INTEGRATED VIRAL DISEASE MANAGEMENT OF OKRA

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ABSTRACT

Effect of different management practices either alone or in combination in controlling okra mosaic disease was studied under natural condition laid out in the field in completely randomized block design. Especially the treatments used in the study, T_0: control; T_1: Foliar spray with Neem extract; T_2: Foliar spray with Karamcha extract; T_3: Foliar spray with Mahogoni extract combined with intercropping Amaranthus in the 1st sowing, Indian spinach in the second sowing and Jute in the 3rd sowing showed significant positive effect in the yield and yield promoting characters. Combined effect of different practices decreased the diseases incidence and severity produce better effect in growth and yield characters of okra. The results indicated that combined use if intercrop, an early date of sowing and an effective foliar spray showed better results than their single use in respect of yield and yield promoting characters. The highest fruit yield (2.30 kg per plot, i.e 5.76 ton/ha) was recorded in plots of first sowing as against (1.55 kg per plot, i.e. 3.88 ton/ha) in the controlled plot. In case of second and third sowing the result were almost similar as the first date of sowing in respect of highest fruit yield. The highest combined yield was recorded in plots where Amaranthus was used as an intercrop along with other treatments. Regarding the economics of okra cropping the first date of sowing fetched the maximum net return (Tk. 115446.5) with a BCR of 3.83 under the treatments were Karamcha extract was used as foliar spray and Amaranthus was inter cropped between okra plant (T_2) or Mehaguni extract was used as foliar spray material keeping Amaranthus as the inter crop (T_3).

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The results showed that higher treatment cost resulted in a lower BCR. A net loss was incurred in the control treatment (Tk.9247.1) where BCR was 0.77.

Introduction:

Okra (Avelmoschus esculentus) in an annual crop. It is one of the important and popular vegetables in Bangladesh, where it is grown in the Kitchen gardens round the year at the home side area, and also in the field; especially in kharif season. Thus, okra is an important cash crop here for marginal farmer. Besides, the fruits, the fiber and stick of okra plants also have commercial value. The succulent green fruits of okra are used as vegetable. It is highly nutritious, delicious and fairly rich in vitamins (A, B and C) and minerals, (Rashid, 1976). It is one of the few vegetables which is being exported to European community markets and occupies 0.2% if the total horticulture export product. (Anonymous, 2006). Worldwide popularity if okra as a fiber rich vegetable is increasing day by day.

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The okra mosaic is a serious problem in Bangladesh and other okra growing areas of the world. It may infect the plant at any growth stage. The early mosaic disease seriously affects the growth yield of the crop. Sastry and Singh in 1975 and Mahmud in 1993 reported that incidence and severity of okra mosaic was directly related to availability and abundance of its insect vector. Nath and Saikia (1993) reported that losses could be reduced by preventing early spread of the disease by controlling white fly (*Bermisia tabaci*), the vector.

Chemical control is not always good, as the toxic insecticides poise public health threat as systemic residual reactions.

Infection by the mosaic virus may be delayed by early or late sowing compared to maximum vector population in okra field. Okra mosaic have been observed to cause 94.42% and 32.65% yield losses when the plants were infected at 35 and 65

days after sowing, respectively (Nath and Saikia, 1993). Mahumud (1993) reported that the decease incidence is related to availability and abundance of the insect vector.

So a judicious combination of cultural practices, such as adjustment of time of sowing to escape high vector population period intercropping with one or more unrelated crop like Amaranthus, jute and Indian spinach etc, foliar spray of botanical extract such as neem, mahogoni and karamcha etc. may be considered safe alternatives for controlling okra mosaic disease without risking human health and eventual environmental pollution.

Alternative disease control measure is of great importance in terms of economic production too. Now-a-days control of plant disease by employing integrated disease management (IDM) programme has drawn special attention to the researcher all over the world. IDM need information on different alterative components to integrate for control or management of this disease.

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Experimental Site

The field experiment was conducted during kharif season of 2006 in the plant pathology field laboratory and the chemical analysis of healthy and infected plants were carried out at the Biochemistry, Department of Laboratory of the Bangladesh Agricultural university, Mymensingh.

Treatments:

There were three date of sowing in this experiment such as first date of sowing (27^{th} February 2006); second date if sowing (27^{th} March, 2006); and third date of sowing (23^{rd} April, 2006). With three different intercrop such as amaranthus,

Indian spinach and jute respectively. Thus, the treatment combinations are as followings for each date of sowing:

1st sowing 27th February 2006: Okra + amaranthus

2nd sowing 27th March, 2006: Okra + Indian Spinach

3rd sowing 23rd April, 2006: Okra + Jute

Under these three different date of sowing, there were three foliar sprays with plant extracts (neem, karamcha and mahogoni and one chemical insecticide Malathiaon 57 EX foliar sprays).

T_1= Foliar spray with Neem leaf extract + Intercropping

T_2= Foliar spray with Karamcha leaf extract + Intercropping

T_3= Foliar spray with Mahogoni leaf extract + Intercropping

T_4= Date of sowing + Insecticidal spray with Malathion 57EC+ Intercropping

T_5= (Control). In these plots no dose of treatment was used on the plants and no intercropping was done.

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Layout design:

The filed experiments was set up in Randomized complete Block Design (RCBD) with 3 replications.

Amaranthus, Indian spincach and jute seed sowing:

Amaranthus sees and jute seeds were sown 10 days after okra seed sowing. The seeds were sown as broadcast n the paces between thr rows of the okra plants.

Indian spinach seeds were sown as line sowing in the spaces between the rows if the okra plants during okra seed sowing.

Collection and preparations of plants extracts:

Leaves of neem (Azadirachta Indiaca), Karamcha (Carissa carada); mahogoni (Sweitenia mahogoni); were collected from in and around the campus of Bangladesh Agricututral University, Mymensingh. Plants extracts were prepared by crushing the leaves in the blender with petroleum oil in 1:2 gm/ml ratio (e.g. 100g plants material was crushed in 200 ml oil) following the method of Asharafuzzaman and Hossain (1992).

Preparation of Insecticide spray solution and application

The insecticide Malatheion 57 EC was used in this experiment. The recommended dose was 1121.38 ml per hectare. After calculation, the required amount of the insecticide was mixed with water to prepare the spray suspension.

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Field data collection:

Data were collected from ten (10) plants randomly selected from unit plot selected from the middle rows. Collection about data of Okra plant started from 25 days after sowing of seeds (DAS). Data from amaranthus, Indian spinach and jute intercrops collected were at 50, 60 and 100 DAS, respectively. Data were on the following parameters were recorded during the growing period of the crop:

% Plant infection

% Leaf infection

% Leaf area diseased

Number of fruits plot 1 (infected plants)

Number of fruits plot 1 (healthy plants)

Average fruit weight (kg) plot 1 (healthy plants)

Average fruit weight (kg) plot 1 (infected plants)

Amaranthus: Weight (kg) of harvested plant plot 1 was recorded.

Indian spinach: Weight (kg) of harvested vine plot 1 was recorded.

Jute: Weight of harvested plant (kg) plot 1 was recorded.

Calculation of percent plant infection:

Percent of mosaic symptom expressing plants was calculated by using the following formula:

% plant infection= Number of infected plants/ Total number of plants X 100

Calculation of percent leaf infection:

Percent of mosaic symptom expressing leaf was calculated by using the following formula:

% leaf infection= Infected leaves/Total number of leaves X 100

Calculation of percent leaf area diseased:

Percent leaf area disease was calculated by using formula (Johnston and Booth, 1983):

% leaf area diseased = Area of plant tissue affected by disease/ Total area X 100

Indicator plant test for identification of casual virus

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Indicator plants were grown in green house under control condition. Species of *Nicotiana tabacum* was used as indicator plant. Age of the indictor plant was 30 days. Extract from virus infected leaves of Okra was prepared. Inoculation into the indicator plants were done by rubbing method for which a cotton pad was soaked in the diseased leaf extract and then rubbed on the leaves of two indicator plants and a third indicate plant was inoculated with sterile water only without the use of any abrasive (control). The inoculated plants were showered with plain water. The pots were marked and observed after a week for the development of local lesion and waited for 3 more weeks for the development if systemic symptom of any.

Result and discussion:

Biochemical changes in the infected leaves

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In case of control plant-leaves the chlorophyll A content were 1.475 mg g^{-1} and 1.052 gmg^{-1} in healthy and infected plants respectively.

Table 1 Biochemical changes in the infected leaves (Chlorophyll content)

Treatments	Chlorophyll A content		Chlorophyll B content	
	Healthy	Infected	Healthy	Infected
Control	1.478c	1.052d	1.855a	0.734d
Neem Extract	1.848a	1.484c	1.799b	1.573a
Karamcha Extract	1.826a	1.686a	1.463c	1.11b
Mahgoni Extract	1.702b	1.562b	1.962a	0.851c
CV (%)	2.32	2.15	10.23	12.25
Level of Significant	**	**	**	**

LSD	0.089349	0.167156	0.244691	0.19979

Mean followed by the same letter(s) in a column did not differ significantly at 5% level by DMRT

Which were significantly lower than that of other treatments employed. In karamcha and mahogoni extract the chlorophyll A content of infected leaves (1.686 and 1.562) were lower than that of healthy leaves (1.826 and 1.702 respectively). In case of chlorophyll B content, healthy leaves of okra were having significant difference between the treated and control leaves. The chlorophyll B content was higher in Mahogoni extract treatment (1.962) and lower at karamcha extract. And between the healthy and infected leaves, the chlorophyll B content were decreasing in trend, in case of healthy leaves the content were 1.855 mg g^{-1}, 1.799 mg g^{-1}, 1.463 mg g^{-1} and 1.962 mg g^{-1} in control, neem extract, karamcha and mahogoni extract treatments respectively but in infected leaves the chlorophyll B content were 0.734 mg g^{-1}, 1.573 mg g^{-1}, 1.115 mg g^{-1} and 0.851 mg g^{-1}, respectively as has been presented in Table 1.

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REFERENCES

Amma, S.P.K., Seemanlhini, R. and Ramdas, S. 1991. Studies of raising amaranthus as mixed crop on suppression and yield of bhindi (*Abelmoschus esculentue* L.). South Indian Horticulture. 39(2): 76-80.

Anonymous, 2006. The total agricultural export production in European market. Hortex Newsletter, Vol. 6, No. 2.

Asharafuzzaman, H. and I. Hossaon. 1992. Antifungal activity of crude extracts of plants against *Rhizoctonia solani* and *Bipolaris sorokininana*. Proc. BAU, Res. Prog. 6: 188-192.

BBS. 2003. Year Book of Agricultural Statistics of Bangladesh, 2003. Bangladesh Bureau of Statistics. Planning Division. Ministry of Planning. Dhaka. P. 96.

Bhagabati, K.N. and Goswami, B.K. 1992. Incidence of yellow vein mosaic diseases of okra in relation of whitefly population and different sowing time. Indian Journal of Virology. 8(1): 37-39. [R.P.P. 72(8): 623. (1993)].

Bhagabati, K.N., Sarma, U.C., Saikia, A.K. and Dutta, S.K. 1998. Effect of yellow vein mosaic virus infection on some morphological parameters in bhendi (*Abelmoschus esculentus* L. Moench). Journal of the Agricultural Science Society. North-East India. 11(1): 94-96.

Board, V.K., Puri, S.N., Brown, J.K. and Butler, G.D. 1993. Relationship of B*ermisia tabaci* population density and yellow vein mosaic diseases incidence in okra. Pest Management and Economic Zoology. 1(1): 14-19.

Borah, R.K. and Nath, P.D. 1995. Evaluation of insecticides schedule on the incidence of whitefly, *Bermisia tabaci* (Genn.) and yellow vein mosaic in okra. Indian Journal of Virology. 11(2): 65-67.

Olasantan, E.O. 1998. Effect of preceding maize (*Zea mays*) and cowpea (*Vigna unguiculata*) in sole cropping and intercropping on growth, yield and nitrogen requirement of okra (*Abelmschus esculentus*). Department of Horticulture, University of Agriculture, Abeokuta, Nigeria. Journal of Agricultural Science. 131(3): 293-298.

Pun, K.B., Sabitaha-Doraiswamy, Jeyarajan, R. and Doraiswamy, S. 1999. Immunological detection of okra yellow vein mosaic virus. Indian Journal of Virology. 15(2): 93-96.

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Saiful, S.I. 2004. Effect of date of sowing, foliar spray and intercropping in controlling the okra mosaic disease under field condition. M.S. Thesis, Department of Plant Pathology, BAU, Mymensingh.

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