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Survey for the disease incidence of root rot of sesame caused by *Macrophomina phaseolina* (Tassi.) Goid, in major sesame growing areas of Telangana

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Abstract
A roving survey was conducted during summer 2017 in major sesame growing areas of Telangana to record the occurrence and distribution of root rot of sesame in ten mandals of the three major sesame growing districts of Telangana. Maximum mean dry root rot incidence was observed in Nirmal district (11.98%) followed by Nizamabd district (6.78%), The highest disease incidence of 15.00% was recorded in Babapur village of Nirmal district and least disease incidence of 2.50% was recorded in Korutla village of Jagtial district. Disease was more prevalent in sandy loam soil areas followed by clay loam and minimum in clay soil areas. Disease incidence was also higher in areas where farmers used susceptible varieties (VRI-1 and private variety) without seed treatment and in areas where irrigation was less frequently given.

Keywords: Sesame, root rot, *Macrophomina phaseolina*, Survey

Introduction
Sesame seeds and its oil are is in high demand for export as Sesame seeds are a good source of dietary protein, with high-quality amino acids making up 20% of the seed. And it is also endowed with biologically active and health promoting phytochemicals such as sesamin, sesamolin, tocopherols, PUFA, phytosterols, phytates and other phenolics (Pathak *et al*. 2014) [9]. Sesame seeds contain magnesium which has anti-cancer properties. They also contain Potential health benefits of sesame include anti oxidative, anticancer, anti-hypersensitive and anti immunoregulatory actions (Reshma *et al*. 2012) [10].
Sesame root rot/stem rot caused by *Macrophomina phaseolina* (Tassi.) Goid (= *Rhizcotonia bataticola*) is one of the important disease as it reduces the crop yield to a greater extent in sesame growing areas especially in summer season and in high temperature areas. Carrying out plant disease survey to know the disease intensity and severity helps in prioritizing research work, In view of the importance of the crop and disease, the present work is planned to carry out survey for the disease incidence of *Macrophomina phaseolina*, in major sesame growing areas of Telangana.

Materials and Methods
A roving survey was conducted during 2017 summer season in major sesame growing areas of Telangana to record the occurrence and distribution of root rot of sesame in ten mandals of the three major sesame growing districts of Telangana. The locations in each district were selected randomly. The number of fields visited per district ranged from 20 to 30 and a distance of 15 - 20 km was allowed between each field. A total of 60 fields covering 3 districts were surveyed and information on soil type, cultivars grown, disease incidence and agronomic practices followed were recorded.
Four $1m^2$ quadrants were randomly selected in each field and infected plants were counted in each quadrant. Based on infected and total number of plants, disease incidence was calculated (Belkar and Gade, 2016) [1]. Sesame plants showing the typical dry root rot symptoms were collected from surveyed areas, packed in labeled paper bags and brought to the laboratory for isolation of the pathogen.

$$\text{Percent disease incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants}} \times 100$$

Results and Discussion

Occurrence and distribution of root rot of sesame in major sesame growing areas of Telangana

A roving survey was conducted during 2017 summer season in different major sesame growing areas of Telangana to assess the status of root rot incidence of sesame and to collect diseased samples infected by *Macrophomina phaseolina* under field conditions. Survey was carried out in ten mandals of the three major sesame growing districts of Telangana. A total of 60 fields covering 3 districts were surveyed and information on soil type, cultivars grown, disease incidence and agronomic practices followed were recorded. The data pertaining to survey is given in Table 1.

Diseased plants with characteristic disease symptoms were observed from the root rot infected sesame fields. The typical symptoms of root rot appeared on stems and roots of the infected sesame plants. In seedling stage, the roots became brown and rot resulting in death of the whole plant and dark cortical lesions were formed near the collar region on stem in the beginning showing brown discoloration rapidly, these lesions increased in size from few mm. to few inches.

In advanced stage, the lesion extended upward and downward. Slowly, the whole plant became brown coloured and small dot-like black pycnidial structures containing fungal spores were seen on stem, branches, capsules and seeds (Plate 1 and 2). The affected plants showed general yellowing, drooping of leaves and ultimately death of the plants at pre-mature stage. When infected plants were carefully uprooted, black coloured roots were observed. Decay of the secondary roots and shredding, brittleness of the cortex of the taproot were recorded.

It is evident from the Table 1. that the mean maximum dry root rot incidence was recorded in Nirmal district (11.98%) followed by Nizamabad (6.78%) and Jagtial (5.90%). The highest disease incidence of 15.00 per cent was recorded in Babapur village of Nirmal district and least disease incidence of 2.50 per cent was recorded in Korutla village of Jagtial district.

Sesame root rot disease was more prevalent in sandy loam soil areas followed by clay loam and minimum in clay soil areas. Disease incidence was also higher in areas where farmers used susceptible varieties (VRI-1 and private variety) and in areas where irrigation was less frequently given which indicates that *Macrophomina phaseolina* flourishes well and causes more damage to plants when there is less availability of soil moisture.

Above results obtained in the sesame root rot disease survey in farmers fields are in agreement with the findings by earlier workers. Krishan *et al*. (1999) [5], Gill-Langarica *et al*. (2008) [4], Kumar and Sharma (2010) [6], Sagr *et al*. (2010) [12] and Muchero *et al*. (2011) [8] also reported that *Macrophomina phaseolina* causes much higher damage to crop plants in moisture deficit soils.

Chand and Khirbat (2009) [2] observed that the disease is favored by drought and high soil temperature. Sharma and Pande (2013) [13] reported that a combination of high temperature (35°C) and soil moisture content (60%) predisposes chickpea to dry root rot caused by *Macrophomina phaseolina.*

Dinakaran and Mohammed (2001) [3] reported that susceptible varieties of sesame *viz.*, TMV 3, Co 1 and VRI 1 recorded the maximum incidence of 66.7, 70.0 and 91.7 percent disease respectively.

Mallaiah and Krishna Rao (2016) [7] observed high incidence of dry root rot of green gram in sandy loam (11.1%) followed by sandy clay loam (8.1%) and least in clay soils (4.3%). Similar results were obtained by Tyagi *et al*. (1988) [14] and Rettinassababady and Ramados (1999) [11] in chick pea and black gram respectively.

Since *Macrophomina phaseolina* is a soil borne pathogen, its activity depends on available free oxygen in soil. A competition between plants and microorganisms arises during seed germination. Sandy soils with more number of macropores have the capacity to hold adequate air though they are poor in water holding capacity (Baver *et al.*1962) [1] compared to clay soils. This might be the probable reason for high percentage of dry root rot incidence in sandy loams when compared to clay loams.

Table 1: Detais of Survey on occurrence and distribution of root rot of sesame in major sesame growing areas of Telangana.

Sl. No	District	Mandal	Location	Previous crop	Cultivar	Seed treatment	Soil type	Irrigation frequency/ number of irrigations	Percent disease incidence	
									Range	Average
1	Jagtial	Jagtial	Polasa	Turmeric	VRI-1	No	Clay loam	3	5-11	9.40
2		Jagtial	Kalleda	Turmeric	Local	No	Clay loam	3	4-8.5	7.60
3		Jagtial	Chinnapur	Turmeric	Local	No	Clay loam	4	5-7	6.80
4		Jagtial	Anthargao	Turmeric	Local	No	Clay	4	2-7	5.80
5		Jagtial	Lakshmipur	Turmeric	Local	No	Clay	4	3-7	6.20
6		Raikal	Raikal	Turmeric	Local	No	Clay	4	2-6	4.00
7		Medipallli	Medipallli	Sorghum	Local	No	Clay	3	3-7	5.60
8		Korutla	Korutla	Turmeric	Local	No	Clay	5	0-4	2.50
9		Metpally	Metpally	Turmeric	Local	No	Clay	3	2-6	5.30
Mean									0-11	5.90
10	Nizamaba0d	Morthad	Morthad	Turmeric	Local	No	Clay	4	2-6	3.40
11		Armor	Armor	Turmeric	Local	No	Clay	3	2-7	4.30
12		Balkonda	Bussapur	Turmeric	Local	No	Clay loam	3	3-8	6.70
13		Balkonda	Renjarla	Turmeric	Private Var	No	Sandy loam	2	8-12	11.40
14		Morthad	Donkal	Sorghum	Local	No	Clay loam	3	5-9	8.00
15		Balkonda	Balkonda	Turmeric	Local	No	Clay loam	3	4-9	7.10
16		Balkonda	Anksapur	Turmeric	Local	No	Clay	4	3-8	6.60
Mean									2-12	6.78
17	Nirmal	Mamda	Mamda	Sorghum	Local	No	Sandy loam	2	9-13	11.00
18		Mamda	Parimandal	Turmeric	Local	No	Clay loam	3	8-12	10.40
19		Lakshmanchanda	Babapur	Turmeric	Swetha	No	Sandy loam	1	10-17	15.00
20		Lakshmanchanda	Narsapur(w)	Turmeric	Local	No	Sandy loam	2	11-13	12.00
21		Lakshmanchanda	Waddyal	Sorghum	Swetha	No	Sandy loam	2	9-13	11.50
Mean									8-17	11.98

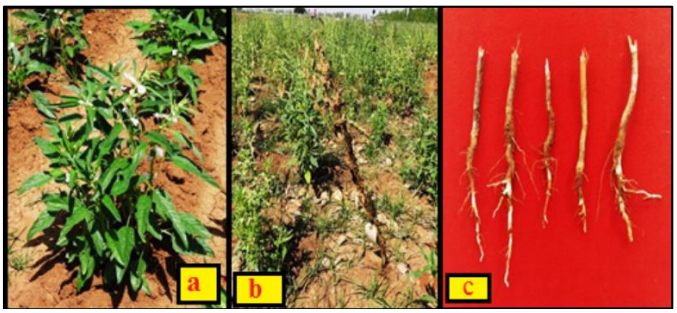

Plate 1: a: healthy plant b: diseased plant at maturity

Plate 2: Black coloured sclerotial bodies on pod (left) and on stem portion of the diseased plants

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