

## Occurrence of *Sclerotinia* blight of mungbean and urdbean under rainfed conditions of Arunachal Pradesh

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*Sclerotinia* blight in mungbean (*Vigna radiata*) and urdbean (*Vigna mungo*) was observed in severe form in the germplasm screening plots in the research farm, Gori of ICAR Research Complex for NEH Region, Arunachal Pradesh, Basar. This is the first report of *Sclerotinia* blight of urdbean in India. Both the pulse crops suffered heavily and mortality was more than 90% in some entries. The disease was characterized by blighting of stems, leaves, branches, flower stalks and even pods at varying intensity during wet period. Presence of dark sclerotia of varying size on the surface (0.2 × 0.2 cm – 0.8 × 0.3 cm) and pith (0.6 × 0.4 cm – 5.7 × 0.1 cm) of infected plant parts were definite sign of the disease. The causal organism was identified as *Sclerotinia sclerotiorum* (Lib) de Bary. The paper also dealt with the epidemiology and the varieties of mungbean and urdbean, which were heavily affected with the disease.

**Key words :** Mungbean, Urdbean, blight, *Sclerotinia sclerotiorum*, epidemiology, rainfed condition.

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### INTRODUCTION

*Sclerotinia sclerotiorum* is a ubiquitous, nonspecific plant pathogenic organism infecting a large number of hosts belonging to a total of 361 plant species (Purdy, 1979). It causes severe losses mainly of vegetables in the North Eastern Hill Region, particularly affecting seed production of cabbage, cauliflower, pea, carrot, raddish and mustard. Recently *Sclerotinia* blight has been found to appear in severe form on the late sown mungbean (*Vigna radiata*) and urdbean (*Vigna mungo*) in germplasm screening blocks at the research farm, Gori, of ICAR Research Complex for NEH Region, Arunachal Pradesh, Basar (India) during the *Kharif* season of 1998-99 (in the months of October-November). Although *Sclerotinia sclerotiorum* had been reported on mungbean (*Vigna radiata*) and French bean (*Phaseolus vulgaris*) from Jorhat, Assam (Roy, 1973), there has been, so far, no report of *Sclerotinia* blight of urdbean from India (Sarbhoy *et al.*, 1980; Sarbhoy

*et al.*, 1986; Mukherjee and Juneja, 1974; Bilgrami *et al.*, 1991) and the present report constitutes a new disease record on *Vigna mungo* in India. The present study deals with the isolation of the pathogen, *Sclerotinia sclerotiorum*, its pathogenicity, influence of natural weather parameters for epidemic development and relative susceptibility of the host germplasm entries in our research farm.

### MATERIALS AND METHODS

#### Isolation

The infected mungbean and urdbean plants were brought to the laboratory, small pieces of infected plant parts were taken and surface sterilized with 3% sodium hypochlorite for 5 minutes and subsequently washed with water and incubated on PDA at 25 ± 1°C for 5 days in petridishes. Isolation was made from both the pulse crops.

### *Pathogenicity test*

Seeds of healthy susceptible mungbean (NDM 94-1) and urdbean (NDU 94-6) were germinated in separate earthen pots. Twenty one days old mungbean and urdbean seedlings were inoculated with 10 mm mycelial disc of the pathogen at the collar region and soil of the pots. One pot each of mungbean and urdbean were not inoculated with the test fungus and kept as control. The pots were kept at natural weather conditions with frequent watering. Symptoms on inoculated pots appeared after 10 days. After 20-25 days typical sclerotia were also seen on and inside the host plants tested. Koch's postulates were successfully proved for the pathogen, *Sclerotinia sclerotiorum*.

### *Epidemiological factors*

Meteorological parameters such as temperature, relative humidity (RH), rainfall and number of rainy days were collected from the Centre's Meteorological Station during 1997-1998 and 1998-1999. From the meteorological data, monthly mean values of temperature, relative humidity, rainfall and number of rainy days were calculated and tried to correlate with the occurrence of the blight on the two hosts. The meteorological data of September, October, November and December for 1998-99 as well as for the year 1997-98 were also analyzed to establish the disease outbreak and weather relationship. October and November month of each year were chosen for the analysis of weather data because maximum disease expression was observed during this period. September and December month of each year were also considered to correlate their influence on disease development and decline of the outbreak.

### *Varietal susceptibility*

Mungbean and urdbean entries sown (two rows for each entry at a spacing of 40 cm × 10 cm) in the germplasm-screening block were all recorded to assess their susceptibility to the blight under natural disease pressure during the epidemic year of 1998-99. Severity of the blight on mungbean and urdbean were recorded after appearance of the disease at 15 days interval. Last recording was done when

epidemic was over. Varieties/lines completely damaged and lost from the germplasm stock were also recorded. Repeated test of varietal susceptibility could not be done during 1999-2000 as some of the mungbean and urdbean entries lost from the germplasm stock during 1998-99.

## RESULTS AND DISCUSSION

### *Symptomatology*

The symptoms were more or less same on both the pulse crops. The symptoms first appeared on the stems at the collar region. Then it extended very fast and reached to the leaf petioles, leaves, branches, flower stalks, flowers and pods. Leaves became blighted and hung down. The stems and leaf petioles became rotted very soon and on the onset of dry season, the barks peeled out from the whole plant parts and subsequently infected plants appeared whitish which still remained standing with dropping leaves and pods. Branches, flower stalks, even fruits get blighted at varying intensity during wet period. On the stems and branches sclerotia were found to remain firmly attached. Damaged/rotten pods were filled up with sclerotia. On uprooting, sclerotia were found strongly appressed on root surface upto 2-3 cm soil depth. On splitting, sclerotia of varying sizes were observed in the pith of stems and branches.

### *The Pathogen*

Repeated isolation, purification and identification of the fungus from both the pulse crops revealed that the blight of mungbean and urdbean was caused by *Sclerotinia sclerotiorum* (Lib.) de Bary. Abundant white mycelium was found to develop on host when environmental conditions were congenial and, subsequently, sclerotia were produced externally on affected plant parts and internally in stem pith or inside of pods. Sclerotia in pith were longer (0.6 × 0.4 cm – 5.7 × 0.1 cm) than that (0.2 × 0.2 cm – 0.8 × 0.3 cm) formed on the host surface. However, the longest sclerotia of *Sclerotinia sclerotiorum* so far reported are 3.0 cm (Purdy, 1955). Sclerotia formed inside the pods and stem pith was cylindrical and regular, flat, curved and variable in shape. On maturity, sclerotia

eventually dropped down during harvesting and reached the soil where they remained on the soil surface as a resting structure or were carried with the harvested (plucked) pods. On threshing, sclerotia get mixed with the seeds and remained as admixture with seed lots in storage.

### Epidemiology

Analysis of epidemiological factors revealed that mungbean and urdbean were sown in the month of September, which was 2-3 months late with respect to normal date of sowing under Arunachal Pradesh conditions as farmers usually sow these pulse crops in the month of May/June and harvest them in the month of August/September. Although these fifty six mungbean and forty six urdbean varieties/lines were sown in the same field in 1997-98 the disease did not occur but the same disease occurred in severe form during 1998-99 probably because of exposure of large number of mungbean and urdbean germplasm in the presence of virulent pathogen isolate continuously for two years. Weather parameters during 1997-98 (from September to December) were also favourable and acted as establishment period of inoculums in the field.

**Table 1 :** Meteorological data of September, October, November and December of two crop seasons preceeding and during 1998-99 (epidemic year).

Month	1997-98				1998-99			
	RF (mm)	RD	RH(%)	Temp. (°C)	RF (mm)	RD	RH(%)	Temp. (°C)
September	401.2	20	67.1	24.1 (25.1)*	208.5	11	59.4	22.1 (25.8)
October	53.5	3	58.8	20.9 (22.9)	189.5	5	60.5	20.6 (24.0)
November	88.5	10	64.7	16.3 (19.0)	15.5	2	62.6	16.0 (19.6)
December	43.5	3	70.2	12.6 (14.3)	0.0	0	64.7	12.2 (16.2)

RF = Rainfall, RD = number of rainy days, RH = Relative Humidity

\* Data in parentheses are maximum temperature

Besides, meteorological factors during 1998-99 were probably more appropriate and that might have been contributed to the severe occurrence of the mungbean and urdbean blight in the area during 1998-99. Analysis of meteorological parameters (Table 1) showed that in the epidemic year of 1998-99 specially during October-November average

rainfall was 105.5 mm; RH ranged from 60.5-62.6%, and maximum and minimum temperature ranged from 19.6-24.0°C and 12.4-17.2°C respectively which could have been favoured the severe outbreak of the blight. It was also evident that during October-November of the same epidemic year, there was 2-5 rainy days, which was sufficient for leaf wetness that probably favoured infection. Weather parameters (11 rainy days, maximum and minimum temperature of 25.8 and 18.4°C respectively) and crop stage (seedling stage) in September contributed to the development of the epidemic. In December, the epidemic declined because of no rainfall and lower temperature in 1998-99. Abawi and Grogan (1975) and Tu (1989) also reported that in beans under field condition a free moisture period of 48-72 h was required for establishment of infection by ascospores of the pathogen. Temperature ranging from 19.6-24.0°C was found to be favourable for incubation of sclerotia from which apothecia were to be produced. This is also supported that in general 10-20°C is the optimum temperature for production of apothecia by *Sclerotinia sclerotiorum*, both in the field and laboratory (Lane and Sproston, 1995; Saito, 1977).

**Varietal susceptibility to blight** Fifty six mungbean and forty six urdbean varieties/lines were sown in separate germplasm screening blocks. Both the pulse crops suffered heavily from blight and mortality was more than 90% in some of the entries. Almost all the mungbean and urdbean varieties/lines were susceptible to the blight. Blight severity was highest in urdbean and out of 46 urdbean varieties/lines 12 varieties/lines (Table 2) did not survive at all and lost from the germplasm stock. Among the mungbean varieties/lines 8 entries could not tolerate the havoc of the disease and completely destroyed.

**Table 2 :** Mungbean and urdbean varieties/lines completely damaged due to *Sclerotinia sclerotiorum* blight.

Corps	Varieties/ lines heavily damaged and lost from germplasm stock
Mungbean	NDM 94-1, MGG 347, TM 97-55, AKM 9303, VGG 20, MGG 348, HUM 6 and KM 2138.
Urdbean	RU 9401-2, UPU 97-10, KU 96-3, URD (WBU-111), KU 310, HK 92-94, NDU 94-6, UG 774, VBG 55, KU 1-1, TU 97-23 and TU 97-81.

The present study reported the severe occurrence of *Sclerotinia sclerotiorum* blight on mungbean and urdbean, of which blight of urdbean is a new report in India. The pathogen was also found to produce longest sclerotia ( $5.7 \times 0.2$  cm), which have not been reported so far in any host. The epidemic outbreak of the blight on mungbean and urdbean emerged probably because of late sowing and the presence of virulent isolate of the pathogen in this area in addition to the exposure of large number of germplasm under favourable climatic (RH-60.5-62.6%, maximum and minimum temperature of 19.6—24.0°C and 12.4—17.2°C respectively, and average rainfall 102.5 mm) conditions. All the germplasm were susceptible to the disease but 12 entries of urdbean and 8 entries of mungbean could not tolerate the aggressiveness of *Sclerotinia sclerotiorum* and became lost from the genetic stock.

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