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EFFECT OF PLANT EXTRACTS, INSECTICIDES AND CULTURAL PRACTICES ON GROWTH CHARACTERS AND DISEASE SEVERITY OF MUNGBEAN YELLOW MOSAIC

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ABSTRACT

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A field experiment was conducted at Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period from March to July, 2007 to evaluate the potentiality of some selected plant extracts, insecticides and cultural practices in reducing severity of mungbean yellow mosaic virus. The lowest (15.85%) disease symptoms expressed in true leaves was recorded from Admire treated plot compare to the control at fifty days after sowing. The insecticide, Admire 200SL treated plot gave the lowest disease severity (3.95) and the tallest (46.52 cm) plant compare to control. The higher number of pods per plant was recorded where Admire was sprayed (23.50) and lower in Reflective tape treated plot. The maximum pod length also increased by Admire treated plot while Reflective tape treated pod length was minimum.

Key words: *yellow mosaic, severity, plant extracts, insecticides, cultural practices, mungbean*

INTRODUCTION

Mungbean yellow mosaic is the most destructive disease of mungbean in this subcontinent and adjacent areas of Southeast Asia (Nariani, 1960; Williams *et al*. 1968; Iwaki and Auzay, 1978; Bakar, 1981; Jayasekera and Ariyarantoe, 1988). It is the most damaging disease of mungbean in Bangladesh (Jalaluddin and Shaikh, 1981). It is widely distributed all over mungbean cultivated area in Bangladesh. Yield loss due to MYMV in mungbean was recorded as 63% (Anon., 1984). Winter mungbean genotypes are highly susceptible to yellow mosaic virus and showed 67-100% loss of grain yield in the field where no control measures were taken (Jalaluddin and Shaikh, 1981). MYMV has not been reported to be transmitted through soil, seed and sap or by any insect vector other than white fly (*Bemisia tabaci*). The incidence and severity of yellow mosaic is considered to be directly related with availability and abundance of insect vector and depend upon the time of infection (Dhingra and Ghosh, 1993). For successful cultivation of mungbean, disease management must be prioritized while trying to develop and release improved high yielding mungbean cultivars. Developing resistant variety is the best way to manage yellow mosaic of mungbean but high and fairly stable resistant varieties of mungbean against MYMV infections are not available in Bangladesh. Some resistant and tolerant cultivars have been released by Bangladesh Agricultural Research Institute (BARI) which depends on cultural and environmental factors to remain healthy. Reports on management of mungbean yellow mosaic are scanty. Generally chemical insecticides are used to manage the disease. But other alternatives like plants extracts cultural practices also used to be investigated for their effectiveness in reducing the incidence of MYMV. So, this experiment was undertaken to explore the potentiality of some selected botanicals, chemicals and cultural practices in controlling yellow mosaic disease of mungbean.

MATERIALS AND METHODS

The experiment was carried out in the farm of Department of Plant Pathology, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, during the period from March to July, 2007. The seeds of BARI Mung-5 were used. Neem, Allamanda, and Garlic extracts were prepared following the method of Ashrafuzzaman and Hossain, (1992) crushing the plant parts in a blender with water in 1:4 (w/ v) ratio (eg. 1000 ml of distilled water was added with 250 g plant parts).

Table 1. The particulars of botanicals used in this study

Common name	English name	Scientific name	Plant parts used
Neem	Margosa tree	*Azadirachta indica*	Leaf
Garlic	Garlic	*Allium sativum*	Clove
Allamanda	Allamanda	*Allamanda cathartica*	Leaf

Some oily substances were kept on yellow plastic container for catching whitefly. Two traps were used per plot ($3m^2$). Traps were set at 20 days after sowing (DAS) and they stayed upto50 DAS. Traps were changed in every week. Reflective tape of cassette was used for avoiding whitefly. The selected experimental plot was harrowed,

ploughed and cross-ploughed several times followed by laddering to obtain a good tilth. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications with the following treatments T_1 = Admire 200SL (Imidacloprid) @ 1 ml/1 litre of water for four times at 7days interval , T_2 =Actara 25WG (Thiamethoxam) @ 0.4 gm/1litre of water for four times at 7days interval, T_3 = Marshal (Carbosulfan) @ 3 ml/1 litre of water for four times at 7 days interval, T_4 = Ripcord (Cypermethrin) @ 1.7 ml/1 litre of water four times at 7 days interval, T_5 = Neem leaf extract (1:4 w/v), T_6 = Garlic clove extract (1:4 w/v) , T_7 = Allamanda leaf extract (1:4 w/v), T_8 = Yellow trap, T_9 = Reflective tape, T_{10} = Untreated (control). Fertilizers were applied as per recommendation of Bangladesh Agricultural Research Institute (BARI), Mungbean in Bangladesh, 2004. Intercultural operations mainly Irrigation and weeding were properly done in time. Percent mosaic expressing leaves were calculated by using the formula-

$$\% \text{ Mosaic expressing true leaves} = \frac{\text{Number of mosaic expressing true leaves in each plot}}{\text{Total number of leaves in each plot}} \times 100$$

Disease severity was recorded at 0-9 scale as used by Jalaluddin *et al*. (1994). Disease severity was determined by calculating the PDI as follows:

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of disease rating}}{\text{Total number of leaves observed} \times \text{highest grade in scale}} \times 100$$

The data were analyzed by using MSTAT-C package Program and the difference among the treatment means was estimated by DMRT at 5% level.

RESULTS AND DISCUSSION

Disease symptom expressed (%) in true leaves

Effect of insecticides, plant extracts and cultural practices on the severity of yellow mosaic of mungbean is shown in Table 2. Disease symptoms expressed (%) in true leaves were calculated at 20, 30, 40 and 50 DAS and recorded significant differences for different insecticides, plant extract and cultural practices that were used as treatments for managing mungbean yellow mosaic.

Table 2. Effect of insecticides, plant extracts and cultural practices on the severity of yellow mosaic of mungbean (var. BARI Mung-5)

Treatments	**% Mosaic expressing true leaves**			
	20 DAS	30 DAS	40 DAS	50 DAS
T_1 = Admire (Imidacloprid)	2.76	6.25 d	9.22 e	15.85 c
T_2 = Actara (Thiamethoxam)	2.65	8.94 c	12.97 cd	17.02 bc
T_3 = Marshal (Carbosulfan)	2.54	9.08 c	14.32 bc	18.36 bc
T_4 = Ripcord (Cypermethrin)	2.46	6.72 d	10.35 de	16.22 bc
T_5 = Neem leaf extract (1:4 w/v)	2.66	7.65 cd	10.42 de	16.15 bc
T_6 = Garlic clove extract (1:4 w/v)	2.71	8.31 c	12.85 cd	17.05 bc
T_7 = Allamanda leaf extract (1:4 w/v)	2.80	9.05 c	12.81 cd	18.45 bc
T_8 = Yellow trap	2.63	10.55 b	15.61 b	19.21 b
T_9 = Reflective tape	2.33	11.08 b	15.95 b	19.16 bc
T_{10} = Untreated (control)	2.66	16.66 a	21.84 a	26.33 a
$LSD_{(0.05)}$	NS	1.408	2.442	2.907
CV (%)	8.59	8.71	10.44	9.22

No significant variation was found at 20 days among the treatments. The lowest (2.33%) disease symptoms expressed in true leaves was recorded in treatment T_9 (reflective tape), while the highest (2.80%) in treatment T_7 (Allamanda leaf extract). Significant difference was recorded for disease symptoms expressed in true leaves for different treatments at 30 DAS. The lowest (6.25%) disease symptoms expressed in true leaves was recorded for treatment T_1 (Admire) which was statistically similar (6.72%) with T_4 (Ripcord). On the other hand the highest (16.66%) disease symptoms expressed in true leaves was recorded for treatment T_{10} (control) which was closely (11.08%) followed by treatment T_9 (reflective tape). A remarkable variation was recorded in disease symptoms expressed in true leaves for different treatments at 40 days. The lowest (9.22%) disease symptoms expressed in true leaves was recorded for treatment T_1 (Admire) followed by T_4 (Ripcord), while the highest (21.84%) was recorded for treatment T_{10} (control) followed by treatment T_9 (Reflective tape). At 50 DAS different treatments showed a

significant variation in disease symptoms expressed in true leaves for managing mungbean yellow mosaic virus. The lowest (15.85%) disease symptoms expressed in true leaves was recorded in Admire treated plot which was statistically identical (16.15%) with the treatment where neem leaf extract was applied. On the other hand the highest (26.33%) in disease symptoms expressed in true leaves was recorded in the control plot which was closely (19.21%) followed by treatment where yellow trap was used.

The highest percentage of mosaic expressing true leaves in winter mungbean was observed in control plots while the minimum was in the plots, which received chemicals and botanical extracts. Chemicals and botanical extracts performed better in respect of per cent mosaic expressing true leaves than that of cultural practices. The findings of Katyal and Friescen (1972) may partially support the findings of this present study, they reported that chemical and plant extracts were more effective but in control condition plants become more vulnerable to disease. Chemical and plant extracts control insect vector avoid the abundance of insect vectors in the crop field. Thus plants protect itself from the severity of yellow mosaic disease. Similar findings were obtained by Kumawat and Kumawat (1996) by using different chemicals. They observed that the monochrotophos sprayed twice at an interval of 20 days, was effective in reducing the population of the pest insects and the ultimate results was the lowest incidence of the yellow mosaic disease. Botanical extracts also effectively and it was more or less similar with chemical practices. Miah *et al*. (1990) reported that neem extract had a potential ability for controlling yellow mosaic virus in mungbean. Among the different plant extracts, neem extracts was more effective, Garlic clove extract also more effective than allamanda leaf extract. Islam *et al*. (2006) found a remarkable reduction of this diseases severity by seed treatment with garlic and bishkatali. The works of Singh and Dwvedi (1990); Achimu and Schloesser (1992) and others confirmed that neem leaf have high pesticidal properties.

Plant height and number of primary branches per plant

Plant height and number of primary branches/plant in treated and yellow mosaic infected mungbean is shown in Table 3. Different treatment such as insecticides, plant extract and cultural practices that were used for managing mungbean yellow mosaic diseases in this trial.

Table 3. Plant height and number of primary branches in treated and yellow mosaic infected mungbean (var. BARI Mung-5)

Treatments	Plant height (cm)	Increase over control (%)	No of primary branches/ plant	Increase over control (%)
T_1 = Admire (I midacloprid)	46.52 a	21.02	5.20 a	70.49
T_2 = Actara (Thiamethoxam)	44.08 ab	14.67	4.25 b	39.34
T_3 = Marshal(Carbosulfan)	42.36 abc	10.20	4.00 bc	31.15
T_4 = Ripcord (Cypermethrin)	46.81 a	21.77	5.15 a	68.85
T_5 = Neem leaf extract (1:4 w/v)	45.28 ab	17.79	4.90 a	60.66
T_6 = Garlic clove extract (1:4 w/v)	45.25 ab	17.72	4.90 a	60.66
T_7 = Allamanda leaf extract (1:4 w/v)	43.11 abc	12.15	4.15 b	36.07
T_8 = Yellow trap	42.41 abc	10.33	4.00 bc	31.15
T_9 = Reflective tape	40.82 bc	6.19	3.75 c	22.95
T_{10} = Untreated(control)	38.44 c	--	3.05 d	--
$LSD_{(0.05)}$	4.646	--	0.297	--
CV	6.22	--	4.00	--

The tallest (46.52 cm) plant was recorded for treatment T_1 (Admire) which was statistically identical (46.81 cm) with T_4 (Ripcord) whereas untreated control showed the shortest (38.44 cm) plant which was similar (40.41 cm) with treatment T_9 (Reflective tape). Plant height increased over control was also differing among the different treatments. The maximum (21.02%) plant height increased over control was recorded for T_1 treatment and the minimum (6.19%) was recorded for treatment T_9 (Reflective tape).

Significant different on number of primary branches per plant was observed among the treatments. The highest (5.20) number of primary branches per plant was recorded in admire treated plot which was statistically similar (5.15) with T_4 (Ripcord). On the other hand the lowest (3.05) number of primary branches per plant was recorded in untreated plot which was closely followed (3.75) with T_9 (Reflective tape). Every treatment gave higher primary branches per plant compare to untreated plot. The highest (79.49%) number of primary branches per plant increase over control was recorded for T_1 (Admire) and the lowest (22.95%) was recorded for treatment T_9 (Reflective tape). Among the treatments, application of insecticides enhances plant height compare to rest of the treatments. However,

plant extract also performed better than cultural practices in relation to plant height. The findings of Singh *et al*. (1982) are consistent with our finding. They observed that application of chemicals and botanicals resulted more vigorous vegetative growth allowing the plants to escape viral infections and effect of infection. The findings of Saran and Giri (1990) and Jain *et al*. (1995) are also relevant with our findings.

Number of pods per plant

A remarkable variation for number of pods per plant was recorded for different treatments (Table 4). The highest (23.50) number of pods per plant was recorded in Admire treated plot which was statistically similar with Ripcord (23.22) and Neem leaf extract (22.18) treated. The lowest (14.84) number of pods per plant was recorded in untreated plot which was followed by Reflective tape (16.45) (Table 2). Number of pods per plant increase over control was highly variable among the treatments. The highest (58.36%) number of pods per plant increase over control was recorded in Admire treated plot and the lowest (10.85%) was recorded for the treatment where Reflective tape was used.

Table 4. Number and length of pod in treated and yellow mosaic infected mungbean (var. BARI Mung-5)

Treatments	Number of pods per plant	Increase over control (%)	Pod length (cm)	Increase over control (%)
T_1 = Admire (Imidacloprid)	23.50 a	58.36	9.26 a	29.33
T_2 = Actara (Thiamethoxam)	20.81 ab	40.23	8.54 bcd	19.27
T_3 = Marshal(Carbosulfan)	18.22 bc	22.78	8.24 d	15.08
T_4 = Ripcord (Cypermethrin)	23.22 a	56.47	9.00 ab	25.70
T_5 = Neem leaf extract (1:4 w/v)	22.18 a	49.46	8.84 abc	23.46
T_6 = Garlic clove extract (1:4 w/v)	20.84 ab	40.43	8.80 abc	22.91
T_7 = Allamanda leaf extract (1:4 w/v)	18.36 bc	23.72	8.32 cd	16.20
T_8 = Yellow trap	18.00 bcd	21.29	8.00 d	11.73
T_9 = Reflective tape	16.45 cd	10.85	8.00 d	11.73
T_{10} = Untreated (control)	14.84 d	--	7.16 e	--
$LSD_{(0.05)}$	3.097	--	0.515	--
CV (%)	9.19	--	3.57	--

Pod length

Different treatments showed a remarkable variation for pod length (Table 4). The maximum (9.26 cm) pod length was recorded in Admire treated plot which was statistically similar (9.00 cm) with Ripcord treated plot. On the other hand the minimum (8.00 cm) pod length was recorded in untreated plot. The length of pod statistically similar where Reflective tape (8.32 cm) and Allamanda leaf extract was used (Table 4). Pod length increased over control was also differing among the treatments. The maximum (29.332%) pod length increased over control was recorded in Admire treated plot and the minimum (11.73%) was recorded where Reflective tape was used.

Saran and Giri (1990) observed that numbers of pods/ plant, pod length, number of seeds per pod were increased significant with 30 and 60 kg/ ha. Vohra and Beniwal (1979) reported that mungbean yellow mosaic virus infection affect grain yield when the plants have infection up to 50 days after planting and reduction in yield contributing characters such as pods/ plants, seeds/ pod, 100-seed weight.

Finally, it is concluded that the insecticide, Admire 200SL showed significant performance in reducing disease severity, higher plant height, higher number of pods per plant and maximum pod length than any other treatments used in this experiment. Reflective tape was not found to be effective in reducing Yellow Mosaic Virus of Mungbean (MYMV). Plant Extracts used here showed moderate disease suppression of MYMV and nothing remarkable influence on growth characters of mungbean var. BARI-5.

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