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STUDY OF INSECT TRANSMISSION OF *JUTE LEAF MOSAIC VIRUS* AND MANAGEMENT THROUGH USE OF INSECTICIDE

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ABSTRACT

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The experiment was conducted in the field of department of plant pathology, BAU, Mymensingh during April to September, 2006 to study the insect transmission and management through use of insecticide and to evaluate the relationship of white fly population with the spread of jute leaf mosaic virus. It was observed that the causal agent is readily transmissible through *Bemisia tabaci* (White fly) in three capsularis species. The transmission rate depended on cultivars. Symptom bearing plants of CV. D-154 gave the highest 24% and 35% symptom for both sprayed and non sprayed plot respectively. In the field experiment it was revealed that the disease incidence was more in non sprayed plots than sprayed plots, indicating vector (white fly) transmission as positive. The rate of increasing disease incidence was higher up to 45 days than later.

Key words: Causal agent, jute cultivars, transmission and management

INTRODUCTION

Jute (*Corchorus capsularis* L. and *C. olitorius* L) is the most important cash crop of Bangladesh and thus plays an important role in the economy of the country. In the last thirty years production of jute declined sharply due to its replacement by artificial fibres made from petrochemicals. The production is now steady. However, it has a great potential to rise. The leaf mosaic of jute has wide spread occurrence in the major jute growing countries of the world, namely Bangladesh, Burma, India, Nepal and Pakistan (Ghosh and Basak, 1951).

The severe yield loss of jute depends on certain factors of which diseases play a major role. Among the diseases of jute, leaf mosaic virus has been reported to be the most important one. Whitefly transmission of the disease has been reported by Verma *et al.*, 1966; Ahmed, 1978 and Ahmed *et al*., 1980. Vector transmission plays a significant role in jute leaf mosaic disease. The whitefly (*Bemisia tabaci*) is a natural vector. It is the most important vector and transmits about 80 diseases distributed throughout the world. Whitefly transmitted viruses are transovarialy or seed transmissible. Jute leaf mosaic virus is a member of Gemini virus group. The virus transmits in the field persistently by *Bemisia tabaci*. Also the virus is transmitted through seed or grafting (Capoor and Verma 1995, Kumar and Moorthy 2000, Singh 1990 and *Jute leaf mosaic virus*, which causes drastic reduction in yield and quality of jute, has been considered to be one of the most important limiting factors of jute cultivation in India and some other jute growing countries (Harender *et al.*, 1993)

The leaf mosaic disease symptoms appeared on the first true leaf or on the third or fourth true leaf or on later leaves as the seedlings are allowed to grow. The symptom bearing true leaves crinkled, leathery and sometimes, at the top of the plant, some-what needle like. The floral organs are more or less deformed. Internodes and branches proliferated. The reasons have been recognized as the virus can attack jute plants in any stage of plant growth, the disease spreads quickly in the field, adversely affects the growth and yield contributing characters due to remarkable alteration of cellular components of the infected plants (Sharma *et al*. 1995). However the trend of works of jute in Bangladesh seems to be indiscriminate, unsystemic and inconclusive with very few exceptions. An appreciable amount of works has also been dine on whitefly transmission of the disease has been reported by Verma *et al.* 1966; Ahmed, 1978 and Ahmed *et al*., 1980.

So for the present yield status of jute in Bangladesh is lamentably poor in contrast to other countries. There is a big gap between the yield potential and the yield of crop in Bangladesh and undoubtedly, the main reason of such a situation is jute leaf mosaic virus. Therefore, it necessitates the well planned, in depth and systemic study on the disease in Bangladesh to formulate management package against such a devastating disease. Considering above point this study was undertaken to study the insect transmission and management through use of insecticide and to evaluate the relation ship of white fly population with the spread of jute leaf mosaic virus.

MATERIALS AND METHODS

The experiment was conducted in the field laboratory, department of plant pathology. Bangladesh Agricultural University (BAU), Mymensingh during the period form April, 2006 to September, 2006. The soil belonged to the old Brahmaputra flood plain characterized by sandy loam with a pH valor of 6.5. Seeds were collected from the breeding division of Bangladesh Jute Research Institute (BARI), Dhaka. The land was opened by ploughing with power tiller then it was ploughed and cross ploughed several times by a country plough until the soil was brought to a good tilth. All the major weeds and other major rubbishes were completely removed from the field. Manures and fertilizers were applied to the experimental field in recommended dose. The experiment was laid out in a Randomized completely Block Design. The experimental field was divided into six plots. The unit plot size was 4m x 2.5m. Three cultivars were assigned in each block at random. Treatments were done one plot sprayed and another plot non-sprayed. Each of jute cultivars viz. BJC-83 (V_1), CC-45 (V_2) and D-154 (V_3) was considered as treatment. Seeds were sown on 11th April, 2006 in line sowing method and the seed rate was 4 kg/ha. The spacing was 25cmx10cm. Insecticide (Melathion 60EC @ 0.2%) was applied in present experiment to control vectors/whitefly (*Bemesia tabaci*) with the help of a hand sprayer for two times at 30 days after emergence (DAE) and 45 DAE in the sprayed indicated plant. Both sprayed and non-sprayed plots were inspected regularly to collect whitefly insect that usually visited jute leaf mosaic plants during the growing period with the help of a sweeping net. Data were collected on present germination, percent leaf mosaic expressed plant at 45 days after sowing (DAS), seed weight per 10 plant (Healthy and diseased). Incidence of mosaic at 30, 45 and 60 DAS and eight seed/plot. Calculation of percent germination using by the following formula:

$$\% \text{ Germination} = \frac{\text{Number of seedlings}}{\text{Number of seeds sown}} \times 100$$

Calculation of % mosaic expressing plant using by the following formula:

$$\% \text{ mosaic expressing plants} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

Calculation of % mosaic expressing leaf using by the following formula:

$$\% \text{ mosaic expressing leaves} = \frac{\text{Number of infected leaves}}{\text{Total number of leaves}} \times 100$$

Data were analyzed following the statistical procedure of Gomez and Gomez (1983). Treatment means were compared by DMRT (Duncan's Multiple Range Tests).

RESULTS AND DISCUSSION

Vector transmission plays a significant role in jute leaf mosaic disease. The whitefly (*Bemisia tabaci*) is a natural vector. It is the most important vector and transmits about 80 diseases distributed throughout the world. Whitefly transmitted viruses are transoverialy or seed transmissible. The leaf mosaic disease symptom was found generally in young leaves of infected plants than old leaves. The virus disease may be brought into sprayed plot from non sprayed plot with plant to transmission in the field through vectors. The plant to plant transmission was very rapid in to the field within a short time. An insecticide was sprayed for the control of whitefly in relation to the incidence of leaf mosaic disease of jute. The spraying in the initial stages of the crop after germination was most important to reduce the population in relation to the incidence of leaf mosaic. The crop was not sprayed within 30 days after germination the incidence of the leaf mosaic would be 45 – 100 percent resulting in low yield (Shastry and Singh, 1973).

By studying the seed to plant transmission of jute leaf mosaic in three cultivars of jute grown in the insecticide treated and non-treated plots, it has been found that non treated plots showed higher incidence then that of insecticide treated plots (Table1). It is evident that V_3 (D-154) had the highest incidence among the varieties (Table 1). The incidence in CVD -154 was very high in both sprayed (24) and non treated plots (35). The severity of the disease calculated by % of mosaic expressed leaves per plant was also highest (59) in CVD-154 than the other two test cultivars expressing lowest seed weight 22 gm and 20gm, respectively (Table 1). This finding supports the earlier findings of Verma *et al* (1966); Ahmad (1978) and Ahmed *et al*. (1980).

In the sprayed plots, the varieties expressed more or less nearly significant differences among the cultivars in terms of % germination, % leaf mosaic expressed plant and % of mosaic expressed leaf/plant, respectively. In

the non sprayed plots all the above parameters had higher values. But these values were in significant among the varieties (Table 1). The results expressed in the Table 1 also revealed that in general infected plants had lower seed yield per plant (in sprayed plant V_1(20), V_2(24), V_3(21) and incase of non-sprayed plant V_1(18), V_2 (22), and V_3(18) but was not statistically significant. However, in the non sprayed plots the seed yields in the healthy plants did not significantly differ among the varieties and it was also apparent in use of disease plants. This indicates that in the non-sprayed plots, factors other than jute leaf mosaic disease also affect seeds production. Nevertheless spraying of insecticide reduced the incidence and severity of the disease highly significant (Table 1).

Table 1. Seed to plant transmission of jute leaf mosaic in three cultivars of jute grown in insecticide treated and non treated plots

Treatment	Name of variety	% of germination	% of leaf mosaic expressed plant at 45 DAS	% of mosaic expressed leaf/plant at 45 DAS	Weight of seed/10 plant	
					Healthy plant seed (gm)	Diseased plant seed (gm)
Spray	V_1 (BJC-83)	60	9.00b	43.00b	28a	20
	V_2 (CC-45)	58	8.00b	47.00b	25ab	24
	V_3 (D-145)	70	24.00a	59.00a	22b	21
LSD 0.01 0.05		-	5.910	5.010	5.062	NS
Non-spray	V_1 (BJC-83)	62	23.00	68.00	21	18
	V_2 (CC-45)	55	27.00	63.00	23	22
	V_3 (D-145)	72	35.00	78.00	20	18
LSD 0.01 0.05		-	NS	NS	NS	NS

The figures having the common letter(s) does not differ significantly.

But it was also revealed that the sprayed plots the highest expression of leaf mosaic was found in the variety V_3, 25% at 60 DAS, 24% at 45 DAS and 22% at 30 DAS followed by V_1 and V_2. The lowest infected plants incidence at 30 DAS was observed 4 percent in V_1 and it was followed by V_2 (6.0%) and the highest infected plants was found in V_3, 22 percent at this which was significantly higher than V_1 and V_2. Similar trend was observed at 45 DAS. At this age also the highest incidence was in V_3 (24.0%) which was significantly higher than both V_1 (9.0%) and V_2 (8.0%). The same trend was maintained at 60 DAS. In the non sprayed plots similar trend was observed though the incidence was higher than the sprayed plots, the incidence differences between the varieties at the three different DAS were in significant (Table 2). The non-sprayed plots showed two to three times' higher incidence of the disease right at the first counting at 30 DAS. Respective similar rate of rise in disease incidence was found in the 2nd and 3rd reading at 45 and 60 DAS. However, the incidence at a particulars DAS were not significant amongst varieties (Table 2).

Table 2. Effect of plant age on the incidence of leaf mosaic of jute in three cultivars in sprayed and non-sprayed plots

Treatment	Variety	Incidence of mosaic at days after sowing		
		30	45	60
Spray	V_1 (BJC-83)	4.00b	9.00b	12.00b
	V_2 (CC-45)	6.00b	8.00b	13.00b
	V_3 (D-145)	22.00a	24.00a	25.00a
LSD value 0.01		6.641	5.910	2.898
Non-spray	V_1 (BJC-83)	13.00	23.00	25.00
	V_2 (CC-45)	14.00	27.00	30.00
	V_3 (D-145)	25.00	25.00	38.00
LSD value 0.01		NS	NS	NS

The figures having the common letter(s) does not differ significantly.

The effect of spraying on seed weight of diseased plant was found lower than that of healthy plants (Table 3). This was found truly in case of 10 randomly selected plants seeds as well as seed-weight of all the plants of variety together. It was also observed that V_1 seeds suffered significantly more loss than the other cultivators due to disease. These result obtained from the present experiments supported the findings of the preview workers like Anonymous (1959); Azad and Wahab (1984); Biswas *et al*. (1989) and Haque *et al*. (1998).

Table 3. Effect spraying on yield due to jute leaf mosaic disease in three cultivars of jute

Treatment	Variety	weight of seed/10 plant			Weight of seed/total plant		
		Healthy plant (gm)	Diseased plant seed (gm)	Loss (gm)	Healthy plant (gm)	Diseased plant seed (gm)	Loss (gm)
Spray	V_1	28.00a	20.00	8	287.00b	240.00a	47
	V_2	25.00ab	24.00	1	257.00b	236.00a	21
	V_3	22.00b	21.00	1	355.00a	337.00a	18
LSD value 0.01		5.062	NS		65.44	125.50	
Non-spray	V_1	21.00	18.00	3	317.00	300.00	17
	V_2	23.00	22.00	1	270.00	236.00	34
	V_3	20.00	18.00	2	320.00	261.00	59
LSD value 0.01		NS	NS		NS	NS	

The figures having the common letter(s) does not differ significantly

The findings of the present work confirmed that the causal agent was vector (*B. tabaci*) transmitted. The disease causes loss in seed production as well. These findings would definitely provide clues about the identification of the pathogen. Insecticide was sprayed for the control of whitefly in relation to the incidence of leaf mosaic of jute. It was revealed that timely administering insecticide reduced the incidence and severity of the disease and increased yield and quality. If the crop was not sprayed within 30 days after germination high incidence of leaf mosaic would result low yield.

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