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Symptom types in rice plants infected with *Rhizoctonia solani* Kuhn.

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Rice plants may be infected with *Rhizoctonia solani* at any stage of growth, seedling to flowering, from different sources of inoculum. Depending upon the source of inoculum and host growth stage different types of symptoms may be produced, of which sheath blight is most prominent and common. Other symptoms produced are pre and post emergence seedling blight, banded leaf blight, panicle infection and spotted seed.

Key words : Rice plants, *Rhizoctoma solani*, sheath blight, symptom types

INTRODUCTION

Sheath blight caused by *Rhizoctonia solani* Kuhn is one of the most serious and destructive diseases of rice (*Oryza sativa* L). Although sheath blight is the most prominent symptom observed in mature plants generally after transplanting, various other symptoms caused by *Rhizoctonia solani* on rice plants at different growth stages of the host are often overlooked. Detailed symptoms on rice plants due to infection of the crop at different growth stages with *Rhizoctonia solani* and the possible sources of infection were studied, an account of which is presented in this paper.

MATERIALS AND METHODS

Symptoms of the disease was studied both in the field and also on plants grown from seeds or seedlings in artifically unoculated soil in pot cultures. Soil inoculation was done by multiplying the fungal inoculum (isolate No. R. 12) in sterilized sand maize meal medium and thoroughly mixing the inoculum @ 5% (W . W) with air dried, pulvarized soil in 20 X 15 cm diameter earthen pots or by placing pieces of sheath blight infected plant pieces (2.5-3 cm long) at a depth of 5 cm in potted soil. Seeds or seedlings (10 day old) of susceptible rice cultivar, "Swarna mashuri", surface sterilized in sodium hypochlorite solution, were sown in inoculated soil @ 25 seeds or 6 seedlings per pot respectively. Seeds or seedlings sown in uninoculated soil served as control. Older plant (50 day old) in pots (6 plants / pot) were inoculated with pieces of infected rice straw as per the method of Ou (1985). For observing the symptoms on seedlings grown from infected seeds (spotted seeds) collected from *R. solani* infected panicles collected from the field (the seeds yielded *R. solani* on water agar plates) were sown in potted soil @ 25 seeds per pot. Seeds collected from disease free plots served as control.

RESULTS AND DISCUSSION

Since sheath blight is the most commonly visible symptom caused by *R solani* on rice, particularly on the older plants, emphasis by various workers has been given and studies have mainly been undertaken on the basis of this symptom. But thorough surveys in some rice fields in the districts of

Nadia, Hooghly and Coochbehar and inoculation experiments undertaken in pot cultures. it has been observed that besides sheath blight various other symptoms are caused by *R. solani* on rice plants. Rice plants may be infected at any growth stage, seedling to grain formation, and depending upon the host growth stage and source of inoculum different types of symptoms may be produced (Table 1and Fig.1a-1f). When infected seeds are used, pre or post imergence seedling blight is quite common. The symptoms may be easily confused with those of the brown spot caused by *Drechslera oryzae*. Sowing of healthy seeds in *R. solani* infested soil also results in seedling blight here the affected seedlings appeared in patches.

Table 1. Symptom types on rice plants caused by *R solani* at different stages of plant growth

Symptom type	General Symptoms	Host growth stage	Source of incoculum
Pre-and post emergence seedling blight	When infected seeds are sown in soil, the seeds may fail to germinate or the emerging radicle may rot before the plumule emerges above the soil surface. The seedlings which have emerged show blight symptoms on the upper most leaves. Gradually the lower leaves also become blighted and the seedlings ultimately collapse (Fig. 1a).	Seedlings (15-20 days) (Cv. Swarna Mashuri-pot culture)	Infected seeds
Seedling blight	Seeds sown in heavily infested soil show blight symptoms of the outer most sheaths and leaves when the seedlings are about 15 day old. Gradually the inner and upper sheaths and leaves are also blighted and ultimately the seedlings collapse (Fig. 1b).	Seedlings (15-20 days) (Cv. Swarna Mashuri-pot culture)	Infested soil
Sheath blight	Lesions first appear on the leaf sheaths near the water line or the lower sheath in the upland crop. The lesions are first water soacked circular to oblong, ellipsoid or oval, 3-4 cm. The centre is greenish grey to greyish white with a narrow dark brown margin. Finally 4-5 such lesions coalesce and girdle the whole leaf sheath, usually causing death of the whole leaf and in severe cases all the leaves of a plant may be blighted in this way. Sclerotia appear loose among fine silvery threads of mycelium about 6 days after appearance of lesions on or near the leison or on or between the leaf sheaths (Fig. 1c).	Mature or transplanted plants at mid ro late tillering stage (Cv. Swarna Mashuri)- rice field at RRF, B.C.K.V., Chakdah)	Sclerotia perennating in soil
Banded blight of leaf	A series of chacracteristic coppery bands appear across the lesion and the symptom is called banded blight (Fig. 1d).	Do (Cv. IR50-Univ. Res.Farm Coochbehar)	Basidiospores from *Thanatephorus* state(probably)
Flag leaf blight spread	Blight occurs on the upper most leaf sheath enclosing young panicles. Early lesions are ellipsoid or oval, greenish grey to greenish white with a deep brown margin. Sclerotia of the fungus on or near the affected area are easily detected (Fig. 1e).	Booting state (Cv. Ratna-pot culture)	Vertical from infection on lower sheaths
Spotted and chaffy grains	Infected grains show dark brown, more or less circular to oval spots. A number of grains become chaffy (Fig. 1f).	Earhead emerging state (Cv. Ratna) pot culture)	Infected flag leaf sorrounding the panicle

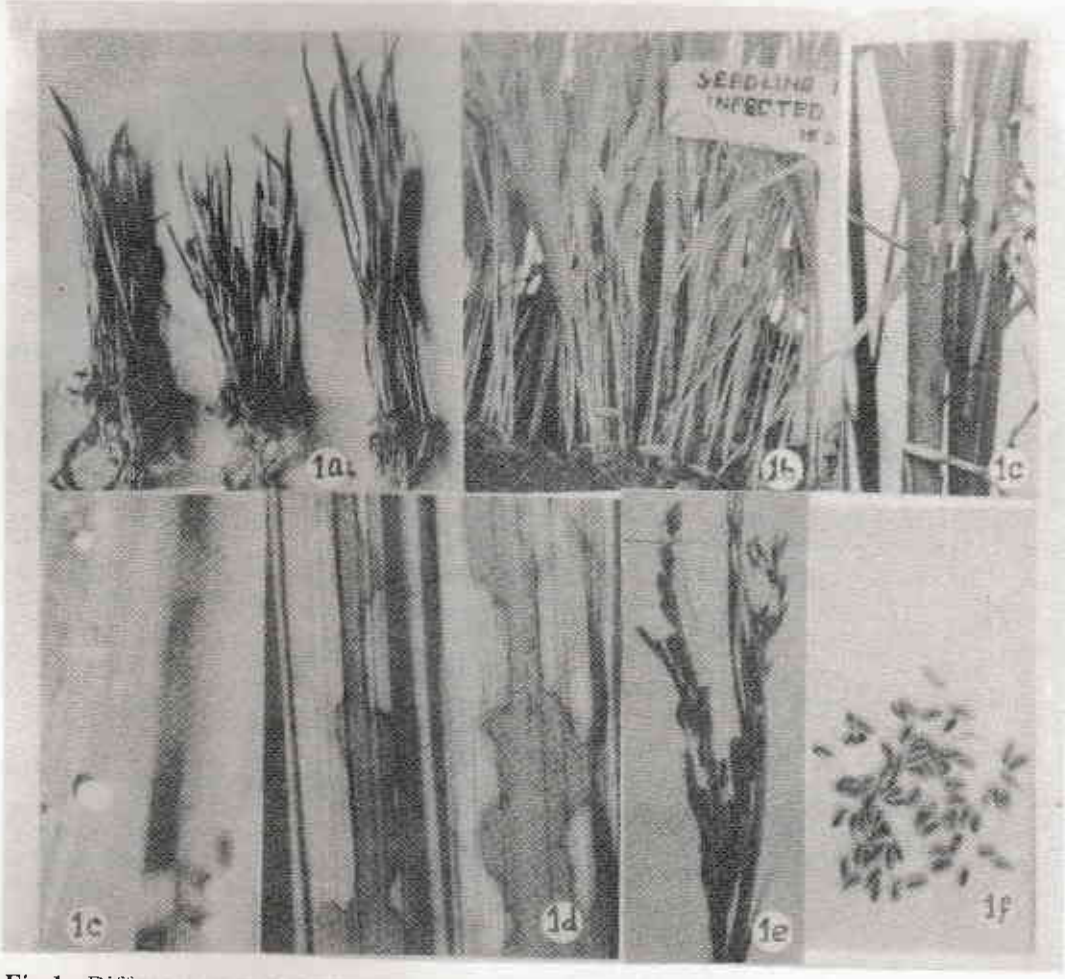

Fig.1. Different types of symptoms on rice plants caused by R. solani infection : Ia), seedling blight from infected seeds; (Ib), seedling blight from infected soil; (Ic), sheath blight & sclerotia formation; (Id), banded leaf blight; (Ie), flag leaf blight / panicle blight; (If), spotted seeds.

The most prominent symptom on mature plants after transplanting (mostly at mid or late tillering stage) is sheath blight. The plants are generally infected by sclerotia of the fungus perennating in the field soil. The sclerotia are raised to the soil surface during the process of land preparation and come in contact with the lower sheaths of the host by irrigation water thus initiating infection (Ou, 1985). In a rice field at the University Farm, Coochbehar, banded leaf blight symptom has been observed on mature plants.

Such symptom, according to Saksena (1973), is caused by the air borne basidiospores of the perfect state (*Thanatephorus cucumeris*). Recently, *Thanatephorus* state has been observed in some rice fields in Coochbehar by one of the authors (A.B.)

Panicle blight has been observed in susceptible cultivars in pot cultures conducted at Kalyani. Symptoms of seed infection consisted of deep brown spots on the grains and chaffy grains. The symptoms are somewhat similar to those produced in brown spot of rice. Seksena (1973) suggested that panicle and seed infection are caused by basidiospores of *T. cucumeris*. However, in surveys conducted during the last 6 years in the rice fields of the districts of Nadia, 24 Parganas and Hooghly,

Thanatephorus state of the fungus was not noticed in these areas, although seed infection was observed in susceptable cultivers in some fields. Basu and Sen Gupta (1992) reported a positive correlation between flag leaf blight and seed infection. Sarkar *et al.* (1993) also observed vertical spread of infection upto the flag leaves in susceptible cultivars and suggested that panicle and seeds may have been infected by contact with infected flag leaves during panicle emergence. Singh *et al.* (1988) produced panicle blight symptoms in rice plant by spraying fragmented mycelia of *R. solani*. The observation seems to confirm the findings of Sarkar *et al.* (1993).

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