STUDIES ON SYMPTOMATOLOGY AND VIRUS VECTOR RELATIONSHIP OF MUNGBEAN YELLOW MOSAIC INDIA VIRUS OF MOTHBEAN

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ABSTRACT

MYMIV of mothbean cause yellow patches alternating with green areas which turned yellow at later stages on leaves. Such completely yellow leaves gradually changed to whitish shade which later on becomes necrotic. There was severe reduction in leaf size, deforming, crinkling and the seeds were deformed, shriveled and un-sized. Yellow mosaic disease of mothbean cannot be transmitted by sap or seed. Typical symptoms of above crop species were confirmed by the molecular characterization and found virus was mungbean yellow mosaic India virus. Study of virus-vector relationship revealed that minimum pre-acquisition starvation period was 30 min and it increased steadily from 1 hr onwards. Minimum acquisition feeding time is 30 min and cent per cent transmission was obtained at an acquisition feeding period of 5 to 6 hrs.

KEY WORDS: Mothbean, MYMIV, whitefly

INTRODUCTION

Mothbean [*Vigna aconitifolia* (Jacq.) Marechal] which is also known as math, mathbean, turkishgram and dewbean is belongs to family *Fabaceae*. Mothbean is believed to be originated in India and Pakistan. The yellow mosaic disease symptoms start appearing in the field when the crop is about one month old. The disease develops on the leaves. Different cultivars gave different mosaic patterns on the leaves. Rathi and Nene (1976) studied virus-vector relationship of MYMIV and found that minimum acquisition and inoculation periods required for whitefly adults to become infective varied from 15 to 60 min and 10 to 60 min, respectively.

MATERIALS AND METHODS

Photographs of progress of symptoms were taken at varying growth stages of the inoculated plants during the crop period and noted down (Plate 1 to 5). Transmission study was done by using viruliferous whiteflies for the influence of acquisition access feeding period and pre-acquisition starvation period of whiteflies on yellow mosaic disease of mothbean (cv. Guj. Moth 2).

Sap transmission (Mechanical inoculation)

5-7 days old seedlings of mothbean were used for mechanical inoculation test. Crude extract was prepared by macerating systemically infected young mothbean leaves in 0.1 M sodium phosphate buffer (pH 7.8) with a chilled mortar and pestle. Carborandum powder (400 mesh) dusted on primary leaves of the ten test plants were gently rubbed with cotton swab soaked in the crude leaf extract. Inoculated plants were kept in insect proof glasshouse for observation over two months for the symptom development.

Pre-acquisition starvation period

To study the pre-acquisition starvation period, the non-viruliferous

whiteflies were starved for different periods ranging from 0 min to 3 hr in a different transmission cages. 10 whiteflies for each test were allowed to feed on diseased young leaves for 6 hr and transferred to the test plants for 24 hr transmission feeding. After inoculation feeding Dimethoate 30 EC @ 0.03 per cent was sprayed to kill the whiteflies. Ten test plants were kept as per treatment and were maintained till the development of symptoms

Acquisition feeding period

To study the minimum acquisition feeding period, the non-viruliferous whiteflies were starved for 1 hr in a transmission cage. Then they were allowed to feed on diseased young leaves for different periods ranging from 5 minutes to 6 hr and transferred after the respective feeding time to test plants for 24 hr transmission (inoculation) feeding. After inoculation feeding Dimethoate 30 EC @ 0.03 per cent was sprayed to kill the whiteflies. Ten test plants were maintained for each acquisition feeding period and the development of symptoms were observed.

RESULTS AND DISCUSSION

In order to study the symptoms of yellow mosaic disease of mothbean, the yellow mosaic disease was transmitted by using viruliferous whiteflies (*B. tabaci*). Inoculated mothbean plants developed yellow mosaic symptoms in 10-15 days of inoculation. The leaves showed yellow patches alternating with green areas which turned yellow at later stages. Such completely yellow leaves gradually changed to whitish shade which later became necrotic. There was severe reduction in leaf size, leaves deformation, leaves crinkling and the seeds were also deformed, small, shriveled and un-sized (Plate 1 -5). Typical symptoms of above crop species were confirmed by the molecular characterization and found virus was mungbean yellow mosaic India virus (Plate 6).

Sap transmission

Ten test plants inoculated with sap containing extract of diseased tender leaves prepared in 0.1 M sodium phosphate buffer (pH 7.8), showed no symptoms of yellow mosaic disease in any of the inoculated plants although the test plants were kept under observation for over two months after sap inoculation. The trial was repeated twice and observations indicated that virus was not sap transmitted. Nene (1973) confirmed most of the yellow mosaic viruses infecting legumes in India are transmitted by the whitefly (*B. tabaci*) and are not seed, soil borne or sap-transmissible. Nariani (1960) reported that the MYMV disease is graft transmissible, but not sap transmissible.

Seed transmission

Grow out test (GOT) was performed to know whether the viral inoculum is carried out through seed or not. Seeds from diseased and apparently healthy field plant each comprising 10 seeds when sown in plastic bags under insect proof condition, none of the seedlings showed yellow mosaic disease symptom even up to maturity of plant.

Minimum pre-acquisition starvation period

Starvation of the vector for 30 minutes before acquisition feeding resulted only in 10 percent transmission. However, the percentage of transmission of MYMIV increased steadily from 1 hr onwards. Maximum transmission (60%) was obtained with starvation period of 3 hrs. Acquisition feeding for 6 hrs and inoculation feeding for 24 hrs was given in each time period under study (Table 1).

Minimum acquisition feeding period

Whiteflies were able to acquire the 10 to 50 percent virus in feeding period of 30 min to 3 hrs, but in a 5 to 6 hrs acquisition feeding period, cent per cent transmission of MYMIV was recorded. To obtain more than 50 per cent transmission, 3 hrs acquisitions feeding was necessary (Table 2). Gour and Valand (2005) reported that minimum acquisition feeding

time was 15 min and same time required for inoculation.

CONCLUSION

Symptomatological studies revealed that the yellow mosaic disease was transmitted by viruliferous whiteflies (*B. tabaci*). Inoculated mothbean plants developed yellow mosaic symptoms in 10-15 days and wide range of symptoms *viz.*, yellow mosaic pattern, necrotic, leaves deforming, leaves crinkling and the seeds deformation and shriveling. Transmission study revealed that yellow mosaic disease of mothbean cannot be transmitted by sap or seed. Study of virus vector relationship showed that minimum pre-acquisition starvation period was 30 min and transmission efficiently increase steadily from 1 hr onwards and maximum transmission obtained at starvation period of 3 hrs. Minimum acquisition feeding time is 30 min and cent per cent transmission was obtained with 5 to 6 hrs acquisition feeding period.

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Table 1: Influence of pre-acquisition starvation period on transmission of MYMIV by *Bemisia tabaci*

Pre-acquisition Starvation Period	Number of Plants		Transmission (%)
	Inoculated	Infected	
0 min	10	00	00
5 min	10	00	00
15 min	10	00	00
30 min	10	01	10
1 hr	10	03	30
2 hr	10	05	50
3 hr	10	06	60

Starvation period = 1.0 hrs, Test plants = 10, Number of whitefly used = 10

Table 2: Influence of acquisition feeding period on transmission of MYMIV by *Bemisia tabaci*

Acquisition Feeding Period	Number of plants		Transmission (%)
	Inoculated	Infected	
5 min	10	00	00
15 min	10	00	00
30 min	10	01	10
1 hr	10	03	30
2 hr	10	03	30
3 hr	10	05	50
4 hr	10	07	70
5 hr	10	10	100
6 hr	10	10	100

Acquisition Feeding Period = 6 hrs, Test plants = 10, Number of whitefly used = 10

Plate 1: Initial appearance of yellow mosaic pattern

Plate 2: Leaves with necrotic spots in later stage

Plate 3: Deforming of mothbean leaves

Plate 4: Deformed and shriveled seeds of mothbean

Plate 5: MYMIV in pot culture

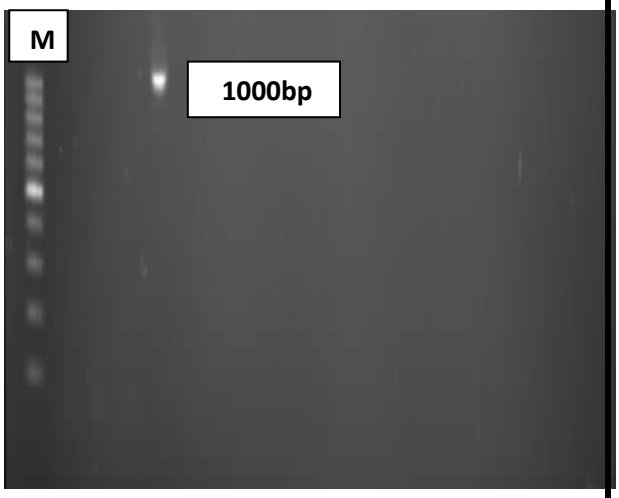

Plate 6: PCR amplification of CP gene with specific primer Lane M 1kb ladder, Annealing temperature- 53.6^{0}C

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