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# Comparative Effect of Insecticide and Blue Polythene Hanging on the Incidence and Severity of Okra Mosaic in the Growth of Okra Plant

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**Abstract:** A field study was conducted to compare the efficacy of blue polythene hanging over the plant and spraying insecticide in reducing incidence and severity of okra mosaic under natural inoculated condition. Size of blue polythene strip was 0.04x3.5 $m^2$ and six polythene strips were used per plot and the recommended dose of insecticide was 454 ml per acre. Blue polythene strips and insecticide reduced the infection of okra mosaic virus. The number of disease infected plants per plot and mosaic infected leaves per plant were the lowest and number of leaves per infected plant and plant height was the highest in the plots, where blue polythene strips were hanged and insecticide was sprayed followed by the spraying of insecticide and hanging of blue polythene strips. The number of disease infected plants per plot and mosaic infected leaves per plant were the highest and number of leaves per infected plant and plant height was the lowest in the control plots.

**Key words:** okra mosaic virus, whitefly (*Bemisia tabaci*), insecticide, blue polythene strips

## Introduction

Okra (*Abelmoschus esculentus*) is an important and popular annual vegetables crop grown all over Bangladesh. It can be grown at homestead area and kitchen garden. Okra is an important cash crop for a small farmer. The green fruits of okra are used as vegetables. It is highly nutritious and delicious vegetable, which is fairly rich in vitamins (A, B, C) and minerals (Rashid, 1976). The popularity of okra is increasing day by day. Per hectare yield of okra is still comparatively low in Bangladesh. During the growing season of 1997-98, Bangladesh produced 17,325 tons of okra (in 13,340 acres) with an average yield of 1.3 tons per acre (BBS, 2000), whereas the yield in other okra growing countries is much higher, which is 3-5 tons per acre (Thomson and Kelly, 1957). There are several reasons of low yield of okra in Bangladesh. Mosaic of okra caused by okra mosaic virus is a serious problem in Bangladesh. It may infect the plant at any growth stage. The mosaic disease seriously affects the growth and yield of the crop (Sastry and Singh, 1974). Incidence and severity of okra mosaic is directly related to availability and abundance of insect vector, *Bemisia tabaci* (Mahmud, 1993). Nath and Saikia (1993) reported that yield loss of okra could be reduced by preventing early spread of the mosaic disease by controlling the vector, whitefly (*Bemisia tabaci*). Sinha and Chakraborti (1978) observed that protection of okra from whiteflies and other insects by spraying with follidol (0.3%) or other suitable insecticides can reduce mosaic incidence significantly. Sastry and Singh (1973) reported that spraying at the initial stage of okra just after germination was most important. If the crop is not sprayed within 20 days after germination disease incidence goes up high. Khan and Mukhopadhyay (1985) reported that mulching with yellow coloured polythene significantly delayed the appearance of yellow mosaic symptoms in okra. In view of the above facts, this was designed to evaluate the comparative effect of blue polythene hanging and spraying of insecticide on the incidence and severity of okra mosaic in the growth of okra plant either alone or in combination.

## Materials and Methods

The experiment was conducted during kharif season of 2000 at farmer's field. The field was located at the village Digharpara nearby Bangladesh Agricultural University, Mymensingh. Five ploughings followed by ladderings were done to have a good tilth. Weeds and other major stubbles were removed from the field. There were four treatments, which are $T_1$ (control): no polythene strips were hanged over the plant and no insecticide was sprayed $T_2$ (hanging of blue polythene strips): blue colour polythene strips were hanged with rope over the plants. Size of blue polythene strip was 0.04x3.5 $m^2$. Six polythene strips were hanged over the plant population at 20 days after germination with the help of bamboo. $T_3$ (spraying of insecticide): Nogos 60EC was selected as insecticide and sprayed to control vector insects. The recommended dose of insecticide (Nogos 60EC) was 454 ml per acre as per schedule a total of five applications of spray were done. First spray was done at 20 days after germination. The subsequent sprayings were performed at 15 days interval and $T_4$ (hanging of blue polythene strips and spraying of insecticide): reduced amount of insecticide was sprayed and blue polythene strips were hanged over the plants. The field was fertilized @ 10 ton cowdung $ha^{-1}$, 150 kg urea $ha^{-1}$, 100 kg TSP $ha^{-1}$ and 150 kg MP $ha^{-1}$ as per recommended dose of Rashid (1993). Full dose of well-decomposed cowdung was applied after first land preparation. Total dose of TSP, MP and half dose of urea were applied at the time of final land preparation. The rest half dose of urea was applied as top dressing at 45 days after sowing. The experiment was set up in a randomized complete block design (RCBD). The size of the individual plot was nine sq. meter (3x3 $m^2$). The space between blocks and plots was 50 cm. The border space was 50 cm on all sides. The okra cultivar Parbhani Kranti was used in this study. Seeds were sown in pits maintaining pit to pit distance 30 cm and row to row distance 50 cm at depth of 1.5 to 2 cm. Weeding, drainage and other intercultural operations were done from time to time as and when necessary. Recording of disease incidence in the experimental plot was started from 61 days after sowing. The incidence of okra mosaic disease was recorded at seven days interval by visual diagnosis method. The visible symptoms of the disease were critically observed and the infected plants were identified according to the description given by Givord *et al.* (1972). Number of infected plant per plot, number of mosaic infected leaves per plant, number of leaves per infected plant and height of infected plants per plot were collected during the growing period of the crop. Data were recorded from the 10 plants in each plot. Average value of each parameter was calculated. Data were analyzed statistically and treatments effects were compared to each other by employing least significant difference (LSD) test.

## Results and Discussion

The number of plants showing mosaic symptom per plot at 61 DAS was significantly different in $T_1$, $T_2$, $T_3$ and $T_4$ treatment. The lowest number of infected plant was recorded in $T_4$ and the highest in $T_1$. Similar effect was found at 68 DAS. The number of plants expressing yellow vein mosaic symptom was maximum in

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Table 1: Number of mosaic infected plants per plot and leaves per plant at different days after sowing as affected by hanging blue polythene strips and spraying insecticide

| | No. of mosaic infected plants per plot (days after sowing) | | | | | |
|---|---|---|---|---|---|---|
| Treatments | 61 | 68 | 75 | 82 | 89 | 96 |
| **Infected plants per plot** | | | | | | |
| $T_1$ | 5a | 8a | 12a | 17a | 21a | 27a |
| | (8.3) | (13.3) | (20.0) | (28.0) | (35.0) | (45.0) |
| $T_2$ | 4b | 6b | 9b | 13b | 16b | 20b |
| | (3.4) | (10.0) | (15.0) | (21.6) | (26.6) | (33.3) |
| $T_3$ | 3c | 4c | 6c | 10c | 12c | 16c |
| | (50.0) | (6.6) | (10.0) | (16.6) | (20.0) | (26.6) |
| $T_4$ | 2d | 3d | 5c | 8c | 10c | 13d |
| | (3.3) | (5.0) | (8.3) | (13.3) | (16.6) | (21.6) |
| LSD (P≤0.05) | 0.191 | 0.541 | 2.281 | 2.43 | 3.121 | 1.514 |
| **Infected leaves per plant** | | | | | | |
| $T_1$ | 3.00a | 4.30 | 6.42a | 8.80a | 10.34a | 12.40a |
| $T_2$ | 2.73a | 3.94 | 5.14ab | 7.53ab | 9.09ab | 10.37ab |
| $T_3$ | 1.76b | 3.45 | 4.31b | 6.31bc | 8.02bc | 9.50b |
| $T_4$ | 1.54b | 2.92 | 3.82b | 5.80c | 6.96c | 8.41b |
| LSD (P≤0.05) | 0.8345 | NS | 1.550 | 1.786 | 1.433 | 2670 |

Table 2: Number of leaves per mosaic infected plants at different days after sowing as affected by blue polythene strips and spraying insecticide

| | No. of mosaic infected plants per plot (days after sowing) | | | | | |
|---|---|---|---|---|---|---|
| Treatments | 61 | 68 | 75 | 82 | 89 | 96 |
| $T_1$ | 12 | 13c | 14b | 15b | 17c | 18b |
| $T_2$ | 12 | 14bc | 15b | 16b | 18bc | 19b |
| $T_3$ | 13 | 15ab | 16b | 18a | 19b | 21a |
| $T_4$ | 14 | 16a | 18a | 19a | 21a | 22a |
| LSD (P≤0.05) | NS | 1.846 | 1.998 | 2.643 | 1.918 | 1.313 |

Table 3: Number of okra mosaic on plant height (cm) at different days after sowing as influenced by hanging blue polythene strips and spraying insecticide

| | No. of mosaic infected plants per plot (days after sowing) | | | | | |
|---|---|---|---|---|---|---|
| Treatments | 61 | 68 | 75 | 82 | 89 | 96 |
| $T_1$ | 65b | 66b | 73b | 80b | 82c | 82c |
| $T_2$ | 70ab | 78a | 83a | 87a | 89b | 91b |
| $T_3$ | 71ab | 78a | 83a | 88a | 95ab | 97a |
| $T_4$ | 72a | 78a | 84a | 89a | 97a | 99a |
| LSD (P≤0.05) | 5.862 | 8.782 | 5.730 | 5.730 | 6.241 | 5.730 |

$T_1$ and minimum in $T_4$ at 75 DAS. There was significant variation between $T_1$, $T_2$ and $T_3$ treatment and $T_3$, $T_4$ statistically similar. Similar effect was found at 82 and 89 DAS. The average number of plants expressing mosaic symptom per plot differ significantly at 96 DAS, where the highest and the lowest number of infected plants were recorded in $T_1$ and $T_4$, respectively (Table 1).

At 61 DAS, number of infected leaves per plant was statistically similar in $T_1$, $T_2$ and $T_3$, $T_4$ treatment. $T_1$ and $T_3$ were statistically different. The highest number of infected leaves were observed in $T_1$ and the lowest in $T_4$ (Table 1). Number of infected leaves per plant at 68 DAS did not differ significantly. During 75 DAS, number of infected leaves in $T_3$ and $T_4$ significantly different from $T_1$. Statistically similar result was observed in $T_2$, $T_3$ and $T_4$. The highest number of infected leaves was recorded in $T_1$ and the lowest in $T_4$ treatment. At 82 DAS, number of infected leaves per plant was statistically identical in $T_1$ and $T_2$: $T_2$ and $T_3$; $T_3$ and $T_4$ treatment. The lowest number of infected leaves was recorded in $T_4$ and the highest in $T_1$ treatment. Similar result was observed at 89 DAS. At 96 DAS, number of infected leaves per plant was different from $T_1$ to $T_3$ and $T_4$ treatment. The highest number of infected leaves were observed in $T_1$ and the lowest in $T_4$.

At 68 DAS number of leaves in the infected plant was similar in $T_1$ and $T_2$ treatment. $T_3$ and $T_4$ were also identical. There was significant difference from $T_1$ to $T_3$ and $T_4$ treatment. Number of leaves per infected plant was statistically similar in $T_1$, $T_2$ and $T_3$ treatment at 75 DAS. There was significance difference between $T_1$ and $T_4$ ($P \leq 0.05$). The highest number of leaves per infected plant was recorded in $T_4$ and the lowest in $T_1$ treatment (Table 2). At 82 DAS, the highest number of leaves were observed in $T_4$ and lowest in $T_1$ treatment. Number of leaves in the infected plant was similar in $T_1$ and $T_2$ but they were different from $T_3$ and $T_4$ treatment. During the period 89 DAS, number of leaves per infected plant was statistically similar in $T_1$ and $T_2$ treatment. Similar result was also recorded in $T_2$ and $T_3$. There was significant difference between $T_1$ and $T_4$. At 96 DAS, there was no significant difference between $T_1$, $T_2$ and $T_3$, $T_4$. The highest number of infected leaves was recorded in $T_1$ and lowest in $T_4$ (Table 2).

Height of infected plant in $T_2$, $T_3$ and $T_4$ were statistically similar during 61 DAS. Maximum height of infected plants was recorded in $T_4$ and minimum in $T_1$. At 68 DAS, height of infected plant was similar in $T_2$, $T_3$ and $T_4$. There was significant difference between $T_1$ with other treatments. Maximum height of infected plants was recorded in $T_4$ and minimum in $T_1$ (Table 3). Similar effect was found at 75 and 82 DAS. Height of the infected plants was significantly alike in $T_2$ and $T_3$; $T_3$ and $T_4$ at 89 DAS. Dissimilar results were also observed in $T_1$ with other treatments. Plant height was significantly higher in treated plots than control. At 96 DAS, plant height significantly differ from one treatment to other treatments. Minimum plant height was recorded in $T_1$ and maximum in $T_4$ treatment.

The results of this study reveal that blue polythene strips with insecticide has immense impact on the reduction of mosaic disease of okra. The number of plants expressing mosaic symptom, reduction of leaves per plant and plant height and increasing number of infected leaves were maximum in control plots and minimum in the plots where blue polythene strips were hanged and insecticide was sprayed. Number of the infected plant was low in blue polythene hanged plots compared with control plots. These results are in close agreement with the findings of Basky (1983). He reported that transparent and light blue plastic strips decreased the number of infected plants by 70 and 77%, respectively. Vani *et al.* (1989) also reported that yellow polythene mulch reduced the incidence of mosaic disease in muskmelone. Lutzinsky *et al.* (1996) found that leaf curl incidence in tomato was low in the rows mulch with yellow or brown plastic. It may be mentioned that blue polythene reduced the incidence of mosaic disease in the field because, okra mosaic vectors dislike blue colour. Rao (1959) confirmed that no chemical completely controlled the virus, but disease incidence was uniformly low when systox and follidol were applied to control *Bemisia tabaci*, so reduction of mosaic disease incidence of okra is correlated with the reduction of insect vectors. The rate of secondary infection was high in control plot compared with other plots. Dahal *et al.* (1992) observed that systematic insecticide delayed or reduced the incidence of okra yellow vein mosaic disease. Khan and Mulhopadhyay (1985) reported that final infection depend on the degree of initial infection. Sastry and Singh (1975) observed that mosaic disease retarded the plant growth and few leaves were produced when infection occurred with in 35 days after germination. Bos (1978) reported that plant height was reduced by yellow mosaic disease. Therefore, it can be concluded that hanging of blue polythene strips and spraying of insecticide can reduce the incidence and severity of okra mosaic disease. The use of blue polythene strips and insecticide by the farmers is an easy way to manage okra mosaic disease. So, a through, critical and multiple agro-ecological zone base investigation will be needed for standardization of the okra mosaic disease management practice.

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