

## RESPONSE OF CABBAGE APHID, *Brevicoryne brassicae* LINNAEUS TO CERTAIN CULTURAL MEASURES ON THE INFESTATION LEVELS OF CANOLA CROP IN SOHAG REGION

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### ABSTRACT

The effect of some agricultural practices such as farmyard manure, first irrigation, space of planting and phosphorus fertilization level on the infestation of canola plants with the cabbage aphid, *Brevicoryne brassicae* L. was studied at the Experimental Farms of South Valley University at Sohag, during 2003 / 2004 and 2004 / 2005 growing seasons. Results revealed that the number of *B. brassicae* was significantly increased at 45 kg chemical nitrogen plus farmyard manure than at 15 or 30 units / feddan of chemical nitrogen during the two seasons. The canola plants which irrigated at 45 and 60 days as a first irrigation harboured highly significant numbers of *B. brassicae* compared with the plants irrigated at 15 or 30 days. Results show also that the population density of *B. brassicae* was significantly increased when using 10 and 15 cm planting space and by increasing phosphorus fertilization levels during the two seasons of study, the high rate of phosphorous fertilization led to the significantly increasing of the population density of *B. brassicae* regardless of using 20 cm space of planting and 45 kg P/feddan.

**Keywords:** *Brevicoryne brassicae* L., farmyard manure, space of planting, phosphorus fertilization, first irrigation, canola plant.

### INTRODUCTION

Canola plants, *Brassica napus* L. has always been an important of canola oil is derived from the seeds. It is widely used in salad dressings, margarines and shortenings and can also be used as a cooking oil as a source of good fat. Canola plants in sohag region are usually infested with various insect pests which threaten the yield. The most economically important pest is the cabbage aphid, *Brevicoryne brassicae* Linnaeus causes seed yield losses, yield components, oil content and oil quality either directly by feeding or indirectly through their role as vectors of plant viruses (Lerin, 1995, Brown *et al.*, 1999, Schliephake *et al.*, 2000 and Walsh and Jenner, 2002). Also it is the most abundant and important aphid species on canola crop (Ellis and Farrell, 1995 and Rohilla *et al.*, 1996, Ellis *et al.*, 1999 and Saha *et al.*, 1999). Many authors fulfilled interesting work upon the use agricultural practice to manipulate the aphid populations, (Soliman *et al.*, 1985, Pasol *et al.*, 1985, Abou Said and Draz, 1989, Ahmed *et al.*, 1992, Helaly *et al.*, 1994, Burgess *et al.*, 1996, Khattak *et al.*, 1996, Van Ermden, 1996, Abou – Aiana *et al.*, 1997, Almaicohi *et al.*, 1997, Saha *et al.*, 1999, Campbell and Ridout, 2001, Ettay and Moshe 2001 and Slman, 2002).

Therefore the subject of the present work was carried out to evaluate the response of cabbage aphid, *Brevicoryne brassicae* L. to farmyard manure, first irrigation, space of planting and phosphorus fertilization levels.

## **MATERIALS AND METHODS**

Three experiments were conducted during two successive seasons (2003 / 2004 and 2004 / 2005) at the Experimental Farm of Faculty of Agriculture, Sohag, South Valley University.

### **1- Effect of farmyard manure on the infestation of canola plant by the cabbage aphid, *Brevicoryne brassicae* L.**

This experiment was included five treatments farmyard manure; farmyard manure + 15 kg N Urea ( 46.5 %); farmyard manure + 30 kg N Urea; farmyard manure + 45 kg N Urea ( Recommended ); and 45 kg N Urea, design with four replicates. The plot size was 10.5 m<sup>2</sup>. Seeds were sown of November 5 and 7 during both seasons. Bactol variety was used at a seed rate of 3 kg / feddan. Farmyard manure was applied during soil preparation at a recommended rate (20 m<sup>3</sup> / feddan). Chemical nitrogen fertilizer was added in the form of Urea ( 46.5 % ) and applied in three equal doses before the first, second and third irrigation times. Normal recommended cultural practices were followed uniformly, and insecticides were entirely avoided. For each considered treatment, five random branches of flowers were visually examined at 3 – 4 days intervals during the beginning of flowers.

### **2-Influence of first irrigation on the population densities of the cabbage aphid, *Brevicoryne brassicae* L.**

The experiment was laid out in a complete randomized block design with four replications. Each plot was 10.5 m<sup>2</sup>. Seeds of bactol variety was sown of November 5 and 7 during both seasons at a seed rate of 3 kg / feddan. Nitrogen fertilizer was used in the form of Urea ( 46.5 % N ) and applied in two equal doses before the first and second irrigations. Regular cultural practices as recommended for canola production were applied and no pesticides treatments were applied. The water regime was after 15, 30, 45 and 60 days throughout the growing seasons. Samples of five branches of flowers were taken randomly twice in week from each plot.

Samples were kept in polyethylene bag until they were examined in the laboratory. Cabbage aphid were counted at 3 – 4 day interval till the end of experiment.

### **3- Impact of space of planting and phosphorus fertilization levels on the population density of *Brevicoryne brassicae* L. infesting canola plant.**

A split plot design with four replicates was used in this experiment. The plot size was 10.5 m<sup>2</sup>. During the two successive seasons 2003 / 2004 and 2004 / 2005, four seeds of canola plant, bactol variety were sown on one side of the ridge at 10, 15 and 20 cm hill spacing ( main plots ) . Seeds were sown of November 5 and 7 during both seasons, respectively. After complete

emergence, plants were thinned to two plants per / hill. The three rates of phosphorus fertilization ( 15, 30 and 45 kg P<sub>2</sub>O<sub>5</sub> feddan ) were distributed in the sub – plots. Regular cultural practices were applied as recommended for canola plant production and no pesticides treatment were applied. Samples of 5 branches of flowers were randomly taken twice in week from each plot during the beginning flowers until end of season, These samples were kept in transparent polyethylene bags and transferred to the laboratory for counting the cabbage aphid on the same day.

The data obtained were statistically analyzed using " F " test, means were compared using L. S. D. at 5 % level of probability.

## RESULTS AND DISCUSSION

### 1–Effect of farmyard manure on the infestation of canola plant by the cabbage aphid, *Brevicoryne brassicae* L.

Data presented in Table 1 show that the effect of farmyard manure on the infestation of canola plant by cabbage aphid, *Brevicoryne brassicae* L.

Results show that population density of *B. brassicae* L. was significantly higher on fertilized canola plants with farmyard manure plus 45 kg N ( Urea 46.5 % ) than canola plants fertilized only with farmyard manure or 45 kg N ( Urea 46.5 % ) during the two seasons. Also results indicate that the infestation of *B. brassicae* was increased significantly at a rate of 45 kg N (Urea 46.5 %) plus farmyard manure as compared with other chemical nitrogen added to farmyard manure showed the increasing with *B. brassicae* populations during both seasons with an average of ( 358.8 and 385.8) Individuals, respectively. These results are in agreement with those obtained by Broadbent *et al.*, (1952) who found that the highest populations of aphids on potato plants achieved by dung, ammonium sulphate and superphosphate. Boguleanu *et al.*, (1977) found that the greenbug, *Schizaphis graminum* on wheat plants was found to be most abundant on the plants fertilized by chemical nitrogen fertilizer plus farmyard manure. Slman (2002) who found that the infestation of *R. padi* and *S. graminum* were increased significantly at a rate of 75 kg N ( Urea 46.5 % ) plus farmyard manure as compared with other chemical nitrogen added to farmyard manure.

**Table (1) : Effect of farmyard manure on the infestation of canola plants by cabbage aphid, *Brevicoryne brassicae* L. during 2003 / 2004 and 2004 / 2005 seasons.**

Treatments	Avg. no. aphids / 5 branches of flowers			
	2003 / 2004		2004 / 2005	
Farmyard manure	296.3	D	302.8	D
Farmyard manure + 15 kg N	308.3	C	316.5	C
Farmyard manure + 30 kg N	340.0	B	367.5	B
Farmyard manure + 45 kg N	358.8	A	385.5	A
45 kg.	297.3	D	306.3	D
L. S. D.	4.44		6.28	

Means followed by the same letter are not significantly different at 5 % probability level.

**2- Influence of the first irrigation on the population density of cabbage aphid, *Brevicoryne brassicae* infesting canola plants.**

Statistical analysis of the data presented in Table 2 showed that population density of *B. brassicae* significantly affected by prolonging the first irrigation in both seasons. It is evident that the highest numbers of *B. brassicae* were recorded at 45 and 60 days (275 – 326 and 393.8 – 525.0 individuals 5 branches of flowers) during 2003 / 2004 and 2004 / 2005 seasons. This may be attributed to the increasing of the essential amino acids in the plants at this stage that leads to increase the infestation of canola plants with the pest. Our finding of this study are agreement with those obtained by Wearing (1968) who mentioned that the fecundity of *Brevicoryne brassicae* increased with water shortage as a result of the enrichment of phloem sap with nitrogen compound.

**Table (2) : Influence of the first irrigation on the population density of cabbage aphid, *Brevicoryne brassicae* L. infesting canola plants during 2003 / 2004 and 2004 / 2005 seasons.**

Irrigation intervals	Avg. no. aphids / 5 branches of flowers	
	2003 / 2004	2004 / 2005
15	167.5 D	198.8 D
30	196.3 C	274.8 C
45	275.0 B	393.8 B
60	326.0 A	525.0 A
L. S. D.	25.85	25.56

Means followed by the same letter are not significant different at 5 % probability.

Abou Said (1987) stated that sugar beet plants were heavily infested with *Scrobipalpa ocellatella* and *Ternorthinus brevirostris* when prolonging the irrigation. Burgess *et al.*, (1996) reported that the infestation of *Brevicoryne brassicae* increased with water deficit. Slman (2002) who found that the broad bean plants which irrigated as 50 and 65 days as a first irrigation harboured highly significant numbers of *Aphis craccivora* compared with the plants irrigated at 20 or 35 days.

**3- Impact of planting space and phosphorus fertilization levels on the population density of *Brevicoryne brassicae* L.**

**3.1 -Planting space :**

Data presented in Table 3 show the effect of the planting space on the population density of *B. brassicae* on canola plants during 2003 / 2004 and 2004 / 2005 seasons ( Average numbers / 5 branches of flowers on three different planting spaces ( 10 , 15 and 20 cm. ). Results obtained show that the population density of *B. brassicae* on canola plants was highly significant when using 10 and 15 cm planting space ( the average numbers were 815.0 and 532.9 individual / 5 branches of flowers during 2003 / 2004 season and 966.67 and 619.17 individual / 5 branches of flowers during 2004 / 2005 season compared with 20 cm planting space during both seasons with an average 416.3 and 492.5 individuals / 5 branches of flowers ) . Our results agree with Way and Heathcote (1966) who found that the increasing in broad bean plants led to increase in the numbers of *Aphis fabae*. Helaly *et al.*,

(1994) stated that the abundance of *Aphis gossypii* Glover and *Tetranychus* Spp was significantly affected by space of planting. Siman (2002) who found that the population density of *A. craccivora* on broad bean plants was highly significant when using 10 and 20 cm planting space compared with 30 cm planting space.

**Table (3) : Impact of planting space and phosphorus fertilization levels on the population density of *Brevicoryne brassicae* L. during 2003 / 2004 and 2004 / 2005 seasons.**

Planting space (cm)	P – Levels (P <sub>2</sub> O <sub>5</sub> kg/fed.)	Avg. no of aphids / 5 branches of flowers			
		2003 / 2004		2004 / 2005	
10	15	716.3	C	762.5	C
	30	793.8	B	987.5	B
	45	935.0	A	1150.0	A
Mean		815.0	A	966.67	A
15	15	387.5	EF	487.5	E
	30	516.3	D	625.0	D
	45	695.0	C	745.0	C
Mean		532.92	B	619.17	B
20	15	267.5	G	315.0	G
	30	350.0	F	416.3	F
	45	416.3	E	492.5	E
Mean		344.58	C	407.92	C
All average of P-levels (P <sub>2</sub> O <sub>5</sub> kg/fed.)	15	457.1	C	521.67	C
	30	553.37	B	676.27	B
	45	682.1	A	795.83	A
L.S.D. at 0.05	Planting Space	20.64		26.10	
	P – levels	22.64		26.10	
Planting Space X P - levels		40.20		45.20	

### 3.2-Phosphorus fertilization levels :

Data presented in Table 3 shows the response of canola plants to the infestation with cabbage aphid at different rates of phosphorus fertilization during 2003 / 2004 and 2004 / 2005 seasons. In general the infestation with the cabbage aphid increased significantly with an increase of phosphorus rates during both seasons ( Average numbers / 5 branches of flowers on three rates of phosphorus fertilization ( 15 , 30 and 45 kg / P<sub>2</sub>O<sub>5</sub> feddan ) . Our results show that the population density of *B. brassicae* on canola plants was significant when using 45 kg / P<sub>2</sub>O<sub>5</sub> feddan during two seasons compared with 15 and 30 kg / P<sub>2</sub>O<sub>5</sub> feddan. Our findings are in agreement with Baker and Tauber (1951), who revealed that high rates of phosphorus fertilization are favourable conditions to the green peach aphid, *Myzus persicae* infestation.

Abdel – Rihim *et al.*, (1984) found that superphosphate increased the fecundity of *Sitobion avena* on wheat plants. Similar results obtained by Hassanein (1994) and Siman (2002), who reported that phosphorus fertilization increased the infestation of broad bean plants with *Aphis craccivora*. On the other hand, Sharaf and Nazer (1983), Omer *et al.*, (1993) and El – Rafie (1999) stated that the use of P<sub>2</sub>O<sub>5</sub> fertilizer improved the

development of the tomato plants, that leads to encouragement white flies migration to infest the healthy plants. Meanwhile, Saha *et al.*, (1999) revealed that applying potash at 45 kg / ha lead to the highest aphid, *Lipaphis erysimi* ( Kait. ) incidence on canola plants.

### **3.3-Interaction between space of planting and phosphorus fertilization levels :**

Data also presented in Table 3 show the interaction between space of planting and phosphorus fertilization levels. Results showed that there was significant interaction levels during 2003 / 2004 and 2004 / 2005 seasons. It is evident that canola plants sown on 10 cm and received P at a rate of 45 kg / feddan harboured the highest numbers of *B. brassicae* during both seasons as compared with other treatment ( Average numbers 935.0 and 1150.0 individuals / 5 branches of flowers ) . Our results agree with slman (2002) who reported that broad bean plant sown on 10 cm and recived P at rate of 45 kg / feddan received the highest numbers of *Aphis craccivora*.

Generally, thus, it could be recommended that using 15 – 20 cm planting space, first irrigation at 15 – 30 days from planting date, 15 – 30 Kg phosphorus and 45 Kg nitrogen fertilization and preventing the canola crop.

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## استجابة حشرة من الكرنب لبعض العمليات الزراعية على مستويات إصابة محصول الكانولا بمنطقة سوهاج

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يعتبر محصول الكانولا من أهم المحاصيل الزيتية ، ومصدرا هاما من مصادر استخلاص الزيوت النباتية في العالم حيث يحتل المرتبة الثالثة من حيث كمية إنتاج الزيوت النباتية بعد زيت النخيل وزيت فول الصويا ، كما أن زيت الكانولا من أفضل الزيوت النباتية عند استخدامه في تغذية الإنسان حيث يحتوي الزيت على ٦ % فقط من الأحماض الدهنية المشبعة ، ٩٤ % أحماض دهنية غير مشبعة . لذلك تتعرض زراعات الكانولا خلال هذه الفترة لهجوم واسع النطاق من حشرة من الكرنب والتي تسبب أضرار بالغة للمحصول نظرا لتغذيتها على الأوراق والشماريخ الزهرية والقرون وإفراز الندوة العسلية التي تؤدي إلى جفاف الأزهار والقرون نتيجة لنمو لفطر العفن الأسود .

لذلك فكان لزاما دراسة استخدام بعض الإجراءات الزراعية وهي ( السماد البلدي وريه المحياة ، والسماد البلدي ، ومسافة الزراعة والتسميد الفوسفوري ، على إصابة نباتات الكانولا بهذه الآفة بمنطقة سوهاج خلال موسمين زراعيين متتاليين هما ٢٠٠٣ / ٢٠٠٤ ، ٢٠٠٤ / ٢٠٠٥ وقد دلت النتائج المتحصل عليها إلى ما يلي :

عند إضافة السماد البلدي إلى مستوى ٤٥ وحدة أزوت من سماد اليوريا أدى إلى زيادة معنوية في تعداد حشرة من الكرنب على نباتات الكانولا وأن نباتات الكانولا التي أعطيت رية المحياة على ٤٥ ، ٦٠ يوما من الزراعة أدت إلى زيادة معنوية بتعداد حشرة من الكرنب من النباتات التي أعطيت رية المحياة على ١٥ ، ٣٠ يوما من الزراعة وعند زراعة نباتات الكانولا على مسافة ١٠ ، ١٥ سم أدى إلى زيادة معنوية بتعداد حشرة من الكرنب كما أن زراعة نباتات الكانولا على مسافة ٢٠ سم وتسميدها بأعلى معدل سماد فوسفاتي بمعدل ٤٥ كجم / فدان كان له الأثر في الزيادة المعنوية للإصابة بحشرة من الكرنب خلال موسمي الدراسة .

ونستخلص من ذلك بهذه التوصية لمزارعي محصول الكانولا بمحافظة سوهاج بأنه يجب عدم الإطالة الشديدة لرية المحياة مع التقليل بقدر الإمكان من التسميد الأزوتي عند إضافة السماد البلدي وكذا السماد الفوسفاتي وتجنب تزاوج النباتات مما يترتب عليه زيادة الإصابة بحشرة من الكرنب لنباتات محصول الكانولا .