J. Plant Prot. and Path., Mansoura Univ., Vol.5 (3): 351-358, 2014

FIELD EVALUATION OF CERTAIN FABA BEAN GENOTYPES TO LEAFHOPPERS INFESTATION WITH REGARD TO THEIR ASSOCIATED PREDATORS IN KAFR EL-SHEIKH REGION

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ABSTRACT

Relative susceptibility of thirteen faba bean genotypes compared to local variety Sakha1 to leafhoppers, *Empoasca* spp. with regard to their associated predators were evaluated at Sakha Agricultural Research Station Farm, Kafr El-Sheikh under two sowing dates (the first week of October and the first week of November) during two growing seasons being 2010/11 and 2011/12.

Judging by the grand mean of leafhoppers of the two successive seasons, statistical analysis revealed insignificant differences among the tested genotypes to the leafhoppers infestation, while there were significant differences for predators attraction for the first date plantation. Genotype H-240A harbored the highest mean number of predators, while the least mean number took place on genotypes H-1972B and H-1973. In respect to the second date plantation, genotypes H-232; H-1992; H-240A; H-1972B and H-230 exhibited the highest mean number of leafhoppers, while genotype H-1973 harbored the least number. The predators recorded the highest mean number on H-230, while H-240B exhibited the least mean number. However, five species of predators (*Crysoperla carnea (*Steph*.); Scymnus interuptus* (Goeze); *Paederus alfierii* (Koch); *Coccinella* spp. and true spiders) were found in faba bean field during the two seasons. The first species was the most dominant.

According to the resistance degree, genotypes H-240A and H-240B appeared moderately resistant; H-1970; H-1972B; H-1973; H-1988 and H-232 appeared relatively resistant; H-1972A; H-1992; H-243; H-244 and Sakha1 appeared susceptible and H-1980 and H-230 appeared as highly susceptible for the first date plantation. As for the second date plantation, H-1973 and H-243 appeared moderately resistant; H-1970; H-1988; H-240B and Sakha1 appeared relatively resistant; H-1972A; H-1972B; H-1980; H-230 and H-244 appeared susceptible and H-1992; H-232and H-240A appeared highly susceptible.

Finally, it could be stated that, faba been genotypes H-240A and H-240B are considered promising genotypes for the first week of October plantation, while H-1973 and H-243 are suitable to the first week of November plantation. Thus, the tested genotypes must be taken great attention in the future to be used as relatively resistant varieties against leafhoppers infestation.

INTRODUCTION

Leafhoppers *Empoasca* spp. (Homoptera: Cicadellidae) are considered one of the most important insect pests in the world. They attack many host plants such as field crops, vegetables, fruit trees, ornamental and medical plants in addition to weeds (Weeb, 1987; Malaschi, 1995) and El-Srand (2005). Both adults and nymphs of leafhoppers cause serious damage by injecting a toxin into the foliage while feeding causing down-curling of leaf edges, which turn yellow at first, then become brown and began to die Nielson,1995 and El-Gindy, 2002). This symptom is known as hopperburn.

The leafhoppers also transmit pathogenic organisms: viruses, mycoplasma, spiroplasma and bacteria. In Egypt, Metwally *et al*. (1997; Nassef *et al*. (2008); El-Mashaly, 2013 and El-Srand (2013) reported that leafhoppers attack faba bean plants.

It is well known that the insecticidal control of the insects causes serious environmental hazards. Thus, one of environmentally safe control measures is the use of resistant cultivars to insect species that represents one of the simplest and most convenient methods of insect pest control (Dent, 1991).

So, the present work was conducted to evaluate the relative susceptibility of thirteen faba bean genotypes compared to the local variety Sakha 1 to leafhoppers, *Empoasca* spp. infestation with regard to associated predators under two sowing dates at Kafr El-Sheikh governorate during two successive growing seasons: 2010/11 and 2011/12.

MATERIERIALS AND METHODS

The experiment was carried out at Sakha Agricultural Research Station Farm under two sowing dates of faba bean during two successive seasons; 2010/11 and 2011/12. The thirteen genotypes and the check cultivar Sakha 1 were supplied by National Legumes Research Program at Sakha Agric. Res. Station. For each season ca. one feddan was divided into 84 plots each of 1/100 fed (42m^2). All the tested genotypes were sown in the first week of October and November in a complete randomized block design with three replicates for each. All normal agricultural practices were applied without any pesticidal treatments throughout the growing season.

To determine the leafhoppers population, weekly sample of ten leaflets was taken at random from each plot representing the three levels of the plant and the numbers of both nymphs and adults was directly counted early in the morning in the field.

Regarding to the associated predators, weekly sample of 10 branches was chosen at random from each plot and the number of the common predators was directly counted in the field under a suitable lens.The inspection began one month after sowing until the end of the season.

The resistance status of the tested faba bean genotypes was dependent on the mean number of *Empoasca* spp.(MN) and the range of change (RC) from one susceptibility degree to another as reported by Nosser (1996).

$$\text{Where: Range of change (RC)} = \frac{\text{Maximum mean number} - \text{minimum mean number}}{4}$$

The genotype that had mean number of aphids more than MN+ RC was considered highly susceptible (HS); between MN and MN +RC, susceptible (S); between MN and MN- RC, relatively resistant(RR); between MN-RC and MN-2RC, moderately resistant (MR) and less than MN – 2RC,

was considered resistant (R). Data obtained were statistically analyzed using F-test and the means were compared according to Duncan s multiple range test (1955).

RESULTS AND DISCUSSION

The population density of leafhoppers, *Empoasca* spp. and their associated predators were determined on certain faba bean genotypes under two sowing dates (1st week of October and 1st week of November) during two successive growing seasons; 2010/11 and 2011/12.

1- The first week of October plantation:-

Results presented in Table (1) clear showed the seasonal mean of the leafhoppers, *Empoasca* spp./10 faba bean leaflets and their associated predators /10 faba bean branches in addition to the resistance status during 2010/11 and 2011/12 seasons. The genotype H-1980 exhibited the highest number of leafhoppers being 19.40 insects/ 10 leaflets, while H-240B recorded the least number (14.29 insects / 10 leaflets) in the first season. The other genotypes showed different levels of infestation.

Table (1): Seasonal mean number of leafhoppers, *Empoasca* spp., resistance status of different faba bean genotypes and associated predators in the first week of October plantation during seasons of 2010/11 and 2011/12.

Genotype	Seasonal mean number of insects/10 leaflets				Seasonal mean number of predators/10 branches		
	2010/11	2011/12	Mean	Resistance status	2010/11	2011/12	Mean
H-1970	15.73bc	16.86a	16.30 a	RR	2.89 a	2.92b	2.91ab
H-1972 A	16.75abc	16.94 a	16.85 a	S	2.65 ab	3.06b	2.86ab
H-1972 B	17.09abc	15.35a	16.22 a	RR	2.42 ab	2.70b	2.56b
H-1973	16.22abc	1 5.77 a	16.00 a	RR	2.33 b	2.78b	2.56b
H-1980	19.40a	15.13 a	17.27 a	HS	2.67ab	2.70b	2.69b
H-1988	17.71abc	15.15 a	16 .43 a	RR	2.44ab	2.93b	2.69b
H-1992	17.07abc	16.70 a	16 .89 a	S	2.64ab	2.84b	2.74b
H-230	1 8.58ab	15.83 a	17.21 a	HS	2.49ab	2.68b	2.59b
H-232	17.07abc	15.60 a	16.34 a	RR	2.71ab	2.97b	2.84ab
H-240 A	14.87c	16.39 a	15.63 a	MR	2.47ab	4.11a	3.29a
H-240 B	14.29c	16.05 a	15.17 a	MR	2.36ab	2.94b	2.65b
H-243	16.42abc	16.80 a	16.61 a	S	2.58ab	2.87b	2.73b
H-244	16.78abc	16.63 a	16.71 a	S	2.24b	3.10b	2.87b
Sakha1	16.95abc	16.09 a	16.52 a	S	2.78ab	2.70b	2.74b
Grand mean±SE*	16.78 ± 0.76	16.09 ± 0.37	16.44 ± 0.34		2.55 ± 0.11	2.95 ± 0.21	2.75 ± 0.11

SE* means standard error

During the second season, the seasonal mean ranged from 15.13 to 16.94 insects/10 leaflets. The grand mean number varied from 15.17 to 17.27 insects/ 10 leaflets. Statistical analysis indicated a signicantly differences among the tested faba bean genotypes to the leafhoppers infestation during the first season 2010/11, while during the second season 2011/12, there

were insignificantly differences among them. Morever, based on the grand mean for the two successive seasons the tested faba bean genotypes existed insignificantly differences to leafhoppers infestation.

The resistance degree according to Nosser (1996) indicated that the tested genotypes were classified into four groups of relative resistance. H-1980 and H-230 appeared as highly susceptible (HS); H-1972A; H-1992; H-243; H-244 and Sakha1 appeared susceptible (S), H-1970; H-1972B; H-1973: H-1988 and H-232 appeared relatively resistant (RR); H-240A and H-240B appeared moderately resistant (MR).

Regarding to associated predators on the tested genotypes, in this study,there are five species of preadtors: *Crysoperla carnea (*Steph*.); Scymnus interuptus* (Goeze); *Paederus alfierii* (Koch); *Coccinella* spp. and true spiders in the faba bean field. The first predator was the most abundant. The total count of the predators was taken into consideration because of the low number of each species. The results indicated that in the first season, the genotype H-1970 harbored the highest number of predators with a mean of 2.89 individuals/10 branches, while H-244 exhibited the least number (2.24 individuals). During the second season, H-240A received significantly the highest number (4.11 individuals). The rest genotypes exhibited low number ranging from 2.68 to 3.10 individuals without significant differences between them. Based on the grand mean of the two seasons, the genotype H-240A harbored the highest number (3.29 individuals) followed closely by H-1970; H-244; H-1972A and H-232with means of 2.91; 2.87; 2.86 and 2.84 individuals, respectively. The remaining genotypes received low number (2.56- 2.74 individuals) without significant differences between them.

2-The first week of November plantation:

Data presented in Table (2) revealed significant differences among the tested genotypes to leafhoppers infestation. In respect to the first season (2010/11), the genotypes H-230; H-1972A and H-244 harbored the highest number with means of 17.64; 17.25 and 17.07 insects/10 leaflets, respectively, while the least number took place on H-1973 (14.49 insects). The other genotypes showed different levels of infestation. During 2011/12 season, genotype H-232 exhibited the highest number of leafhoppers being 18.87 insects, while H-243 recorded the least number (16.18 insects). Based on the mean of the two study seasons, the genotypes H-232; H-1992; H-240A; H-1972B; and H-230 exhibited the highest number with means of 17.90; 17.74; 17.66; 17.52 and 17.49 insects, respectively, while H-1973 harbored the least number (15.67 insect). The rest genotypes were arranged in a descending order as follows: H-244 (17.33insects); H-1972A (17.24 insects); H-1980 (17.13 insects); H-1988 (16.99 insects); H-240B (16.84 insects); H-1970 (16.79); Sakha1 (16.51 insects) and H-243(16.27 insects). According to the resistance status throughout the two seasons, the tested genotypes existed four degrees of resistance. The genotypes H-1992; H-232 and H-240A appeared as highly susceptible (HS); H-1972A; H-1972B; H-1980; H-230 and H-244 appeared susceptible (S); H-1970; H-1988 ;H-240B and Sakha1 appeared relatively resistant(RR) ; H-1973 and H-243 appeared moderately resistant (MR).

Concerning the predators, the same species were existed as the first date plantation and the total count was taken in consideration. Statistical analysis indicated significant differences in the predators number on the tested genotypes. The highest number took place on genotypes H-230; H-1988 and H-232 (2.18; 2.13 and 2. 13 individuals/10 branches, respectively), while the least number existed on H-240B (1.24 individuals) in the first season.

Table (2): Seasonal mean number of leafhoppers, *Empoasca* spp., and resistance status of different faba bean genotypes and associated predators in the first week of November plantation during seasons of 2010/11 and 2011/12

Genotype	Seasonal mean number of i nsects/10 leaflets				Seasonal mean number of predators/10 branches		
	2010/11	2011/12	Mean	Resistance status	2010/11	2011/12	Mean
H-1970	16.40ab	17.18bcd	16.79ab	RR	1.50cd	2.91 a	2.21ab
H-1972 A	17.25a	17.22abcd	17.24ab	S	1.60bcd	2.74 a	2.17ab
H-1972 B	17.02ab	18.01abc	17.52 a	S	1.47cd	2.55 a	2.01ab
H-1973	14.49b	16.85cd	15.67 b	MR	1.69bcd	2.46 a	2.08ab
H-1980	17.29a	16.96bcd	17.13ab	S	1.64bcd	2.88 a	2.26ab
H-1988	16.98ab	17.00bcd	16.99ab	RR	2.13a	2.61 a	2.37ab
H-1992	16.89ab	18.59ab	17.74 a	HS	2.00ab	2.43 a	2.22ab
H-230	17.64a	17.33abcd	17.49 a	S	2.18a	2.85 a	2.52a
H-232	16.93ab	18.87 a	17.90 a	HS	2.13a	2.55 a	2.34ab
H-240 A	16.80ab	18.52abc	17.66 a	HS	2.00ab	2.69 a	2.35ab
H-240 B	16.27ab	17.41abcd	16.84ab	RR	1.24d	2.46 a	1.85b
H-243	16.36ab	16.18 d	16.27ab	MR	1.64bcd	2.77 a	2.21ab
H-244	17.07a	17.59abcd	17.33ab	S	1.78abc	2.70 a	2.24ab
Sakha1	16.09ab	16.93bcd	16.51ab	RR	1.51cd	2.72 a	2.12ab
Grand mean ± SE*	16.68 ± 0.44	17.47 ± 0.45	17.08 ±0.36		1.75 ± 0.17	2.67 ± 0.09	2.21 ±0.10

SE*means standard error

During the second season, there were insignificant differences in the numbers of the predators on the tested genotypes and the mean number ranged from 2.43 to 2.91 individuals. Based on the mean number of the two seasons, the highest number was recorded on H-230 (2.52 individuals) while the least number took place on H-240B (1.85 individuals). The rest genotypes harbored a moderate number without significant differences among them.

From the mentioned results, it can be reported that the sowing dates affected the susceptibility of the tested genotypes to leafhoppers infestation. This may be due to the environmental conditions, as they affect the ability of plants to resist insect attack in addition to fundamental physiological

processes of the plant as well as the insect, consequently a variety that exhibits resistance in one locality or environment may be susceptible in another (Kumar, 1984). Also, variation the planting date of crops works as a mean of cultural control by creating asynchrony between the phenology of both crop and insect pests which can retard the rate of colonization (Ferro, 1987) or means that the pest fails to coincide with a critical crop growth stage (Dent,1991).

However, many authors reported differences among faba bean genotypes to leafhoppers infestation (Metwally *et al*., 1997; Hegab, 2008; El-Mashaly, 2013 and El-Srand, 2013). Metcalf and Luckmann (1975) mentioned that morphological characteristics of the plants mostly influence the mechanisms of locomotion, feeding, oviposition, ingestion and digestion of the pest, while biochemical factors of plants affect the behavior and / or metabolism of insects. Van Emden (1987) reported that the variation of genotypes susceptibility to insect infestation may be due to the presence of antiexnosis and / or antibiosis phenomena.

In conclusion, it can be stated that H-240A and H-240B are considered promising genotypes for first of October plantation, as they exhibited a desirable resistance to the leafhoppers, while H-1973 an H-243 are suitable to first of November plantation. Thus, the tested genotypes must be taken great attention in the future to be used as relatively resistant varieties against leafhoppers.

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تقـيم حقلـي لـبعض التراكيـب الوراثيـة مـن الفـول البلـدي للإصـابة بنطاطـات الأوراق والمفترسات المصاحبة لها بمحافظة كفر الشيخ.

محمد عبد الحافظ خطاب ، على ممدوح ناصف و محسن عطية ابوطايش.
معهد بحوث وقاية النباتات- مركز البحوث الزراعية – الجيزة – مصر.

تم تقيم الحساسية النسبية لثلاثة عشر من التراكيب الوراثية المبشرة للفول البلدي مقارنة بالصنف المحلى سخا 1 للإصابة بنطاطات الأوراق (الجاسيد) وكذلك المفترسات المصاحبة لها بالمزرعة البحثية بمحة بحوث سخا – كفر الشيخ خلال ميعادين للزراعة (الأول من أكتوبر، والأول من نوفمبر) فى موسمي 2011/2010 و2012/2011 م.

بناءاً على متوسط تعداد نطاطات الأوراق خلال موسمي الدراسة أوضحت النتائج وجود اختلافات ولكنها غير معنوية بين السلالات المدروسة ومستويات الإصابة، بينما كانت الاختلافات معنوية بين جذب المفترسات خلال ميعاد الزراعة الأول. السلالة H-240 A استقبلت أعلى تعداد من المفترسات بينما أقل تعداد وجد على السلالة H-1972 B ، H-1973 فى الميعاد الثاني السلالة H-232 ، H-1992 A، H-240 B، H-1972 والسلالة H-230 استقبلت أعلى تعداد من الجاسيد. سجلت المفترسات أعلى تعداد على السلالة H- 230 بينما السلالة 240 B استقبلت أقل تعداد.وبصفة عامة وجدت خمسة أنواع من المفترسات مصاحبة للحشرات بحقول الفول البلدي خلال موسمي الدراسة وهى أسد المن، الأسكمنس، الحشرة الرواغة، أنواع أبو العيد والعناكب الحقيقية وكان أسد المن هو الأكثر تعدادا عن المفترسات الأخرى.

طبقاً لدرجات الحساسية للإصابة بالجاسيد وجد أن السلالة A 240 ،B 240 متوسطة المقاومة ، والسلالة 1970 ، B 1972، 1973 ، 1988 ،والسلالة 232 أظهرت مقاومة نسبيا و السلالة A 1972 ، 1992 ، 243 ، 244 والصنف المحلى سخا 1 أظهرت حساسية للإصابة والسلالة 1980 والسلالة 230 أظهرتا حساسية عالية للإصابة وذلك من خلال ميعاد الزراعة الأول. وبالنسبة لميعاد الزراعة الثاني وجد أن السلالة 1973 والسلالة 243 أظهرتا مقاومة متوسطة، والسلالة 1970،198 ، B 240، B 1972، 1980، 230 والسلالة 244 كانت حساسة للإصابة بينما السلالة 232، والسلالة A 240 كانت عالية الحساسية للإصابة.

أخيرا يؤخذ في الاعتبار أن السلالة A 240 والسلالة B 240 من السلالات المبشرة من خلال ميعاد الزراعة الأول، بينما السلالة 1973 والسلالة 243 من السلالات المبشرة لميعاد الزراعة الثاني ولذلك هذه السلالات يتم الاهتمام بها في المستقبل لاستخدامها كأصناف حساسة لنطاطات الأوراق.

قام بتحكيم البحث

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