MODELING POPULATION DYNAMICS OF COWPEA APHIDS (*APHIS CRACCIVORA* KOCH) AND MANAGEMENT SYSTEM OF EARLY SEASON INFESTATION IN MIDDLE EGYPT FABA BEAN FARMERS FIELDS

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Abstract

The population abundance of the cowpea aphid, *Aphis craccivora* and its associated natural enemies in faba bean fields were studied at Al-Wasta, Ahnasia, Beba and Alfashn districts, Beni-Suef Governorate, Middle Egypt in 2002/03 and 2003/04 seasons. The occurrence and status of aphids in relation to virus disease incidence on faba bean farmer's fields was also monitored.

Results showed that cowpea aphid population buildup faba bean was a combined function of maximum and minimum temperatures, relative humidity and associated insect predators. Cowpea aphid population was initiated high incidence in the last week of October extended to mid-January, due to favorable weather conditions. Cowpea aphid population was modeled under different weather conditions by using Multiple Regression. The coefficient of determination for the model was 0.6922. The model can be used to predict cowpea aphid population as pest and its roll in the transmission threaten FBNYV disease and its threshold level for adopting control measures and preventing ultimate crop losses.

Also, an early-season aphid control trials was conducted at 5 farmers' fields (1500 ²m each) in Ahnasia, Beni-Suef Governorate, Middle Egypt, during two successive seasons of 2004/05 and 2005/06, to determine the impact of early season insecticide treatments on aphid population abundance, FBNYV disease incidence and crop yield productivity under pilot demonstration farmers fields. Results clearly indicated, Imidacloprid, (Gaucho) seed treatments before faba bean cultivation at a rate of 3 and 5 gm /kg seed weight and Pirimicarb (Aphox) foliar spray 0.5 and 0.75 gm /lit. w., proved highly efficacy against *Aphis craccivora* infestation giving 94.25, 94.63, 86.51 and 87.17 % reduction in aphid population, respectively. Gaucho or Pirimicarb treated field plots with the two rates was exhibited the same efficient materials in reduce the number of plant infected with FBNYV over two seasons being 97.33, 97.90, 97.27 and 98.31 % reduction in plants infected with FBNYV over the two tested seasons.

These data suggest that seed applied insecticide treatments (if labeled) can provide control of early season infestation of faba bean aphids and could be minimizing FBNYV disease incidence within fields early. Faba bean aphid control with well-timed foliar insecticides application is significantly better than seed applications tested. .

INTRODUCTION

The major factor contributing to low production of Faba bean (*Vicia faba* L.), was the crop's vulnerability to wide spread occurrence of insect pests and diseases (Marzouk, 1990 and El-Defrawi *et al.*, 1994b). These biological stresses causes appreciable yield losses, but in fact, plant protection aspect of this crop has received little attention during the last two decades in Egypt (Anonymous, 2006).

The cowpea aphid, *Aphis craccivora* Koch, is a devastating pest of faba bean grown in most farmers fields (Nassib and Basheer, 1983, Bishara, 1983 and Abeer, 1998). On the other hand, all faba bean cultivars presently in commercial production are susceptible to *A. craccivora* feeding damage (El-Defrawi and Omar, 1998, El-Defrawi *et al.*, 1998a and El-Defrawi and Shalaby, 2002). Yield losses mainly depend on the time and intensity of aphid infestation (Bishara et al., 1984 and El-Defrawi *et al.*, 1998a). In middle Egypt districts, earlier cultivation of faba bean crop is sown in autumn (October), the higher are the aphid infestation vectored of several viral diseases (El-Defrawi, *et al.*, 2002 and Makkouk *et al.*, 1988 & 1994 and Abeer, 1998). Since, aphids and virus diseases attack all together leguminous crops inflicted extreme heavy damage and severe yield losses, made farmers reduce faba bean acreage by 32 % in 1992/93 and 40 % in 2001/2002 growing season. Therefore, most growers become familiar with a wide range of insecticides, which they can use to increase their yields and profits. These insecticides may not be stopping a feeding aphid from transmitting the virus into a plant because the aphids have to feed for some time before they are killed by the insecticide. The Insecticides which kill aphids or deter them from feeding will slow down or stop colonization, reducing the secondary spread. Unfortunately, the intensive use of pesticides has generated major environment problems in most growing areas. The optimum period for an insecticide application is when aphids are migratory and seeking a suitable alternate host (El-Defrawi and Abd El-Azim, 1992 and El-Defrawi *et al.*,1994a). To identify this period, a system to monitor aphid population is required as well as a process to notify growers to help them make the correct spray decision.

The present work, systems adopted for monitoring the viruses that infect faba bean crop are based mainly on monitoring aphid vector population and infectivity. Once the relationship is determined it may be possible to predict the level of FBNYV infection. This data, along with historical data on virus incidence, epidemiological data gain in the last 15 years (El-Defrawi, 2002) could be used to predict the risk of virus infection. Also, to evaluate selected management programs for control of an early season faba bean aphids in Middle Egypt.

MATERIALS AND METHODS

The present work was carried out at farmers fields (Pilot Demonstration Fields), Beni-Suef Governorate, Middle Egypt throughout four consecutive seasons of 2002/03 and 2003/04 to monitoring the cowpea aphid abundance in relation to viral disease incidence, and 2004/05 and 2005/06 seasons to try to minimize the population abundance of this insect pest on faba bean crop, via advantage early season aphid control.

The First Experiment (2002/03 and 2003/04):

Work was carried out at four sites (Al-Wasta, Ahnasia, Beba and Alfashn districts) in Beni-Suef Governorate, Middle-Egypt Region (80-160 km. South of Cairo). Fixed area of about 1500 ²m. in each district was seeded with faba bean cv. Giza 429 variety in the 1st. week of October of 2002 and 2003. Normal agricultural practices were followed and no pesticide treatments were applied. Plot size 7 X 12 m, equal 1/50 feddan, separated each other by 1-m uncultivated land. The activity and abundance of *Aphis craccivora* alate and apterae and their associated aphidophagous predators were recorded weekly. At any sampling date, 25 plants (one central shoot for each) were randomly chosen and replicated 4 times at each of the East, West, North, South and Middle of the experimental fields. Insects on the upper most two-thirds pf the plants (one central shoot /plant) were checked using the Inverse Binomial Sampling Technique (Hafez, 1964 and El-Defrawi, 1987). Records of main climatic factors mainly daily maximum, night minimum and daily mean percentage of relative humidity covered the whole experimental period.

To determine the roll of *A. craccivora* in the spread of FBNYV disease in faba bean fields, infestation was monitoring by Visual Inspection Method based on disease symptoms (Katul *et al.*, 1993). Estimation was made weekly on 100 plants randomly chosen and replicated four times at each of the 5 considered sampling sites. Plants showing FBNYV-disease were transferred to the laboratory to confirm the presence of the pathogen using aphid inoculation and Enzyme linked immunosorbent assay (ELISA) tests as described by Katul *et al.* (1995).

The Second Experiment (2004/05 and 2005/06):

Early-Season Cowpea Aphids Control was conducted at 5 farmers' fields (1500 ²m each) in Ahnasia, Beni-Suef Governorate, Middle Egypt, throughout two successive seasons of 2004/05 and 2005/06. Fields were planted in conventionally tilled soil on the last week of October. Plot size 42 ²m, with a 10-rows each and seeds were sown on ridges 60 cm apart, in double rows with 20 cm between the holes along each row and two seeds per hole with seeding rate of 63 kg seed weight per feddan. Seeds of cv. Giza 843 and Giza 429 were used, that supplied by the Field Crops Research Institute, ARC, Egypt for the first and second year of studies. Treatments were arranged in a randomized complete block design with five replications.

The insecticides used were Imidacloprid (Gaucho, 70 % WS), and Pirimicarb (Aphox, 50% DG), that obtained from producer company. Treatments consisted of a no-treatment plot, Gaucho WSP seed treatment (ST) at two rates (3 and 5 g / kg seeds weight), and Aphox foliar spray (FS) at two rates (0.5 and 0.75 g /liter water). Aphox was applied as a low volume spray, with 3 successive sprays, 15-days intervals, applied in 2, 4 and 6 weeks after planting (WAP). The volume of spray per acre was 100, 150, 200 liter, respectively.

Efficacy early decisions critical for faba bean aphids' control was determined by taking a 10-plant sample (two plants from each of the five center rows for each plot) on every sample date. Individual plants were selected at random and gently pulled from the soil and placed in plastic transparent box, which was gently inverted to withdraw the aphids from the plants. All samples were taken to the laboratory, labeled with the plot number, farmers' field and date. Samples were later counted adopted Actual Counting Method (El-Defrawi, 1987).) and the average number of aphids /plant shoot (counts on the most-upper 10 cm. long each) were recorded. Aphids' samples were collected 2, 3, 4, 5, 6, 7, and 8 weeks after planting (WAP). Also, plants in each plot were checked infected with Faba Bean Necrotic Yellows Virus (FBNYV) disease and estimated weekly for 8 WAP in a randomly selected 20 plants per plot. Leaves (at least 5 /plant) from each showing FBNYV disease symptoms (Katul *et al.*, 1993) were well kept separately on plastic bags inside ice box transferred to the virology laboratory at Giza, ARC, to confirm the presence of the pathogen using an aphid inoculation test and Tissue-Blot Immunoassay (TBIA) technique as described by Makkouk and Vetten, 1997. The antisera monoclonal antibodies were used for detection FBNYV provided by Dr. S.G. Kumari, ICARDA, Aleppo, Syria. Goat anti-rabbit- and goat anti-mouse-alkaline phosphate conjugates and enzyme substrates were obtained from Sigma Chemical Company, expiry date: 6-8 months and storage at 4-10 °C. The plots were watered by furrow irrigation every 21 days. Spraying against any organism pest was omitted, but the whole experimental area was hand-weeded twice and weeds were kept well controlled. After crop ripening well in both tested years, seed yield in every experimental plot was weighted from a net area of 20 ^{2}m., also the gain per feddan was estimated by subtracted the cost (in LE.) of the pesticide used plus labor charge and spray operations from the cost of the extra yield over the control obtained in a particular treatment.

All obtained results were statistically analyzed according to completely randomized block design to evaluate the differences of infestation between treatments. The proper "F" and L.S.D. at 0.05 values were calculated as described by Snedecor and Cochran, 1980). Partial regression and simple correlation were done to find the relationship between the insect numbers and the main climatic factors, i.e., daily mean temperature, night mean temperature and daily mean relative humidity. All calculations and statistical analysis were computerized by using "CoStat and SASS Programs".

RESULTS AND DISCUSSION

A1. Modeling Population Dynamics of Cowpea Aphids in Middle Egypt.

Data obtained are illustrated in Fig. 1 and 2, show the fluctuations in the population density of cowpea aphid (CA), *Aphis craccivora* Koch., harboring faba bean plants throughout two successive seasons of 2002/03 and 2003/04, at four sites, Al-Wasta, Ahnasia, Beba and Alfashn districts, Beni-Suef Governorate.

In 2002/03 growing season (Fig., 1), clearly indicated that the initial infestation of CA set on faba bean plants at an early during seedling establishment 17 days from sowing in the four sites: Al-Wasta, Ahnasia, Beba and Alfashn recording 22, 22, 12 and 0.8 aphids /plant shoot, respectively. The seasonal average mean of CA infestation was slightly higher alate and apterae individuals per plant shoot in Ahnasia (11.15 & 402.46 individuals) and Beba (9.63 & 343.73 individuals), than in both Alfashn (5.39 & 320.76 individuals) and Al-Wasta (2.44 & 256.90 individuals), whereas the L.S.D. values at 0.05 were 1.85 and 64.73, for the two aphid forms, respectively ($P = > 0.01$). The population density of the winged *A. craccivora* was relatively higher during late October extended to late January 2002, in the four districts being 13.79, 10.53, 7.08 and 3.11 individuals /plant shoot at Ahnasia, Beba, Alfashn and Al-Wasta district, respectively. Peak population activities of the alate CA were recorded early during the 2nd. week of December in Al-Wasta and Beba districts (8.0 and 19.2 individuals /plant shoot, respectively), while it occurred late in the 4th. week of January in Ahnasia (20.4 individuals) and the 1st. week of December in Alfashn (15.0 aphids /plant shoot).

In the second season 2003/04 (Fig., 2), data indicated that the initial infestation with CA, *A. craccivora* attacking faba bean was started in a few numbers at the seedling stage, 18 days from planting at Ahnasia, 25 days in Beba and 31 days in both Al-Wasta and Alfashn, with an average of 10.2, 16.9, 0.2 and 7.4 individuals /plant shoot, respectively. The seasonal averaged of the infestation alate and apterae

CA was slightly higher in Ahnasia (7.42 and 368.1 aphids), followed by at Beba district (4.79 and 265.3 individuals), Alfashn (3.9 and 220.16), and lowered in Al-Wasta (2.07 and 174.69). winged and wingless aphid / plant shoot, respectively. The population abundance of the winged *A. craccivora* was relatively low during late October in the four districts except in Ahnasia, that recording 0.0, 5.2, 0.2 and 0.0 individuals /plant shoot at Al-Wasta, Ahnasia, Beni-Suef and Alfashn, respectively. Later, the population density of the aphids increased gradually and reached the maximum counts in 27 November 2003 in Al-Wasta, Ahnasia and Alfashn and at the 4^{th}... week of December 2003 in Beba, recording 7.4, 17.2, 13.0, and 13.5 alate individuals /plant shoot, respectively.

Fig. (1 & 2) further shows that the differences between the mean averages of the alate and apterae cowpea aphid population size during the 2003/04 growing season were significant differences among the four districts, recording 0.6 and 66.4 individuals /plant shoot at Ahnasia, Beba (2.6 and 25.7), Alfashn (1.7 and 34.8) and Al-Wasta (2.6 and 20.0) in mid-March early when the plants were still in later growth stage, forming higher migrants that transferred to wild hosts and other early legume summer crops cultivation in 2004 season, such as cowpea, cotton, soybeans etc. (El-Defrawi, 1999).

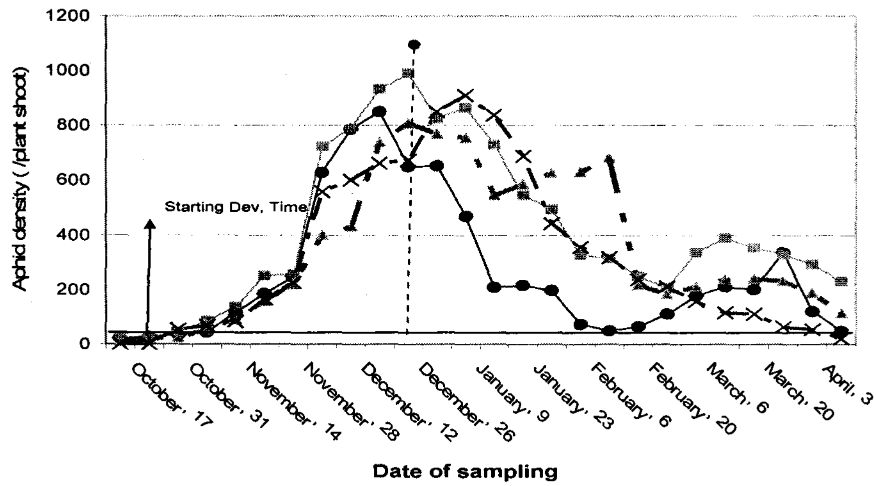

Fig.(1).The strting developing time, size and geographical distribution of *A. craccivora* population density (Aphids /plant shoot) buildup faba bean plants at 4 different sites located in Beni-Suef Gov., Middle-Egypt in 2002/03 growing season

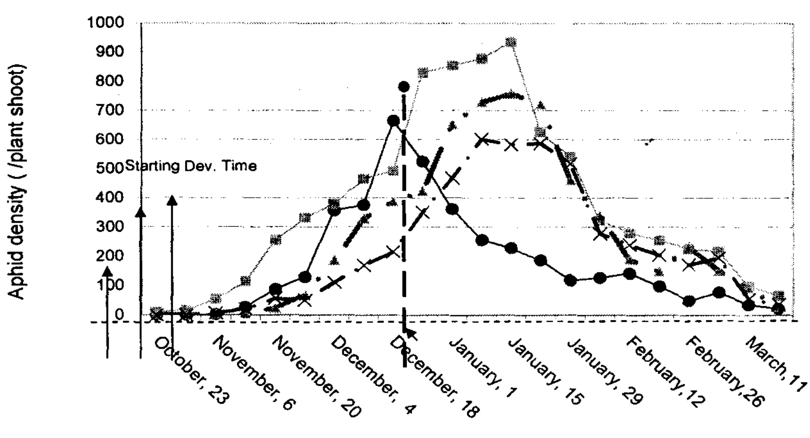

Fig.(2).The Starting-Developing Time, size, and geographical distribution of *A. craccivora* population density (Aphids /plant shoot) buildup faba bean plants at 4 different sites located in Beni-Suef Gov., Middle-Egypt during 2003/04 growing season

A 0-developing point was clearly obvious out of faba bean growth periodicity late in April 2004 at all investigated sites (Fig., 2). At these points, alatoid individuals began to multiply faster for dispersal in order to search alternate hosts (El-Defrawi, 1999 and 2002). The statistical analysis of the data showed no significant differences in the abundance of the winged aphid among the last five successive counts, starting on 19 February to 18 March, at the four different faba bean cultivation sites in Beni-Suef. Multiple Regressions was used to analyze the data and obtain the correlation between weather conditions (abiotic factors), predator numbers (biotic factor) and aphid population. The data presented in Fig. 3 and 4 are pointed out weekly averages progress for CA in a period from mid-October- to last week of December in 2002/03 and 2003/04 season. The presented data showed aphid population buildup was a combined function of temperature, mean relative humidity and prevailing insect predators. Both temperatures (max. & min.) and mean relative humidity for a longer period suppressed the aphid population. Cowpea aphid population was high abundance from the last week of October to the last week of December (R^2 = 0.8865 and 0.9389, respectively) in both 2002/03 and 2003/04 seasons. Analysis of the data showed also, that there was correlation of cowpea aphid population abundance with temperature (Max.T and Min.T), relative humidity and aphidophagous predators (Table, 3). Cowpea aphid under different weather conditions and prevailing insect predators was modeled by using Multiple Regression analysis.

CPA (2002/03) = -943.01 + (-0.6924 Tmin.+ 40.7108 Tmax.-5.6491 R.H.+ 411.296 Pred.).

CPA (2003/04) = -329.30 + (-30.074 Tmin. + 20.6592 Tmax. +1.1767 R.H.+ + 177.284 Pred.).

CAP = Cowpea Aphid Population

Tmin. = Tminimum

Tmax. = Tmaximunm.

RH = Relative Humidity

Pred. = Predators

The model can be used to predict cowpea aphid (*Aphis craccivora*) population and in threshold level to adopt control measures and could be prevent ultimate crop losses. Coefficient of determination (R^2) for the multiple regression was.0.6922. The results are clearly exhibited in Table (1 & 2).

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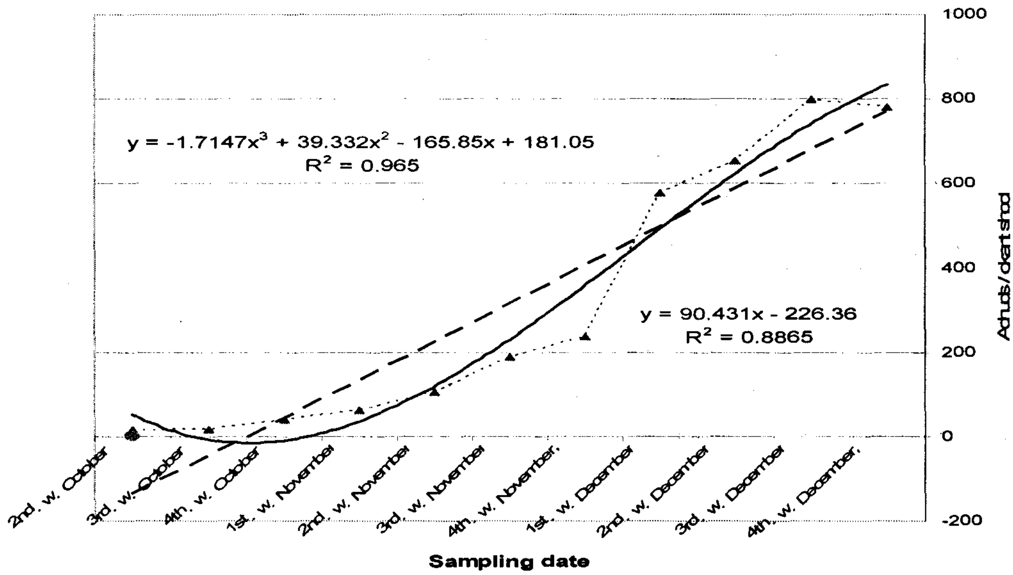
A2. Modeling of Cowpea Aphid Vector FBNYV Populations in Middle Egypt.

The external symptoms of FBNYV-disease as previously described by Katul *et al.* (1993) were evidently observed during the experimental season of 2002/2003 and 2003/04. Symptoms produced by aphid inoculation tests in the greenhouse and confirmed by Enzyme linked immunosorbent assay (ELISA) technique, were quite similar to natural symptoms. It was assumed, therefore, that the symptoms observed in the field were most probably due to a pathogen of FBNYV-disease mainly transmitted by the Dominican cowpea aphid, *A. craccivora.*

A3. Spread of FBNYV-Disease Within Faba Bean Fields at Beni-Suef Governorate:

Data given are illustrated in Fig. (5 and 6) show the weekly mean percentages of the accumulated virus diseased infected faba bean plants at four different sites in Beni-Suef Governorate during 2002/03 and 2003/04 seasons. In the 2002/03 faba bean growing season, FBNYV-disease did not appear in the fields until the plants were 4-5 weeks old in Al-Wasta and Alfashn (0.14 and 0.24 % incidence, respectively), while it appeared earlier in both Ahnasia and Beba districts (0.40 and 0.15 %, respectively), during the 4^{th}. week of October (3 weeks old plants) as shown in Fig. (5). Sign of infection gradually increased parallel to increase in plant age (r = 0.9858 *** and b = 0.5477). The highest percentage of infection was recorded when the plants were 8 weeks old. The relationship between the weekly mean number of alate forms two weeks before the virus disease incidence and the associated percentage of infected plants was positive and had a statistically significant correlation (r = 0.4048** and b = 1.024). As for the apterae forms, this relationship was also highly significantly and positive with respect to virus disease incidence (r = 0.6667*** and b = 0.00269). In 2003/04 growing season, the FBNYV-disease was noticed appeared in Al-Wasta and Beba in November 13 (6 weeks old plants), in November 6 (5-weeks old plants) in Alfashn, while it appeared earlier in Ahnasia district, with infection percentages are 0.01, 0.12, 0.05 and 0.04 % incidence, in the four districts, respectively.. Sign of infection gradually increased with the increase in plant age (r = 0.9278 *** and b = 0.6020). The highest percentage of infection was recorded when the plants were 12-weeks old (Fig., 6). The relationship between the weekly mean number of alate forms, two weeks before the virus disease incidence, and the associated percentage of infected faba bean plants was negative and had a statistically significant correlation (r = -0.3199* and b = -0.1297). As for the apterae forms of CA, this relationship was highly significantly and also negative with respect to virus disease incidence (r = -0.4970** and b = -0.00274).



Fig, 3. Plant infested progress curve of *Aphis craccivora* during a period from mid-October to last week of December in BeniSuef Governorate, 2002/03 season.

A4. Model of FBNYV-Disease Transmission:

The experimental results showed that, the highest percentage of virus transmission were obtained with nymphs (78.2 %), apterae (51.25 %), and alate (31.25 %). The highest percentages of virus transmission (71.15 and 86.1 %) were obtained when there were 5 or 10 viruliferous individuals /plant, while the rate of transmission was reduce to 43.70 % when a single aphid /plant,. The aphid that acquired FBNYV from the infected plants after a relatively long feeding time (2 hours) gave a low percentage of transmission (3.0 %) and the maximum acquisition access feeding period (AAT max.) for *A. craccivora* nymphs was up to 48 hours (87.0 %). The highest transmission percentage (95.5 %) was obtained after 48 hours inoculation access feeding time (IAT min.). Thereafter, *A. craccivora* was able to transmit FBNYV and inoculate the pathogen successfully after 15 min., feeding on healthy plants.

Table 1. Correlation Matrix: In 2002/03 growing season

	Aphid Population	Min. Temp.	Max.Temp.	RH	Predator
Aphid Population	1.000	-0.4108 0.0371 *	-0.3951 0.0458 *	0.1114 0.5880	0.7622 0.0001 ***
Min. Temp.	-0.4108 0.0371 *	1.000	0.9492 0.0001 ***	-0.4851 0.0120 *	-0.7776 0.0001 ***
Max.Temp.	-0.3951 0.0458 *	0.9492 0.0001 ***	1.000	-0.4581 0.0186 *	-0.7846 0.0001 ***
RH	0.1114 0.5880	-0.4851 0.0120 *	-0.4581 0.0186 *	1.000	0.3479 0.0815
Predator	0.7622 0.0001 ***	-0.7776 0.0001 ***	-0.78046 0.0001 ***	0.3480 0.0815	1.000

In 2003/04 growing season

	Aphid Population	Min. Temp.	Max.Temp.	RH	Predator
Aphid Population	1.000	-0.7145 0.0001 ***	-0.6348 0.0005 ***	0.3901 0.0488 *	0.7965 0.0001 ***
Min. Temp.	-0.7145 0.0001 ***	1.000	0.8688 0.0001 ***	-0.2920 0.1477	-0.8392 0.0001 ***
Max.Temp.	-0.6348 0.0005 ***	0.8688 0.0001 ***	1.000	-0.3902 0.0187 *	-0.8392 0.0001 ***
RH	0.3901 0.0488 *	-0.2920 0.1477	-0.3902 0.0187	1.000	0.5199 0.0065 **
Predator	0.7965 0.0001 ***	-0.7859 0.0001 ***	-0.8392 0.0001 ***	0.5199 0.0065 **	1.000

Regression Equation

Y = a + bx (Mini. Temp., Maxi Temp., RH and Predator)

Table 2. Multiple Regression between cowpea aphid population and different weather condition (abiotic factors) and predators (biotic factor). In 2002/03 season

Variable	Regression coefficient	Student Tvalue	Prob.
Mini. Tem.	-0.6924	0.020	0.9841
Maxi. Temp.	40.7108	1.264	0.2200
RH	-5.6492	0.517	0.6109
Predators	411.296	5.916	0.0001***

Intercept = -943.01
Coefficient of determination (R^2) = 0.6922
Adjusted R-Square = 0.6335
Multiple R = 0.8320

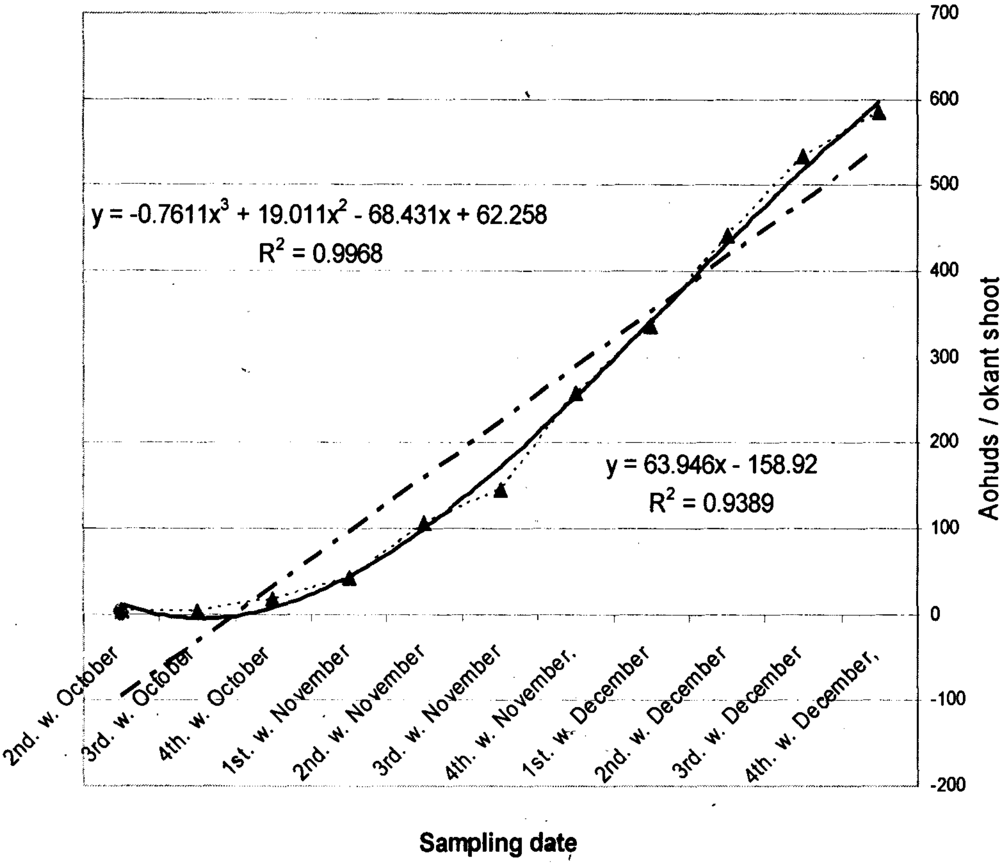
In 2003/04 season

Variable	Regression coefficient	Student Tvalue	Prob.
Mini. Tem.	-30.074	1.899	0.0714
Maxi. Temp.	20.6592	1.596	0.1255
RH	1.1767	0.110	0.9135
Predators	177.284	3.144	0.0049**

Intercept = -329.30
Coefficient of determination (R^2) = 0.6922
Adjusted R-Square = 0.6336
Multiple R = 0.8320

The aphids lived an average of 28 days and were able to transmit the virus throughout their life span. *A. craccivora* was not able to acquire FBNYV from infected faba bean plants during the first three days after virus inoculation. The aphids acquired the virus on the fourth day, at which time, the virus symptoms on the infected plants had not appeared (the rate was 35 %). The primary sign of infection on the faba bean plants was not detected before the eleventh day of inoculation (90%). Therefore, four days from the infection into the field, the infected plants may act as active sources for the vector for further transmission within the field

B. Timing of Insecticide Applications, is so important to achieve maximum effectiveness in reducing the transmission of viruses within fields via controlling vectors. The monitoring results in the last 2 years lead to the optimum period for an application is when aphids are migrating into a crop. To identify this period, a system to monitor aphid flights is required carried out annually by scientists with sufficient time detected as well as a process to notify growers to help them make the correct spray decision.



Fig, 4. Plant infested progress curve of *Aphis craccivora* during a period from mid-October to last week of December in BeniSuef Governorate, 2003/04 season.

B1. Aphids Control:

To give faba bean crop protection against early season aphid pests and viral disease vectors an insecticide must have adequate residual bio-activity. This was investigated after seed dressing or foliar sprays. At-planting insecticide treatment, even at low rates, both Pirimicarb and Imidacloprid gave an adequate efficacy for controlling *A. craccivora* at least 8 weeks as shown in (Table, 3 & 4). Alate cowpea aphid (AlCA) numbers differed significantly among treatments 2-8 WAP. (Table, 3). Numbers of this morph among insecticide treatments were all lower than in the untreated check 3 WAP up to 8 WAP. Lowest numbers of AlCA were found on the Imidacloprid treated plants (Gaucho 3 and 5 g). At 5-7 WAP, alate numbers did not differ among insecticide treatments, and all were different from the untreated. At all sampling date, alate numbers were lowest in the 7-day after spraying with Aphox, in 6, 7, 8 WAP, and almost lower than in the Gaucho (3 and 5 g /kg seed) treatment, but did not significantly differ from the two rates of Aphox except in 2 and 4 WAP.

Apterae cowpea aphid (ApCA) numbers on all the six sampling dates (3-8 WAP), were significantly different among insecticide treatments except the first sample date, due to the first spray applied in that day, and all were significantly lower than the untreated (Table, 4). The lowest numbers of ApCA's were detected on the Gaucho treated seeds up to 6 WAP, but did not differ from the foliar spray with Aphox in 7 and 8 WAP. At 7 WAP, ApCA numbers were lower in the Aphox (0.5 and 0.75 g / lit) treatments, but also were significantly differ from the two Gaucho treatments and gave highest reduction in aphid numbers that achieved by both two rates of Aphox (0.50 and 0.75 g / lit). 8 WAP, the tested insecticides with two different treatments did not differ in their efficiency. Gaucho and Aphox with two rates for each proved highly effective against CA giving 86.51, 87.17, 94.25 and 94.63 % reduction in aphid populations, respectively (Table, 7). Based on the bioactivity of the tested insecticide treatments via seed coated and foliar spray during the two tested seasons, it can be resulted that both seed treatments with Gaucho or foliar spray with Pirimicarb were almost the same effective (Table, 7).

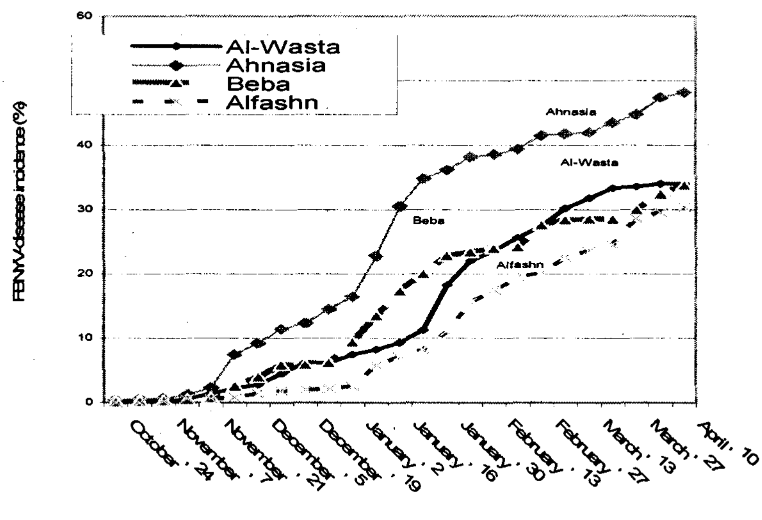


Fig. (5): Plants disease progress curves of FBNYV in faba bean fields throughout the season at four sites in Beni-Suef Governorate, Middle Egypt, 2002/2003.

B2. FBNYV Disease Incidence:

Table (5) show the weekly mean numbers of the infected plants of faba bean with Faba Bean Necrotic Yellows Virus disease (FBNYV) out of 100 random plant sampling within five pilot field trials carried out in Ahnasia districts, Beni-Suef

Governorate throughout 2004/05 and 2005/06 growing seasons. The incidence of FBNYV disease within tested farmer's fields did not differ between insecticide treatments 2-8 WAP, but there was significantly difference were noted among treatments 3, 4, 5, 6, 7 and 8 WAP, and lowered than in untreated ones in both tested seasons (Table, 5). Gaucho or Pirimicarb treated plots with the two rates were given the same efficacy in reducing the number of plant infected with FBNYV throughout the first four sampling dates 2, 3, 4 and 5 WAP. The higher rate for both tested insecticides Gaucho and Aphox, seems to be more efficient than the lower ones. Accordingly, Aphox (0.75 g /l.w.) was superior performance than any other treatment 8 WAP, when adopted three successive sprays, 14-days intervals, but did not differ from the two rates of Gaucho. No significant differences were observed among treatments when the insecticides bioactivity was started.

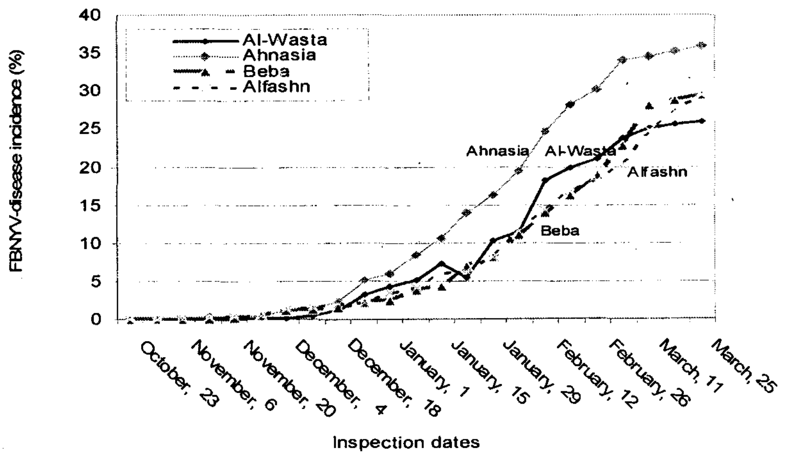


Fig. (6): Plants disease progress curves of FBNYV in faba bean fields throughout the season at four sites in Beni-Suef Governorate, Middle Egypt, 2003/2004.

In general, 56 days after treatments (at flowering stage) with the two tested insecticides with different mode of action did not differ in their efficiency in reducing FBNYV disease spreading within faba bean fields. Fortunately, the two rates of Gaucho and Aphox proved highly effective against viruliferous aphids giving 97.27, 98.31, 97.33 and 97.90 % reduction in plants infected with FBNYV over the two tested seasons (Fig. 7).

B3. Seed Yield Performance:

Seed yields were significantly different among treatments in the five tested sites at Ahnasia-Beni-Suef Governorate (Table, 6). Aphox (0.5 and 0.75 g /lit. w.) produced significantly more yields of faba bean than in all other ST Gaucho (3 and 5 g / kg seed). The lowest rate of Gaucho ST or Aphox FS applied did not differed from the higher rates, but all treatments with the two insecticides were significantly different from the untreated ($P < 0.001$). Results in Table (6) show that the yield in the insecticides treated fields were higher than in the untreated one. Avoidable loss in yields of faba bean ranged between 49.61 to 54.55 % depending on insecticidal treatments and between the varieties. The avoidable loss in yields of faba bean cv. Giza 843 and 429 varieties being (40.91, 45.77, 38.58 and 38.79 %) and (63.51, 64.18, 61.15 and 62.60), respectively were given by Aphox and Gaucho at an early aphid control in the two seasons. The economics of an aphid control early on the basis of pooled yield obtained with the different treatments are summarized in Table (7). The highest net benefit over control was obtained in case of the two insecticides with two rates treated early by LE. 2383, 2630, 2202 and 2282, respectively.

As regards the gain over control, it was highest (L.E. 2383 & 2630), when plant vigor's received three successive sprays (14-day intervals) with Pirimicarb (Aphox 50 % DG) at the two rates (0.5 and 0.75 g / lit. w.) to maintain aphid populations below economic threshold throughout 42-day after plant emergence. Romankow and Zarzycka (1980) found that Pirimicarb (as Aphox 50 % DG) was effective against *A. fabae* on *V. faba* even at the lower rate and significantly increased the number of pods and seed yield. Since these new candidates do not protect the newly developed plant growth, they should be manipulated as to help the plants escape new aphid infestation. Considering the overall performance, Gaucho seed treatments proved to be an effective material against cowpea aphid. Since the two dosages *i.e.,* 3 and 5 g / kg seed, proved equally effect, the lower dose is preferable for economy and safety. Results obtained are in harmony with those found by some authors e.g., (Elbert *et al.*, 1990, Altmann & Elbert, 1992, Selim & Emam 1993, and Salem *et al.*, 1998)

El-Defrawi *et al.*, 2002, found all the field plots sown with faba bean cv. Giza 674 variety, seed treatments with Gaucho 3 and 5 g / kg seed, before cultivation gave significantly higher yield than control in both seasons of 1997/98 and 1998/99. Gaucho at the lower rate 0.5 and 1 g /kg seed weight, was on a par but significantly superior to the check control (untreated). The results presented in this research show that many of the viruliferous insect pest problems encountered in faba bean fields in Beni-Suef Governorate, Middle Egypt, can be attributed to risk averse farmers over using insecticides:

Table 3. Effect of at-planting insecticide treatments on mean numbers of alate *A. craccivora* harbored faba bean plants, 2004/05 and 2005/06 growing seasons at Beni-Suef Governorate, Middle Egypt.

Treatment	Rate	Mean number winged aphids /plant shoot during													
		2004/05 season							2005/06 season						
		2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP
Untreated		4.4 a	5.2 a	7.6 a	10.4 a	12.7 a	8.6 a	7.4 a	6.6 a	14.3 a	3.0 a	2.4 a	2.0 a	1.0 a	1.1 a
Aphox 50 % DG	0.5 g / lit. w	3.8 a	0.36 b	1.43 b	0.02 b	1.68 b	0.45 b	1.55 b	5.8 a	0.22 b	0.45 b	0.00 b	0.23 b	0.03 c	0.74 c
Aphox 50 % DG	0.75 g / lit. w	4.1 a	0.27 b	1.15 b	0.02 b	1.13 b	0.26 b	1.27 b	5.9 a	0.20 b	0.18 b	0.07 b	0.16 b	0.05 c	0.58 c
Gaucho 70 % WS	3 g / kg seed	0.0 b	0.00 c	0.10 c	0.03 b	0.67 b	0.81 b	1.53 b	0.0 b	0.00 c	0.00 c	0.00 b	0.25 b	0.33 b	1.34 b
Gaucho 70 % WS	5 g / kg seed	0.0 b	0.00 c	0.00 c	0.02 b	0.57 b	0.77 b	1.46 b	0.0 b	0.00 c	0.00 c	0.00 b	0.27 b	0.46 b	1.20 b
P > F		0.003	0.001	0.001	0.002	0.004	0.001	0.001	0.001	0.001	0.003	0.001	0.007	0.001	0.001

* Means within a column followed by the same letter are not significantly different (P <0.05, Duncan's Multiple Range Test).

Table 4. Effect of at-planting insecticide treatments on mean numbers of apterae *A. craccivora* harbored faba bean plants, 2004/05 and 2005/06 growing seasons at Beni-Suef Governorate, Middle Egypt.

Treatment	Rate	Mean number wingless aphids /plant shoot during													
		2004/05 season							2005/06 season						
		2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP
Untreated		110.2 a	147.4 a	267.0 a	308.4 a	456.0 a	515.3 a	744.3 a	377.0 a	816.7 a	1010.3 a	225.0 a	64.6 a	45.8 a	105.0 a
Aphox 50 % DG	0.5 g / lit. w	133.4 a	7.3 b	18.9 b	3.6 b	88.0 b	4.8 c	17.3 c	287.0 a	26.7 b	43.4 b	5.6 b	21.0 b	0.3 c	38.0 c
Aphox 50 % DG	0.75 g / lit. w	145.6 a	2.3 b	15.3 b	2.6 b	47.6 b	1.0 c	15.0 c	327.7 a	22.4b	18.6 b	1.7 c	28.4 b	0.3 c	33.6 c
Gaucho 70 % WS	3 g / kg seed	0.0 b	0.0 c	0.1 c	0.13 b	97.0 b	43.3 b	105.0 b	0.0 b	0.0 c	0.0 c	0.07 c	3.8 c	22.5 b	26.70 b
Gaucho 70 % WS	5 g / kg seed	0.0 b	0.0 c	0.0 c	0.12 b	63.4 b	28.1 b	118.0 b	0.0 b	0.0 c	0.0 c	0.07 c	11.2 b	20.7 b	37.3 b
P > F		0.0001	0.0016	0.0012	0.0016	0.0014	0.0017	0.0013	0.0001	0.0001	0.0001	0.001	0.001	0.001	0.001

* Means within a column followed by the same letter are not significantly different (P <0.05, Duncan's Multiple Range Test).

Table 5. Effect of at-planting insecticide treatments on mean percentages FBNYV disease incidence within faba bean fields, 2004/05 and 2005/06 growing seasons Beni-Suef Governorate, Middle Egypt..

Treatment	Rate	FBNYV incidence (%) during															
		2004/05 season							2005/06 season								
		2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP		
Untreated		0.220 a	0.437 a	0.887 a	1.033 a	1.178 a	0.220 a	0.437 a	1.680 a	4.309 a	3.540 a	2.191 a	2.140 a	1.680 a	4.309 a		
Aphox 50 % DG	0.5 g / lit. w	0.060 b	0.010 b	0.026 b	0.029 b	0.043 b	0.060 b	0.010 b	0.022 b	0.027 b	0.043 b	0.117 b	0.166 b	0.022 b	0.027 b		
Aphox 50 % DG	0.75 g / lit. w	0.020 b	0.013 b	0.020 b	0.023 b	0.052 b	0.020 b	0.013 b	0.007 b	0.022 b	0.029 b	0.048 c	0.113 b	0.007 b	0.022 b		
Gaucho 70 % WS	3 g / kg seed	0.020 b	0.018 b	0.022 b	0.026 b	0.086 b	0.020 b	0.018 b	0.003 b	0.023 b	0.027 b	0.133 b	0.226 b	0.003 b	0.023 b		
Gaucho 70 % WS	5 g / kg seed	0.030 b	0.017 b	0.019 b	0.023 b	0.077 b	0.030 b	0.017 b	0.005 b	0.024 b	0.028 b	0.077 c	0.134 b	0.005 b	0.024 b		
P > F	.	0.0016	0.0011	0.0011	0.0011	0.0017	0.0016	0.0011	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		

* Means within a column followed by the same letter are not significantly different (P <0.05, Duncan's Multiple Range Test).

Table 6. Seed yield response to the different treatments of at-planting insecticide applications for early control faba bean pests, 2004/05 and 2005/06 growing seasons at Beni-Suef Governorate, Middle Egypt..

Treatment	Rate	Mean seed yield (ton /fed.) at indicated 5 farmers fields (S) during											
		2004/05 season (Giza 843 variety)						2005/06 season (Giza 429 variety)					
		S1	S2	S3	S4	S5	Mean	S1	S2	S3	S4	S5	Mean
Untreated		0.617	0.808	0.533	0.734	0.896	0.718 b	0.410	0.426	0.474	0.443	0.405	0.432 b
Aphox 50 % DG	0.5 g / lit. w	1.188	1.226	1.350	1.278	1.034	1.215 a	1.072	1.116	1.339	1.126	1.266	1.184 a
Aphox 50 % DG	0.75 g / lit. w	1.166	1.245	1.782	1.162	1.266	1.324 a	0.955	1.210	1.362	1.326	1.175	1.206 a
Gaucho 70 % WS	3 g / kg seed	1.144	1.266	1.208	1.149	1.078	1.169 a	0.980	1.120	1.307	1.258	0.896	1.112 a
Gaucho 70 % WS	5 g / kg seed	1.098	1.268	1.245	1.130	1.124	1.173 a	1.042	0.998	1.403	1.083	1.250	1.155 a
L.S.D. (0.05)		1.98						0.577					

* Means within a column followed by the same letter are not significantly different (P <0.05, Duncan's Multiple Range Test).

Table 7. Economics of aphid control early on faba bean seed yield under different treatments of insecticides at planting applied over 2 years (2004/05 and 2005/06) in 5 pilot fields, Beni-Suef, middle Egypt.

Treatment	Rate of application	Aphid abundance		FBNYV incidence		Seed yield (t. /fed,)	Increase in seed yield Over control (t. /fed.)	Gain over control (LE. /fed,)	Cost of insecticide application (LE. /fed.)	Net benefit over control (LE. /fed.)
		Mean aphids /plant shoot	Reduction In population (%)	Mean Per cent Incidence	Reduction (%)					
Untreated	-	377.12	-	1.733	-	0.575	-	-	-	-
Aphox 50 % DG	0.5 g / lit. w	50.86	86.51	0.047	97.27	1.200	0.625	2500	117	2383
Aphox 50 % DG	0.75 g / lit. w	48.39	87.17	0.029	98.31	1.265	0.690	2761	131	2630
Gaucho 70 % WS	3 g / kg seed	21.69	94.25	0.046	97.33	1.141	0.565	2264	62	2202
Gaucho 70 % WS	5 g / kg seed	20.26	94.63	0.036	97.90	1.164	0.590	2358	76	2282

* at seed price of L.E. 4000 per ton.

** at insecticide cost (Gaucho = L.E. 120 / kg and Aphox = L.E. 120) + Labor + spray operations.

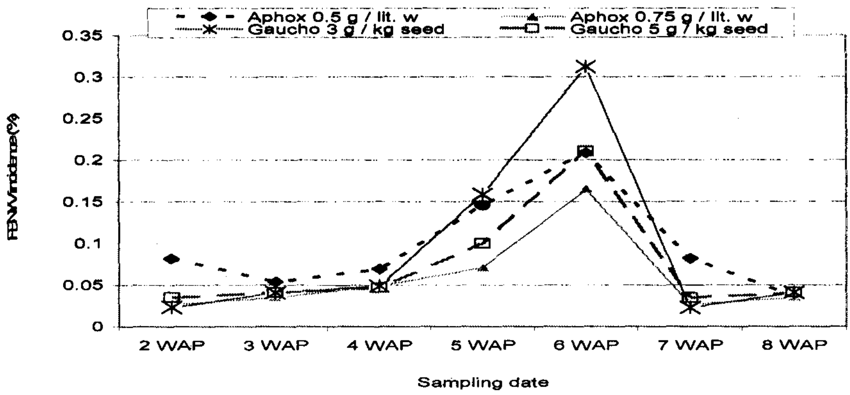


Fig. (7). Effect of at planting insecticide treatments on per cent FBNYV incidence within faba bean fields during 20044/05 and 2005/06 at Ahnasia, Beni-Suef Gover., middle Egypt.

ACKNOLOWLDGMENT

The Study was Proposed as Objective of Enhancing Food Security in The Nile Valley and Red Sea Region "Integrated Control of Aphids and Major Virus Diseases in Cool Season Food Legumes and Cereals" As Part of Technology Generation and Dissemination for Sustainable Production of Cereal and Cool-Season Food Legumes ICARDA/NVRSRP/IFAD Project Supported by The International Fund for Agricultural Development (IFAD).

REFERENCES

1. Altmann, R. and A. Elbert. 1992. Imidacloprid- a new insecticide for seed treatment in cereals, maize, and beets. *Mitteilungen der Deutschen Gesellschaft fur Allgemeine* und Angewandte Entomologie, 8 : 1-3, 212-221.
2. Anonymous. 2006. CGIAR Challenge Program on Water & Food. CPWF Annual Report, 2006, DRAFT.
3. Abeer, S.E.A. 1998. Aphid species and aphid borne viruses associated with faba bean in Egypt. M. Sc. Thesis, Fac. Agric., Cairo University.
4. Bishara, S.I.K, E.Z. Fam, A.A., Attia and M.A. El-Hariry 1984. Yield losses of faba bean due to aphid attack. FABIS Newsletter No. 10 : 16-18, Dec. 1994.
5. El-Defrawi, G.M. 1987. Studies on insect vectors of plant virus diseases infesting legumes in Egypt. Ph. D. Thesis. Fac. Agric., Ain Shams Univ., Cairo Egypt. 253 pp.

6. El-Defrawi, G.M. 1999. Investigations on the possible role of some wild plants in the severity of Aphis craccivora Koch in faba bean and cowpea fields at Beni-Suef region, Egypt (Homoptera: Aphididae). Proc. Conf. Strategy for Safe Agricultural Production in Arab Countries, Arab Council for Graduate Studies and Scientific Research Association of Arab Universities, Cairo-Egypt, 27-29 October, 1999.
7. El-Defrawi, G.M. 2002. Major factors affecting in the population dynamics of insects and importance of forecasting with special attendance to aphids. 2nd. International Conference, Pl. Prot. Res. Inst., ARC, Cairo- Egypt, 21-24 Dec., 2002.
8. El-Defrawi, G.M. and M.A. Omar. 1998. Performance of some faba bean breeding lines for resistance to the cowpea aphid, Aphis craccivora Koch. Proc. 8th. Conf. Agron., Suez Canal Univ., Ismailia, Egypt, Nov. 1998, Vol. 1: 298-3o7.
9. El-Defrawi, G.M. and M. Abd El-Azim. 1992. Chemical control of cowpea aphid, Aphis craccivora Koch on faba bean crop. Zagazig J. Agric. Res., Vol., 19 (6): 2657-El-
10. El-Defrawi, G.M. and F.H. Shalaby. 2002. Field resistance of Vicia faba breeding lines to attack by cowpea aphid, Aphis craccivora Koch in Egypt. J. Agric. Sci. Mansoura Univ., 27 (9): 5701-5712, 2002.
11. Defrawi, G.M. , Azza K. Emam and F.H. Shalaby. 1998a b. Economic- Injury Levels and Economic Thresholds of Aphis craccivora Koch on faba bean in Egypt (Homoptera: Aphididae). Annals Agric. Sci., Ain Shams Univ., Cairo, 43 (2): 289-298, Dec. 1998.
12. El-Defrawi, G.M., S.A. Mahmoud and F.H. Shalaby. 1998b a. Resistance to cowpea aphid in faba bean (Vicia faba L.) Egyptian landraces. Proc. 8th. Conf. Agron., Suez Canal Univ., Ismailia, Egypt, Nov. 1998, Vol. 1: 308-318.
13. El-Defrawi, G.M., L. Rizkalla, and F. Shalaby. 1994a b. The flight activity of winged forms of Aphis craccivora Koch in relation to virus disease incidence within faba bean fields. Pages 152-160. In Nile Valley Regional Program on Cool-Season Food Legumes and Cereals. Six Annual Coordination Meeting, 11-15 September 1994, Cairo, Egypt.
14. El-Defrawi, G.M., M. Abd El-Azim, I.A. Marzouk and S.I. Bishara. 1994 b a. Seasonal fluctuation of five aphid species infesting faba bean plants in Beni-Suef Governorate, Egypt. Egypt. J. Appl. Sci., 9 (10): 235-247.
15. El-Defrawi, G.M., I.S. Abd El-Wahab, S. Mostafa and F.H. Shalaby. 2002. Effects of sowing date and seed treatment with gaucho (imidacloprid) on the population abundance of cowpea aphid, Aphis craccivora Koch, yield and its components of faba bean crop in Beni-Suef, Middle Egypt. J. Agric. Sci. Mansoura Univ., 27 (1): 583-595.

16. Elbert, A., H. Overbeck, K. Iwaya and S. Tsuboi. 1990. Imidacloprid, a novelsystemic nitromethylene analogue insecticide for crop protection. Brighton Crop Prot. Conf., Pests and Diseases 1990 vol.1: 21-28.
17. Hafez, M. 1964. Estimation of Aphid Abundance in the Field. Text Book Dept. of Agrarian Culture, Cairo, p. 14.
18. Katul, L., H.J. Vetten, E. Maiss, K.M. Makkouk, D.E. Lesemann and R. Casper. 1993. Characteristics and serology of virus-like particles associated with faba bean necrotic yellows. Ann. Appl. Biol. 123: 629-647.
19. Katul, L., H.J. Vetten, D.E. Lesemann, E. Maiss and K.M. Makkouk. 1995. Diagnostic methods for the detection of faba bean necrotic yellows virus, a circular ssDNA virus, EPPO Bulletin 25, 329-336.
20. Makkouk, K.M. and H.J. Vetten. 1997. Diagnosis of plant virus diseases. In Course on diagnosis of plant viruses with special emphasis on faba bean necrotic yellows virus, April 8-15, 1997, AGERI, Cairo-Egypt, Sponsored by European Commission INCO-DC Programme , 85 pp.,
21. Makkouk, K.M., L. Bos, O.I. Azzam, S. Kumari and L. Rizkalla. 1988. Survey of viruses affecting faba bean in six Arab countries. Arab Journal of Plant Protection, 6: 53-61.
22. Makkouk, K.M., L. Rizkalla, M. madkour, M. El-Sherbeeny, S.G. Kumari, A.W. Amriti and M.B. Solh. 1994. Survey of faba bean (Vicia faba L.) for viruses in Egypt. Phytopathologia Mediterranea, 33 : 207-211.
23. Marzouk, I.A. 1990. Susceptibility of different varieties of faba bean (Vicia faba L.) to aphids and leafminers and their control. Ph.D. Thesis, Fac. of Agric., Al-Azhar Univ., Cairo, Egypt.
24. Nassib, A.M and A. Basheer. 1983. On-farm trials. Pages 38-48. in Faba Bean in the Nile Valley Report on the First Phade of the ICARDA /IFAD Nile Valley Project (Saxena, M.C. and Stewart, R.A., edt), Martinus Nijhoff Publications, Dordrecht. The Netherlands.
25. Romankow, W. and K. Zarzycka. 1980. Control of the bean aphid on bean crop using Pirimor 50 % DP. Prace Naukowe Inst. Och. Roslin, 20 (2): 183 – 187.
26. Salih, F.A. 1987. Effect of nitrogen application, sowing date and plant population per hill on faba bean yield. FABIS Newsletter (1987) No. 17 : 27-30.
27. 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.
28. Selim, A.A. and A.K. Emam. 1993. Effect of certain aphicides on growth of cotton seedlings, control of cotton aphid Aphis gossypii (Glov.) and certain fibber characters. Annals of Agricultural Science Cairo, 38 : 311-317.
29. Snedecor, G. W. and W. G. Cochran. 1980. Statistical methods. 7th. Edn. Ames. Iowa: Iowa State University Press. 507 pp.

نموذج ديناميكية تعداد حشرة من اللوبيا .Aphis *craccivora* Koch
ونظام مبكر للسيطرة علي إصابة الفول البلدي في حقول المزارعين بمنطقة مصر الوسطي

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٢. المركز الدولي للزراعة في المناطق الجافة "أيكا ردا"

تمت دراسة الوفرة العددية لحشرة من اللوبيا وأعداءها الطبيعية المصاحبة لها في حقول الفول البلدي بمناطق الواسطى – أهناسيا – ببا والفشن التابعين لمحافظة بنى سويف – إقليم مصر الوسطي خلال موسمي ٢٠٠٢/٢٠٠٣ و ٢٠٠٣/٢٠٠٤. وتهدف الدراسة أيضا رصد مواعيد ظهور حشرة من اللوبيا وحجم التعداد وعلاقتها بحدوث الإصابة بالأمراض الفيروسية في حقول مزارعي الفول البلدي.

أوضحت النتائج أن حشرة من اللوبيا يجدد حجم وتواجدها على نباتات الفول البلدي بالحقول يرتبط بصورة معنوية عالية بكل من العوامل المناخية وهى درجات الحرارة الدنيا والقصوى والرطوبة النسبية و العوامل الحيوية ومنها تعداد المفترسات المرتبطة بها.

وتبدأ الإصابة في الزيادة والارتفاع خلال الأسبوع الأخير من شهر أكتوبر وتمتد إلى منتصف شهر يناير، وذلك بسبب الظروف الجوية المواتية

وقد أمكن وضع نموذج لنظام التعداد لحشرة من اللوبيا يتغير بتغير العوامل الجوية باستخدام معدلة الانحدار المتعدد. وقدرت درجات الثقة لمعامل التحديد للنموذج (٦٩,٢٢ %). ويمكن استخدام هذا النموذج في التنبؤ بحجم الإصابة حشرة من اللوبيا في حقول الفول البلدي مستقبلا والتعرف علي إمكانية نشر للمسبب الفيروسي لمرض اصفرار وموت الفول البلدي ودرجة كفاءتها بدقـة وتحديـد درجة الضرر للاعتماد عليها وتدبير أساليب الوقاية والمكافحة لدرء الخسائر في المحاصيل في نهاية المطاف.

أيضا ، أجريت تجارب في خمسة مواقع بحقول المزارعين(مساحة كل موقع منهـا حـوالي ١٥٠٠ متر مربع) في محافظة بنى سويف خلال موسمي ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ ، بغرض التعرف على إمكانية مكافحة الحشرة مبكرا ، ولتحديد أنسب المبيدات الحشرية للاستخدام وإثرها على تعداد حشرة من اللوبيا ومدى انتشار مرض اصفرار وموت الفول البلدي وإنتاجية المحصول تحـت ظروف الحقول التجريبية لدى المزارعين.

٢٥،بينت النتائج أن استخدام مبيد الجاوشو من مجموعة الاميدوكلوبريد في تغطية التقـاوي (معاملة بذرة) من الخارج قبيل الزراعة مباشرة بمعدل ٣ و ٥ جرام مبيد لكل كيلـو جـرام بـذرة ومقارنته باستخدام مبيد الافوكس من مجموعة البيريميكارب رشا على المجموع الخـضري بمعـدل ٠,٥ و ٠,٧٥ جرام لكل لتر ماء، فأن كلاهما قد أثبت فاعلية عالية في خفض تعداد حشرة من اللوبيا

٠,٥ و ٠,٧٥ جرام لكل لتر ماء، فأن كلاهما قد أثبت فاعلية عالية في خفض تعداد حشرة من اللوبيا بحقول المزارعين الخمس وقدرت نسب الانخفاض في التعداد لكل من المعدلات المستخدمة بالمركبين ٩٤,٢٥، ٩٤,٦٣، ٨٦,٥١، و ٨٧,١٧ % على التوالي.

وأيضا قد بينت النتائج بان المركبين الجاوشو والافوكس بالمعدلات التجريبية قد كانت لهما فعالية عالية في خفض نسب الإصابة بمرض اصفرار وموت الفول البلدي في حقول المزارعين الخمس، حيث قدرت نسب الانخفاض كمتوسط عامي الدراسة ٩٧,٣٣، ٩٧,٩٠، ٩٧,٢٧ و ٩٨,٣١ %، على التوالي.

ويمكن استخلاص النتائج والاقتراح بأن استخدام المبيدات في صورة معاملة التقاوي قبل الزراعة وفى حالة التصريح باستخدامها أن هذه الطريقة قد أثبتت جدواها وقدرتها على حماية النباتات مبكرا من الإصابة العالية بحشرات من اللوبيا الحاملة لمرض موت واصفرار الفول البلدي وخفض نسب الإصابة بحقول المزارعين.

ثم أيضا فان استخدام المبيدات رشا على النباتات في مواعيد مبكرة خلال موسم النمو (طور البادرة) قد أثبت فعالية عالية جدا ومؤثرة على حجم تعداد الحشرات الحاملة للمرض بشرط الاستخدام الامثل في التوقيت الملائم وقبيل تفاقم المشكلة، بل وتتفوق على المبيدات المستخدمة في معاملة البذور.