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Research Note

SALIENT RESARCH FINDINGS ON RICE STEM ROT DISEASE (*Sclerotiumoryzaecatt.)* AND ITSMANAGEMENT

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Stem rot caused by *Sclerotiumoryzae* Catt., which was considered as a minor disease earlier, is now one of the major [1] constraint in rice cultivation in East Godavari, Warangal and Khammam districts of Andhra Pradesh (A.P). In A.P the disease is occurring in moderate to severe form in both *Kharif* and *Rabi* seasons.

Survey studies conducted in the rice growing districts of Andhra Pradesh, revealed that incidence of stem rot disease varied from field to field (0 to 15%) in the surveyed districts of Khammam and Warangal. The field symptoms varied with varieties grown under different locations. At field level the symptoms were characterized by presence of irregular olive green to dark colour lesions without any definite border or shape. Attack on the stems increases in its intensity as the crop nearing to maturity. Weakened stalks showed more sloughning leading to complete rottening of stems exhibiting jet black colour of bottom portion of hill with obnoxious odour emitting particularly from infected roots. Similar type of field symptoms were reported by several workers [1,2,3,4] on rice infected with *Sclerotiumoryzae*.

The disease incidence was highest on cv. MTU 1061 (14.8%) followed by WGL 14 (13.7%), MTU 1075 (13.6%), BPT 5204 (10.0%), MTU 1010 (8.7%), MTU 1001 (8.6%), WGL-14 (7.7%), JGL 384 (7.2%), MTU 1078 (3.2%), NP 360 (2.7%), RNR 2465 (2.5%), NLR 34449 (2.5%) and PT 1042 (2.5%) at all the locations during the survey. High disease incidence (13.1%) was recorded in late transplanted crop (September 8-24) followed by August 8-21 (8.1%) and July 8-24 (2.7%) transplanted crop. The crop sequence played an important role in reducing the disease incidence. Maximum stem rot incidence (14.8%) was recorded in rice-rice followed by rice-groundnut (3.8%), rice-maize (2.8%) and sunhemp-rice-maize-vegetables (2.1%). Similarly, highest disease incidence was found in clay loam soils (14.1%), followed by clay soils (8.7%), loamy soils (7.9%), while lowest incidence of stem rot was noted in fields with sandy soils (2.7%) and sandy loam soils (2.6%). The fields fertilized with 151-180 kg N ha^{-1} showed highest disease incidence (11.1%) followed by 120-150 kg N ha^{-1} (8.1%) and 100-120 kg N ha^{-1} (2.6%). Maximum disease incidence of stem rot was recorded in the fields which received pretilachlor (7.9%) as compared to the fields received butachlor (2.6%). Maximum disease incidence of stem rot was recorded in the fields which record pretilachlor (7.9%) as compared to the fields recorded butachlor (2.6%). Comparatively higher incidence of stem rot was noticed in fine grain type cultivars (BPT -5204, WGL 14, WGL 44) of rice than the medium slender / coarse grain types (MTU 1010, MTU 1001, JGL 384, RNR 2465, NLR 34449, NP 360).

The causal organism was isolated from the infected stem of the plant samples and pure cultures of the fungus revealed its identity as *Sclerotiumoryzae*. The fungus *Sclerotiumoryzae* was repeatedly isolated from all the locations. Pathogenicity test conducted *in vitro* confirmed their association with disease by showing similar type of symptoms as observed in field expect with less sloughning of the plant.

Based on the morphological and cultural characteristics, the fungus associated with the disease was identified as *Sclerotiumoryzae* Catt. The pathogen formed distinct white colonies and also produced abundant globose, dark colored sclerotia from the fourth day onwards, which were initially white in colour, later turned to reddish brown and then dark brown to almost black with spherical shape measuring 418 (185-685) x 355 (165-545) µm in size.

The symptoms expressed by test cv. MTU 3626 in pathogenicity studies revealed that the affected leaf sheath turned straw colored from the tip downwards and finally hang downwards. The culm of the affected plants discolored to black and rotten, upon opening of infected stems, dark grayish mycelium was observed in the hollow stem along with numerous tiny black sclerotia embedded in all the diseased leaf sheaths of stem. As the disease progressed the leaves of affected sheaths dehydrated, wilted, lost color and fully droop down. Drying of leaves was noticed from bottom to upward. Sclerotia were clearly seen in affected sheaths when viewed against sunlight and observed under a dissecting binocular microscope through transmitted light. Till flowering and grain formation stage, the pathogen was usually restricted to leaf sheaths. Later, it gradually penetrated inside the stem and colonized in the hallow stem under artificial inoculated conditions. The sclerotia were not seen inside the internodes, but restricted to the plant below water level. During later stages of crop growth *i.e.,* grain hardening stage the affected hills completely lodged due to rotting of stem. The secondary tillers which were non-productive remained green, and even if grain was produced, they were chaffy and sterile emitting very obnoxious odour due to rottening of stem.

The mycoflora and bacteria were isolated from rhizosphere soil associated with diseased rice plants during the survey on Martin medium and soil extract agar medium, respectively. Mycoflora*viz., Aspergillus flavus, Aspergillus niger, Cladosporium,Trichoderma viride* isolate-1 and 2 while bacterial isolates *viz.,Pseudomonas fluorescens*(BI-1), isolate–2 (BI-2), isolate-3 (BI-3), isolate-4 (BI-4), isolate-5 (BI-5) were found to be antagonistic to test pathogen *Sclerotiumoryzae*.

The detected mycoflora and bacterial isolates were further screened following dual culture technique and the results indicated that among mycoflora screened, *Trichoderma viride* (T1) was found to have most potential antagonistic effect with maximum inhibition (75.3 %) of test pathogen [5]. Similarly among antagonistic bacterial isolates screened *Pseudomonas fluorescens* (BI-1) was found to be highly effective in inhibiting the test pathogen by 77.2 per cent. These potential biocontrol agents can be exploited as an integrated approach in the management of stem rot of rice.

The compatibility studies between *Trichoderma viride* (T1) and *Pseudomonas fluorescens* (BI-1) following dual culture technique under *in vitro* conditions indicated that the per cent inhibition of *Trichoderma viride* (T1) by *Pseudomonas fluorescens* was 5.0 per cent, while no inhibition was observed in the growth of *Pseudomonas fluorescens*.

Out of six fungicides tested, Hexaconazole @ 200 ppm and Propiconazole@ 100 ppm completely inhibited *Sclerotiumoryzae* in poisoned medium [6]. Out of two herbicides tested, the inhibition of test pathogen was high (97.1%) in Butachlor (400 ppm) and least (28.0%) in Oxadiargyl (150 ppm).

In compatibility studies, *Trichoderma viride* (T1) was incompatible with fungicides Propiconazole (100 ppm) and Hexaconazole (200 ppm). However, it was 60.6 per cent inhibited by Butachlor (400 ppm). Similarly, *Pseudomonas fluorescens* was least (7.9%) compatible with Propiconazole and highly (3.6%) compatible with Butachlor (400 ppm).

Integrated management against stem rot of rice was attempted with twelve treatments under pot culture. Of the twelve treatments combined soil application of butachlor (400 ppm) 8-10 days after inoculation by the pathogen followed by application of *Trichoderma viride* @ 10 g $kg^{-1}$and *Pseudomonas fluorescens*@10 ml kg^{-1} just at the appearance of the disease followed by spraying of propiconazole (100 ppm) were found superior over other treatments in reducing the disease and promoting the plant growth parameters like root length, shoot height, dry shoot and root weight of rice plants.

REFERENCES

[1] Cother E and Nicol H 1999. Susceptibility of Australian rice cultivars to stem rot fungus *Sclerotiumoryzae*. Australasian Plant Pathology 28:85-91.

[2] Ferreira S A and Webster R K 1976. Evaluation of virulence in isolates of *Sclerotiumoryzae*. Ibid.6:1151-1154.

[3] Ou S H 1985. Rice Diseases (2nd edition).Common wealth Mycological Institute, Kew (England), 380pp.

[4] Ram Singh, Hari Chand, Dodan D S and Sunder S 1988. Chemical control of stem rot of paddy. Oryzae25: 392-395.

[5] Banyal D K, Mankotia V and Sugha S K 2008. Integrated management of tomato collar rot caused by *Sclerotiumrolfsii*. Journal of Plant Pathology vol.32 (2): 164-167.

[6] Kumar A, Ram Singh and Jalali B L 2003. Management of stem rot of rice with resistance inducing chemicals and fungicides. Indian Phytopathology 56(3):266-69.

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