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# Response of mungbean germplasm against some important foliar diseases in pre and post *kharif* season under *terai* agroecological region of West Bengal

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One of the major constrains in increasing the production of mungbean [*Vigna radiata* (L.) Wilczek] in terai region of West Bengal is diseases such as *Cercospora* leaf spot (CLS), Anthracnose, Powdery Mildew (PM), Mungbean Yellow Mosaic Virus (MYMV) and Bacterial Leaf Spot (BLS). During pre-kharif, only CLS and MYMV infection were observed but the severity was more during post-kharif season. Whereas, anthracnose and powdery mildew were selected for chemical and morphological as compared to susceptible ones, but reverse phenomenon was observed with nitrogen concentration. A positive correlation between stomatal frequency and susceptibility to CLS was observed.

## INTRODUCTION

Food, nutrition and environmental security were the theme of 88th session of Indian Science Congress. Indian population is predominantly vegetarian and their protein requirement is mostly met with the pulses. Mungbean [*Vigna radiata* (L.) Wilczek], commonly known as green gram, is one of the most important grain legumes in many Asian countries like India. In India this crop is grown all around the year in three crop seasons; Pre-*kharif* (March to June), *kharif* (July to Oct.) and Post-*kharif* (Sept. to Dec.) and are vulnerable to several diseases caused by fungi, virus, bacteria, MLOs and nematodes. Among these, only a few diseases like *Cercospora* leaf spot (CLS), anthracnose, powdery mildew (PM), munbean yellow mosaic virus (MYMV) and bacterial leaf spot (BLS) cause potential economic loss to this crop under Terai Agroecological region of West Bengal. Keeping in view the importance of the diseases, attempts were made to locate sources of resistance. So far, little information was available regarding relationshop between biochemical parameters, morphological basis and relative resistance of mungbean to CLS. Therefore, the present investigation was undertaken to select some mungbean germplasms resistant to some of its important foliar diseases and some biochemical and morphological parameters associated with the disease reaction of mungbean to CLS disease.

## MATERIALS AND METHODS

### *Screening for Diseases*

During 2002-2003 season, 15 mungbean germplasms were swon in both Pre-*kharif* (18th March) and Post-*kharif* (6th Sept.) season in a randomized block design with 3 replications, at Pundibari Farm, Uttar Banga Krishi Viswavidyalaya. All the normal agronomic practices were followed except any chemical management of pest, disease or weeds. Percent disease intensity (PDI) was recorded at 50 days after sowing. Disease intensity on 10 randomly selected plants in each plot was recorded. Scoring was done by 0-5 scale for CLS (Singh, 1980) and powdery mildew (Singh, 1980); 1-9 scale for MYMV (Singh *et al.* 1988) and by 0-5 scale for anthracnose [where 0=Healthy leaf, 1=Up to 5%, 2 = 5-20%, 3 = 20-30%, 4 = 30-50% and 5 = more than 50% leaf area infected]. The percent Disease Intensity (PDI) was calculated by using the formula of Wheeler (1969).

### *Biochemical Parameters*

From the above screening 4 germplasms (2 resistant

and 2 susceptible to CLS) were selected for further studies of biochemical and morphological basis of disease reaction. Fresh healthy leaves, from 50 days old plants, were extracted in 80% ethanol and extracts were analyzed for total phenol following the method of Malick and Singh (1980).

Dried healthy leaves, from 50 days old plants, were digested in digestion mixture and nitrogen was estimated by modified Kjeldahl's method.

### *Morphological Characters*

Fresh, healthy leaves of 50 days old plants were collected. The upper and lower epidermal layers were peeled off. The frequency of stomata (per sq. cm) of upper and lower epidermal layers was counted under compound microscope at 400x.

## RESULTS AND DISCUSSION

CLS and MYMV infections were found in both the pre- and post-kharif season in Terai agro-ecological region, West Bengal (Table-1). However, the mean disease intensity of the most susceptible lines, to both the diseases, was higher in post-kharif season than on pre-kharif. Anthracnose and powdery mildew were only observed in post kharif crop.

**Table 1 :** Disease severity of mungbean in Pre- and Post-kharif season under Terai region of West Bengal.

| Diseases | Season | |
|---|---|---|
| | Pre-kharif | Post-kharif |
| Cercospora leaf spot | + + | + + + |
| MYMV | + | + + + |
| Anthracnose | – | + + |
| Powdery mildew | – | + + |

'+ + +' Severe '+ +' Moderate '+' Mild '–' No infection.

None of the 15 varieties studied, show multiple resistance to all the diseases. However, three lines (Viz. SLM-70, A-12-4/1 and A-300) and two lines (Viz. SLM-70 and HUM-6) were found resistant to CLS and MYMV, respectively. But no source of resistance was found against anthracnose and powdery mildew under natural infection (Table-2). Several mungbean lines were earlier identified with resistance to Cercospora leaf spot (Singh, 1991; Verma *et al.*, 1991), to MYMV (Singh, 1991; Verma *et al.*, 1991)and to powdery mildew (Anonymous, 1975; Grewal, 1978).

**Table 2 :** Disease reaction of mungbean germplasms to different foliar diseases in Post-kharif season under Terai region of West Bengal.

| Germplasms | Season | | | |
|---|---|---|---|---|
| | CLS | MYMV | Anthracnose | Powdery mildew |
| Pusa-95-31 | MR | MR | MR | MS |
| Pusa-96-32 | MR | MR | S | S |
| Pusa-93-33-2 | MR | S | S | S |
| SML-190 | S | MR | MR | MS |
| SML-264 | MS | MR | MR | MS |
| SLM-70 | R | R | MR | MR |
| PDM-84-143 | MS | MR | MR | MS |
| Mld-95-12 | S | S | MR | S |
| A-43 | MR | S | MR | S |
| A-12-4/1 | R | MR | MR | MS |
| A-300 | R | MR | MR | MR |
| A-267 | MS | MR | MR | MR |
| NBM-36 | S | MR | MR | S |
| NBM-100 | MS | MR | MR | MR |
| HUM-6 | MS | R | MR | MS |

R—Resistant MR—Moderately resistant MS—Moderately susceptible S—Susceptible

**Table 3 :** Total phenol, Nitrogen and Stomatal frequency in the resistant and susceptible germplasms.

| Germplasms | Disease reaction | Total phenol (mg/g fresh weight) | Nitrogen (%) | Stomatal frequency ('000 per $cm^2$) | |
|---|---|---|---|---|---|
| | | | | Upper surface | Lower surface |
| A-300 | R | 191.35 | 3.11 | 13.10 | 26.03 |
| A-12-4/1 | R | 198.22 | 3.07 | 14.10 | 23.32 |
| NBM-36 | S | 136.58 | 4.19 | 21.10 | 39.60 |
| Mld-95-21 | S | 174.34 | 3.95 | 19.50 | 34.70 |

The percent disease intensity of the lines A-12-4\1, A-300, NBM-36 and Mld-95-21 to CLS were 1.3%, 34.5% and 21%, respectively. Analysis of biochemical constituents of these lines revealed that the general level of total phenol was higher in resistant genotypes (198.22 and 191.35 mg/g fresh tissue in A-12-4/1 and A-300, respectively) than in susceptible ones (168.53 and 174.34 mg/g fresh tissue in NBM-36 and Mld-95-21, respectively). The role of phenol in disease resistance has already been reported by Kim and Hwang (1987), Luthra *et al.* (1988).

Leaves of the resistant lines contained less nitrogen in comparison with susceptible ones. The nitrogen content was highest in susceptible line NBM-

36(4.19%) and lowest in resistant line A-12-4/1 (3.07%). This result is in agreement with those observed earlier by Gupta *et al.* (1984) in groundnut against tikka disease.

It was also observed that both the resistsnt genotypes were characterized by significantly lower stomatal frequency than the two susceptible ones. Stomatal entry of the pathogen may be the cause of higher susceptibility of the mungbean lines, having higher stomatal frequency. Similar results were observed by Basra *et al.*, (1985) and Mayee and Suryawanshi (1995) in groundnut against leaf spot disease.

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