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SHORT COMMUNICATION

Symptomatological study of Stem and Root rot of Sesame

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Sesame (*Sesamum indicum* L.) is the oldest cultivated oil seed crop, plays an important role in human nutrition . Among the biotic factors responsible for low yield, Stem and Root rot or Charcoal rot disease caused by *Macrophomina phaseolina* is the most prevalent and important disease in Odisha. The first initiation of symptom in seed resulted in seed rot, poor seedling stand, pre and post emergence damping off and reduced vigour. The pathogen gradually affected the fibro-vascular system and base internodes resulting in water scarcity leading to loss of vigour, progressive wilting and premature dying. The growth of secondary root system was reduced to a great extent. The root system as a whole was poorly developed in diseased plant. Some other prominent symptoms such as seedling blight, damping off and stem rot was observed. The characteristic symptom appeared after flowering as browning to grayish discoloration of the plant and hallowing of the stem resulting in reduction in stem girth and height of the plant. Finally the whole plant withered giving blackish appearance due to death of the plant and presence of numerous microsclerotial bodies.

Key words: *Macrophomina phaseolina* , sesame, stem and root rot

INTRODUCTION

In Odisha, sesame is generally grown in all most all districts during *rabi* season whereas in some districts in *kharif*. Mainly it is grown in Ganjam, Angul, Sundergarh, Dhenkanal, Raygada, Subarnapur, Bargarh and Bolangir. It produces 85.85 ('000 MTs) from 212.85('000ha) area with a productivity of 403 kg/ha. Stem and root rot is one of the important diseases in Odisha condition causing 25-30% economic loss. Generally sesame plant produces a much branched, erect stem and bushy type of root system. Due to the disease incidence, the anatomy of the plant changes. The investigation has been carried out to study the symptomatology of stem and root rot disease in detail.

For studying the incidence of stem and root rot disease of sesame , necessary steps were taken to conduct the survey work at different zones of Odisha. In order to study symptomatology, frequent visit to sesame field and close observation of inoculated plants was done to find out the incidence, effect of pathogen and symptom produced by it at all stages of plant growth from sowing to harvesting showing symptom as seed rotting to plant withering at matured stage. A comparative study on symptomatology of healthy and diseased plant was undertaken just after uprooting and subsequent splitting of stem and roots. For the purpose, five healthy and five diseased plants were randomly collected from different place of a field and the root length, stem girth, height and density of roots were properly studied.

Symptoms of disease as observed under field condition at different growth stage are presented below.

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Table 1 : A comparison of anatomy of plant in healthy and diseased plant

Plants	Root length (cm)		Stem diameter(cm)		No of roots		Root length(cm)		Plant height (cm)		Girth of transition zone(cm)	
	H	D	H	D	H	D	H	D	H	D	H	D
1	12	10.9	1.12	0.86	48	31	4.5	3.2	125	115	6.5	4.9
2	15	9.5	0.7	1.06	52	24	5	2	138	86	5.1	5.2
3	17	16.5	1.2	1.03	59	22	5.6	2.9	135	127	5.3	4.0
4	14	12.5	1.3	0.93	42	20	4.5	2.2	130	98.5	5.1	5.5
5	13	15.0	1.8	0.9	39	18	5.3	2.7	124	105	4.5	4.4
Mean	14.2	12.88	1.22	0.96	48	23	4.93	2.6	130.4	106.3	5.3	4.8

H- Healthy ; D- Diseased

The first symptom started with the rotting of seeds after sowing. Few days after germination the stems became brownish, thin wire like and topple down from that point though the upper portion was green. Later the whole plant exhibited wilting and browning leading to death of the seedling. This pre and post emergence damping off symptom led to poor plant stand in the field.

In later stage in standing crop the fungus again attacked plants. The infection started with a small dark coloured lesion on the stem which increased in size and girdled the stem. It turned black in colour and spread to whole stem portion heading towards top. The blackening was spread in both directions. The weak and unhealthy seedlings were more vulnerable to attack of the pathogen. The whole plant was found quickly infected, lost vigour and dried out. In some cases, the diameter was reduced in the diseased plant(0.96cm) than healthy one(1.22 cm). In advance stage, the lesion became ashy coloured with black dots on it. In severe case, the stem was unable to support the heaviness of foliage due to weak stem and broken down from the affected part. When an infected stem was splitted the vascular bundle was found hollow and blackening of the internal tissues. Sometimes sclerotia were seen inside the stem. Infected seed and presence of sclerotia in soil also infected the root portion through wound and spread into the host. The root length of infected plant (12.88 cm) was found to be shorter than healthy ones (14.2 cm). The tap root was longer but the secondary roots were less in numbers than the healthy ones The roots were black and dry root rot symptom also seen in some cases.

Due to malfunctioning of conduction process, symptoms were observed in leaves also. It started with yellowing of lower leaves, dropping and defoliation. When the disease spread from the stem to the leaves via petioles, the infected leaves were found discoloured and rotting. In severe case the whole leaf was darken and possessing small dot like black sclerotia.

It was observed that, plant was infected during flowering and capsule formation stage leading to brownish to black discolouration and rotting of the capsules. The capsules were open prematurely exposing shrivelled seeds.

Due to infection the seeds became shrivelled and discoloured making it unmarketable. Infected and healthy seeds were indistinguishable by naked eye. The infected seeds carried the pathogen in testa and spread disease to next season causing seed rotting. Sclerotia were also found adhering to the seed surface. As the diseased capsule open up prematurely, sometimes diseased seed fell it in the soil and worked as source of inoculum for next season.

Over all, in severe case the whole plant was found to be infected by the pathogen. As a result, the plants were poor in growth and stunted. The height of plants were also found shorter (106.3 cm) as compared to healthy (130.4 cm) ones and girth of the transition zone found to be reduced (4.8 cm) against 5.3 cm recorded from healthy plant.. Plant appeared as burning giving black coloration throughout the plant parts. The infected plants were easily pulled out. Sudden death of plants were found in patches. Examination of affected parts revealed a dry rot with many tiny black sclerotia distributed throughout the wood and soft tissues.

The result of present study (Table 1) supports the

findings given by many earlier workers. *Macrophomina phaseolina* caused typical wilting with dry root rot associated with discoloration of infected tissues due to sclerotial formation. Normal germination from seeds occured first in infected seed, then seedling deterioration followed by abundant pycnidia formation which also in agreement with the present investigation (Abdou *et al,* 1980 a,b) . Singh *et al,* (1982) reported that after 8 weeks, almost every surviving plant developed pale yellow to brown circular or oval concentric spots on leaves, stem and capsules. Mycelium and microsclerotia were observed in the peripherial region of lesions. Inter and intracellular mycelium was demonstrated in cortex, xylem and pith cells. Infection in the capsule was recorded on inner wall, septum, placenta and seed spreading from base to apex which is corroborating the present report. *M.phaseolina* colonized the host surface in the hypocotyl region, penetrated the host by forming infection cushions and then pegs. The fungus employed both mechanical as well as biochemical mode of infection as evident from the present finding. Examination of affected parts revealed a dry rot, with many tiny black sclerotia distributed throughout the wood and softer tissues. The fungus could also caused hallow stem, root rot, pre-emergence and post-emergence damping-off which is also supported our findings. According to Maiti *et al* (1988), it attacked mostly the basal portion of plant but it is not so in all the cases.

Ahmad and Saidaei (1988) reported that, the fungus caused seedling rot, stalk rot, root rot, charcoal rot and blight in sesame which also supports the present findings.

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