VARIETAL RESISTANCE OF NINE POTATO VARIETIES TO NATURAL INFESTATION BY CERTAIN LEAF PESTS AT GEMMEZA REGION, EGYPT.

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(Manuscript received 16 March 1993)

Abstract

The varietal resistance of the nine potato varieties Lesita, Nicola, Diamont, Baraka, Draga, Spunta, Serrina, Mondial and Timate to natural infestation with seven serious pests attacking leaves during the two successive years, 1991 and 1992 was studied at Gemmeza region. The results showed that in summer plantation in both 1991 and 1992 seasons, Lesita var. seemed to be more susceptible to *Aphis gossypii* Glover , whereas Spunta var. in the first season and Baraka var. in the second showed the highest levels of resistance. Lesita potato plants were more attractive to *A. craccivora Koch* than the other tested varieties . Serrina Var. was less preferrable to insect attack. Spunta var.in the first year and Serrina var. in the second showed the highest level of resistance to *Myzus persicae* Sulz .Draga and Lesita vars .were however more susceptible . Timate potato plants were more attractive to *Empoasca decipiens* Paoli. Potato plants of Nicola, Baraka, Draga and Spunta cultivars were not infested by this pest .Timate potato var. was more susceptible to *Thrips tabaci* Lind. The lowest average numbers of thrips insects occurred on Nicola and Baraka var. in 1991 and 1992 , respectively. Serrina var. showed the highest level of resistance to *Bemisia tabaci* (Genn.). Lesita Var. was the lowest in this respect. *Tetrancychus* sp. attacked potato leaves of all tested cultivars in the first year of study , while in the second, Timate was the only cultivar invaded by this pest.

In winter plantation, A. gossypii insects prefered winter potato plants of Spunta and Serrina cultivars more than the other tested cultivars. Draga var. was the most susceptible to infestation with *A.. c racci - vora.* On the other hand , Timate potato var. was not infested by this species of aphid. *M. persicae* insects occurred in high numbers on Draga potato plants in both years. Baraka var. in 1991 and Timate var. in 1992

recorded the lowest numbers . The highest populations of *E.decipiens* were recorded on potato plant of Draga and Mondial in 1991 and Draga in 1992 . Plants of Nicola, Diamont, Baraka and Draga cultivars were immune against *T. tabaaci* attack. On the other hand, the highest average numbers were recorded on potato plants of Spunta (1991) and Mondial (1992). Nicola, Timate and Diamont cultivars showed high degrees of resistance to *B. tabaci* attack . Draga. Baraka, Mondial and Lesita were the most susceptible to this pest.

INTRODUCTION

During the last few years , there has been a phenomenal increase in potato cultivation in order to cover consumption and for export purposes. With such growing interest, potato pests also received attention. Among these pests, *Aphis gossypii* Glover, *A. craccivora* Koch, *Myzus persicae* Sulz., *Empoasca decipiens* Paoli, *Thrips tabaci* Lind., *Bemisia tabaci* (Genn.) and *Tetranychus* sp. which infest potato leaves and cause considerable damage in both quantity and quality (Harakly 1974; Hemeida 1981; El-sharkawy 1989).

The economic importance of evaluating varietal resistance for certain pests received the attention of many workers (Bottoger *el al.*, 1964; Lukehafr and Martin, 1966; Marzouk 1975; Hemeida 1981; El-Borolosy and Hemeida 1986; Helaly 1989; Hassanein *et al.*, 1992)

The growing of varieties tolerating infestation could be considered as a basic method of control . Therefore, the aim of the present work is to study the varietal resistance of nine potato varieties to natural infestation by potato pests . This would certainly help plant breeders to produce new varieties that are less susceptible to infestation with pests , a matter that would serve establish sound integrated pest management programs.

MATERIALS AND METHODS

Field studies were carried out during summer and winter plantations of two consecutive years (1991 and 1992) at the Experimental Farm of Gemmeza Research station, Agriculture Research Centre, Ministry of Agriculture, Gharbia Governo-

rate, Egypt. A complete randomized design with three replicates was used . Each plot had an area of about 10.5 meter^2. The tested potato varieties were Lesita, Nicola, Diamont, Baraka, Draga, Spunta, Serrina, Mondial and Timate. The planting date was on 14th October and 29 th of January of both 1991 and 1992 during winter and summer seasons, respectively. All agricultural practices were made as usually performed and no pesticidal treatments were applied . The main leaf pests studied on the tested potato varieties were *Aphis gossypii Glov., A .craccivora* Koch, *Myzus persicae* Sulz. *Empoasca decipiens* Poli, *Thrips tabaci* Lind., *Bemisia tabaci* (Genn.) and *Tetranychus* sp.

Samples of 60 potato leaflets per variety were taken at random from different levels of plant height (one leaflet per plant) after about 30-40 days from the planting date and examined at weekly intervals. These samples were kept in tightly closed paper bags and the included pests were counted in the laboratory in the same day with the aid of a stereomicroscope. The total number of nymphs and adults of *A. gossypii, A. craccivora, M. persicae, E. decipiens and T. tabaci* found on both surfaces of each leaflet was taken as an indication of the population size of these insects at the respective date for each variety . The population density of *B. tabaci* was estimated by counting the total number of immature stages (eggs, larvae and pupae) found per inch^2 of both srufaces of each leaflet . In case of *Tetranychus* sp., counting of eggs and moving individuals was made on each surface of the leaflet in a given area of one inch^2 . The tested area was chosen at the base of leaflet and around its mid-rib.

All the obtained results were statistically analyzed according to complete randomized design. The proper "F" and L.S.R. values were calculated as described by Fisher (1944) and Snedecor (1957).

RESULTS AND DISCUSSION

Summer plantation

Aphis gossypii Glover

As clearly shown in Tables 1 and 2 ,the population density of the cotton aphid on summer potato plants differed according to the cultivated variety . Statistical analysis revealed that the differences between the nine tested varieties were insignificant and highly significant during the summer season 1991 and 1992 , respecti

Table 1. Average numbers of *Aphis gossypii* Glover, *Myzus persicae* Sulz., and *Thrips tabaci* Lind. per leaflet, *Bemisia tabaci* (Genn) and *Tetranychus* sp. per inch of leaflet on different potato varities during summer plantation of 1991.

Variety	*A.gossypii*	*M.persicae*	*T.tabaci*	*B. tabaci*	*Tetranychus sp*
Lesits	0.130	0.015 bc	0.146 b	1.481e	0.013c
Nicola	0.029	0.036 bc	0.108b	0.712a	0.044a
Diamant	0.015	0.032 bc	0.384 a	0.775 a	0.033ab
Baraka	0.024	0.046bcd	0.154 b	1.083 f	0.011c
Draga	0.032	0.094 a	0.381 a	0.557 g	0.015
Spunta	0.0	0.0 d	0.187b	0.425 b	0.009c
Serrina	0.023	0.052 ab	0.56 b	0.239 d	0.004c
Mondial	0.025	0.050 ac	0.181 b	0.385bc	0.008c
Timate	0.031	0.040 bc	0.594	0.285cd	0.006c
F.test	N.S.	*	**	**	*

N.S. not significant
* significant at 5% level of probability.
** significant at 1% level of probability.
The differences between averages followed by similar letter were statistically insignificant.

Table 2. Average numbers of Aphis *craccivora Koch, Myzus persicae* Sulz., and *Thrips tabaci* Lind. per leaflet, *Bemisia tabaci* (Genn.) and *Tetranychus* sp. per inch^2 of leaflet on different potato varieties during summer plantation of 1992.

Variety	*A.gossypii*	*A.craccivora*	*M.persicae*	*E.decipiens*	*T.tabaci*	*Tetranychus sp.*
Lesits	1.184d	0.129a	2.717d	0.036a	0.173 d	0.0b
Nicola	0.315c	0.106ab	0.808a	0.0bc	0.291cd	0.0b
Diamant	0.756a	0.065bcd	0.732a	0.019ac	0.887a	0.0b
Baraka	0.142c	0.079ad	0.833a	0.0bc	0.199d	0.0b
Draga	0.236c	0.044cde	0.523ab	0.0bc	0.208 d	0.0b
Spunta	0.527b	0.073bcd	0.865a	0.0bc	0.713ab	0.0b
Serrina	0.169c	0.012e	0.356b	0.025ab	0.636b	0.0b
Mondial	0.629ab	0.092ac	0.748a	0.015a	0.452c	0.0b
Timate	0.274c	0.029de	0.535ab	0.115	1.094e	0.032a
F.test	**	**	**	**	**	**

vely . The potato var. Lesita was more susceptible to natural infestation with this species showing the highest average numbers of 0.130 and 1.184 insect/ leaflet in the first and second year, successively . Whereas, Spunt var. in 1991 and Baraka var. in 1992 were more resistant to this pest recording the lowest population of 0.0 and 0.142 aphid/ leaflet, respectively. The other tested varieties gave a moderate level of resistance to cotton aphid attack under field conditions .

***Aphis craccivora* Koch**

The data given in Table 2 revealed that the differences between the average numbers of the leguminous aphid on the nine tested varieties were highly significant for the second season of 1992. Serrina potato var. proved to be a less susceptible host for *A. craccivora* infestation (0.012 insect/leaflet), wherease Lesita var. appeared to be more susceptible recording the higheşt population (0.129). It could be observed that summer potato plants of all tested cultivars during the first season of 1991 were completely free from the leguminous aphid individuals.

***Myzus persicae* Sulz.**

The maximum averages of the green peach aphid numbers were recorded on Draga and Lesita vars. (0.094 and 2.717 aphids/leaflet during summer of 1991 and 1992 , respectively) as shown in Tables 1 and 2 The minimum numbers were obtained on Spunta and Serrina vars. showing 0.0 in the first year and 0.356 in the second . The differences between average numbers of this insect recorded on the nine tested poltato varieties were statistically signifcant in 1991 and highly significant in 1992.

***Empoasca decipiens* Paoli**

The potato leafhoppers occurred only on certain potato cultivars during summer plantation of 1992 (Table 2). Potato plants of Nicola, Baraka, Draga and Spunta varieties were completely free from the cicadellid insects . Timate var. proved to be more preferable to jassids attack showing the highest average number of leafhoppers per leaflet (0.115), but the lowest population of this insect was recorded on potato plants of Mondial cultivar (0.015).

***Thrips tabaci* Lind.**

The effect of variety on thrips incidence was highly significant during summer plantation . Timate var. was more attractive to thrips showing the highest average numbers of 0.594 and 1.094 insects/leaflet in 1991 and 1992 seasons, respectively. Nicola var. in 1991 and Baraka var. in 1992 were less preferable to thrips attack recording the lowest populations of 0.108 and 0.119 insect/ leaflet. The other tested cultivars gave a moderate degree of resistance to natural infestation by thrips (Tables 1 and 2).

***Bemisia tabaci* (Genn.)**

From the data presented in Table 1, it was clear that in the first season of 1991 the average numbers of immature individuals (eggs, larvae and pupae) of white fly on leaves of the nine tested varieties varied significantly and ranged between 0.239 individual /inch^2 of leaflet (Serrina var.) and 1.481 (Lesita var.) On the other hand , the insect disappeared completely on all tested cultivars during summer plantation of 1992.

***Tetranychus* sp.**

The data given in Table 1 and 2 indicated that the number fo red spider mites infesting all the tested potato varieties was low in the first year , while in the second one, Timate variety was only infested with this pest recording 0.32 individual (eggs and moving stages/inch^2 of leaflet). The mite population density varied significantly in 1991 and highly significantly in 1992 according to the tested variety.

Winter plantation

***Aphis gossypii* Glover.**

During winter season, Serrina potato var. in 1991 and Spunta var. in 1992 were strongly infested with cotton aphids recording the highest average numbers that were 0.040 and 0.044 insect/leaflet in the two years, respectively . Whereas, Baraka var. in the first year and Drag var. in the second were more resistant to this species of aphids showing the lowest average numbers of 0.006 per leaflet in both years (Tables 3 and 4) . Statistical analysis showed that the differences between average numbers of *A. gossypii* on the nine tested potato varieties were significant during the winter of 1991 and highly significant during the winter fo 1992.

Table 3. Average number of *Aphis gossypii* Glover, *Aphis craccivora* Koch, *Myzus persicae* Sulz. *Empoasca decipiens* Paoli and *Thrips tabaci* Lind. per leaflet and *Bemisia tabaci* (Genn.) per inch of leaflet on different potato varieties during winter plantation of 1991.

Variety	*A.gossypii*	*A.craccibora*	*M.persicae*	*E.decipiens*	*T.tabaci*	*B.tabaci*
Lesits	0.011bc	0.009c	0.023b	0.006	0.0c	22.283d
Nicola	0.013bc	0.015c	0.083a	0.0	0.0c	9.225b
Diamant	0.027ab	0.046a	0.019b	0.0	0.0c	12.085a
Baraka	0.006bc	0.017bc	0.015b	0.0	0.0c	14.141a
Draga	0.009bc	0.077d	0.152c	0.021	0.0c	17.858e
Spunta	0.028a	0.050a	0.029b	0.0	0.015a	13.213a
Serrina	0.040a	0.034ab	0.042ab	0.0	0.009ab	13.756a
Mondial	0.011bc	0.009c	0.029b	0.021	0.002bc	31.611c
Timate	0.023ac	0.0c	0.087a	0.0	0.0c	8.610b
F.test	*	**	**	N.S.	* *	**

Table 4. Average number of *Aphis gossypii* Glover, *Aphis craccivora* Koch, *Myzus persicae* Sulz. *Empoasca decipiens* Paoli and *Thrips tabaci* Lind. per leaflet and *Bemisia tabaci* (Genn.) per inch of leaflet on different potato varieties during winter plantation of 1991.

Variety	*A.gossypii*	*A.craccivora*	*M.persicae*	*E.decipiens*	*T.tabaci*	*B.tabaci*
Lesits	0.019cd	0.017cdc	0.019a	0.0b	0.004	16.013a
Nicola	0.015cf	0.019cde	0.004a	0.0b	0.0	6.977d
Diamant	0.036ab	0.042 bd	0.023a	0.015ab	0.0	9.038cd
Baraka	0.008def	0.019cdf	0.021a	0.0b	0.0	25.071e
Draga	0.006 ef	0.079a	0.146b	0.029a	0.0	30.858f
Spunta	0.044a	0.056ab	0.04a	0.0b	0.004	12.207b
Serrina	0.021 c	0.048bc	0.024a	0.0b	0.010	11.417bc
Mondial	0.017ce	0.011dh	0.027a	0.009b	0.063	17.725a
Timate	0.025 bc	0.0efgy	0.004a	0.0b	0.004	7.496 d
F.test	* *	* *	* *	* *	* *	* *

***Aphis craccivora* Koch**

During winter plantation as clearly shown in Tables 3 and 4 the diferences between the nine varieties in their sensitivity to aphid infestation were highly significant in both 1991 and 1992. It was very obvious that Timate potato cultivar was resistant against this species of aphid, since its plants were completely free from the insect infestation throughout the period of winter season . On the other hand, the other tested cultivars were attacked by the insect at different degrees . In both the first and second seasons, Draga potato var. proved to be more susceptible to insect attack (0.077 and 0.079 aphid/leaflet in 1991 and 1992, successively), while Lesita and Mondial potato vars. were more resistant showing 0.009 , 0.009 and 0.017 , 0.011 insect / leaflet in 1991 and 1992, respectively.

***Myzus persicae* Sulz.**

Data in Tables 3 and 4 show that the highest average number of M.persicae occurred on potato plants of Draga cultivar which seemed to be more attractive to green peach aphid in both years . For the other varieties, the insect population varied from one year to another. This may be due to changes in the environmental conditions prevailing during the two years of investigation. Potato variety affected significantly the population density of the green peach aphid infesting potato leaves during winter plantation of both years .

***Empoasca decipiens* Paoli**

The data recorded in Tables 3 and 4 show that there were no significant differences between the tested cultivars in their resistance to potato leafhopper attack during winter plantation of 1991, while in the second season (1992) differences were highly significant It could be concluded that Nicola, Baraka, Spunta , Serrina and Timate were immune against the leafhopper attack since the insect population did not occur on them in both 1991 and 1992 seasons. It has been found that the Draga and Mondial cultivars in the first season and Draga cultivar in the second one showed a high degree of susceptibility to leafhopper infestation recording the highest numbers of 0.021 , 0.021 and 0.029 Jassids/ leaflet , respectively.

***Thrips tabaci* Lind.**

The differences between average numbers of thrips insects on different tested

potato cultivars were statistically highly significant during winter of 1991 and insignificant during winter of 1992 as clearly shown in Tables 3 and 4. In 1991 season, *T. tabaci* appeared only on potato plants of the three varieties Spunta (0.015) , Serrina (0.009) and Mondial (10.002), but on the other tested varieties the insect was not recorded . In 1992 season, thrips insects were recorded on five cultivars namely Lesita, Spunta, Serrina, Mondial and Timate showing average number of 0.004, 0.004 , 0.010, 0.063 and 0.004 insect/leaflet respectively. Leaves of potato plants from the cultivars Nicola, Diamont, Baraka and Draga were completely free from thrips insects during winter plantation of both years.

***Bemisia tabaci* (Genn.)**

The degree of infestation by white fly as measured by average number of immature stages on the nine tested potato varieties during winter plantation of 1991 and 1992 are given in Tables 3 and 4 . The analysis of variance showed that the differencs between the nine potato varieties in their susceptibility to infestation with B. tabaci were highly significant in both 1991 and 1992 seasons. The insect occrrence on the nine tested potato varieties somewhat changed from one year to another . It could be concluded that Draga potato plants grown in the winter season of 1992 were heavily infested by whitefly showing the highest average number of immature individuals per inch^2 of leaflet (30.858), while Nicola var. appeared to be slightly infested by the insect compared with other cultivars (6.977 individuals / inch^2 of leaflet).

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دراسة مدي مقاومة تسعة أصناف بطاطس للاصابة ببعض آفات الأوراق فى منطقة الجميزة - جمهورية مصر العربية

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أجريت دراسات علي مدي مقاومة تسعه أصناف بطاطس للإصابة الطبيعية ببعض آفات الأوراق خلال عامين متتاليين (١٩٩١، ١٩٩٢) في منطقه الجميزة - محافظة الغربية ويمكن تلخيص النتائج المتحصل عليها فيما يلي :

أ - العروة الصيفية:

١- في العروة الصيفة لكل من عامي الدراسة أظهرت نباتات الصنف ليسيتا درجة عالية من القابلية للاصابة بحشرة من القطن . بينما أظهرت نباتات الصنف أسبونتا في العام الاول والصنف بركه في العام الثاني درجات عالية من المقاومة لتلك الحشرة.

٢ - لقد كانت نباتات الصنف ليسيتا أكثر جذبا لحشرة من البقوليات مقارنه بالاصناف الاخري ولكن نباتات الصنف سيرينا كانت أقل تفضيلا للاصابة بتلك الحشرة.

٣ - لقد ثبت أن نباتات الصنف تايميت اكثر جذبا لجاسيد أوراق البطاطس. بينما لم تصب أصناف نيكولا ، بركة، دراجا واسبونتا بتلك الآفة.

٤ - لقد أظهرت نباتات الصنف تايمتي درجة عالية من القابلية للاصابة بحشرة تربس القطن . ولكن تواجدت حشرات التربس بأقل عدد علي نباتات الصنفين نيكولا وبركة في العام الاول والثاني علي التوالي .

٥ - أظهرت نباتات الصنف سيرينا أعلي درجة من القاومة ضد حشرة الذبابة البيضاء ، في حين أعطت نباتات الصنف ليسيتا أقل درجة مقاومة.

٦ - لقد هاجمت أفراد أكاروس العنكبوت الأحمر اوراق كل أصناف البطاطس المختبرة في العام الاول من الدراسة بينما وجد أن صنف تايميت هو الصنف الوحيد الذي أصيب بتلك الآفه في العام الثاني .

ب – العروة الشتوية

١ – لقد فضل من القطن نباتات البطاطس الشتوية للصنفين أسبونتا وسيرينا أكثر من الاصناف الأخري .

٢ – لقد ثبت أن نباتات الصنف دراجا أكثر قابلية للاصابة بحشره من البقوليات . وعلي العكس من ذلك وجد أن نباتات تايميت لم تصب بتلك الحشرة.

٣ – لقد تواجدت أفراد من الخوخ الاخضر بأعداد كبير ة علي نباتات الصنف دراجا في كلا عامي الدراسة بينما سجل كل من صنفي بركه في عام ١٩٩١ وتايميت في عام ١٩٩٢ أقل أعداد.

٤ – لقد سجل أعلي أعداد لجاسيد أوراق البطاطس علي نباتات صنفي دراجا ومونديال في عام ١٩٩٢.

٥ – لقد ثبت أن نباتات أصناف نيكولا ،و دايمونت ، بركه ودراجا كانت منيعة ضد الاصابة بحشرة تربس القطن . وعلي العكس من ذلك تواجدت أفراد التربس باعداد كبيره علي نباتات صنفي اسبونتا (١٩٩١) ومونديال (١٩٩٢) .

٦ – لقد أظهرت نباتات أصناف نيكولا ، ودايمونت درجات عالية من المقاومة بحشرة الذبابة البيضاء بينما كانت أصناف دراجا، بركة ، مونديال وليستيا أكثر قابلية للاصابة بتلك الآفة.