

Cowpea Aphid *Aphis craccivora* Koch as Insect Vector of Faba Bean Necrotic Yellow Virus (FBNYV) on Broad Bean Plants.

Aml Z. N. Al-Habshy

Plant Prot. Res. Inst., Agric. Res. Cent., Dokii, Giza, Egypt



ABSTRACT

Ability of *Aphis craccivora* Koch to transmission of faba bean necrotic yellow virus (FBNYV) on broad bean plants was studied under laboratory condition. These studies were carried out in the laboratory of plant protection institute, Zagazig. The result show that the acquisition threshold feeding periods were ranged between 60 - 120 min. Incubation periods in *A. craccivora* ranged between 120-160 min., while in celery plants was 12 - 18 days.

Keywords: broad bean plants, celery plants, faba bean necrotic yellow virus, Cowpea Aphid *Aphis craccivora* Koch

INTRODUCTION

Faba bean necrotic yellow virus is an economic important disease in broad bean fields. Many others studies the relationship between a *Aphis craccivora* and FBNV. Aphids are responsible for the natural spread of FBNV in Egypt El-Defrawi *et al.*, (2000), Salem *et al.*, (2004) and Soliman (2013). In Egypt broad bean plants were infected with (FBNYV) serious losses in the total yield of broad bean were attributed to this virus. Data obtained from survey studies showed that *A. craccivora* is one of the most abundant aphid in broad bean fields. Among these pests, certain homopterous insects such as aphids, leafhoppers, planthoppers and whiteflies are of great economic importance which causes yield losses either directly by sucking plant sap or indirectly as vectors of virus diseases El-Gindy (2002), Hashem (2005), Saskia *et al.*, (2008) and Adane *et al.*, (2010). According to the results of the survey studied on the aphid species on broad bean plants, the following species were found *Aphis craccivora* (Koch), *Myzus persicae* Sulzer and *Aphis gossypii* Glov. Abd – Elsamed and Al-Habshy Aml (2013). So, this study was carried out to investigate the ability of *A. craccivora* in transmitting faba bean necrotic yellow virus in broad bean plants.

MATERIALS AND METHODS

Samples of *Aphis craccivora* individuals were collected from broad bean plants in different area at Diarb Nigm district, Sharkia, Governorate. The samples were transfer the laboratory of plant protection research institute branch in Sharkia. The test plants were celery (*Apium graveolens Dulc.*) were plants in pots. The collected *A. craccivora* critically examined to be free from any contaminating diseases pathogen before using in the test the *A. craccivora* placing directly after collected from field on healthy celery plants for 3-4 weeks. The test celery plants were kept under observation in the laboratory for symptoms development. The plants without disease symptoms confirmed that these insects used in feeding were free from disease pathogen. Microisolators of the plastic leaf cages (1.5 cm in length and 2.5 cm in diameter) were especially constructed to ensure the continuous stay of the aphids on the host plant throughout the periods of

acquisition and inoculation feeding Hegab (1981) and Abd-Elsamed (2017). The inspected aphids were classified into different groups according to the length of the acquisition feeding period on broad bean plants infested with FBNYV. In order to prove the ability and the efficiency of the tested aphid species as important vector of this disease pathogen in broad bean, virus transmission from broad bean to celery plants and subsequent transmission were carried out from artificially infected celery plants (showing clear symptoms) to healthy ones (as indicator plants) experiments were also carried out to transmit this agent from infected celery plants to healthy ones. In both acquisition and inoculation feeding periods, (5-10) aphids were placed on each plant using five plants (as replicates) for each test. The tested acquisition feeding period ranged from 10 min to 160 min. The inoculation feeding period lasted for 3 - 4 weeks., during which, aphids were transferred daily to new indicator celery plants one after the other and the plants were kept under observation in the laboratory for symptoms development. To determine the length of the virus latent period in the insects after acquisition the pathogen, the *A. craccivora* were transferred at intervals to fresh healthy celery plants. The celery plants were kept under observation in the laboratory for symptoms development.

RESULTS AND DISCUSSION

Primary experiments of faba bean necrotic yellow virus (FBNYV) transmission by *Aphis craccivora* vectors were carried out in the laboratory of Plant Protection Research, Institute, branch, Sharkia Governorate, Zagazig City.

Effect of length of acquisition feeding period on the efficiency of (FBNYV) transmission:

The results of primary experiments showed that the efficiency of FBNYV transmission increased gradually as acquisition feeding period increased from infected broad bean plants to healthy celery plants and from infected celery plants to healthy plants (Table 1 and 2). The result showed that efficiency of FBNYV transmission by *A. craccivora* ranged from 20-60%, also the result showed that *A. craccivora* is capable of transmitting FBNYV as short as 60 min. feeding on the test plants. Also, longer feeding times 160 min. increased the efficiency of virus transmission by aphid.

Results in Table (1 and 2) indicated that the acquisition feeding period 10 - 50 min. on infected celery proved insufficient for successful pick up of the pathogen by the tested aphid. The efficiency of FBNYV transmission increased gradually as acquisition feeding period increased and ranged from 40 - 60%. These results confirmed efficiency of *A. craccivora* as economic vector for FBNYV in broad bean fields.

Effect of inoculation feeding period on the FBNYV transmission by the aphid *A. craccivora* :

Inoculation feeding periods of 10 - 50 min. proved insufficient time for successful of FBNYV for successful inoculation FBNYV. The aphid began to successful inoculation FBNYV at 60 min. and the highest proportion of infected plants was 60%. Incubation periods in insects ranged between 120-160 min.

Symptoms appeared on celery plants within 12-18 days after inoculation of agent. In comparison with their control, the leaves of diseased celery plants were faint yellowish green blotches on leaf. The infected plants appear smaller in size, while the characteristic symptoms on diseased broad bean plants is necrotic and the faint yellowish green blotches on leaf enlarge rapidly changing to yellow. The symptoms generally appear first on the older leaves of young plants.

In general, it can be conclude that the *A. craccivora* was able to transmit FBNYV from infected broad bean plants to healthy celery plants and from infected celery to healthy ones plants. These results are agreement with the findings of Franz (1998), El-Amri(1999), El-Defrawi et al (2000), Salem et al (2004), and Abd-ElSamed (2006), Ortiz et al (2006) who mentioned that FBNYV was transmitted by *A. craccivora*.

Table 1. Transmission of the faba bean necrotic yellow virus (FBNYV) from infected broad bean plant to healthy celery by *Aphis craccivora*

Acquisition feeding period (min.)	% efficiency of virus transmission from infected broad bean to celery plant	Range Of latent period in	
		An insect vectors (min.)	An indicator plant (day)
00	00	00	00
10	00	00	00
20	00	00	00
30	00	00	00
40	00	00	00
50	00	00	00
60	20	120	18
70	20	130	18
80	20	140	17
90	40	150	16
100	40	140	15
110	40	150	13
120	40	160	12
130	60	170	11
140	60	180	11
150	60	190	10
160	60	200	10

Table 2. Transmission of the faba bean necrotic yellow virus (FBNYV) from infected celery plant to healthy one by *Aphis craccivora*

Acquisition feeding period (min.)	% efficiency of virus (FBNYV) transmission from infected celery plant to healthy ones	Range of latent period in	
		An insect vectors (min.)	An indicator plant (day)
00	00	00	00
10	00	00	00
20	00	00	00
30	00	00	00
40	00	00	00
50	00	00	00
60	20	120	18
70	20	130	18
80	20	140	17
90	40	150	16
100	40	140	15
110	40	150	13
120	40	160	12
130	60	170	11
140	60	180	11
150	60	190	10
160	60	200	10

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من اللوبيا *Aphis craccivora* Koch كحشرة ناقلة لفيروس البقع الميتة الصفراء على نباتات الفول البلدى.
أمل زكريا نور الدين الحبشى
معهد بحوث وقاية النباتات- مركز البحوث الزراعية - الدقى -جيزة - مصر

دراسة على قدرة حشرة من اللوبيا *A. craccivora* فى نقل المسبب المرضى الفيروسي لمرض البقع الميتة الصفراء الذي يصيب نباتات الفول وقدرة الحشرة على نقل المسبب الفيروسي من نباتات الفول المصابة الى نباتات كرفس سليمة و من نباتات الكرفس المصابة الى نباتات الكرفس السليمة و كذلك أوضحت النتائج (١) ان أقل فترة تغذية لازمة لاكتساب المسبب المرضى ٦٠ - ١٢٠ دقيقة (٢) أقل فترة لازمة لحفن المسبب المرضى داخل نبات الكرفس ٢٠ دقيقة (٣) فترة الحضانة داخل حشرة من اللوبيا كانت تتراوح بين ١٢٠ - ١٦٠ دقيقة (٤) فترة الحضانة داخل نبات الكرفس ١٢ - ١٨ يوم.