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Manegment To Reduce The Natural *Faba bean necrotic yellows virus* Infection In Faba Bean Crop

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ABSTRACT

The effectiveness of using Gaucho® (imidacloprid) for seed dressing used different cultural practices to reduce the natural infection by *faba Bean Necrotic Yellows Virus* (FBNYV) in faba bean crop. The results of seed dressing by Gaucho were obtained in the growing season 2007/08 and 2008/09 growing seasons. In 2007/08 growing season showed that seed dressing with Gaucho was effective in reducing FBNYV from 44.50% in plant without treatment to 8% only when used the concentration 2 g / kg seeds. The results in 2008/09 growing season was showed that seed dressing with Gaucho was effective in reducing FBNYV from 52.6% in plant without treatment to 5.6% only when used the concentration 2 g / kg seeds.

In 2007-2008 growing season From the obvious results found that the better result when we used insecticide peremore 0.2% with used rouging, the percent of disease incidence was 10.7% followed by using masrona oil was 22.7%, and 27.8% with used rouging with K.Z oil and the percentage of disease incidence was 46.5% with used rouging and used nestapon. On the other hand, the control treatment with rouging and without using any insecticide or detergents the disease incidence was 59.6 % in 2007-2008 growing season. In 2008-2009 growing season, the disease incidence was 21.3% followed by using masrona oil was 41.25% and without rouging with K.Z oil was 48.75%; the disease incidence was 61.25% with using Nestapon and without rouging. On the other hand, the control without using any insecticide or detergents and without rouging the disease incidence was 87.87%.

KEY WARDS: Faba bean, *Faba bean necrotic yellows virus*, Seed-dressing, imidacloprid, insecticide, detergents.

INTRODUCTION

Legume crops can be severely affected by several biotic stresses including virus and aphids, the total faba bean cultivated area *i.e.* Beni-Suef governorate, Egypt was about 40000 fed with an average yield of 7.2 ardab. / fed. The virus epidemic resulted in almost complete crop failure with an average yield of 0.16 ardab./fed. In 2009-2010 growing season, the total cultivated area reached 206,000 fed. and current faba bean production in Egypt stands at about 290,000 tons.

Some viruses were isolated from faba bean crop *i.e. Broad Bean Welt Virus* **(Rizkalla *et al.*, 1985)**; *Faba Bean Necrotic Yellows Virus* **(Rizkalla *et al.*, 2004 and El-Abagy *et al.*, 2008)**.

Faba Bean Necrotic Yellows Virus (FBNYV; genus *Nanovirus*) causes severe yield losses and crop failure in food and fodder legumes in Western Asia and North Africa **(Franz *et al.*, 1995; Makkouk and Kumari, 2000)**. The virus has a wide host range ~58 host legume species have been identified **(Franz *et al.*, 1997)**. FBNYV is persistently transmitted by aphids, most efficiently (in laboratory tests) by *Acyrthosiphon pisum* (Harris) and *Aphis craccivora* (Koch). *Acyrthosiphon pisum* is considered the most efficient vector of Syrian FBNYV isolates and *A. craccivora* the most important vector under field conditions **(Franz *et al.*, 1998)**. The main host is the faba bean (*Vicia faba* L.). Early-infected plants remain stunted, showing

leaf yellowing followed by necrosis and plant death. The presence of FBNYV was reported for the first time in Spain a few years ago **(Babín *et al.*, 2000)**.

The insecticide imidaclobrid Gaucho® is anitroguanidin which has both contact and systemic properties, and is active against a wide rang of economically important insect pest including aphids, thrips, leafhoppers, leafminers and some beetles which attack a variety of crops (such as cereals, cotton, potato and sugar beet). The insecticide when applied as seed treatment, provides protection for some time after seedling emergence **(Nauen and Elbert, 1994)**. However, is known of the effect of imidacloprid in reducing virus spread in legume crops through aphid control. The search will provide a good opportunity to test the general technologies in integrated manner on farmer's fields with their full participation to help farmers expand faba bean cultivation because the crop is important for soil fertility as well as diversifying farmer income.

The present paper examines the usefulness of treating seeds of faba bean seeds with imidacloprid and foliar with insecticide *i.e.* rouging and / or detergents *i.e.* Permore 0.2%, Masrona oil, KZ oil and liquid soap Nestapon to reduce incidence of the aphid-vectored FBNYV was investigated under field conditions in the main faba bean producing area in Egypt.

MATERIALS AND METHODS

1. Virus isolate

The FBNYV isolates used in this study was previously collected from faba bean plants in Benin-Sweef Governorate, Egypt and identified serologically using a FBNYV monoclonal antibody provided by A Franz BBA Germany **(Franz *et al.*, 1996 and Aboulata *et al.*, 2005)**.

2. Aphid vector and inoculation

An *Aphid craccivora* colony the most predominant FBNYV vector under field condition was isolated originally from faba bean Giza 429 c.v. in Egypt and identified by Department of Economic Entomology and Pesticides, Faculty of Agriculture ,Cairo University.

A pure virus free colony of this species was established from a single apterous aphid and reared in a screen cage in greenhouse.

Aphid were kept on infected plants for 48 h to provide access of the virus. Ten to fifteen *A. craccivora* were then placed on test plant to be inoculated and were killed with a non-systemic spray [Sevin W 85 (carbarly)] at 1.0 g / l according to the method described by **Makkouk and Kumari (2001)**.

3. Seed treatment and experimental conditions

To investigate the ability of seed treatment with the systemic insecticide Gaucho® 70 WSP (Imidacloprid) to reduce the spread of aphid-vectored FBNYV in field trial conducted during the period two growing seasons in November 2007-2008 and 2008-2009 at Sids Research Station, Agricultural Research Center (ARC) under rain fed conditions.

Seeds were coated with the insecticide with a sticking agent "Sacrust M-455 (Postfach 302, Frankfurt, Germany)" at the rate of 1.0 ml/kg seeds.

4. Virus spread in faba bean under field conditions (2007/08 and 2008/09)

Faba bean c.v. (Giza 429) seeds were treated before cultivation with imidacloprid at the rate of 0.5, 2.0 and 5.0 g *a.i* (active ingredient) / kg seeds and compared with untreated seeds (control). The experimental was carried out in a split-plot design with four replicates for both the inoculated and non-inoculated treatments. Each replicate plot consists of 25 rows (4 meter long) 30 cm apart with 10 cm between plants within

row (40 seeds were sowing in the row). All plants were artificially inoculated with virus after tow months of sowing date.

5. Foliar treatment for faba bean yellow necrotic of disease management

virus-like symptoms appear on plants showing ("Fig. 2." such as leaf rolling, yellowing, necrosis, and stunted growth) to reduce the spread of aphid-vectored FBNYV in field trial conducted twice during the growing seasons in November / 2007 & November / 2008 at Sids Research Station, Agricultural Research Center (ARC) under rain fed conditions.

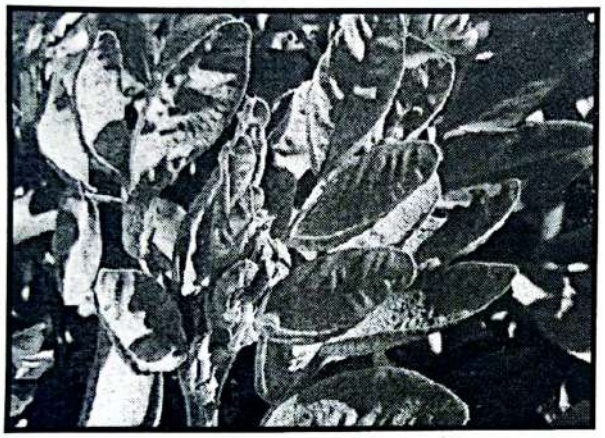

Fig. 2. Natural infection of Faba bean with FBNYV showing leaf roaling, yellow necrosis, stunted growth.

Faba bean c.v. (Giza 429) plants infected with *Faba bean yellow necrotic* of disease symptoms inside the sowing date as main plot sprayed by insecticide (rouging) and detergent (*i.e.* Permore 0.2% & Masrona oil & KZ oil and liquid soap Nestapon) as complete protection against aphids compared with faba bean plants without spraying insecticide (rouging) as a control inside the sowing date (sub-main plot). The experimental was carried out in a split-plot design with four replicates for both the rouging and non-rouging treatments. Each replicate plot applied consists of as obvious before in seeds treatment.

In each expriment virus incidence was based on the development of the characteristic symptoms of FBYNV and also serologically by using the tissue blot immunoassay (TIBA) and was carried out at four to six weeks after inoculation **(Makkouk *et al.*, 1994)**.

To investigate the ability of foliar treatment with the insecticide (rouging) and detergents (Permore 0.2% & Masrona oil & K.Z. oil and liquid soap Nestapon) after

6. Data analysis and statistics

Data were analyzed using analysis of variance (ANOVA), and the means were compared by the least significant differences (LSD) at $P \geq 0.05$ described by **Snedecor and Cochran (1980)**, the significant mean differences between treatment means were separated by Duncan's Multiple Range Test **(Duncan, 1955).**

RESULT

1- Virus speared in faba bean as affected by seed treated with Gaucho®.

Faba bean seeds dressing with imidacloprid at 5.0g *a.i.* active ingredient / kg seed was very effective in reducing the disease incidence of FBNYV from 44.5% in the untreated plots to 7.5% in treated seeds during 2007/08 season (Table, 1). Clearly, seed treatment with imidaclobrid at lower concentration (0.5 and 2.0g *a.i.* active ingredient/ kg seeds) significantly ($P = 0.05$) reduced incidence in spread FBNYV from 44.5% in the untreated plots to 25.5 and 8% in treated seeds with 0.5 and 2.0 g *a.i.* active ingredient/ kg seeds, respectively (Table, 1). The same trend was recorded, when faba bean seeds dressing with imidacloprid at 5.0g *a.i.* active ingredient / kg seed was very effective in reducing the disease incidence (%)in spread FBNYV from 52.63% in the untreated plots to 3.85% in treated seeds with 5.0 g *a.i.* active ingredient/ kg seeds during 2008/09

season (Table, 1). Also, seed treatment with imidaclobrid at lower concentration (0.5 and 2.0g *a.i.* active ingredient/ kg seeds) recorded a significantly (P = 0.05) reduction in disease incidence (%) in spread FBNYV from 52.63% in the untreated plots to 23.25 and 5.63% in treated seeds with 0.5 and 2.0 g *a.i.* active ingredient/ kg seeds, respectively (Table, 1).

Table 1. The number of infected plants and % of disease incidence as seed dressing treatments with Gaucho® at different concentrations during 2007/08 and 2008/09 growing seasons

Treatments (g *a.i.* active ingredient / kg seeds)	Growing seasons			
	2007/08		2008/09	
	No. of infected plants	% of disease incidence	No. of infected plants	% of disease incidence
Control (without)	430 [a]	44.5 [a]	526.25 [a]	52.63 [a]
0.5	255 [b]	25.5 [b]	232.50 [b]	23.25 [b]
2.0	80 [c]	8.0 [c]	56.25 [c]	5.63 [c]
5.0	75 [c]	7.5 [c]	38.50 [c]	3.85 [c]
L.S.D. $_{(0.05)}$	73.89	8.75	110.8	11.08

- Each value represents the mean of four replicates;
- Mean values with the same letters in column are not significantly different by Duncan's Multiple Range Test at ($P \leq 0.05$).

2- Virus speared in faba bean as affected by foliar treated insecticide and detergents.

Manegment spread of aphid-vectored FBNYV with the rouging insecticide combined with spraying primore oil 2% was very effective in reducing the disease incidence of FBNYV from 59.6% in the untreated plots to 10.7% in treated plots during 2007/08 season (Fig. 3). Clearly, faba bean plants treated with the rouging insecticide combined with other detergent types were reduced disease incidence (%) in spread FBNYV from 59.6 in the untreated plots to 22.7, 27.8 and 46.5% in treatment with Masrona oil, K.Z. oil and Nestapon, respectively (Fig., 3).

The same trend was recorded, when faba bean plants treated with rouging as insecticide and combined with detergents during 2008/09 season (Fig., 3) which recorded 65.87% in the untreated plots and reduced to 14.50, 22.87, 33.25 and 52.75%, respectively in case of combining the treatment with detergent primore oil, Masrona oil, K.Z. oil and Nestapon, respectively.

On the other hand, faba bean treated with different detergent without treated with rouging recorded a significantly (P =

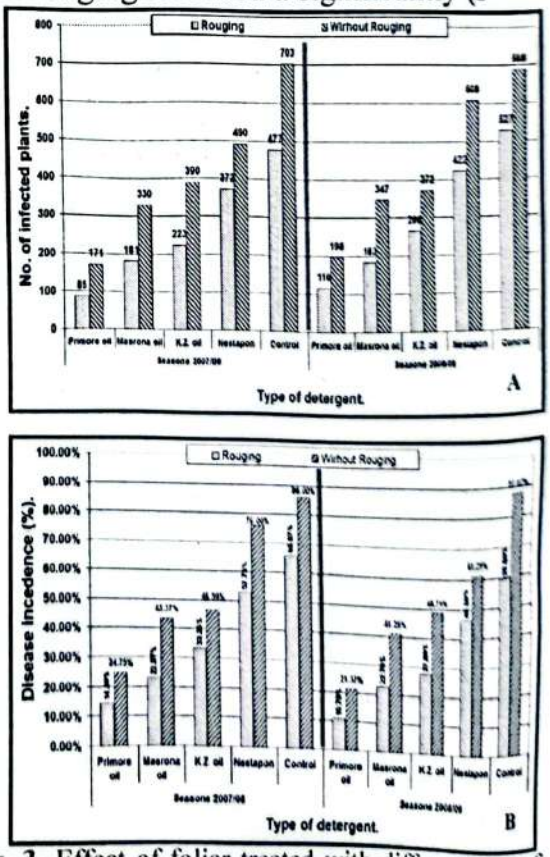

Fig. 3. Effect of foliar treated with different type of detergents combined with and without rouging treatment on **A)** Number of infected plants & **B)** Disease incidence (%) to control *Faba Bean Necrotic*

Virus (FBNYV) at two growing seasons 2007/08 and 2008/09 under field conditions

0.05) low reduction in disease incidence (%) in spread FBNYV from 86.0 in the untreated plots to 24.75, 43.37, 46.50 and 76.0% in treatment with primore oil 2%, Masrona oil, K.Z. oil and Nestapon, respectively (Fig., 3).

DISCUSSION

Imidacloprid seed-treatment proved to be effective method for reducing virus infection in faba bean crop. Such protection lasted for two months and was effective at rate of 0.5 - 5.0 g *a.i.* active ingredient / kg seeds. Similar treatment have been reported to reduce the incidence of some insect-borne viruses, such as *Bean Yellow Dwarf Virus* (BYDV) in cereals **(Wangai *et al.*, 2000)**. Since, the effect of using 2.0 or 5.0 g *a.i.* active ingredient / kg seeds on virus incidence (%) in field experiment was not significantly less than that of 0.5 *a.i.* active ingredient / kg seeds, the lower rate are recommended for use by farmers.

In this study, any residual effect of imidacloprid in faba bean green pods or dry grains was not evaluated, however, previous work showed that there is no residual effect of this compound in faba bean pods and wheat grains following seed-treatment with imidacloprid at 2100 and 700 ppm, respectively **(Salem *et al.*, 1998)**. Accordingly, it is concluded that imida-cloprid is unlikely to cause a residue problem in faba bean grain following seed treatment with imidacloprid.

Wanagai *et al.* (2000) compared the effect of imidacloprid seed-treatment alone with seed treatment followed by seven foliar sprays with an insecticide (Cyper-methrin) on the incidence of BYDV in wheat in Kenya. Results showed that there was no significant effect between the two treatments and seed treatment alone was effective.

From the obvious results found that the better result when we used insecticide peremore 0.2% with used rouging, the percent of disease incidence was 10.7% followed by using masrona oil was 22.7%, and 27.8% with used rouging with K.Z oil and the percentage of disease incidence was 46.5% with used rouging and used nestapon. On the other hand, the control treatment with rouging and without using any insecticide or detergents the disease incidence was 59.6 % in 2007-2008 growing season. In 2008-2009 growing season, the disease incidence was 21.3% followed by using masrona oil was 41.25% and without rouging with K.Z oil was 48.75%; the disease incidence was 61.25% with using Nestapon and without rouging. On the other hand, the control without using any insecticide or detergents and without rouging the disease incidence was 87.87%.

This results disagreement with those reported by **Makkouk and Kumari (2001)** who stated that the reasons of this results is partly because the FBYNV isolates used is more aggressive under field condition and also this virus is more efficiently transmitted by the aphid vector, which rendered the chemical more effective. More than investigation needed to clarify this point.

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