ANTIFEEDING EFFECT OF NEEM EXTRACT AGAINST SWEET POTATO WHITEFLY *BEMISIA TABACI* (HOMOPTERA: ALEYRODIDAE) VECTOR OF BEAN ANGULAR MOSIAC VIRUS

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INTRODUCTION

The whitefly *Bemisia tabaci* (Genn.) is one of the most economic pests infesting over 900 host plants in the world especially squash, cucumber, tomato and beans, beside, both nymph and adult secrete copious quantities of honey dew which causes growth of sooty mould (Gameel 1974). Furthermore, whiteflies are known as vectors of many serious virus diseases (about 111virus disease) to many agricultural crops, out of which is the bean angular mosaic virus disease (BAMV). Infected plants with BAMV show different symptoms such as chlorotic batches, systemic mottling, malformations and local lesions (Sutic *et al.*, 1999). Few studies were carried out on the relationship between virus infection and its vector especially in Egypt. Aim of this work is to study two points:

1-The effect of neem extract on *B.tabaci* mortality.

2- The effect of both neem extract and BAMV on some biological aspects of *B. tabaci.*

MATERIAL AND METHODS

1- Plant inoculation

Bean- plant *Phaseolus vulgaris* showing typical symptoms of BAMV infection were collected and enfolded in wet paper until being used. Inoculum was prepared by grinding(1:1,w/v) infected bean leaf tissues in phosphate buffer solution(pH 7.0) with sterilized pestle and mortar, then pressing the pulp through two layers of cheesecloth. The obtained crude sap was used in mechanical inoculation of one month old *Chenopodium amaranticolor* plants. Mechanical inoculation was performed by the method described by Rawlins and Tompkin (1993), in which

forefinger were used. Leaves inoculated were first slightly dusted with carborandum, then inoculated and rinsed with tap water. Shortly after inoculation, plants were kept in proof plastic- house. Inoculated plants were checked daily for the appearance of local lesions symptoms, when symptoms appear on the above mentioned indicator plant, back inoculation into *Chenopodium amaranticolor* and bean plant were carried out to insure BAMV presence. Virus was propagated into bean plants using single lesion obtained from *Chenopodium amaranticolor* leaves.

2- Virus identification

2.1-Diagnostic host

Ten seedlings of the following hosts belonging to different families were inoculated with sap obtained from virus infected bean leaves under plastic- house conditions *Chenopodium amaranticolor, C. quinoa, Arachis hypogaea, Glycine max, Datura stramonium, Gomphrena globosa, Nicotiana tabacum, Pisum sativum, Beta vulgaris.*

2.2- Virus stability

Thermal inactivation point (TIP), longevity in vitro (LIV) and dilution end point (DEP) of the isolated virus was studied. Crude sap from infected bean plants was used. Virus stability was determined as described by Noordam (1973).

2.3- Enzyme linked immunosorbent assay (ELISA)

Enzyme linked immunosorbent assay (ELISA) method described by Clark and Adams (1977) was used for rapid serological identification of bean angular mosaic virus.

3- Neem extraction procedure

The extraction procedure was conducted using an aqueous cold infusion of equal parts of leaves and ripe fruits. These parts were blended with water and maintained in a glass container for 24 hr., after which the infusion was filtered through a fine cloth and used for bioassay. Three concentrations were prepared 200, 150 and 100g/l in addition to the control.

4- Effect of neem extract on the *B. tabaci* mortality

Three treatments each contains four replicates and each replicate contains 25 adults of *B. tabaci* of uniform age collected from a colony reared on sweet potato plant confined in glass cage over a pot with two bean plants, in addition to untreated

plants which were sprayed by water. The number of dead and live insects was counted daily for four days.

5- Effect of neem extract on some biological aspects of *B.tabaci*

The experiment consists of two treatments and each treatment was repeated four times, each replicate contains ten potted bean plants with the higher concentration(200g /l) for treatment 1 and 0.0 concentration (control) for treatment 2.Also, potted plants (with 2 primary leaves) were exposed to two separate groups of *B. tabaci*. The first group contains healthy whiteflies and the other group contains BAMV infected whiteflies, the two groups were exposed to the two treatments for 72hr.at 25±2C°, after this period, all adults of whiteflies was removed. For each treatment 20 test plants were typically chosen for counting the number of eggs, these eggs were followed till accessing the adult stage in order to count the number of pupae, number of adults and percentage of adult survival.

RESULTS AND DISCUSSION

Virus stability

Results indicated that thermal inactivation point was 75- 80 C°, dilution end point was 10-4- 10-6 and longevity *in vitro* was 4- 6 weeks at room temperature. Similar results were obtained by Campbell (1971).

Enzyme linked immunosorbent assay (ELISA)

Results showed the possibility of using ELISA as a tool for rapid identification of bean angular mosaic virus. This result agreed with that obtained by Brunt (1996), Edwards and Cooper (1985) and Mowat and Dawason (1987).

Antifeedant effect of neem extract on *B.tabaci*

Data recorded in table (1) show the rates of mortality of *B. tabaci* on bean plants sprayed with different concentrations of neem extract. However, those rates were significantly higher than on plants sprayed with water (control).Also the mortality percentages increased with increasing the concentration rate *i.e.* the higher concentration gave 100% mortality after 96hr. while the lower concentration recorded 62% after 96hr. These results suggest a possible antifeedant action of the neem extract on the insects. Studies of plants of the family Meliaceae have resulted in the isolation of many limonoids with insect antifeedant and insecticidal properties (Kraus *et al.*, 1987 and Schumuterer, 1990). Similar results were observed by Nardo

(1989) who attributed a considerable reduction of the infection level of BAMV in *B. tabaci*, to an antifeedant activity of neem extract on the vector. Also, Nardo and Costa (1990) demonstrated that the antifeedant effect of neem extract was not effective enough to prevent transmission of a non circulative virus by *B. tabaci* probably because it could not prevent probing of the leaves by the insect. This antifeedant action seems to be very specific to *B.tabaci* because the transmission of two viruses by *Myzus persicae* was not affected by neem extract.

TABLE (I)
Effect of neem extract on *B. tabaci* mortality

Concentration g/l	Mortality %			
	24 hours	48 hours	72 hours	94hours
200	45 cd	72d	89 d	100d
150	39 c	60 c	77 c	83 c
100	30 b	44 b	51 b	62 b
0	11 a	16 a	20 a	23 a

N.B: In each row, values followed by the same letters are not significantly different at 5% level.

TABLE (II)
Effect of neem extract on some biological aspects of *B. tabaci*

Treatment		Biological aspects			
		No. of eggs /plant	No. of pupae	No. of adults	Survival%
200g/l	Healthy	26.6± 1.45	21.2±0.95	20.85±1.25	78.38
	BAMV	35.5 ±2.58	30.75±0.38	29.3±0.79	82.45
control	Healthy	55.8± 0.8	47.5±2.3	44.75±1.63	80.2
	BAMV	67.4±0.6	58.6±4.75	55.5±0.96	84.7

Effect of neem extract on some biological aspects of healthy and BAMV infected *B. tabaci*

In this experiment, the number of deposited eggs / plant sprayed with neem extract was significantly lower than on plants sprayed with water (Table2). Also

whiteflies infected with BAMV deposited significantly more eggs on sprayed or control bean leaves than nonviruliferous whiteflies. However, the pupal number, adult number and percentage of survival were the same on both kinds of plant. On the other hand, there was non significant difference between virus-infected and nonviruliferous whiteflies for the number of adults emerged or the proportion of those adults surviving from the egg stage. Results obtained in table(2) are in agreement with the findings of Nardo *et al.*(1997) who indicated that *Melia azadarach* extract could have affected the number of eggs laid by *B.tabaci* and the corresponding number of pupae produced, probably because of its antifeeding action. Mckenzie *et al.* (2002) found that healthy plants infested with ToMoV-infected whiteflies consistently had 2.5-fold more eggs and 4.5 fold more nymphs than plants with nonviruliferous whiteflies.

SUMMARAY

Tests conducted under plastic- house conditions indicated that the antifeeding effect of aqueous neem extract applied on bean plant leaves could interfere in field spread of BAMV directly by reducing feeding and consequently, the transmission efficiency of this virus by the vector and indirectly by reducing the population of *B. tabaci* Also, whiteflies carrying bean angular mosaic virus deposited significantly more eggs than nonviruliferous whiteflies when provided treated or non treated bean host.

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