

Gaicho and Cruiser as safe insecticides for management of faba bean insects and associated predators under field conditions of North Delta

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Abstract

Seed treatment with the systemic insecticides is one of the most effective and safe components in the integrated pest management program for any crop. Therefore, an experiment was carried out during 2006/2007 growing season of faba bean at Sakha Agric. Res. Station Farm to evaluate the efficiency of Gaicho 70%WS (imidacloprid) and Cruiser 50%WP (thiamethoxam) as faba bean seed treatments with three rates (1,2 and 4 gm/kg seed) against four piercing & sucking insects (aphids, *Aphis* spp.; whitefly, *Bemisia tabaci* (Genn.); leafhoppers, *Empoasca* spp. and green stink bug, *Nezara viridula* L.), leaf miners *Liriomyza* spp. and the common associated predators during the growing season of 2006/2007 .

The results of the general mean of weekly counts of the population indicated that the high rate of the two insecticides was more effective against aphids and the effect decreased proportionally with the decrease in application rate. On the other hand, the two insecticides with the three applied rates had low effect on the other piercing & sucking insects; whitefly, leafhoppers and green stink bug without significant differences between the two insecticides. As well as, the leaf miners did not significantly affected by the two insecticides at the three tested rates. As for the predators, Cruiser had less toxic effect on the population than Gaicho without significant differences between the three rates of each insecticide.

Thus, the two insecticides as seed treatment (at high rate of application) could be introduced in the integrated management programs of aphids in faba bean fields to avoid the damage before occurring the infestation.

Introduction

Faba bean, *Vicia faba* L. is one of the most important source of plant protein for human and many domestic animals. In the field, the plants

are attacked by many insects which reduce its quality and quantity. Among of which are aphids that cause direct feeding damage and transmit plant virus diseases, as well as the leaf hoppers, *Empoasca* spp. ; whiteflies , *Bemisia tabaci* (Genn.);the green stink bug, *Nezara viridula* L. and the leaf miners. *Liriomyza* spp. Some of these insects live on inaccessible parts of the plant and the other feed on the plant sap causing serious injury to the plants (Abate & Ampofo,1996 and Nuessly et al.2004).

The foliar application of contact insecticides for control insects rarely reach all insects in addition to their side effect on the beneficial insects. Consequently, the insect infestation might be resurgence and that requires further insecticide application. Also, in some times, a foliar application can be made after the damage of the insect may be occurred to the crop. Consequently, with a seed treatment, the protection is conveniently in place before the insect arrives.

Therefore, the use of systemic insecticides as seed dressing is considered one of the most effective components in the integrated pest management programs in different crops to minimize the side effects of the insecticides applied foliarly such as harmful effects on the population density of the beneficial insects and insect resistance to many insecticides (Dent, 1991; Elbert et al.,1991; Omar et al.,1994; Elbert et al., 1996; Nauen et al., 1996;Abd-El-Meguid et al., 1999 : Aioub et al.,2002; Helal et al.,2003 and El-Naggar,2006).

So, the present work was carried out to evaluate the effectiveness of both Gaucho and Cruiser as seed treatments with three rates against the piercing & sucking insects and leaf miners as well as the associated predators on faba bean in the field during 2006/2007 growing season.

Materials and methods

The experiment was carried out at Sakha Agric. Res. Station Farm during 2006/2007 faba bean growing season. The insecticides used were:

- 1- Gaucho 70 % WS (imidacloprid): 1- (6 – chloro-3 – pyridinylmethyl)- N- nitroimidazolidin -2- ylideneamine .
- 2- Cruiser 50 % WP (thiamethoxam): 3-(2-chloro-1,3-thiazol-5-ylmethyl)- 5-methyl-1,3,5- oxadiazinan-4-ylidene (nitro) amine.

Each insecticide was used at three rates: 1, 2 and 4 gm / kg faba bean seed. The treated seeds as well as untreated check were cultivated on 5th October, 2006. Each treatment in addition to untreated one was replicated three times of 6 x 7 meters in a complete randomized block

design. All normal agricultural practices were followed without any foliar chemical spray during the growing season.

To determine the population density of aphids, *Aphis* spp. (all stages) and the green stink bug, *Nezara viridula* L (adults), in addition to the associated predators , sample of 10 shoots was chosen weekly at random from every plot and the number of the two insects and the predators were counted directly in the field. The common predators were *Chrysoperla carnea* (Steph.) , true spiders, *Paederus alferii* (Koch) and *Scymnus* spp. As for leafhoppers, *Empoasca* spp. (nymphs and adults) and whitefly, *Bemisia tabaci* (Genn.) (adults) , weekly sample of 10 leaflets of faba bean was chosen at random from each plot representing the three levels of the plant and the numbers of the two insects were directly counted early in the morning in the field . The same leaflets were transferred in paper bags to the laboratory to count the leaf miners larvae using a binocular. The inspection began from the fourth week after sowing and continued till the eleventh week. The general mean number for every insect and the reduction percentage in the population throughout the scouting period were calculated according to Abbott's formula (1925). Duncan's multiple range test (1955) at 5 % level was used to evaluate significant differences of insect population between the different treatments.

Results and discussion

The efficiency of Gaucho and Cruiser as faba bean seed treatments with three rates; 1, 2 and 4 gm/ kg seed was evaluated against four piercing & sucking insects (aphids, *Aphis* spp.; whitefly, *Bemisia tabaci* (Genn.); leafhoppers, *Empoasca* spp. and green stink bug, *Nezara viridula* L.) ,leaf miners *Liriomyza* spp. and the common associated predators under field conditions during the growing season of 2006/2007 .

1- Effect on the piercing & sucking insects:-

The results presented in Table (1) clear the general mean of the four piercing & sucking insects and the percentage of reduction in population after using Gaucho and Cruiser as faba bean seed treatments throughout the scouting period.

Table (1): General mean (GM) and reduction percentage (%R) in piercing & sucking insect's population on faba bean plants following seed treatment with Gaucho and Cruiser during the growing season of 2006/2007.

Treatment	Rate gm/kg seed	<i>Aphis</i> spp.		<i>Bemisia tabaci</i>		<i>Empoasca</i> spp.		<i>Nezara viridula</i>	
		G.M.	%R	G.M.	%R	G.M.	%R	G.M.	%R
Gaucho	1	122.2 a	16.8	4.3 b	34.9	12.9 b	44.1	2.4 b	43.4
	2	13.7 bc	86.4	4.2 b	35.9	13.2 b	43.0	2.1 b	49.4
	4	7.4 c	92.5	4.1 b	39.1	14.6 b	38.3	2.1 b	51.3
Cruiser	1	28.2 b	69.0	4.6 b	31.1	14.8 b	36.5	2.2 b	44.6
	2	14.5 bc	84.3	4.5 b	32.1	14.5 b	37.8	2.4 b	43.0
	4	6.6 c	88.5	4.2 b	37.5	12.9 b	44.7	2.0 b	51.4
Control	—	137.8 a	—	6.7 a	—	23.2 a	—	3.9 a	—

In the same column, means followed with the same letter are not significant at 5% level (DMRT)

As for aphids, both Gaucho and Cruiser caused significant decrease in the population except Gaucho at rate of

1 gm/kg seed, where it did not affect the population compared to untreated check. Also, the effect increased with the increase in the rate of insecticide application, where the general mean of population was 7.4 and 6.6 insects /10 shoots for Gaucho and Cruiser at rate of 4 gm /kg seed, respectively ,while rate of 2 gm raised to 13.7 and 14.5 insects for the two insecticides , respectively.

Based on the general reduction in the population, it cleared that the rate of 4gm for Gaucho and Cruiser exhibited the highest reduction by 92.5 % and 88.5%, respectively, followed closely by the rate of 2 gm (86.4 % and 84.3 %, respectively). At rate of 1gm, Cruiser and Gaucho recorded 69.0 % and 16.8% reduction in population, respectively.

With regard to whitefly, *Bemisia tabaci* (Genn.), the results revealed that all treatments showed low efficacy against the insect population without significant differences between the two insecticides at the three applied rates. The general mean of population varied from 4.1 to 4.6 insects/10 leaflets for the two insecticides compared to 6.7 insects for untreated check. Also, the overall reduction ranged from 34.9 % to 39.1 % for Gaucho and from 31.1 % to 37.5 % for Cruiser.

Concerning the leafhoppers, *Empoasca* spp., it is of interested to notice similar trend of results as *Bemisia tabaci*, where the reduction in population ranged from 38.3 % to 44.1 % for Gaucho and from 36.5 % to 44.7 % for Cruiser. On the other hand, the population varied from

12.9 to 14.8 insects /10 leaflets in the insecticide treated- plots compared to 23.2 insects in untreated ones.

As for the green stink bug, *Nezara viridula* L., both Gaucho and Cruiser showed the same trend of results as reported for the two previous insects. The population number ranged from 2.0 to 2.4 insects / 10 shoots in the insecticide treated- plots compared to 3.9 insects in untreated ones. The general reduction in population varied from 43.4 % - 51.3 % for Gaucho and from 43.0% - 51.4 % for Cruiser.

These results agreed with those obtained by Salem et al.(1998) who reported that Gaucho as seed dressing reduced the population density of *Aphis craccivora* (Koch) infesting faba bean plants and its effect increased with an increase of the application rate. Also, Elbert et al. (1991); Mullins (1993) and Leicht (1993) reported that Gaucho is a very important agent for controlling aphids, leafhoppers, and whiteflies in vegetables. Aioub et al., (2002) reported that Gaucho as seed dressing had low effect on the population density of leafhoppers in cotton fields.

However, Lowery and Bioteau (1988) reported that the high concentrations of the systemic insecticides inside the plant affect the settling of aphids after ingestion of a certain dose, which kill them quickly. Later on, the level of insecticides concentration in the plant declined due to growth, dilution and metabolism. Also, the low concentration of these insecticides acted as antifeedant to protect the plants from aphids.

2 -Effect on leaf miners larvae, *Liriomyza* spp.:-

The data presented in Table (2) revealed that both Gaucho and Cruiser caused insignificant effect on the larval population, where the general mean of population ranged from 3.2 to 3.5 larvae /10 leaflets in treated plots compared to 3.8 larvae in untreated check. Also, the reduction in larval population varied from 12.6 % to 17.9 % for Gaucho and from 10.4 % to 12.2 % for Cruiser. This may be due to the nature of feeding, as the females puncture the upper surfaces of leaves to oviposit and the hatching larvae live in mines between the two surfaces of blades, consuming the palisade tissue not sucking the plant sap, consequently the larvae did not greatly affected by the systemic insecticides.

Table (2): General mean and reduction percentage in leaf miners larvae *Liriomyza* spp. population on faba bean plants following seed treatment with Gaucho and Cruiser during the growing season of 2006/2007

Compound	Rate gm/kg seed	General mean number	% general reduction
Gaucho	1	3.4 a	12.7
	2	3.2 a	17.9
	4	3.4 a	12.6
Cruiser	1	3.3 a	11.1
	2	3.4 a	12.2
	4	3.5 a	10.4
Control	—	3.8 a	—

General means numbers followed with the same letter are not significant at 5% level (DMRT)

2- Effect on the predators:-

With regard to the associated predators, it was an important to take into consideration the total number of the common predators because of low population densities of the predators on faba bean plants during the study season. Also, *Chrysoperla carnea* (Steph.) and the true spiders were the abundant followed by *Paederus alferii* (Koch) and *Scymnus* spp. The results in Table (3) indicated that all treatments reduced numbers of the predators compared to those in check treatment, but the effect of Gaucho was significantly more than of Cruiser. Also, there are insignificant differences between the three rates of each insecticide, as the general mean of population varied from 1.7 to 1.9 predators /10 shoots for Gaucho and from 2.4 to 2.6 predators for Cruiser compared to 3.1 predators for untreated check. Based on the general mean of reduction throughout the scouting period, the reduction ranged from 38.9 % to 45.1 % for Gaucho and from 13.7% to 20.1 % for Cruiser.

Table (3): General mean and reduction percentage in the population of the associated predators on faba bean plants following seed treatment with Gaucho and Cruiser during the growing season of 2006/2007

Compound	Rate gm/kg seed	General mean number	% general reduction
Gaucho	1	1.8 c	39.3
	2	1.9 c	38.9
	4	1.7 c	45.1
Cruiser	1	2.6 b	13.7
	2	2.5 b	19.2
	4	2.4 b	20.1
Control	—	3.1 a	—

General means numbers followed with the same letter are not significant at 5% level (DMRT).

These results agreed with the findings of Abd-El-Meguid *et al.*, (1999); Aioub *et al.*, (2002) and El-Naggar (2006) who reported that Gaucho and Cruiser had low effect on the population density of the beneficial insects.

Finally, it can be concluded that Gaucho and Cruiser at rate of 4 gm/kg seed were effective against aphids in faba bean fields and the effect decreased increased with a decrease of application rate. These results are of an important in reducing the chance of plant damage especially in case of viral diseases transmission. On the other hand, the two insecticides had low effect on the other piercing-sucking insects; whiteflies, leafhoppers and the green stink bug as well as the associated predators. On contrary, the population of leaf miners was not affected by the two tested insecticides. Thus, the obtained results are of an importance in the integrated management programs of faba bean insects to minimize the bad effects of foliar insecticides for control of these insects and to avoid damage before the insect infestation.]

References

- Abate, T. and J.K.O. Ampofo (1996) . **Insect pests of bean in Africa. Their ecology and management. Ann. Rev. Entomol.,41: 45-73.**
- Abbott, W.S. (1925). **A method of computing the effectiveness of an insecticide. J. Econ. Entomol. 18: 295-297.**
- Abd El-Meguid ,M.A.; M.A. Romellah and M. A. Rizk (1999). **Studies on the effect of imidacloprid (Gaucho) (NTN 33893) insecticide in changes of the population density of sap sucking insects, some mites and beneficial insects. 2th Int. Conf. of Pest Control, Mansoura, Egypt, Sept., 643-655.**
- Aioub, A. A.A.; S.A.A. Raslan; E. A. Gomaa; W.M.H. Desuky and A.A. Zaki (2002). **Management of sap sucking insect populations on cotton plants by imidacloprid application and NPK fertilization. Zagazig j. Agric. Res.,29 (1):269-289**
- Dent, D. (1991).**Insect pest management. C.A.B. International Wallingford UK. 604 pp.**
- Duncan, D. B.(1955). **Multiple range and multiple F- test. Biometrics, 11:1-42**
- Elbert, A.; B. Becker; J. Hartwig and C. Erdelen (1991). **Imidachloprid – a new systemic insecticide. Pflanzenschutz – Nachr. Bayer, 44 : 113-136**

- Elbert, A.; R. Nauen ; M. Cahill ; A. L. Devonshire ; A. W. Scarr ; S. Sone and R. Steffens (1996). Resistance management with chloronicotinyl insecticides using imidacloprid as an example. *Pflanzenchutz – Nachr. Bayer*, 49:5-54
- El-Naggar, Jehan,B.(2006). Population density of certain early cotton season insects and associated predators as influenced by seed treatments. *J. Agric. Sci. Mansoura Univ.*, 31 (11): 7423-7434
- Helal, R. M.Y.; S.M.I. Metwally ; M.B. Shawer ; R.M. Salem and A. B. M. El-Mezaien (2003). Evaluation of certain insecticides and insecticides alternatives against whitefly, *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae) under cotton field conditions. *J. Agric. Res. Tanta Univ.*, 29 (4):680-697.
- Leicht, W. (1993). Imidacloprid - a chloronicotinyl insecticide . *Pesticide Outlook*, 4 : 17-24.
- Lowery, T. and G. Bioteau (1988). Effects of five insecticides on the probing, walking and settling behaviour of the green peach aphid and the buckthorn aphid (Homoptera : Aphididae) on potato. *J. Econ. Entomol.*, 81 : 208-214.
- Mullins, J. W.(1993). Imidacloprid : a new nitroguanidine insecticide. In *Pest Control with Enhanced Environmental Safety*, ed . S.O. Duke, J.J. Menn and J. R. Plimmer, American Chemical Society, Washington, DC,pp.183-197.
- Nauen, R. ; J. Strobel ; K. Tietjen ; Y. Otsu ; C. Erdelen and A. Elbert (1996). Aphicidal activity of imidacloprid against a tobacco feeding strain of *Myzus persicae* (Homoptera : Aphididae) from Japan closely related to *Myzus nicotianae* and highly resistant to carbamates and organophosphates. *Bull. Entomol. Res.*, 86:165-171.
- Nuessly , G. S.; M. G. Hentz ; R. Beiriger and B.T. Scully (2004). Insects associated with faba bean, *Vicia faba* (fabales : Fabaceae) ,in southern florida . *Florida Entomologist* 87(2): 204-211
- Omar, H.I.; M.H. El-Khawalka ; H.M. El-Maghraby and M.A. El-Besomy (1994). Reduction of different stages of the whitefly, *Bemisia tabaci* (Genn.) on cucumber plants after foliar and seed treatment to insecticides. *Alex. Sci. Exch.*, 15 (1): 95-103.

Salem, R. M.; E. M. E. Khalafalla and Y. S. Ibrahim (1998).
Gaucho (imidacloprid) as a safe compound for aphid
management in faba bean and wheat. J. Agric. Sci.
Mansoura Univ., 23 (3): 1283-1291.

الملخص العربي

الجاوشو والكرويزر لمبيدات حشرية آمنة لإدارة حشرات الفول البلدي
والمفترسات المصاحبة لها تحت الظروف الحقلية لشمال الدلتا

السيد محمد السيد خلف الله ، علي معدوح ناصف ، محمد
عبد الحافظ خطيب

معهد بحوث وقاية النباتات، مركز البحوث الزراعية- الجيزة مصر

تُعد معاملة البذور بالمبيدات الحشرية الجهازية واحدة من أهم
المكونات الفعالة والأمنة في برنامج مكافحة المتكاملة لأي محصول. لذا
أجريت تجربة على الفول البلدي بمزرعة محطة البحوث الزراعية بسخا
موسم ٢٠٠٦ / ٢٠٠٧م لتقييم فعالية مبيد الجاوشو ٧٠ % (WS)
والكرويزر ٥٠ % (WP) ضد أربعة من الحشرات الناقبة الماصة (هي
المن والذبابة البيضاء ونطاطات الأوراق والبقعة الخضراء) وصانعات
الأنفاق وكذا المفترسات الشائعة والمصاحبة لهما. وقد استخدم كل مبيد
بثلاثة معدلات هي ١، ٢، ٤ جرام مبيد / كيلوجرام بذرة .

أوضحت نتائج المتوسط العام للتعداد الاسبوعي للحشرات أن
المعدل العالي للمبيدين كان فعالاً ضد حشرات المن وتناقص هذا التأثير
بنقص معدل التطبيق - على الجانب الآخر لوضحت النتائج أن تأثير
المبيدين كان منخفضاً على باقي الحشرات الناقبة الماصة (الذبابة البيضاء
ونطاطات الأوراق والبقعة الخضراء) بدون فروق معنوية بين المبيدين -
على العكس من ذلك لم تتأثر صانعات الأنفاق بالمبيدين عند المعدلات
الثلاثة المستخدمة . وبالنسبة للمفترسات كان الكرويزر له تأثير منخفض
عن الجاوشو ولم توجد فروق معنوية بين المعدلات الثلاثة لكل مبيد .

وهكذا فإنه يوصى باستخدام الجاوشو والكرويزر بالمعدلات العالية
كمركبات آمنة في برامج الإدارة المتكاملة للمن على الفول البلدي وذلك
لتقليل التأثيرات الضارة للمبيدات المطبقة رشا