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Screening of Soybean Genotypes against Collar Rot using Direct Soil Application Method

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A B S T R A C T

The present investigation was carried out at the greenhouse of the Department of Plant Pathology, AAU Jorhat during 2018 to study the disease reaction of 15 genotypes of Soybean against Collar rot caused by *Sclerotium rolfsii*. The genotypes were screened for their resistance against Collar rot using direct soil application method. The results showed that no genotypes were found to be immune or completely resistant. PS1347, BRAGG, JS335 however showed moderate resistance against collar rot.

Introduction

Among the various legumes and oilseed crops, soybean [*Glycine max* (L.) (Merrill)] promises to be an important crop of the family Fabaceae. It has highest protein (42%), 20 per cent oil, rich in lysine and vitamins A, B and D. However, the crop suffers from various production constraints the most serious being diseases. Among all the diseases found in soybean, Collar rot caused by *Sclerotium rolfsii* is worth mentioning.

Collar rot caused by *Sclerotium rolfsii* Sacc. takes place during seedling stage and causes heavy losses resulting in uneven stand of the crop. The initial symptom of collar rot of soybean was recorded on the leaves in form of slight paleness followed by yellowing of leaves and loss of vigour of the plant. Infection usually occurs at the collar region as brownish black discoloration. In advanced stage the leaves shed off, turn brown and dry and often cling to dead stem.

The mycelium of the pathogen grows over the diseased tissue surrounding the soil forming a white mat of mycelium thread.

Numerous tan to brown spherical sclerotia form on the infected plant material (Belkar and Gade, 2013). Developing disease free genotype is very important in any crop improvement programme and hence the present study was conducted to screen15 soybean genotypes against collar rot.

Materials and Methods

Seeds of the 15 varieties were collected from AICRP on Soybean. Planting materials were generated in the sterilized soil in seed trays inside the green house of the Department of Plant Pathology, Assam Agricultural University (Plate.1).

Pure culture of the fungus was collected and it was maintained throughout the period of investigation on PDA slants by subsequent periodical sub-culturing and storing at 4°C in refrigerator (Plate.2).

For the preparation of suspension culture of the pathogen 24 g PDB was taken in 1 litre distilled water and then heated in the oven until it thoroughly mixed. The hot solution was then poured in 20 numbers of 250 ml conical flask which were kept sterilized.

The conical flasks were plugged tightly with non-absorbent cotton and autoclaved at 15 lb. pressure per square inch for 20 min.

The conical flasks were then inoculated with the spores of *Sclerotium rolfsii* (Plate3). After 30 days the medium flasks were found to be covered with white mycelium. This culture was used for inoculation.

The 30 days old suspension culture of *Sclerotium rolfsii* was applied to the soil in the seed trays @15 spores /holes to the eight days old seedling (Plate4). The trays were moistened with water regularly for establishment of the pathogen.

Screening of seedlings against *Sclerotium rolfsii*

The disease severity was scored on 0 to 9 rating scale on 8th day after inoculation (Table 1) and the cultivars were classified into different grades(table 2) (Konde *et al.,* 2017).

Results and Discussion

In the present study White, fanlike mat of fungal mycelium forms on stem bases around infected plants. The mycelial mat was observed several centimetres up the stem above the soil line. Light brown lesions, which quickly turn dark and enlarge on the hypocotyls/stem was observed. Numerous white (immature) tan to brown, spherical sclerotia, about the size of mustard seeds, form on infected plant material and the plants were finally found to be dead. Similar symptoms were also reported by Wilson (1953), Wheeler (1969) and Borah (2019). Based on the Mortality % of different genotypes of soybean (Fig 1) the genotypes were classified into some distinct classes (Table.3).

The data presented indicate that none of the entry was free from collar rot. The entries PS1347, BRAGG, JS335 showed moderately resistant reaction (Plate5), entries DS3109, NRC146, SL1191, GJS3, NRC139, JS9305 showed susceptible reaction and entries PS24, Dsb33, JS21-72, AUKS176, DS3110, RSC11-15 showed highly susceptible reaction to disease under artificial inoculated condition. In a similar experiment Agarwal and Kotasthane (1971) screened the 25 soybean varieties against collar rot disease. Out of which nine entries exhibited resistant reaction while 12 entries showed a moderately resistant reaction.

The findings contributed to the screening of some soybean genotypes which shows moderate resistance against *Sclerotium rolfsii* which causes collar rot in soybean. This will be helpful for future research concentrating on crop improvement and development of resistant genotypes against collar rot which in turn will be helpful in increasing the cultivation of Soybean in non-traditional areas like Assam.

Table.1 Scale used for screening different soybean cultivars

Rating	Description
0	No mortality
1	1% mortality
3	1.1 to 10% mortality
5	10.1 to 25% mortality
7	25.1 to 50% mortality
9	More than 50% mortality

Table.2 Based on disease score cultivars were grouped as

Disease score	Quantitative Grade	Reaction
0 to 1	Immune	I
>1 to <3	Resistant	R
>3 to <5	Moderately Resistant	MR
>5 to < 7	Susceptible	S
>7 to 9	Highly Susceptible	HS

Table.3 Classification of genotypes into grades based on mortality %

Genotypes	Quantitative grade
PS24	HS
NRC139	S
DS3109	S
Dsb33	HS
SL1191	S
JS21-72	HS
NRC146	S
AUKS176	HS
PS1347	MR
GJS3	S
RSC11-15	HS
DS3110	HS
BRAGG	MR
JS335	MR
JS9305	S

Fig.1 Mortality % due to collar rot in different genotypes

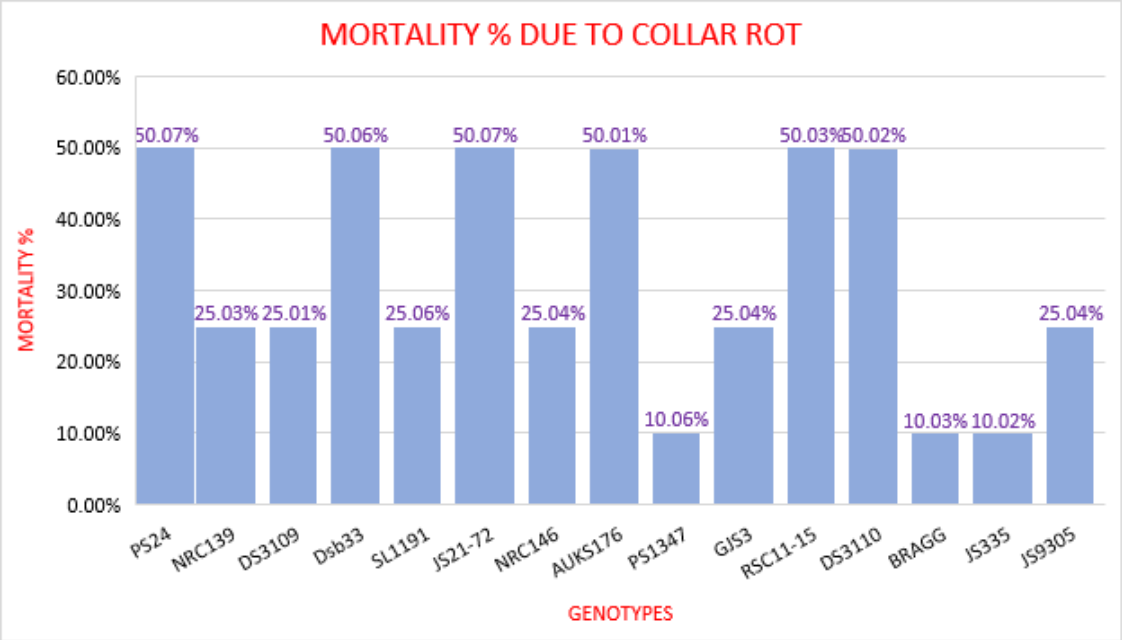

Plate.1 Generation of Planting materials and initiation of seedlings

Plate.2 Pure culture of *Sclerotium rolfsii* on PDA slant

Plate.3 Preparation of suspension culture of S*clerotium rolfsii*

Plate.4 Eight days old seedlings growing on sterilized soil to which suspension culture was applied

Plate.5 Moderately resistant variety (BRAGG) less affected by the pathogen

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