

Prospect of using cowpea - *Rhizobium* and Dithane M-45 for disease management (*Cercospora* - leaf spot) and yield of mungbean

D.K. MISRA AND P. BHATTACHARYYA

Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur 741252 West Bengal

Field experiment in two successive years with three *Rhizobium* strains and a dithiocarbamate fungicide (Dithane M-45) showed positive effect on controlling *Cercospora*-leaf spot of mungbean (*Cercospora canescens*, *C. cruenta*) *Rhizobium* helped in reducing the disease intensity and corresponding yield increase. Dithane M-45 at seed and foliar spray at 30 and 45 days after sowing had also beneficial effect to lower down the leaf spot of green gram. Best effect was obtained in combined application of both the treatment.

Key words: *Rhizobium*, *Cercospora canescens*, mungbean, Dithane M-45, management

INTRODUCTION

In India the major diseases of mungbean are mungbean yellow mosaic virus (MYMV), *Cercospora*-leaf spot (CLS) and bacterial leaf spot. In summer/spring mungbean crop normally does not suffer from serious disease problems but kharif crop is prone to attack by many diseases and most damaging is the CLS (Ahmid, 1985, Singh *et al.*, 1978).

Since these diseases are the main constraints in increasing mungbean production, attempts have been made in our present work to control the intensities of CLS and to increase yield by the application of cowpea-*Rhizobium* at seed and Dithane M-45 both at seed and foliar spray.

MATERIALS AND METHODS

The field trial was conducted at Kalyani farm of the Viswavidyalaya, under rainfed condition using the mungbean cultivar B-105 (Panna) in the year 1996 and 1997. Sixteen treatments consisting of different combinations of *Rhizobium* and fungicides and uninoculated control were replicated four times in a randomised block design with microplots of 6 sq. in net plot size. The crops was inoculated with the respective symbiont namely Caj 6/1, JCA-1 and M-10 strains of cowpea group by seed inoculation (charcoal based *Rhizobium* powder mixed with soaked seeds just

before sowing) at a strength of 48.66×10^6 , 51.33×10^6 and 53.66×10^6 cells/ml for Caj 6/1, JCA - 1 and M-10 strain respectively. *Rhizobium* cells were grown in yeast mannitol agar (YMA) medium containing mannitol 10.0 g, Di-potassium monobydrogen phosphate 0.5 g, magnesium sulphate 0.2 g, sodium chloride 0.1 g, yeast extract 1.0g, calcium carbonate 0.5g, distilled water 1.0 L, pH 6.8 - 7.0, agar agar 15.0g (Vincent, 1970). Yeast mannitol broth (YMB) was prepared by preparing YMA without agar. Three days old YM-broth cultures of the symbiont were used for inoculation of the plant. The fungicide Dithane M-45 (alkylene bis dithiocarbamate product) was treated at seed @ 4 g/Kg. Foliar spray of fungicides were given to the crop (at 30 and 45 day after sowing DAS) @ 2.5 g/litre. The sixteen treatments were : T₁, *Rhizobium* strain I (Caj 6/1) at seed, T₂, *Rhizobium* strain II (JCA-1) at seed, T₃, *Rhizobium* strain III (M-10) at seed, T₄, *Rhizobium* strain I at seed + fungicide at 30 DAS, T₅, *Rhizobium* strain II at seed + fungicide at 30 DAS, T₆, *Rhizobium* strain III at seed + fungicide at 30 DAS, T₇, *Rhizobium* strain I at seed + fungicide at 45 DAS, T₈, *Rhizobium* strain II at seed + fungicide at 45 DAS, T₉, *Rhizobium* strain III at seed + fungicide at 45 DAS, T₁₀, *Rhizobium* strain I at seed + fungicide at seed, T₁₁, *Rhizobium* strain II at seed + fungicide at seed, T₁₂, *Rhizobium* strain III at seed + fungicide at seed, T₁₃, fungicide at 30 DAS, T₁₄, fungicide at 45 DAS, T₁₅, fungicide at seed and T₁₆, control (untreated/uninoculated). The experiments were repeated in two successive years.

Table 1 : Analysis of variance of different treatments

Source	d.f	Disease Severity								Yield (kg/ha)	
		Time Intervals									
		20 DAS		30 DAS		40 DAS		50 DAS			
		Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2
Treatment	15	0.88*	0.69	2.22**	1.51**	4.08**	4.09**	2.08**	1.59**	663.61**	633.70**
Block	2	0.25	0.25	0.09	0.59	1.59	1.09	0.09	0.25	73.16	58.25
Error	30	0.52	0.34	0.44	0.67	0.32	0.37	0.08	0.16	152.30	117.65

** & * Significant at 1% & 5% levels respectively

Table 2 . Mean performance of disease severity at four time intervals and their yield in differenn treatments in mungbean

Treatments	Disease Severity								Yield/6m ² (g)		Yield/ha (Kg)		Increased yield over control (%)	
	20 DAS		30 DAS		40 DAS		50 DAS							
	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2	Trial-1	Trial-2
T ₁	1.67	1.00	3.00	3.00	6.33	6.33	9.00	9.00	283	271	472	451	12.92	13.03
T ₂	1.00	1.00	3.00	3.00	7.00	7.00	9.00	9.00	266	254	444	423	6.22	6.01
T ₃	1.00	1.00	2.33	3.00	7.00	7.00	9.00	9.00	272	259	439	432	5.02	8.27
T ₄	1.00	1.00	3.00	3.00	5.67	5.67	9.00	9.00	293	282	488	470	16.75	17.79
T ₅	1.00	1.00	1.00	1.67	4.33	4.33	9.00	9.00	304	290	507	482	21.29	20.80
T ₆	1.67	1.00	1.67	1.67	5.67	5.67	9.00	9.00	291	280	485	467	16.03	17.04
T ₇	1.00	1.00	2.33	2.33	7.00	7.00	7.00	7.00	275	265	459	442	9.81	10.78
T ₈	1.00	1.00	2.33	2.33	7.00	7.00	7.00	7.00	261	255	435	425	4.07	6.52
T ₉	2.33	1.67	3.00	3.00	7.00	7.00	7.00	8.33	268	256	447	427	6.94	7.00
T ₁₀	1.00	1.00	1.00	1.67	7.00	7.00	9.00	9.00	268	256	447	427	6.94	7.02
T ₁₁	1.00	1.00	1.00	1.67	7.00	7.00	9.00	9.00	263	253	438	422	4.78	5.76
T ₁₂	1.00	1.00	1.00	1.00	7.00	7.00	9.00	9.00	262	249	437	416	4.55	4.26
T ₁₃	1.00	1.00	1.00	1.00	7.00	7.00	9.00	9.00	262	249	437	416	4.55	4.26
T ₁₄	1.67	1.67	1.67	1.67	3.00	3.00	7.00	7.00	290	278	483	462	15.55	15.79
T ₁₅	1.67	1.67	1.67	1.67	3.00	3.00	7.00	7.00	290	278	483	462	15.55	15.79
T ₁₆	2.33	2.33	3.00	3.00	7.00	7.00	9.00	9.67	266	256	443	427	5.98	7.02
T ₁₇	2.33	2.33	3.00	3.00	7.00	7.00	9.00	9.67	266	256	443	427	5.98	7.02
T ₁₈	1.00	1.00	1.67	1.67	6.33	6.33	9.00	9.00	257	243	428	405	2.39	1.50
T ₁₉	1.00	1.00	1.67	1.67	6.33	6.33	9.00	9.00	257	243	428	405	2.39	1.50
T ₂₀	2.33	2.33	3.00	3.00	7.00	7.00	9.00	9.00	250	239	418	399	-	-
T ₂₁	2.33	2.33	3.00	3.00	7.00	7.00	9.00	9.00	250	239	418	399	-	-
SE ±	0.59	0.48	0.54	0.66	0.46	0.19	0.23	0.33	10.05	8.86	-	-	-	-
CD at 5%	1.20	0.98	1.10	1.35	0.94	1.01	0.47	0.66	20.51	18.09	-	-	-	-

DAS - Days after sowing

Observations were taken on 20, 30, 40 and 50 days old plants after sowing in terms of estimation of intensities of disease using 0-9 scale (Mayee and Datar, 1986). Grain yield estimates were made at harvest as Kg/ha.

RESULTS AND DISCUSSION

Significant difference of severity of disease caused by all treatments in different time intervals except at 20 days of trial-2. Yields/plot also differed significantly in all the treatments studied (Table 1).

The results (Table 2) gave an interesting picture of the disease severity in the two trials. A gradual increase of rate of infection was recorded in most of the treatments in two trials upto 50 days of both the years. It was also noted that the severity of disease was markedly pronounced only after 30 days of sowing onwards.

Infection was significantly lower in comparison to the control in 4, 5, 6 and 13 treatment combinations upto 40 days.

Out of sixteen treatment combinations only seven treatments had a significantly higher yield in both the years. Highest yield over the control was recorded in treatment no. 5 followed by treatment no. 4, 6, 1 and 13 respectively. The host plant with those of five treatments registered less infection during 40 DAS which is a pick period of vegetative as well as reproductive growth, ultimately resulting less damage in its end products.

The two trials did not show any difference of infection during the older age i.e. at 40 and 50 DAS in most of the treatments. Among the three *Rhizobium* strains Caj 6/1 and JCA-1 found to be better as regards lowering the disease intensity and yield improvement. That the inoculation with *Rhizobium* increased yield by reducing the disease intensity (Bhattacharyya and Mukherjee, 1988; 1990) and the application of fungicides decreases the extent of *Cercospora* leaf spot of mungbean Grewal, *et.al.* (1980). Singh and Singh (1978) and had ability to promote yield of mungbean (Gupta *et.al.* 1988). Our work confirm these earlier findings. *Cercospora canescens* is considered as an important pathogen responsible for reduction of yield of mungbean (Ahmed, 1985).

The disease incidence normally appear after 30-35 days after sowing. So the application of fungicides at seed followed by foilar spray at 30 DAS might have some role in reducing disease intensities in these treatments. The possibility of using high *Rhizobium* inoculum at seed and Dithane M-45 at seed and 30 DAS for lowering the pressure of the *Cercospora*-leaf spot disease of mungbean due to *C. canescens* is clearly expressed from the present work.

ACKNOWLEDGEMENT

The authors express their deep sense of gratitude and sincere indebtedness to Dr. Biman Shasmal, Reader (Research), Deptt. of Genetics and Plant Breeding, Bidhan Chandra Krishi Viswavidyalaya for his valuable guidance throughout the course of investigation.

REFERENCES

- Bhattacharyya, P. and Mukherjee, N. (1988). *Rhizobium-Sclerotium* interaction in groundnut (*Arachis hypogaea*) rhizosphere. *Indian Jour. Agricul. Sci.* 58(8) : 643-644.
- Bhattacharyya, P. and Mukherjee, N. (1990). Cowpea *Rhizobium* activity lower aerial blight (*Macrophomina phaseolina*) disease intensity on mungbean. *J. Mycopathol. Res.* 28(2) : 153-158.
- Grewal J S, Pal, M. and Kulshrestha, D.D. (1980). Control of *Cercospora* leaf spot of green gram by spraying Bavistin. *Indian Jour. Agricul. Sci.* 50(9) : 707-711.
- Gupta S.B, Rawat, A.K and Khasre A.K. (1998). Effect of pre and post inoculation seed treatment with fungicides on nodulation and grain yield of soybean. *Legume Research* 11(4) : 167-172.
- Gurdip Singh, Shashi Kapoor and Kuldip Sing. (1987). Proceedings of 2nd International Symposium on mungbean. pp.290.
- Mayee, C. D. and Datar, V. V. (1986). Phytopathometry. pp. 74-75.
- Ahmed, Quisar, (1985). Fungicidal control of *Cercospora*-leaf spot of mungbean (*Vigna radiata*). *Indian Phytopathol* 38(3) : 418-422.
- Singh, D. V. and Singh, R. R. (1978). Field evaluation of fungicides for the control of *Cercospora*-leaf spot of green gram. *Pesticides* 12(6) : 28-29.
- Vincent, J.M. (1990). *A manual for the practical study of the root nodule bacteria*. IBP Hand Book No. 15 Black well and Scientific Pub, Oxford.

(Accepted for publication 30 March 1999)