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Cultural and Nutritional Management of Yellow Mosaic in Winter Mungbean

Bimal Kumar Pramanik and Md. Ayub Ali
Seed Pathology Laboratory, Department of Plant Pathology,
Bangladesh Agricultural University, Mymensingh-2202 Bangladesh

Abstract: The effects of plant spacings (30 cm x 5 cm and 25 cm x 5 cm), dates of sowing (15 September, 25 September, 5 October and 15 October) and soil application of boron, molybdenum and sulphur on the incidence and the severity of yellow mosaic (YM) and grain yield in winter mungbean cultivar Binamoog 4 was studied under natural field condition during the rabi seasons of 1996-97 and 1997-98. The incidence and severity of YM was lower in plots with 30 cm x 5 cm plant spacing than that in 25 cm x 5 cm plant spacing. The highest grain yield (1273.70 kg ha^{-1}) was obtained from plots where seeds were sown on 25 September. The single or combined application of boron (2 kg ha^{-1}) and molybdenum (1.5 kg ha^{-1}) significantly reduced the severities of YM and increased grain yield (24.8 to 30.6%).

Key words: Yellow Mosaic, Winter Mungbean, Cultural Practices, Nutritional Management.

Introduction

Mungbean (*Vigna radiata* L. Wilczek) is an important pulse crop grown in Bangladesh. It provides valuable supplement of protein to rice based diet in this country (Tsu and Hsu, 1978). In Bangladesh its contribution is 5% to the total pulse production (Rahman and Mian, 1988). Average yield of this crop is about 0.6 ton ha^{-1} in Bangladesh. Among the factors limiting mungbean production, disease is considered as one of the most important one.

Among the diseases, yellow mosaic caused by yellow mosaic virus (Willians *et al.*, 1968) is most damaging disease of mungbean .It causes significant yield reduction every year (Jalaluddin and Shaikh, 1981). Winter mungbean varieties are highly susceptible to yellow mosaic and showed 67 to 100% loss of grain yield in the severely infected fields. The incidence and severity of this disease is related to many factors among them the availability virus source, abundant vector population and time of infection are important. Use of some chemicals against the vector is very expensive and environment unfriendly. Resistant cultivars are not available. Integration of some cultural management practices may help to combat this problem. Integration of plant spacings, sowing date(s) and fertilizer application (Sulphur, Boron and Molybdenum) may be useful to minimise the yield loss. No systematic research has been done in Bangladesh on integration of cultural practices to control mungbean mosaic.

In view of the above background, two experiments were conducted to find out the combine effect of plant spacing and time of sowing interacting with fertilizer application.

Materials and Methods

Two field experiments were conducted during the rabi seasons of 1996- '97 to 1997- '98 Cultivar "Binamoog-4" was used.. The first experiment was laid out in the split plot design with three replications. There were two factors namely sowing date(s) and spacing(s). Spacing was assigned in the main plot and sowing date(s) in the sub plot. Seeds were sown in four different dates such as 15 September, 25 September, 05 October and 15 October. Two spacings viz 30 cm X 5 cm and 25 cm X 5 cm were maintained The size of the each sub plot was 4 m x 2.5 m. The space between the block was 0.75 m and between the sub plots was 0.5 m.

The second experiment was conducted at field laboratory of Department of Plant Pathology in BAU during October, 1997 to December, 1997. The experiment was laid out in the randomized complete block design with 3 replications. The unit plot size of each treatment was 4m X 2.5 m. Spacing between blocks and plots were 0.75 m & 0.5 m respectively. Altogether there were 8 treatments including one control comparing sulphur (S), Boron (B) and Molybdenum(Mo). The treatments combinations were Control (O), Boron (B) Molybdenum (Mo), B + Mo, Sulphur (S), S + B, S + Mo, S + B + Mo. The nutrients were added in soil 20 kg ha^{-1} for S, 2 kg ha^{-1} for B and 1.5 kg ha^{-1} Mo respectively. A basal dose of 35 kg N_2 ha^{-1}, 70 kg P_2O_5 ha^{-1} and 28 K_2O kg ha^{-1} were applied in every plot during the land preparation. The sources used for B was boric acid (H_3BO_3) containing 17% B, for the Mo was sodium molybdate ($Na_2MoO_2.2H_2O$) containing 54%.

Incidence and severity of yellow mosaic were recorded twice-one at 40 Days After Sowing (DAS) and another at 60 DAS. For scoring the incidence and severity of the disease, 10 infected plants were selected randomly from each plot. The severity of yellow mosaic disease was recorded following the grade as used by Jalaluddin *et al.* (1994).

Symptom Score at flowering and pod formation stage

0	No visible symptoms on leaves.
1	Few yellow chlorotic spots or flecks scattered on the young leaves.
3	Large yellow chlorotic flecks or mottle covered about 25% of leaf area on some leaves.
5	Yellow chlorotic mosaic covered 50% of leaf area on some leaves.
7	Yellow chlorotic mosaic covered about 75% of leaf area of several leaves.
9	Young leaves completely yellow, plant severely stunted.

The crop was harvested at full ripening stage. Before harvesting 10 diseased plants and 10 apparently healthy plants in each plots were selected randomly for data collection on the following parameters: plant height (cm), number of primary branch/plant, number of pod/plant, pod length (cm), 100 seeds weight (g), grain yield of 10 diseased plants (g), grain yield of 10 apparently healthy plants (g) and total seed yield per plot (kg ha^{-1}). The data were subjected statistical analysis by F-test and the significant mean differences were determined by LSD (least significant difference) test and Duncan's Multiple Range Test (DMRT).

Results and Discussion

The incidence and severity of yellow mosaic were recorded at 40 DAS and 60 DAS. Spacing(s) and sowing date(s) had pronounced effect on the incidence and severity of yellow mosaic. (Table 1). Incidence of yellow mosaic was recorded at 40 DAS and 60 DAS ranged from 63.93 to 70.25% and 70.25 to 91.25%, respectively. Mean yellow mosaic incidence lowest in plot sown on 25 September having spacing 30 cm X 5 cm in both the counting periods. Severities of yellow mosaic recorded at 40 & 60 DAS were ranged from 3.01 to 4.41 and 3.97 to 5.56 respectively. Sowing on September 15 was favourable for yellow mosaic development. It seems that micro-environment was favourable for the pathogen in early sowing (15 September) than that of late sowing (25 September, 05 October and 15 October).

Grain yield and 100 seed's wt. loss were influenced due to different spacing(s) and sowing date(s). The highest 100 seeds wt. (30.43%) and grain yield (17.03%) loss were obtained in plots where crop was sown on 15 October having the spacing 25 cm X 5 cm where the lowest yield was (8.92 %) found in 25 September having the higher spacing of 30 cm X 5 cm (Table 3).

The highest grain yield was obtained form the plots where the crop was sown on 25 September. The yield of mungbean recorded in plots sown on 15 September and 25 September seems to be directly correlated with the severity o the disease. The grain yield recorded in plots sown on Octob 5 and 15 October seems not to be correlated with the severit of the disease. Though the severity of these diseases was lea during those dates of sowing, the grain yield was n increased satisfactorily. Late sowing that shortened th vegetative growth, limited the pod formation and hampered th maturity, for this reason late sowing even low disea presence had low yield. Similar results were reported b Jalaluddin *et al.* (1994) who conducted the similar type experiment at Ishurdi, the North Western Region Bangladesh. The results of the present investigation as well the results obtained from the previous study by Jalaluddin *al.* in 1994 and Jalaluddin and Rahizuddin 1996 indicate th date of sowing of mungbean may not be same for increasi grain yield at different agro ecological zones of Bangladesh. is clear from the present work that 25 September sowing h good effect on yellow mosaic disease reduction, growth a yield of winter mungbean, Binamoog 4.

The effects of three nutrient elements (Boron, Sulphur a Molybdenum) on the incidence and severity of yellow mo disease of winter mungbean cultivar Binamung 4 was a tested. The incidence and severity of yellow mosaic w recorded twice at 40 and 60 DAS. Mean incidence of yell mosaic was not influenced by either of the treatments.

Table 1: Effect of plant spacing and sowing date on the incidence and severity of yellow mosaic in winter mungbean (cv.Binamung 4)

Sowing date	Spacing			
	30 cm X 5 cm		25 cm X 5 cm	
	Incidence (%)	Severity (0-9)	Incidence (%)	Severity (0-9)
40 DAS				
15 September	65.24 a	4.41 a	70.25 a	3.57 a
25 September	63.93 b	3.75 b	68.91 b	4.02 b
05 October	65.02 a	3.08 c	69.87 a	3.45 c
15 October	65.55 a	3.01 c	70.03 a	4.00 b
60 DAS				
15 September	73.23 a	5.40 a	91.25 a	5.49 a
25 September	71.08 b	4.77 b	89.40 b	4.62 b
05 October	72.85 a	4.00 c	91.25 a	3.90 c
15 October	72.83 a	3.97 c	91.19 a	5.56 b
CV (%)	0.85	7.57	0.43	7.59
LSD	0.78	0.67	0.69	0.70
Level of significance	*	**	**	**

Values are averages of three replications. Data in the same column with a common letter are not significantly different at 5% level (*) and level (**) of significance. DAS = Days after sowing

Table 2: Effect of plant spacing and sowing dates on yield and yield components of winter mungbean (cv. Binamoog 4)

Treatment	Plant height (cm)	Number of primary branch/ plant	Number of pod/ plant	Weight of 100 seeds (g)	Yield (kg ha^{-1})
Spacing(s)					
30 cm x 5 cm (S_1)	30.85 a	2.23	19.53	4.28 a	1094.67
25 cm x 5 cm (S_2)	30.03 b	2.11	20.03	3.58 b	1070.33
Sowing dates					
15 September (D_1)	30.09 b	1.92	19.50 bc	4.11 a	1043.67 ab
25 September (D_2)	31.02 a	2.27	20.22 a	4.23 a	1273.67 a
5 October (D_3)	30.60 ab	2.29	20.08 ab	3.06 b	1092.33 ab
15 October (D_4)	30.05 b	2.19	19.31 c	3.32 b	920.33 b
CV (%)	1.68	21.42	2.62	9.22	12.64
LSD	0.64	NS	0.65	0.64	237.7
Level of significance	*		*	**	**

Values are averages of three replications. Data in the same column with a common letter(s) are not significantly different at 5% level (*) an level (**) of significance. NS = Not significant, DAS = Days after sowing.

Table 3: Mean percent loss in yield component of winter mungbean Binamoog 4 due to yellow mosaic under different plant spacing and sowing dates

Sowing date	Spacing			
	30 cm X 5 cm		25 cm X 5 cm	
	100 seed wt.	Grain yield	100 seed wt.	Grain yield
15 September	21.67	10.24	24.57	16.37
25 September	22.31	8.92	24.00	15.48
5 October	25.37	10.98	25.22	15.37
15 October	26.55	11.25	30.43	17.06
LSD	NS	1.43	4.15	NS
CV (%)	14.04	11.01	9.02	6.90
level of significance	*	*	*	*

Values are averages of three replications. Data in the same column with a common letter(s) are not significantly different at 5% level (*) of significance. NS = Not significant.

Table 4: Effect of Boron, Molybdenum and Sulphur on incidence and severity of yellow mosaic in winter mungbean (cv. Binamoog 4)

Treatment	Incidence (%)		Severity (0-9)	
	40 DAS	60 DAS	40 DAS	60 DAS
Control	62.94	68.58	4.80	5.79 a
Boron (B)	50.98	60.72	3.34	4.48 bc
Molybdenum(Mo)	58.87	61.16	3.58	3.96 c
B + Mo	56.07	64.67	3.53	3.95 c
Sulphur (S)	54.39	64.96	3.67	5.16abc
S + B	55.58	60.95	3.88	4.95abc
S + Mo	55.47	62.86	3.41	5.52 ab
S + B + Mo	52.53	66.88	4.03	4.92abc
CV (%)	7.03	5.3	20.46	9.85
LSD	NS	NS	NS	1.16
Level of significance				**

Values are averages of three replications. Data in the same column with a common letter(s) are not significantly different at 5% level (*) and 1% level (**). NS = Not significant, DAS = Days after sowing.

Table 5: Effect of Boron, Molybdenum and Sulphur on yield and yield components of winter mungbean (cv. Binamoog 4)

Treatment	Plant height (cm)	Number of primary branch/ plant	Number of pod/ plant	100 seeds weight (g)	Yield (kg ha^{-1})	Per cent yield increase over control
Control	29.36 c	1.97	16.29 c	3.19 d	906.67 c	-
Boron (B)	30.09 bc	2.50	20.04 a	4.14 abc	1206.66ab	24.83
Molybdenum(Mo)	30.83 ab	2.13	20.06 a	4.35 ab	1230.33ab	26.31
B + Mo	31.39 a	2.47	20.35 a	4.65 a	1307.00a	30.63
Sulphur (S)	30.16 bc	1.98	18.78 bc	3.40 d	923.67c	2.01
S + B	30.22 bc	2.45	19.99 a	3.42 cd	1079.33abc	15.99
S + Mo	29.65 c	2.11	19.50 ab	3.23 d	967.00bc	6.24
S + B + Mo	30.21 bc	2.00	19.48 ab	3.65 cd	1000.00bc	9.33
CV (%)	1.28	18.15	3.14	9.20	12.73	
LSD	0.94	NS	1.08	0.83	240.30	
Level of significance	**		*	**	*	

Values are averages of three replications. Data in the same column with a common letter(s) are not significantly different at 5% level (*) and 1% level (**). NS = Not significant.

Table 6: Mean percentage loss in yield and yield component of winter mungbean (cv. Binamoog 4) due to yellow mosaic (YMV) under different fertilizer treatment

Treatment	Mean loss percentage	
	100 seed weight YMV	Grain yield YMV
Control	45.91	13.01a
Boron (B)	14.84	11.21 b
Molybdenum(Mo)	13.15	10.28 bc
B + Mo	6.82	10.22 b
Sulphur (S)	42.91	11.64 ab
S + B	32.70	11.76 ab
S + Mo	25.81	11.50 ab
S + B + Mo	18.10	11.83 ab
LSD	22.89	1.61
Level of significance	*	*
CV (%)	52.42	3.57

Values are averages of three replications. Data in the same column with a common letter(s) are not significantly different at 5% level (*).

However, the highest incidence of yellow mosaic was recorded in control plots in both the counting periods. The mean severity of yellow mosaic was not affected by the treatments during early stage of plant growth. However, the treatments showed significant effects on the severity of yellow mosaic at later stage of plant growth (Table 4). The mean severity of yellow mosaic was ranged from 3.95 to 5.79. The highest mean severity was recorded in control plots and the lowest severity was obtained in plots fertilized with molybdenum and the combined application of both molybdenum and boron followed by single application of boron. The application of other nutrients viz. sulphur, sulphur plus boron or molybdenum and the combined application of sulphur, boron and molybdenum were significantly reduced the severity of yellow mosaic (Table 4).

Among the nutrient elements either single or combined application of Boron with Molybdenum had positive effect in reducing the severity of yellow mosaic of winter mungbean in the field. It appears that plant's resistance or tolerance against the diseases is supported and boosted metabolically due to soil application of Boron and Molybdenum and their combinations. The results confirmed the results reported by Ahmed *et al.* (1987). They reported that micronutrient increased resistance and decreased the disease index.

The yield of mungbean recorded from different treatments seems to be directly correlated with the severity of the disease in the field. Among the three nutrient elements (B, Mo and S) used in the present study only Boron and Molybdenum individually or collectively produced positive effect on yield and yield contributing characters. Again, combined application of B and Mo was found to be more effective in plant height, pod/plant, 100-seed weight yield (kg ha^{-1}) finally yield loss (Table 5 & 6). Our findings are in agreement with those of Zaman *et al.* (1996).

The results of the present work clearly demonstrated that both single and combined application of 2 kg ha^{-1} Boron and 1.5 kg ha^{-1} Mo as soil application in the winter mungbean field resulted lowest severity of yellow mosaic and increased yield and yield promoting characters. However, combined application of Boron and Molybdenum might give better results than single application.

References

Ahmed, B.Y. F.M. Sharif and A.R.T. Sarhan, 1987. Effect of certain micronutrients on fusarium wilt of tomato. J. Agricultural and Water Resources Research. Plant Protection, 6: 13-28.

Jalaluddin, M. M. Rahizuddin and M.A. Razzaque, 199 Effects of sowing dates on cercospora leaf spot, yello mosaic and grain yield of two winter mungbean strai Bangladesh J. Nuclear Agriculture, 10: 83-88.

Jalaludding, M. and M.A.Q. Shaikh, 1981. Evaluation mungbean (*Vigna radiata* (L.) Wilczek) germplasm f resistance to yellow mosaic virus. SABRAO J., 13 : 61-

Rahman, M.M. and A.A. Mian, 1988. Mungbean in Banglad - Problems and Prospects. Proceeding of the 2n International Symposium, Asian Vegetable Cent Shanhua, Taiwan, pp. 13-23.

Tsu, S.C.S. and M.S. Hsu, 1978. The potential roles mungbean as a diet componenet in Asia. The fi International mungbean symposium held in Feb. 1978. AVRDC. pp: 40-45.

Williams, F.J. J.S. Grewal and K.S. Amin, 1968. Serious new disease of pulse crops in India in 1966. Plant Dise Report, 52: 300-304.

Zaman, A.K. M.M., M.S. Alam, B.K. Biswas and B. Roy, 199 Effect of B and Mo application on mungbean. Banglad Journal of Agricultural Res., 21: 118-124.