

EFFECT OF SOWING DATE OF BARLEY ON ITS INFESTATION  
WITH THE CORN LEAF APHID, *Ropalosiphum maidis*  
(Fitch) (Homoptera: Aphididae) AND  
YIELD COMPONENTS

MARZOUK I.A.<sup>1</sup> AND A.M.O. EL-BAWAB<sup>2</sup>

1 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Egypt.

2 Field Crops Research Institute, Agricultural Research Centre, Giza, Egypt

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Abstract

Field experiments were conducted at El-Giza Research Station during the two successive seasons (1995/1997) to determine the effect of sowing date of barley on its infestation with the corn leaf aphid, *Ropalosiphum maidis* (Fitch) (Homoptera: Aphididae) and yield components. Testing sowing dates were 23/11, 8/12 and 23/12 in the first season and 26/11, 11/12 and 26/12 in the second one. For both seasons of investigation, aphids colonized barley plants in the early stages of their life in negligible number. The mean total numbers of aphids/tiller in 1995/96 was comparatively low for the three sowing dates (5.52, 4.64 and 2.75, respectively) compared to that for 1996/97 (40.71, 23.46 and 13.68, respectively). Peaks of infestation occurred at mean weather conditions of 10-11°C and 63-73% R.H. Both biological and grain yield were affected under heavy aphid infestation. The first sowing date showed the highest significant values of biological and straw yield compared to the other two tested sowing dates. The highest grain yield was took place at the second sowing date.

INTRODUCTION

Epidemic spread of infestation with the cereal aphid during the last few years attracted attention. The population dynamics of such specific species of aphids seems to be considerably influenced by both weather conditions, and agricultural practices likewise including sowing dates. The goal of the present investigation is to contribute knowledge that may help planning a successful IPM program for cereal aphids in barley fields through selection of the most appropriate date of sowing.

The relatively mild weather conditions in Egypt provide a suitable ecosystem for the prevalence of cereal aphids shortly after seedling emergence. Aphids, however, may last colonizing barley plants till the advanced stages of grain filling. Accurate prediction of yield loss caused by cereal aphids in small grains involves assessment of the aphid population density on plants, the duration of their feeding

and the growth stage of the crop at the time of infestation. Therefore, it was left important to reveal aphid behaviour in colonizing barley plants sown at different sowing dates through two successive seasons. Although, barley plants are liable to infestation with several species of cereal aphids, in Egypt the most economic of them is apparently the corn leaf aphid, *Ropalosiphum maidis* (Fitch).

## MATERIALS AND METHODS

Barley variety Giza 125 was cultivated at the Agricultural Experimental station, ARC, Giza. Three sowing dates, November 23, December 18 and December 23 for 1995/96 season and November 26, December 11 and December 26 for 1996/97 season were tested. Experimental design was a completely randomized blocks, with three replicates. Plot size included 6 rows 3 m. long with 20 cm. distance between rows. Regular agricultural practices were performed and no insecticides were applied.

Sampling for aphid counts started immediately after complete emergence of seedlings (about 35 days old plants) and continued at weekly intervals. Thereafter until the end of the growing season. Five tiller from five random plants were taken every week, thus making the total sample size per sampling cycle 15 tillers. Aphids were collected in glass tubes containing 75% ethyl alcohol, then transferred to the laboratory for counting. Records of the daily mean temperature and relative humidity throughout the whole experimental periods were obtained from ARC, Giza Meteorological Station. Yield components, i.e. biological yield, grain yield, straw yield and harvest index were taken. Data were statistically analyzed according to steel and Torrie (1980).

## RESULTS AND DISCUSSION

Table 1 shows the mean number of aphid individuals on barley plants sown at three different dates in 1995/96 and 1996/97 seasons. For both seasons, aphids colonized barley plants in negligible numbers during their early stages of growth. In 1995/96, aphid population was generally lower for the three tested sowing dates than that in 1996/97 (5.52, 4.64 and 2.75 individuals/tiller), in the former season and 13.63-40.71 individuals/tiller in the latter one. The whole period of aphid activity occupied nearly 9 weeks. The highest number synchronized with the peak periods of shooting, booting, and heading stages when plants were about 95 days old. In 1995/96 season, aphid population peaks were of 20.80, 16.07 and 15.13 aphids/

tiller, for the first, second and third sowing dates, respectively, while in 1996/97 the corresponding recorded population peak were 150.07, 108.13 and 48.87, aphids/tiller. A gradual decrease in aphid population occurred after the heading stage, when the plants underwent drastic physiological changes that rendered them unsuitable for aphid feeding. Disappearance of aphids took place by the end of the growth stage and the beginning of the maturity stage.

Though the two seasons however, the first sowing date always harboured more aphid population than the second or third dates. This phenomenon may be attributed to the scarcity of suitable host plants during fall. Aphids move from grasses to winter cereal crops (barley and wheat) and alight on the early preferred host plants (El-Hariry, 1979).

Results in Table 2 show that both the biological yield and grain yield data were affected during the two growing seasons under heavy aphid infestation.

In 1995/96 biological yield, when low aphid population occurred, was 107.8, 93.6 and 925.9 Kg/fed for the 1st, 2nd and 3rd sowing dates, respectively with a grand mean of 98.1 Kg/fed. The corresponding yield for 1996/97 was 89.4, 74.6 and 66.4 Kg/fed when higher aphid population occurred with a grand mean of 76.8 Kg /fed.

Grain yield was also affected drastically through 1996/97 owing to the higher incidence of aphid. Means of 23.7, 24.1 and 22.4, with a grand mean of 23.4 Kg/fed were recorded for 1st, 2nd, and 3rd sowing dates in 1995/96 under light infestation and 16.2, 19.0 and 17.5 Kg/fed with a grand mean of 17.6 Kg/fed for 1996/97 under heavy aphid infestation.

In 1995/96 straw yield coincided with the previous finding being 84.1, 69.5 and 70.5 Kg/fed for the 1st, 2nd, and 3rd sowing dates, respectively, with a grand mean of 74.7 Kg/ fed, while in 1996/97 the corresponding data were 73.2, 55.6 and 49.0 Kg/fed, with a grand mean of 59.3 Kg/fed.

Table 2 shows that for both years of investigation the first sowing date had the highest values of [BY] 107.8 and 89.4 Kg/fed and [SY] 84.1 and 73.2 Kg/fed, possibly due to the relatively longer period of the vegetative growth for that particular sowing date (El-Sayed *et al.*, 1998).

The highest values of [GY] were obtained for the 2nd sowing date. Such a val-

Table 1. Mean numbers of aphid individuals on barley plants grown at three different sowing dates at Giza during 1995/96 and 1996/97 seasons.

Inspection No.	Sowing date			Mean for sowing date	Means of	
	23/11	8/12	23/12		Temperature °C	Relative humidity %
<b>1995/1996</b>						
1	0.27	0.00	0.00	<b>0.09</b>	9.43	78.73
2	0.53	0.00	0.00	<b>0.18</b>	12.55	67.50
3	1.00	0.13	0.00	<b>0.38</b>	10.73	76.60
4	2.40	0.00	0.00	<b>0.80</b>	9.80	77.80
5	4.47	1.47	0.00	<b>1.98</b>	9.10	74.20
6	5.20	5.27	0.47	<b>3.64</b>	11.06	67.50
7	7.93	10.53	1.00	<b>6.49</b>	9.61	73.64
8	12.20	16.07	3.80	<b>10.69</b>	13.60	47.89
9	20.80	13.93	6.80	<b>13.84</b>	15.75	64.50
10	15.27	12.13	15.13	<b>14.18</b>	12.14	78.14
11	5.87	4.27	8.20	<b>6.11</b>	15.02	64.90
12	1.47	1.00	2.20	<b>1.56</b>	13.22	66.08
13	0.00	0.20	1.00	<b>0.40</b>	18.96	53.48
14	0.00	0.00	0.00	<b>0.00</b>	15.38	72.72
<b>General mean</b>	<b>5.52</b>	<b>4.64</b>	<b>2.75</b>	<b>4.31</b>		
LSD at 5% for				0.65	F-Cal.	F-Tabul.
	Sowing date			4.80	47.34	19.45
	Inspection time			10.95	21.49	1.84
	Sowing date x Inspection time				14.65	1.70
<b>1996/1997</b>						
	26/11	11/12	26/12			
1	0.40	0.00	0.00	<b>0.13</b>	10.94	76.81
2	6.00	0.13	0.00	<b>2.04</b>	13.06	64.43
3	15.00	2.13	0.00	<b>5.71</b>	10.18	61.89
4	20.73	11.13	1.47	<b>11.11</b>	9.57	79.56
5	27.00	10.47	2.20	<b>13.22</b>	12.23	78.83
6	32.07	20.47	15.40	<b>22.64</b>	12.41	70.96
7	50.73	45.47	30.13	<b>42.11</b>	9.79	72.90
8	74.67	47.67	42.07	<b>54.80</b>	11.03	65.91
9	114.13	108.13	48.87	<b>90.38</b>	11.04	63.01
10	150.07	51.80	27.60	<b>76.49</b>	14.31	60.23
11	61.80	27.47	15.27	<b>34.84</b>	11.17	70.87
12	15.93	3.53	8.00	<b>9.16</b>	9.68	77.43
13	1.33	0.00	0.53	<b>0.62</b>	10.10	63.42
14	0.00	0.00	0.00	<b>0.00</b>	10.82	71.03
<b>General mean</b>	<b>40.71</b>	<b>23.46</b>	<b>13.68</b>	<b>25.95</b>		
LSD at 5% for				8.96	F-Cal.	F-Tabul.
	Sowing date			20.32	35.96	3.11
	Inspection time			27.81	27.16	1.84
	Sowing date x Inspection time				12.78	1.70

ue was high for 1995/96 (24.1Kg/fed) than 1996/97 (19.0Kg/fed) because the plants in the latter season harboured more aphid populations.

Table 2. Means of biological yield (BY), grain yield (GY), straw yield (SY) in Kg/ fed and harvest index(%) of barley grown on three sowing dates at Giza during 1995/96 and 1996/97.

Season	Sowing date	Biological yield (kg/fed)	Grain yield (kg/fed)	Straw yield (kg/fed)	Harvest index (%)
1995/1996	1 <sup>st</sup> (November 23)	107.8	23.7	84.1	21.96
	2 <sup>nd</sup> (December 18)	93.6	24.1	69.5	25.72
	3 <sup>rd</sup> (December 23)	92.9	22.4	70.5	24.07
	Mean	98.1	23.4	74.7	23.92
1996/1997	1 <sup>st</sup> (November 26)	89.4	16.2	73.2	18.15
	2 <sup>nd</sup> (December 11)	74.6	19.0	55.6	25.43
	3 <sup>rd</sup> (December 26)	66.4	17.5	49.0	26.34
	Mean	76.8	17.6	59.3	23.31
General mean	First	98.6	19.95	78.6	20.23
	Second	84.1	21.55	62.5	25.89
	Third	79.7	19.93	59.7	25.02
LSD for	Years	**	**	*	NS
	Sowing dates	*	*	**	**
	Interaction	NS	NS	NS	NS

Literature refers that several species of cereal aphids can cause insidious, incremental, but significant yield loss in small grains, especially if their feeding occurs during the early growth stages of the crop (Ba-Angood and Stewart, 1980; Burton *et al.*, 1985; Pike and Schaffner, 1985; McPheson *et al.*, 1986; Johnson and Bishop, 1987; Kieckhefer and Kantack, 1988). Aphid feeding during seedling stages at population densities of only 15 to 20 aphids/tiller for one week may reduce grain yield by 20% (Kieckhefer *et al.*, 1995). However, accurate prediction of the level of yield loss caused by aphid feeding on cereal crops, which is the crux of IPM of cereal aphids, involves assessment of aphid population density, duration of their feeding time, and the growth stage of the crop at the time of feeding (Lee *et al.*, 1981). In conclusion, this investigation revealed that the longer the time of aphid settlement on barley plants, the larger its population levels is expected, and consequently greater damage is expected.

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تأثير مواعيد زراعة الشعير علي اصابته بمن الذره  
*Rhopalosiphum maidis (Fitch)*  
 ومكونات المحصول

إبراهيم على مرزوق ١، احمد محمد على ٢

١ معهد بحوث وقايه النباتات -مركز البحوث الزراعيه - الدقى - الجيزة .  
 ٢ معهد بحوث الحاصل الحقلية - مركز البحوث الزراعيه - الجيزة .

أجريت تجربتان حقليتان بمحطه البحوث الزراعيه بالجيزة خلال موسمى الزراعه ١٩٩٥ / ١٩٩٦ و ١٩٩٦ / ١٩٩٧ فى ثلاث مواعيد زراعه مختلفه هى ٢٣ نوفمبر و ٨ ديسمبر و ٢٣ ديسمبر / ١٩٩٧ . استخدم موسم ١٩٩٥ / ١٩٩٦ و ٢٦ نوفمبر و ١١ ديسمبر و ٢٦ ديسمبر لموسم الزراعه ١٩٩٦ / ١٩٩٧ . استخدم الصنف جيزة ١٢٥ فى تصميم قطاعات كامله العشوائية ذات ثلاث مكررات . وقد اظهرت النتائج المتحصل عليها وجود حشرات المن على البادرات بعد الانبات بفترة وجيزه و باعداد قليلة اخذت فى التزايد حتى بلغت اقصاها بعد حوالى ٩٥ يوما من الزراعه تناقصت تدريجيا حتى نهايه الموسم . وكانت تغيرات التعداد متناسبه أثناء الذروه مع الظروف الجويه السائده ، حيث كانت متوسطات درجة الحرارة (١٥،٧٥ و ١٤،٣١ م) والرطوبة النسبيه (٦٤،٥ و ٦٠،٣ %) فى موسم ١٩٩٥ / ٩٦ ، ١٩٩٦ / ٩٧ على التوالى .

كان تعداد المن فى ١٩٩٦ / ٩٧ اعلى بكثير عنه فى موسم ١٩٩٥ / ٩٦ حيث بلغ المتوسط الكلى للتعداد ٤٠،٧١ و ٢٦،٤٦ و ١٢،٦٨ فردا فى موسم ١٩٩٦ / ٩٧، بينما كان ٥،٥٢ و ٤،٦٤ و ٢،٧٥ فردا فى موسم ١٩٩٥ / ٩٦ بالنسبه لمواعيد الزراعه الاول والثانى والثالث على التوالى . وقد تآثر كل من المحصول البيولوجى ومحصول الحبوب بالاصابه بالمن فى كلا الموسمين حيث قل الانتاج بزيادة تعداد المن . ارتبطت اعلى قيمة للمحصول البيولوجى ومحصول القش بميعاد الزراعه الاول اكثر من الميعادين الثانى والثالث بسبب طول فترة النمو الخضرى خلال الميعاد الاول ، بينما اعطى الميعاد الثانى اعلى قيمة لمحصول الحبوب مما يجعله انسب موعد لزراعه الشعير حيث يهئ الفرصه لهروب النباتات من الاصابة الشديده بحشره المن .