

HOST RANGE AND SEASONAL ABUNDANCE OF THE CORN LEAF APHID, *Rhopalosiphum maidis* FITCH IN SHARKIA, EGYPT

Ibraheem, M.M.A. and H.E. Megahed and M.A. El-Gendy
Plant Protection Res. Institute, Dokki, Giza, Egypt

ABSTRACT

Host range and seasonal abundance of the corn leaf aphid, *Rhopalosiphum maidis* Fitch (CLA) was estimated at Zagazig district, Sharkia Governorate during two continuous years (2001/2002 and 2002/2003).

Rhopalosiphum maidis Fitch found infesting 21 plant species two as grain crops (maize presented and wheat), 5 species as foliage crops (millet, broom corn, soccharia, maize and Johnson grass) and 14 species of weeds [jungle rice, barnyard grass, rabbit grass, green fox tail, little seed canary grass, wild oat, sugar can (solitary plants), common reed, dog grass, annual bluegrass, rabbit foot grass, purple nut sedge and mosa (solitary plants)]. The grain crop plants (*Z. mays*) harbored relatively the highest numbers (presented with 24.46% of the total number of aphid) followed by foliage plants (especially, *Sorghum vulgure* presented with 22.21%) and weeds.

Seasonal abundance of *Rh. maidis* population on the different hosts indicated that, population density of CLA on foliage crop and weed plants was raised before and after suitable growing periods of maize and wheat plants. The infestation of *Rh. maidis* started on the weed plants *Echinochloa colonum* Link, *Polypogon monspeliensis* Desf and *Cyperus rotundus* L.) from end November till mid or end January then aphid migrate to wheat and maize which cultivated as foliage crops the infestation continuous reaching to mid April and then migrate to early summer plantation maize (grain crop), also the aphids migrate from *Bachiararia eruciformis* Grisb and *Setaria* spp. to maize (grain and foliage crops) and to soccharia (foliage crop).

INTRODUCTION

The corn leaf aphid, *Rhopalosiphum maidis* Fitch is ranked as one of the most important insect pest by cereal growers over the world. The aphid is considered as the key pest attacking gramineae plants. The aphid is occurs all over the year and its distribution is not limited. The gramineae plants were colonized by *Rh. maidis* in different densities of infestation [Hassan (1957); Gangulu and Raychauduri (1980) and Megahed *et al* (1983)], The corn leaf aphid (CLA) began to be aerial injurious pest on maize plants [Youssef (1990) and Abd El-Rahim *et al* (1991)] This aphid species cause sever damage (20-33%) and colonize wide range of cereal hosts [El Harriry (1979); El Nagar *et al* (1982- 1983); Tawfik *et al* (1974); Ismail *et al* (1993) Dean (1974), Warten and Redhead (1976) and Megahed (2000).

The effective Pest Management Program always needs more and recent information. The present work aimed to scout host range and study seasonal abundance of CLA on gramineae plants at Zagazig district.

MATERIAL AND METHODS

The present work was carried out at Zagazig district (Sharkia Governorate at end of November 2001 till early December 2003. Five kilometers distant from Kafr Abd El-Aziz to Zerkia village were selected for screening the host range (economic and weed plants) and seasonal abundance of corn leaf aphid. Weekly the numbers of different stages of *Rhopalosiphum maidis* were counted on ten plants for each plant species in the field as following schedule: 1-Maize, ten plants till tassel emergence then ten longitudinal inch on main stem of tassels were inspected. 2-the millet , broom corn, jonson grass, soccharia, wheat, jungle rice, barnyard grass, rabbit grass, green fox tail, giant reed, wild oat, little seed canary grass, rabbit foot grass, sugarcane, purple nut sedge dog grass , mosa, annual blue grass, common reed; ten tillers for each plant species. The weed plants : sample presented by plants found between economic plants and out fields beside road and irrigation canals banks. Relative abundance (R%) of *Rh. maidis* population on each host plants was calculated as follow :

$R\% = \text{total number of aphid on each host plant} / \text{total number of aphid on all host plants} .$

RESULTS AND DISCUSSION

1. Host range of corn leaf aphid (CLA) *Rhopalosiphum maidis* Fitch.

Data in Table(1) cleared that, the corn leaf aphid colonized wide range of gramineae economic crops (6 species) and weed plants (14 species). These hosts could be arranged in descending order as follows:

a. Economic crops: Mean numbers of CLA infested gramineae plants were varied significantly from host to another. The highest occurrence of CLA were recorded on maize plants *Zea mays* which cultivated as grain crop presented with 24.64% of general total numbers recorded on economic and weeds plants, followed by millet plants, *Sorghum vulgare* (foliage crop) by 22.21%, broom corn, *S. technicus* (foliage crop) with 11.05%. The moderate percentages were recorded on soccharia, *Z.mays saccharata* (foliage crop) with 7.82% , *Z mays* which cultivated as foliage crop with 7.21% .of general total. The relatively low occurrence percentages recorded on jonson grass, *S. virgatum* with 5.14% followed by wheat, *Triticum vulgare* (grain crop) with 0.98% of general total numbers.

b- Weed plants:

i.Gramineae weeds: The weed plants were arranged in descending order according to the harbored aphid numbers as follows: *Echinochloa colonum* (jungle rice) harbored 6.95% followed ,by *E.crus galli* (Barnyard grass) harbored 5.48%, *Bachiararia eruciforms* (rabbit grass) with 1.93% *Arundo donaxl* (Giant reed) with 1.65% *Setaria* sp (green foxtail) with 1.16%, *Phalaris minor* (little seed canary grass) with 0.95% *Avena fatua* (wild oat) with 0.62%, *Ploypogon monspeliensis* (rabbit foot grass harbored 0.57% solitary plants of

Saccharum officinarum (sugar can) with 0.44% *Cynodon dactylon* (dog grass) with 0.35%, *Poa annua* (Annual Blue grass) with 0.17% and *Phragmites australis* (common reed) with 0.13% of general total numbers of CLA on different hosts.

Table (1): Host range and relative abundance of the corn leaf aphid, *Rhopalosiphum maidis* at Zagazig region during 2001/2002 and 2002/2003 years.

Family	Scientific name	Common name	Growth habit	The mean	Relative abundance	
Gramineae	1- Economic plants					
	A- Foliage crops					
		<i>Sorghum vulgare</i>	Millet	P*	2511	22.21
		<i>S. technicus</i>	Broom corn	P	1249	11.05
		<i>Zea mays saccharata</i>	Soccharia	P	884	7.82
		<i>Z. mays</i>	Corn	Asw	815	7.21
		<i>S. virgatum</i>	Jonson grass	P	581	5.14
	B- Grain crops					
		<i>Z. mays</i>	Corn	AS	2786	24.64
		<i>Triticum vulgare</i>	Wheat	AW	111	0.98
	C- Sugary crops					
		<i>Saccharum officinarum</i>	Sugar can	P	50	0.44
	Mosaceae	D- Fruit crops				
			<i>Mosa paradisiaca</i>	Banana	P	24
Gramineae	2- Weed plants					
		<i>Echinochloa colonum</i> Link	Jungle rice	AS	786	6.95
		<i>E. crus. galli</i> L.	Barnyard Grass	AS	620	5.48
		<i>Bachiaria aruciformis</i> Grisb	Rabbit grass	AS	218	1.93
		<i>Arundo donax</i> L.	Giant reed	P	186	1.65
		<i>Setaria</i> spp.	Green fox tail	AS	131	1.16
		<i>Phalaris minor</i> Retz	Little seed canary grass	AS	106	0.94
		<i>Avena fatua</i> L.	Wilde oat	AW	70	0.62
		<i>Polypogon monspeliensis</i> Desf.	Rabbit foot grass	P	65	0.57
		<i>Cynodon dactylon</i> Pers	Dog grass	P	40	0.35
		<i>Poa annua</i> L.	Annual blow grass	AW	19	0.17
		<i>Phragmites communis</i> Trin	Common reed	P	15	0.13
	Cyperaceae	<i>Cyperus rotundus</i>	Purple nut sedge	P	39	0.34
Total				11306	100	

* P = Perennial A.= Annual S. = Summer W. = Winter

ii. **The Cyperaceae plants:** this family was represented by *Cyperus rotundus* (purple nut sedge). It harbored 0.34% of the total numbers of CLA on different hosts.

iii. **The Mosaceae plants:** this family was represented by solitary plants of *Mosa paradisiaca* (mosa or banana). It harbored 0.21% of the total numbers of CLA on different hosts.

The obtained results agree with those of Hassan, (1957), Ismail, et al (1993), Megahed (2000) and Mohammad (2000) they , found that, *Rh. maidis* colonized mainly on economic cereal, maize and sorghums with relatively high numbers; while on wheat, broom corn, jonson grass and soccharia it occurred with relatively low numbers. The authors added that the main weeds infested by *Rh. maidis* were *Bromus arvensis* L., *Cynodon dactylon* Pers, *Echinochloa colonum* Link , *Eleusine indica* L. and *Polygonum* SP.

2- Seasonal abundance of *Rh. maidis*.

a- Economic hosts:

1. Maize plants , *Zea mays* :

The data illustrated in Fig (1) showed that *Rh. maidis* colonized maize plants from early April till the end of August during the 1st season. Three peaks were recorded ;The highest one was at early August (222 individuals/ plant). The infestation period extended from mid-March till early October during the 2nd Season. Three peaks were recorded too; the greatest one was recorded at the end of August (267 individuals/ plant).

2. The millet plants, *S. vulgure* .

The CLA, *Rh. maidis* occurred on sorghum plants throughout the study years except some short periods. The first extended from the 3rd week of January till the 2nd week of April 2002. During the 2nd year they were during the 3rd and the 4th week of January , June and the 1st week of July. The population of CLA fluctuated recording 6 peaks during the 1st year, the highest one was 200 individuals/tiller at 4th week of June 2002. During the 2nd year, 8 peaks were recorded . The highest one was 135 individuals/tiller at the 4th week of September (Fig. 1).

3. The broom corn, *S. technicus*

The broom corn harbored *Rh. maids* throughout the periods extended from the 3rd week of December 2001 till early May 2002, from the 1st week of June till the 4th week of July, from the 3rd week of August till the 2nd week of September and from the 3rd week of October 2002 till the 4th week of April 2003, while the last period extended from the 2nd week of August till early December 2003. The population of CLA fluctuated throughout the occurrence periods . Five weak peaks were recorded at 2002 ;the highest one was 75.0 individuals/tiller. There were three peaks during 2003. The highest was recorded at the 1st week of September (37.0 individuals/tiller), (Fig. 1).

4. Soccharia, *Z. mays saccharate* :

The obtained results cleared that the soccharia plants harbored *Rh. maidis* at four periods throughout the study period, the 1st one extended from the 1st week of December 2001 till the 4th week of January 2002, from the 1st

week of June till the 3rd week of August, from the 1st week of November 2002 till the 2nd week of January 2003 and from the 4th week of June till the 1st week of August 2003. The CLA recorded 4 weak peaks, the greatest were recorded at the 2nd week of July 2002, and the 3rd week of July 2003 with 125.0, individuals/ tiller for each one (Fig. 1).

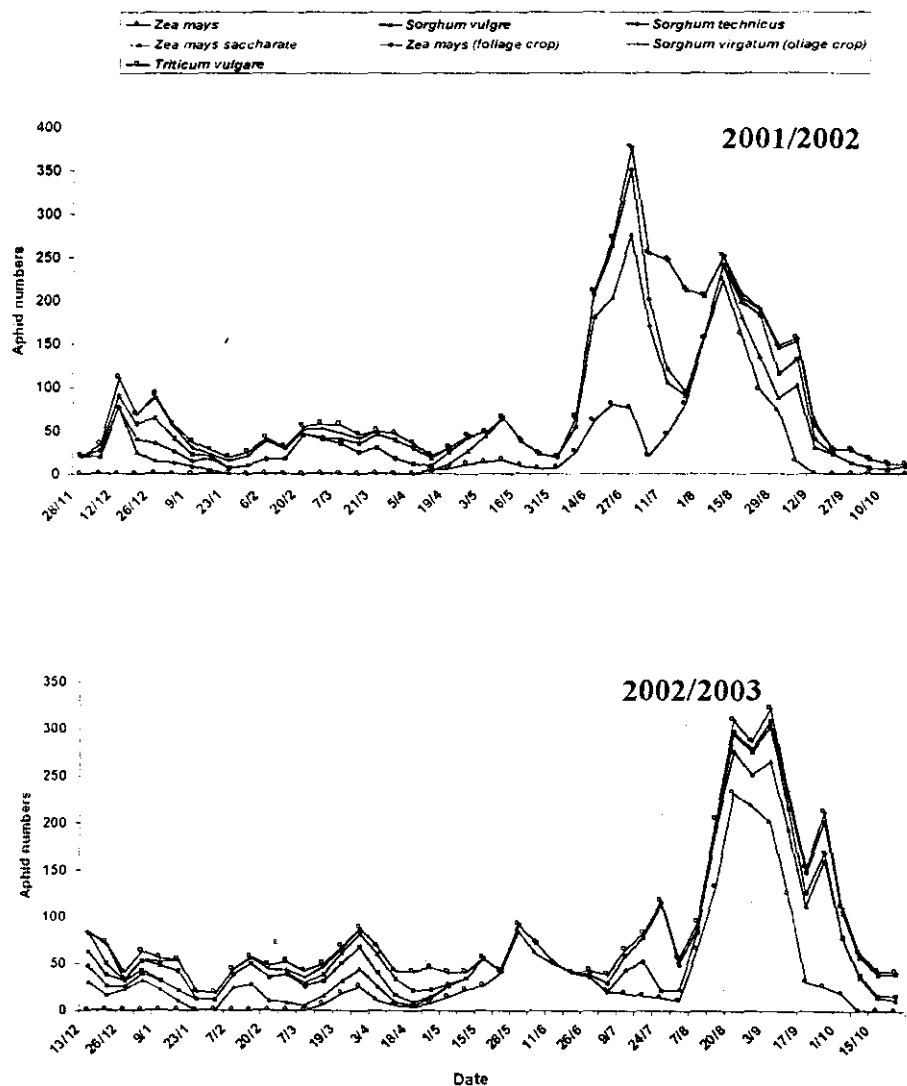


Fig. (1): Seasonal abundance of leaf corn aphid, *Rhopalosiphum maidis* on main economic plants at Zagazig region during 2001/2002 and 2002/2003 years

5. Maize, *Z. mays* (foliage crop):

The foliage maize plants harbored CLA with 4 periods, extended from the 4th week of February 2002 to the 4th week of April (with one peak 21 individuals/plant at the end of March), from the 3rd week of August till the 3rd week of January 2003 (with 2 peaks at the 1st week of September and the end of November with 29.0 and 41.0 individuals/plant, respectively), from the 4th week of February till early May 2003 (with one peak at the end of March with 20 individuals/plant) while the 4th period extended from the 3rd week of August till early December 2003 (with two peaks at the 4th week of September and at the 2nd week of November 2003 recorded 32.0 and 55.0 individuals/plant, respectively) (Fig. 1).

6. Jonson grass, *S. virgatum* (foliage crop)

Jonson grass was colonized by relatively low numbers of CLA. Fig. (1) showed 4 occurrence periods with weak fluctuation. The highest density was 24.0 individuals / tiller recorded at the end of December 2001 and the end of April 2003.

7. Wheat, *Triticum vulgare*

The wheat plants were colonized by CLA at 3 periods with low numbers. The first one extended from the end of December 2001 till the 2nd week of March 2002. The others were short (from the 2nd week of December 2002 till the 2nd week of January 2003 and from the 2nd week of February till the 3rd week of March 2003). The highest number was 9 individuals/tiller (Fig. 1). These results are in agreement with these of Ismail, *et al* (1993); El. Harriry (1974); Tawfik, *et al* (1979); Hassan (1957) and Mohammad (2000) who found *Rh. maidis* infesting maize from June till September and from November till mid-March on wheat.

b - Weeds plants:

1. Jungle rice, *Echinochloa colonum*

The highest numbers of CLA on weed plants recorded on Jungle rice, *E. colonum* plants. The population of CLA fluctuated with weak peaks. The greatest one was 60 individuals / tiller at the 4th week of April (Fig.2).

2. The barnyard grass, *E. crus galli*

According to the population of aphids the barnyard grass followed the previous weed plant. It harbored aphids from the 2nd week of August till the end of November 2002. Two peaks of 69.0 and 74.0 individuals/tiller were recorded at the 1st week of September and the 3rd week of October 2002, respectively. Also, aphids were harbored from the 2nd week of August till early October 2003. One peak of 29.0 individuals / tiller was recorded at 3rd week of September 2003 (Fig. 2).

3. Rabbit grass, *Bachiaria eruciformis*

The followed weed species was the rabbit grass, *B. eruciformis*. occurred from the 2nd week of April till the 3rd week of May 2002 with one peak at the end of April with 35.0 individuals / tiller. The CLA was found during the 2nd years from the 2nd week of August till early October 2003. The CLA had one peak of 33.0 individuals/ tiller at early May (Fig. 2).

4. The Giant reed, *Arundo donax*.

The Giant reed thirdly ranked in aphid population. Two occurrence periods, the first one extended from the 2nd week of March till early May 2002 with one peak at the 1st week of April (30.0 individual/ tiller). The 2nd period extended from the 2nd week of March till the 2nd week of May 2003 with one peak too, at the end of March (18.0 individ/ tiller) (Fig. 2).

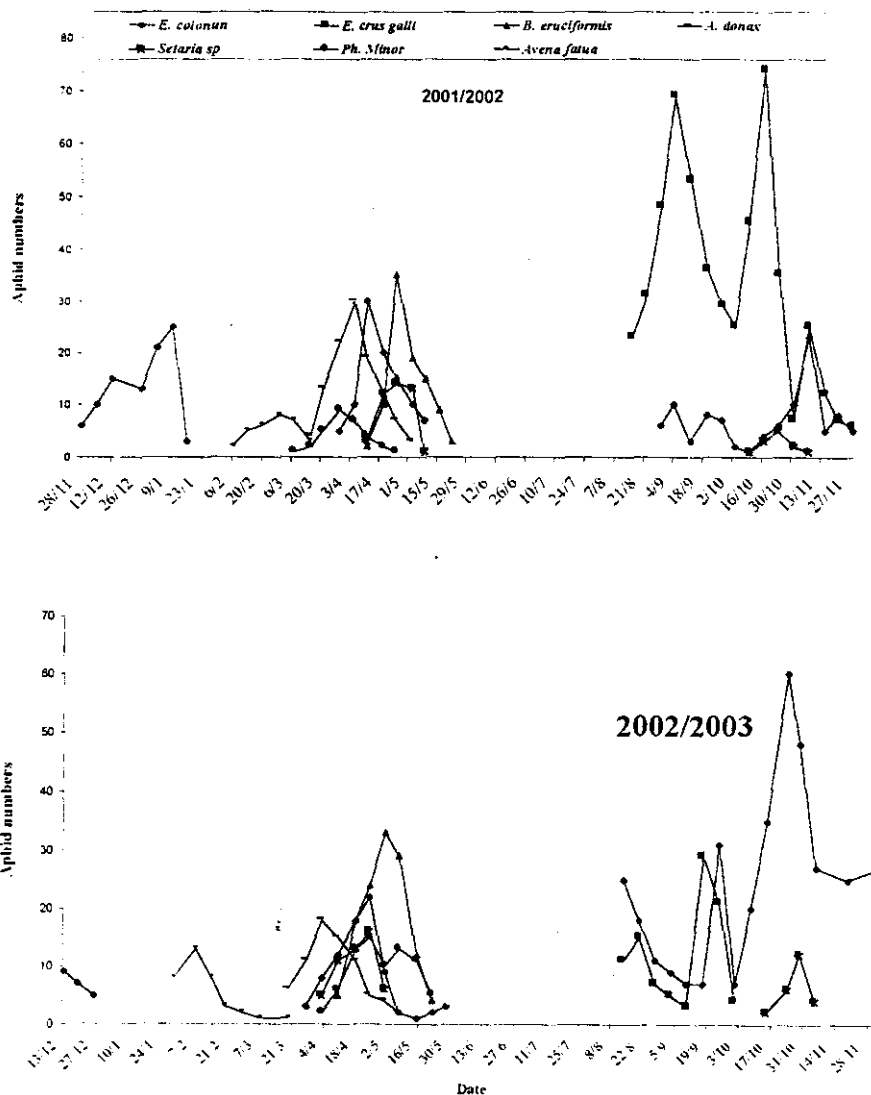


Fig. (2): Seasonal abundance of leaf corn aphid, *Rhopalosiphum maidis* on weed plants at Zagazig region during 2001/2002 and 2002/2003 years

5. The green fox tail, *Setaria sp*

The green fox tail, *Setaria* sp. harbored CLA by 4 short occurrence periods, the 1st extended from the 2nd week of April till the 2nd week of May, the 2nd from early October till early November 2003, the 3rd from end of March till early May and the 4th from the 3rd week of October till the 2nd week of November 2003 with weak oscillation, the highest density of CLA on *Setaria* sp was 16 individuals/tiller at the 4th week of April 2003. these periods are very important because their timing is between the aphid occurrence on the other hosts (Fig. 2).

6. The little seed canary grass, *Phalaris minor*

The little seed canary grass, *P. minor* harbored the CLA from the 1st week of March till the 4th week of April 2002 with very weak peak 9 individuals/tiller at the end of March. The population of the CLA fluctuated during 2003. It was recorded relatively high numbers of 15.0 individuals / tiller at the 4th week of April 2003 (Fig. 2).

7. The wild oat, *Avena fatua*

The wild oat, *A. fatua* was colonized by low numbers of CLA at two periods. The 1st one extended from the 1st week of February till mid-March 2002 with low numbers ranged 2-8 individuals/tiller. The 2nd period extended from the end of January till the 3rd week of March 2003 ranged 1-13 individuals/tiller (Fig. 2).

8. The rest weeds species were harbored very low numbers of *Rh.maidis* at relatively short occurrence periods.

Generally, the *Rh. maidis* found on gramineae hosts throughout the two years of study. The gramineal economic crops harbored highest numbers of CLA during long occurrence periods (especially maize and millet). The foliage crops were found as perennial shelter plants. They gave the aphids continues occurrence. The weed plants complete this roll as alternative hosts, especially before or after growing seasons of economic crops (between plantation periods), the economic crops plants are unsuitable (as morphological or physiological characters). The highest population density of CLA was recorded on maize, millet and broom corn as economic crops and on jungle rice and barnyard grass as weed plants. Therefore, it could be classified the hosts of CLA to three groups, i.e. grain crop hosts (maize and wheat), foliage crop hosts and weed hosts, that gave a clear focus about the economic importance of host scouting study, where the grain crops presented by two species (maize and wheat) harbored CLA at two periods of occurrence throughout each year, the 1st extended from the end of December 2001 till mid-March 2002 on wheat as winter grain crop host and the 2nd period from the 2nd week of April till early September 2002 on maize as summer grain crop host. During the 2nd winter season the occurrence on wheat recorded two periods. The 1st extended from the 2nd week of December 2002 till the 2nd week of January, while the 2nd period to the summer occurrence of aphid. The infestation was earlier than the 1st season and extended till early October 2003 (Fig. 2).

The foliage crop plants harbored relatively high numbers of CLA throughout the hole period of study except one week of mid-June: 1- during October till December (after maize growing season and before suitable

growing stage of wheat). 2- during April and early June (after wheat growing season and before suitable growing stage of maize)

The weed plants as alternative hosts of CLA found harbored by four occurrence periods , extended from the 4th week of November 2001 till the end of May with relatively high numbers during April, from mid–August 2002 till the 2nd week of January 2003 from the end of August till mid – September (after the maize growing season and before the suitable growing stage of wheat) While the 3rd period extended from the end of January till the end of May at the period extended from the end of March till mid-May (after the wheat growing season and before the suitable growing stage of maize). The 4th occurrence period of CLA on weeds extended from the 2nd week of August till early December 2003 (after maize growing season and before wheat suitable growing stage).

It could be concluded that the raise in population density of CLA on maize and wheat plants and the serious damage to these grain crops due to the continues of gramineae foliage crops and lets weed plants without control.

REFERENCES

- Abd El-Rahim, M.; M. Abd El Fatah; Farag, A. and M. El Nagar; (1991): Contribution to the study of the corn leaf aphid *Rh- maidis* F. on maize plants. Bull. Soc. Ent. Egypt.70:91-98
- Dean, G.J (1974): Effects of parasites and predators on the cereal aphids *Metoplophium dirhodum* (Wik) and *Macrosiphum avenae* F. (Hem. Aphididae). Bull. Ent. Res. 63, 411 - 422
- El-Harriry, M. A. (1979): Biological studies on aphids attacking corn and wheat in Egypt. M Sc Thesis Fac. Agric. Ain Shams Univ.Egypt.
- El-Nagar, S.; I. I. Ismail and A. A. Attia (1982-1983): Aspects of seasonal occurrence and life cycle of *Aphis punicae* Pass, in Egypt. Bull. Soc. Ent. Egypt, 64: 155 -159
- Gangulu, R. and D. Raychauduri (1980): Studies on *Rhopalosiphum maidis* F (Aphididae : Homoptera) a formidable pest of *Zea mays* (maize) in Tripura. Science and Culture 46 (7) : 259 – 260
- Hassan, M.S. (1957): Studies on the damage and control of *Aphis maidis* in Egypt. Bull. Soc. Ent. Egypt. 41: 213-230
- Ismail, I.I.; A. M. Semeada and A. Shahinas, Abd El Salam (1993): Seasonal occurrence and host range of the corn leaf aphid *Rhopalosiphum maidis* Fitch. at Giza and Qualubia Governorate. Bull. Soc. Ent. Egypt, 71: 33-40.
- Megahed, H. E. (2000): Studies on aphids. Ph.D. Thesis. Fac. Agric. Zagazig Univ. Egypt.
- Megahed, M.; S. El-Nagar and A. Amin (1983): Seasonal abundance of four cereal aphids on wild plants in Giza, Egypt. Bull. Soc. Ent. Egypt, 62: 227-230

- Mohammad-Monira, M. (2000): Cereal Aphids in Egypt and their impact on wheat .M.Sc. Thesis Fac. Agric. Cairo Univ.Egypt.
- Tawfik, M.; M. Kira; and S. Metwally (1974): The abundance of major pests and their associated predators in corn plantations. Bull. Soc. Ent. Egypt, 58: 167- 177.
- Wartten, S. D . and P. C. Redhead (1976): Effect of cereal aphids on the growth of wheat . Ann. App . Bio. 84, 437- 440
- Youssef, Ez El Din (1990): Ecological and biological studies on maize aphid insects M.Sc . Thesis . Fac . Agric. Ain Shams Univ.Egypt.

المدى العوائلى و التواجد الموسمى لمن أوراق الذرة فى محافظة الشرقية - مصر
محمد محمد احمد إبراهيم - حمدى السعيد مجاهد - محمد عبد الوهاب الجندى
Plant Protection Res. Institute, Dokki, Giza, Egypt
حماية نبات Res. المعهد، Dokki، الجيزة، مصر

يعتبر من الذرة من أهم الأفات الحشرية التى تصيب نباتات الذرة تحت الظروف المصرية وكذلك النباتات النجيلية الأخرى ولذلك كان لابد من معرفة المدى العوائلى لهذه الحشرة وأجريت هذه الدراسة فى منطقة الزقازيق خلال عامين متصلين بداية من ٢٠٠١/١١/٢٨ وحتى ٢٠٠٣/١٢/٢ ووجد هذا النوع يصيب ٢١ نوع من النباتات فى منطقة الدراسة على مدار العام منها نوعين كمحاصيل حبوب هما السذرة الشامية ويوجد عليهما بنسبة ٢٤,٦٤ ٪ والقمح ويوجد عليهما نسبة ٠,٩٨ ٪ وذلك من جملة التعداد وكذلك خمس أنواع من النباتات النجيلية والتي تزرع كعلف اخضر ومنها الذرة الرفيعة يمثل التعداد عليهما ٢٢,٣ ٪ ، ذرة المكائس (١١,٠٥ ٪) و السكرية (٧,٨٢ ٪) و الراوة (٠٧,٢١ ٪) وحشيشه السودان (٥,١٤ ٪) من التعداد الكلى. كما سجل هذا النوع على ١٤ نوع من الحشائش هى أبو ركة يمثل التعداد عليه ٦,٩٥ ٪ يليه الدنيبة ٥,٤٨ ٪ ، حشيشة الأرناب (١,٩٣٤ ٪) وديل الفار ٠,١٦٩ ٪ ، الفلارس (٠,٩٤ ٪)، والزميز (٠,٦٢ ٪) ، و القصب (نباتات فردية) (٠,٤٤ ٪) و البوص (٠,١٣ ٪) و النجيل (٠,٣٥ ٪) وقمح العصافير (٠,١٧ ٪) وديل القطن (٠,٥٧ ٪) و السعد (٠,٣٥ ٪) من العائلة السعدية و نباتات الموز الفردية (٠,٢١ ٪) من عائلة الموز.

سجل التعداد عدد من التقلبات خلال فترة الدراسة على العوائل المختلفة وسجل أعلى تعداد على نباتات الحبوب ثم نباتات العلف النجيلية ثم الحشائش وبالنظر الى حركة المجموع يلاحظ أن التعداد يزيد على نباتات العلف والحشائش قبل وبعد موسم النمو لمحاصيل الحبوب. تأخذ الإصابة على العوائل شكل دورات تبدأ على أبو ركة وديل القطن والسعد من نهاية نوفمبر وحتى منتصف ونهاية يناير ثم تهاجر الى القمح والذرة الذى يزرع كمحصول علف فى موسم الشتاء وتستمر هذه الإصابة حتى منتصف ابريل ثم تهاجر الى الذرة الصيفى المبكر (محصول حبوب) كذلك يهاجر المن من حشيشة الأرناب وديل الفار الى الذرة (محصول علف وحبوب) والى السكرية (محصول علف).