B	3.31 A	1.06 A
	3rd date (Nov.30th)	13.49 A	0.0	5.49 A	1.51 A	0.20 A	7.20 A	5.31 A	1.71 A
Mean		10.92	0.0	4.01	0.94	0.17	5.12	4.52	1.40
F value		10.7**	-	4.7**	6.9**	0.32 ins	9.5**	1.7 ins.	1.10 ins
LSD value at 0.5%		2.43	-	2.28	0.88	0.22	2.39	2.30	0.88

Means in the same column not followed by the same letter is significantly different (P < 0.05) using LSD test.

* Ins. Insignificant

** Highly significant

1.2. Cotton white fly, *Bemisia tabaci* (Genn.)

The cotton white fly, *B. tabaci* was recorded with few numbers on the fenugreek plants sown in the 1st and 2nd dates in the 1stseason (2010/2011).The highest mean number of *B. tabaci* population was 0.80 immature stages/ 20 leaves by sowing in late October followed by 0.20 immature stages/ 20 leaves in the 2nd sowing date (mid-November) whereas the fenugreek sown in late November (3rdsowing date) was found free from infestation.

In contrary, the fenugreek plants were found free from infestation with *B. tabaci* in the three sowing dates in the 2nd season. This may be refers to unsuitable environmental conditions. In Qalubiya Governorate, EL-Khayat *et*

al. (2010) reported similar results and the lowest infestation with different stages of white fly, *B. tabaci* occurred by sowing lately.

1.3. Aphid species

Data in Table (1) showed that the fenugreek plants infested with many aphid species during its developmental stages from emergence of newly plants until the final growth and harvest. The infestation with aphid species causes considerable damage to the plants and significantly effect on the seeds production. The present work revealed three aphid species on fenugreek plants *i.e.* pea aphid, *Acyrthosiphon pisum*; cotton aphid, *Aphis gossypii* and leguminous aphid, *Aphis craccivora.* The infestation with aphid species were recorded with varied population in the two seasons (2010/2011 - 2011/2012) as follows:

1.3.1. Pea aphid, *Acyrthosiphon pisum* (Harris)

Pea aphid, *A. pisum* was recorded with varied population (Table, 1) on the terminal buds of the fenugreek plants in the three sowing dates in the two seasons. The infestation with *A. pisum* in the 1st season was lesser than 2nd ones in the three sowing dates. In the 1st season, the mean number of *A. pisum* population ranged 0.8 - 2.0 insects/20 terminal buds in the three sowing dates. The highest infestation was recorded in the 1stsowing date (Oct.30th) whereas the lesser ones was found in the 2nd and 3rd sowing dates (0.80 - 1.0 insects/20 terminal buds) in mid and late November without differences means.

On the other hand, the infestation with *A. pisum* was relatively higher in the 2nd season, the highest infestation had recorded in the 1st and 3rd sowing dates in late October and November without differences means (4.51-5.49 insects /20 terminal buds). The less infestation was found in the 2nd sowing date (Nov.15th) with mean population 2.04 insects/20 terminal buds. The obtained results revealed that the infestation of fenugreek plants with pea aphid, *A. pisum* affected with sowing dates in the both seasons. The minimum infestation with *A. pisum* occurred by sowing in mid-November.

1.3.2. Cotton aphid, *Aphis gossypii* Glover

Data in Table (1) showed varied infestation with cotton aphid, *A. gossypii* on the terminal buds of the fenugreek plants in the three sowing dates during the 1stseason (2010/2011).The mean number of aphid population was 1.33 insects/20 terminal buds by sowing in late October (1st sowing date) compared with lower number of aphid population in the 2nd and 3rd sowing dates (0.18 - 0.25 insect/20 terminal buds) without differences means.

In the 2ndseason (2011/2012), the infestation with *A. gossypii* was lesser than the 1stones. The highest infestation was recorded in the 1st and 3rd sowing dates without differences means. The mean number of aphid population ranged 1.31 -1.51insects/ 20 terminal buds whereas fenugreek plants were found free from infestation with *A. gossypii* when sowing in mid-November (2nd sowing date). Similar results were reported by Shehata (1998) that certain sowing dates have an adverse effect on the activity of individuals of *Aphis gossypii* infesting cowpea plants. Megahed-Metwally *et al.* (2005)

revealed that planting dates has highly significant differences between average numbers of *A. gossypii*, *T. tabaci* and *B. tabaci* infesting three medical and aromatic plants (Guar, Roselle and Peppermint) at Gharbiya Governorate.

1.3.3. Leguminous aphid, *Aphis craccivora* Koch.

The obtained results (Table, 1) revealed that, the fenugreek sown in the three sowing dates received less infestation with leguminous aphid, *A. craccivora* in both seasons. In the 1st season, the highest infestation occurred in the 1st and 2nd sowing dates without differences means, the mean number of aphid population ranged 0.41 - 0.49 insects/ 20 terminal buds. The fenugreek plants sown in late November (3rd sowing date) were found free from infestation. In the 2ndseason, the infestation of fenugreek plants with *A. craccivora* was similar in the three sowing dates (0.12 - 0.20 insect/20 terminal buds) without differences means.

1.3.4. Aphid population

Regardless of species, the mean number of seasonal population of aphid species (3 species together) infesting terminal buds of fenugreek plants were taken into consideration. The mean number of seasonal population of aphid species was varied (Table, 1) on fenugreek plants in the three sowing dates (Oct. 30th, Nov.15th and Nov. 30th) in the two seasons. In the 1st season, the 1stsowing date (Oct. 30th) received the highest mean number of aphid population (3.82 aphids/ 20 terminal buds) followed 2nd and 3rd sowing dates in middle and late November without differences means. The infestation with aphid species ranged 0.98-1.66 aphids/20 terminal buds. In the 2nd season, the fenugreek sown in the 1st and 3rd sowing dates received the highest infestation (6.02-7.20 aphids/20 terminal buds) without differences means. The obtained results revealed that sowing fenugreek by mid-November receive less infestation with aphid species.

1. 4. Cotton thrips, *Thrips tabaci* Lind.

Cotton thrips, *T. tabaci* infested the terminal buds of fenugreek plants in the three sowing dates in the two seasons. In the 1st season, the highest infestation with *T. tabaci* occurred in the 1st sowing date (7.29 individuals/ 20 terminal buds) followed by 2nd and 3rd dates in the 2nd half of November without differences means (3.29 - 4.94 individuals/ 20 terminal buds). In the 2nd season, the infestation with *T. tabaci* was observed in the three sowing dates but without differences means. The obtained results revealed that the 2nd half of November is proper time for sowing fenugreek. Al-Shannaf (1994) stated that the influence of sowing date on the abundance of *T. tabaci* on cotton plants don't constant and varied from season to another.

In Upper Egypt, Salman and Abou-Elhagag (2001) stated that number of *T. tabaci* differ on faba bean according to sowing dates. In Qalubiya Governorate, Hanafy (2007) found the population of *T. tabaci* increased by delaying planting date of sweet pea plants; fewest numbers attacked the

earliest planting date of sweet pea whereas the plants of the latest planting date were more liable for insect infestation. EL-Khayat *et al*. (2010) found the abundance of *T. tabaci* on cowpea plants increased only in the early planting dates and the population significantly varied according to the sowing date. In Nigeria, Ogah (2011) recorded that planting African yam bean earlier in the season has significant effect on the flower thrips *M. sjostedti* incidence and grain yield. In Zimbabwe, Karavina *et al.* (2013) stated that the planting date has an effect on bollworms and sucking insect pests of cotton.

1.5. Clover leaf weevil, *Phytonomus brunneipennis* Boh.

Clover leaf weevil, *P. brunneipennis* was recorded with varied population in the terminal buds of fenugreek plants sown in the three dates in the two seasons (Table, 1). The highest infestation with *P. brunneipennis* was found in the 1stseason (2010/2011) than the 2nd ones (2011/2012) except the 3rd sowing date (late November).

During the 1st season, the fenugreek sown in late October (1st sowing date) received the highest infestation with the *P. brunneipennis* weevil (4.02 weevil/ 20 terminal buds) followed by 2nd sowing date in mid-November (2.26 weevil/ 20 terminal buds).The less infestation was found in terminal buds in late November (0.43 weevil/ 20 terminal buds). In the 2nd season (2011/2012), the infestation with *P. brunneipennis* was relatively lower in the three sowing dates than the 1st season. The fenugreek plants received similar infestation with *P. brunneipennis* without differences means, the infestation ranged 1.06 - 1.71 weevil /20 terminal buds.

2. Heat requirements (accumulated heat units) for insect pests

Accumulated heat units were calculated for the above-mentioned insect pests and the statistical relationships between accumulated heat units and the mean number of seasonal population of each insect pest were obtained.

The calculation of accumulated heat units for insect pests of fenugreek plants were carried out by method of Van Der Waals *et al*. (2013) and Fahim *et al*. (2013) whereas the thermal threshold for these insect pests were collected throughout the literatures (Table, 2).

2.1.Variation of accumulated heat units during different sowing dates and seasons.

Data in Table (3) and Fig. (1) showed the accumulated heat units (Degree-Days Units) for the studied insect pests in the three sowing dates over two seasons at Qalubiya Governorate. Calculated heat units Degree-Days (D°) for the studied insect pests confirmed the variability of population density for insect pests in different sowing dates and growing seasons.

On the hand, the high amount of accumulated heat units during these periods leads to increase the population of insect pests at 1st date in both seasons as mentioned by Singh and Jackai (1985).

Table (2): Thermal thresholds of the studied insect pests

No.	Insect pest	Lower threshold °C	Upper threshold °C	Reference
1	Leaf miner, *Liriomyza* spp. (Diptera: Agromyzidae)	9.75	-	Haghani *et al.*(2007)
2	Cotton white fly, *Bemisia tabaci* (Genn.) (Hemiptera: Aleyrodidae)	11.53	-	Bosco and Caciagli (1998)
3	Pea aphid, *Acyrthosiphon pisum* (Harris) (Homoptera: Aphididae)	5.5	28	Campbell and Mackauer (1975)
4	Cotton aphid, *Aphis gossypii* (Glover) (Homoptera: Aphididae)	6.19	-	Zamani *et al.* (2006)
5	Leguminous aphid, *Aphis craccivora* Koch (Homoptera: Aphididae)	7.1	-	Berberet *et al.*(2009)
6	Cotton thrips, *Thrips tabaci* Lind. (Thysanoptera: Thripidae)	8.1	-	Jamieson *et al.* (2012)
7	Clover leaf weevil, *Phytonomus brunneipennis* Boh. (Coleoptera: Curculionidae)	8.9	-	Whiteford and Quisenberry (1990)

Generally, the insect pests have highly accumulated heat units in the 1st season (2010/2011) than the 2nd ones (2011/2012), the differences in accumulated heat units were varied in the two seasons, ranged 7.5 -19.9%.

The larvae of leaf miner (*Liriomyza* spp.) have varied heat units mostly increased with 13.8% in 1st season than the second ones. The accumulated heat units for *B. tabaci* were varied in the two seasons (435 -542.7 D°) and the difference reached 19.9%. There for, the insect don't occur during the season if the accumulated heat units below than 435 D°.

The aphid species (*A. pisum*, *A. gossypii* and *A. craccivora*) has highly accumulated heat units in the three sowing dates ranged 1003.3 - 1188.7 D° in the 1st season and 901.0 - 1099.3 D° in the 2nd ones with differences ranged 7.5 - 10.2%. Cotton thrips, *T. tabaci* has accumulated heat units ranged 782.7 - 891.7 D° in the two seasons with differences 12.2%. The clover leaf weevil *P. brunneipennis* has varied accumulated heat units in the two seasons, ranged 603 - 715 D° with difference 15.7%. The above mentioned results are similar with Jackai and Dauost (1986) and Ogunwola & Ekefan (1991).

Table (3): Accumulated heat units for the studied insect pests of fenugreek plants at Qalubiya Governorate during two successive seasons (2010/2011 - 2011/2012).

Insect pests / Sowing date		On leaves		On terminal buds				
		Liriomyza spp.	*B. Tabaci*	*A. pisum*	*A. gossypii*	*A. craccivora*	*T. Tabaci*	*P brunneipennis*
1st season 2010/2011	1st date (Oct. 3oth)	905	637	1292	1213	1107	993	815
	2nd date (Nov.15th)	781	522	1165	1084	980	868	693
	3rd date (Nov.30th)	724	469	1109	1029	923	811	637
Mean		803.3	542.7	1188.7	1108.7	1003.3	891.7	715.0
2nd season 2011/20122	1st date (Oct. 3oth)	703	443	1112	1025	912	794	613
	2nd date (Nov.15th)	633	381	1038	951	839	721	545
	3rd date (Nov.30th)	742	481	1148	1065	952	833	652
Mean		692.7	435.0	1099.3	1013.7	901.0	782.7	603.0
Difference (D° %)		13.8%	19.9%	7.5%	8.6%	10.2%	12.2%	15.7%

$$\text{Difference (D° \%)} = (1 - \frac{\text{D° in the 2nd season}}{\text{D° in the 1st season}}) \text{ X } 100$$

Fig. (1): Relationship between the accumulated heat units (Degree-Days Units) and mean number of seasonal population of fenugreek insect pests at Qalubiya Governorate during two successive seasons (2010/2011- 2011/2012).

2.2. Relationship between the accumulated heat units (Degree-Days Units) and mean numbers of seasonal population of fenugreek pests.

The statistical analysis and the linear model for the relationship between accumulated heat units (Degree-Days Units) and mean number of seasonal population of the studied insect pests in the two successive seasons were shown in Figs. (2).The presented models include simple regression and correlation relationships of the obtained data. Most of regression models were linear equation for studied insect pests. However, the regression models were performed polynomial equation for cotton aphid and pea aphid. The population dynamics analyzed as a result of regression analysis for individual population trends and accumulated heat units (Degree-Days Units) were presented in following equations:

$y = 13.472x + 492.79$, $R^2 = 0.776$ ……. ……...… (1)

$y = 242.12x + 448.49$, $R^2 = 0.753$ ……..…….…. (2)

$y = -4.2166x^2 + 24.421x + 1122.1$, $R^2 = 0.013$ ……..… ……. (3)

$y = -297.3x^2 + 518.66x + 955.16$, $R^2 = 0.675$ …… ……..... (4)

$y = 387.63x + 862.84$, $R^2 = 0.671$ …… …… (5)

$y = 53.282x + 582.49$, $R^2 = 0.499$ ……..… ……... (6)

$y = 64.747x + 630.45$, $R^2 = 0.745$…….…..… (7)

Where Y is mean number of seasonal population and X is accumulated heat units (DDU) for studied insect pests as presented in the equations from 1 to 7 for leaf miner, cotton white fly, pea aphid, cotton aphid, leguminous aphid, cotton thrips and clover leaf weevil, respectively. Correlations between (X) and (Y) showed varied relations between $0.499 \leq R^2 \leq 0.776$, which correlated highly for most studied insect pests whereas pea aphid has low correlated relationship (Equation no. 3).

The obtained results created beneficial methodological developments for designing maps of ecological zones for distribution the insect pests over the country. The ecological zones maps are essential for designing dynamic program for integrated pest management (IPM) under different ecological conditions in Egypt.

CONCLUSION

The fenugreek plants must be cultivated and preservation free from pest infestation to produce plenty of dry fenugreek seeds without using pesticides. The obtained results revealed that the sowing dates had significant differences between mean numbers of seasonal population of insect pests, which refers to the variation amount of heat requirements of insect pests. The Degree-Days Units (DDU) is explained the relationships among the population density, the sowing dates and different sowing seasons.

Fig 2

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تأثير مواعيد الزراعة على الآفات الحشرية التى تصيب نباتات الحلبة وعلاقتها بالوحدات الحرارية فى محافظة القليوبية - مصـــر

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الملخص العربى

أجريت الدراسة الحالية لمدة موسمين متتاليين (٢٠١٠/٢٠١١- ٢٠١١/٢٠١٢) فى محطة بحوث وقاية النبات بقها- محافظة القليوبية بغرض دراسة تاثير ثلاثة مواعيد زراعية مختلفة على اصابة نباتات الحلبة بالآفات الحشرية مع تحديد العلاقة بين تعداد الآفات الحشرية والوحدات الحرارية اللازمة لتواجدها. تم اجراء التجربة الحقلية وزراعة بذور الحلبة فى ثلاثة مواعيد زراعية مختلفة (نهاية اكتوبر، منتصف نوفمبر ونهاية نوفمبر) فى موسمين متتاليين، واتضح من نتائج الدراسة مايلى:-

١- تم حصر سبعة أنواع من الآفات الحشرية تصيب نباتات الحلبة ، نوعان يصيبان الأوراق (صانعات الأنفاق وذبابة القطن البيضاء) وخمسة أنواع أخرى تصيب البراعم الطرفية (من البسلة، من القطن، من البقوليات، تربس القطن وسوسة أوراق البرسيم).

٢- وجد من الدراسة تباين واضح فى تعداد الآفات الحشرية على نباتات الحلبة فى مواعيد الزراعة الثلاثة.

٣- وجد ان زراعة الحلبة فى منتصف نوفمبر كانت اقل عرضة للإصابة بالحشرات عن الزراعة المبكرة (نهاية أكتوبر) والمتأخرة (نهاية نوفمبر) ولذلك فان التوقيت المناسب لزراعة الحلبة يفضل ان يكون مع بداية النصف الثانى من نوفمبر.

٤- تم حساب الوحدات الحرارية المتجمعة للآفات الحشرية التى تم حصرها فى مواعيد الزراعة الثلاثة واتضح منها وجود تباين فى الوحدات الحرارية المتجمعة واللازمة لتواجدها على نباتات الحلبة فى مواعيد الزراعة الثلاثة .

٥- وجد من الدراسة ان التباين فى الوحدات الحرارية المتجمعة لآفات الحلبة فى مواعيد الزراعة الثلاثة وفى موسمى الزراعة كان له تأثير واضح على تعداد الآفات الحشرية على نباتات الحلبة فى مواعيد الزراعة الثلاثة وفى موسمى الزراعة.

٦- تراوحت الوحدات الحرارية المتجمعة لصانعات الانفاق ٩٢.٧- 803.3 وحدة حرارية فى موسمى الزراعة ، وفى ذبابة القطن البيضاء كانت ٤٣٥ - ٥٤٢.٧ وحدة حرارية ولذلك فأن ذبابة القطن البيضاء لاتتواجد فى موسم الزراعة اذا قلت الوحدات الحرارية المتجمعة عن ٤٣٥ وحدة حرارية.

٧- كانت الوحدات الحرارية المتجمعة لأنواع المن الثلاثة عالية فى كلا الموسمين حيث تراوحت ١٠٠٣.٣- ١١٨٨.٧ وحدة حرارية فى موسم الزراعة الاول وكانت ٩٠١.٠-١٠٩٩.٣ وحدة حرارية فى موسم الزراعة الثانى وبفروق تراوحت ٧.٥ - ١٠.٢% وحدة حرارية .

٨- تراوحت الوحدات الحرارية المتجمعة لتربس القطن ٧٨٢.٧ - ٨٩١.٧ وحدة حرارية فى موسمى الزراعة بنسبة ١٢.٢ %، بينما كانت الوحدات الحرارية المتجمعة لسوسة اوراق البرسيم ٦٠٣ - ٧١٥ وحدة حرارية فى موسمى الزراعة بفارق ١٥.٧% فى الموسمين.

٩- اتضح من نتائج التحليل الاحصائى وجود ارتباطات عالية بين متوسط تعداد معظم الافات الحشرية الموجودة على نباتات الحلبة مع الوحدات الحرارية المتجمعة فى مواعيد الزراعة الثلاثة عدا منّ البسلة الذى كان له ارتباط ضعيف .

١٠- يمكن الاستفادة من النتائج فى تصميم خرائط بيئية باستخدام الوحدات الحرارية المتجمعة واللازمة لكل آفة والتنبؤ بامكانية تواجدها وانتشارها فى بيئات جديدة فى كل مناطق مصر حتى يمكن تصميم برامج مكافحة متكاملة وناجحة لتلك الأفات تتماشي مع الظروف البيئية المتغيرة .