**Regional Analysis of Rice Sheath Blight Caused By *Rhizoctonia* *solani* Across *Telangana* And Tamil Nadu**

**ABSTRACT**

A roving survey was conducted during rabi, 2023-2024 in rice growing areas of kadthal, Achampet, Makthal, Rajendranagar, Polasa, Makulapet, Gangadhara, Atmakur, Eligedu, Dharmaram, Thidalveli, Saliyanthoppu, Sivapuri, Kadavacheri, Usuppur, Vallampadugai, Velakudi, Perampattu, Pathupullividuthi, and Thirumanur regions of Telangana and Tamil nadu to assess the disease severity of sheath blight disease in rice. The per cent disease severity ranging from 17.26 to 74.23 per cent was noticed Maximum disease severity (74.23 %) was recorded at Polasa village of Jagtial district while minimum (17.26 %) was recorded at Gangadhara village of Karimnagar district. The maximum disease was observed from tillering stage to harvesting stage.

**KEYWORDS**: *Survey, sheath blight, rice, Rhizoctonia solani, Percent Disease Incidence (PDI); pathogen identification, minimum and maximum.*

**INTRODUCTION**

 Rice is the most important staple food crop in the world. Rice being a tropical plant, it can flourish in hot and humid climate. It can be grown in both Kharif & Rabi seasons. Rice is attacked by a number of fungal, bacterial and viral diseases. Among the fungal disease rice sheath blight is regarded as an internationally important disease. Sheath blight is a soil borne disease caused by the fungus *Rhizoctonia* *solani* Kuhn AG1-IA. This disease causes significant yield losses about 11.1- 58.0 per cent depending on variety and stage of the crop (Chahal et al., 2003). Studies on the survey of disease in an area to know the current status of the disease in the various rice growing districts is essential to take decision regarding management of the disease. (Gangopadhyay and Chakrabarti, 1982). In India, this disease was first reported in Punjab, and later in Uttar Pradesh. Further, the disease was reported in Tamil Nadu, Kerala, Andhra Pradesh and Kashmir (C.K Reddy, 1986). Disease has been spreaded widely in terms of both occurrence and intensity over the past twelve years. It has become more prevalent on the improved varieties viz., BPT 5204, JGL1798, JGL 384, Swarna, MTU1010, MTU1061 and MTU1075 (Prakasam et al., 2013). The management of sheath blight of rice is to reduce the primary source of inoculum by killing sclerotia or to inhibit their germination. The disease has been efficiently controled by the use of systemic and non-systemic fungicides to seed, soil or foliage applications (Rabindran and Vidhyasekaran, 1996). Because of the hazardous residual effects of chemical fungicides in soil, in recent years several researches have been carried out to assess the potentiality of bio control agents for management of sheath blight, through the application of antifungal bacterial strains isolated from the soil (Nandakumar et al., 2001). Distribution of Bacillus spp. in different ecological habitats and its endospore forming ability, sheath blight disease more possibly controlled by effective strains of B. subtilis among others bio control agents (Qin and Zhang, 2005).

**MATERIAL AND METHODS**

Roving survey was conducted during Rabi 2023- 24 in major rice growing areas of Telangana and Tamil Nadu districts. In each district, 1 Area were selected, in each area 1 villages were taken. From each village, 1 fields were surveyed to study the disease severity of sheath blight disease. Four one squire meter quadrants were randomly selected in each field and infected plants were counted in each quadrant based on relative lesions height. The disease severity was calculated based on a scale developed by IRRI, 2002.

Rating scale (based on relative lesion height)

 0 - No infection observed

 1 -Lesions limited to lower 20% of the plant height

 3 - Lesions limited to 20-30% of the plant height

 5 - Lesions limited to 31-45% of the plant height

 7 - Lesions limited to 46-65% of the plant height

 9 - Lesions observed more than 65% of the plant height

Per cent disease index (PDI) was calculated as per the following formula given by Wheeler (1969).

|  |
| --- |
| Number of plants observedPDI = ---------------------------------------------× 100Total number of plants observed |

**Collection of Sheath blight symptoms**

 During survey characteristics symptoms on the leaf sheath at water level and the lesions in its early stages were circular or oblong with dark brown margin. The lesions were usually confined to the lower leaf sheaths at or near the water level described by (Paracer and Chahal 1963). Those diseased samples were collected for isolation of R. solani Kuhn pathogen

**Isolation of pathogen**

The causal organism R. solani Kuhn was isolated from the rice plants showing typical sheath blight symptoms under field conditions. Leaf sheath showing typical symptoms was washed in tap water for few minutes and leaf bits of 3-8 mm size were surface sterilized with 1% sodium hypochloride solution for one minute and then rinsed with sterile distilled water to remove the traces of sodium hypochlorite. These leaf bits are then transferred to potato dextrose agar medium in petriplates and kept for incubation at 28 ± 2° C. When the growth of the fungus from the leaf bits was seen on the PDA surface, the hyphal bits from the periphery of the culture growing in the petriplates was transferred to the PDA in culture tubes. The culture was purified by hyphal tip method and pure culture was maintained on PDA by regular sub culturing at frequent intervals. Pathogenicity of R. solani was proved by mycelial ball insertion technique as observed by (Park et al., 2008 and Nadarajah et al., 2014).

**RESULTS AND DISCUSSIONS**

The survey data is presented in the table 1. The data indicated that among the all locations surveyed, from Telangana and Tamil nadu regions Jagtial district recorded the per cent disease severity range 74.23 while Karimnagar district recorded comparatively less disease severity range 17.26 per cent. In Jagtial District, the highest disease severity (74.23 %) was recorded in Polasa (74.23 %) area, whereas the least disease severity (17.26 %) was observed in Gangadhara area of Karimnagar (D). In Cuddalore district, the highest disease severity was recorded in Thidalveli (71.43%) of Tamil nadu (D) whereas the least disease severity was observed in Usuppur (21.19%) of Tamil nadu (D).

**Stage of the crop**

During the survey, the disease severity was recorded at different stages of rice crop. In seven villages disease severity was observed during Tillering stage and Active tillering stage of the crop, in four village it was during the Panicle stage and Panicle initiation stage, in one village it was during the booting stage, in one village it was during the heading stage, in three village it was during the flowering stage, in three village it was during the milky stage and in one village it was during the Hardening stage.

Per cent disease severity during the Tillering stage and Active tillering stage varied from 25.66 per cent to 71.43 per cent, whereas during the Panicle stages and Panicle initiation stage it ranged from 28.09 per cent to 69.08 per cent respectively. In Cuddalore districts surveyed maximum severity was recorded during Active tillering stage and in Jagtial district surveyed maximum severity was recorded during the Hardening stage.

whereas disease severity during the booting stage varied from 29.05 per cent in Vallampadugai area of Cuddalore (D), Disease severity during the heading stage was recorded only in Perampattu area of Cuddalore (D), during the flowering stage maximum severity was recorded in Kadthal (57.41%) area of Ranga Reddy (D) and minimum severity was recorded in Usuppur (21.19%) area of Cuddalore(D). In milky stage maximum severity was recorded in Achampet area of Nagarkurnool district, and minimum severity was recorded in Gangadhara (17.26%) area of Karimnagar district,in hardening stage recorded disease severity ranging from 74.23 per cent in Polasa area of Jagtial (D).

**Crop variety**

The per cent disease severity recorded in each variety varied depending upon the place of cultivation. MTU1010 variety was cultivated in three area had disease severity ranging from 27.95 (Dharmaram, Nizamabad (D) to 52.03 per cent (Achampet, Nagarkurnool (D), BPT-5204 variety was cultivated in four area had disease severity ranging from 25.66 per cent (Rajendranagar, Ranga Reddy (D) to 74.23 per cent (Polasa , Jagtial (D) and TN-1 variety was cultivated in two area disease severity ranged from 46.07 per cent in Makthal, Mahabubnagar(D) and to 48.02 per cent in Makulapet, Mancherial(D).

 whereas JGL-24423 variety was cultivated only one area Gangadhara bit (17.26%)of Karimnagar (D) and WGL-1368 variety was cultivated in Atmakur (55.63%) of Warangal (D). whereas disease severity in TRY-1 variety was observed only in Saliyanthoppu (42.08%)of Cuddalore (D) and CR1009 variety in Vallampadugai (29.05%) of Cuddalore (D), ADT-36 variety was cultivated in five area had disease severity ranging from 21.19 per cent (Usuppur, Cuddalore (D) to 69.08 per cent (Velakudi, Cuddalore (D), ADT-43 variety was cultivated only two area Thirumanur (44.73%)of Thanjavur (D) and in Pathupullividuthi (54.75%) of Ariyalur (D).

During survey both Telangana and Tamil nadu districts clay loam soils were the predominant type of soil for rice cultivated. Similarly, (Reddy et al. 2018) carried out survey for the assessment of sheath blight severity in rice in nine districts of Telangana state. In Adilabad district the maximum severity (9scale) was observed Huzurnagar and Miryalaguda villages. The disease was observed from panicle initiation to grain hardening stage. Whereas some other workers were found different growth stages susceptible for infection. (Shahjahan et al. 1990) reported panicle initiation to booting stage is most susceptible stage for sheath blight infection. (Pal et al., 2016) also found grain filling stage as most susceptible for sheath blight disease to occur.

Similar results were also recorded by (Kapse et al. 2012) and (Pal et al. 2015) plant variety is the major factors influencing sheath blight disease. Pratiwi et al. (2021) reported disease severity on rice plants in Northern Sumatra, Indonesia. Highest disease incidence (99.48%) and the highest disease severity (12.38%) was recorded Sumber tani and Talawi in Batubara district.

 **Isolation and purification of Pathogen**

Sheath blight pathogen was isolated from rice plants exhibiting typical symptoms were greenish grey ellipsoid lesions on the leaf sheaths near the waterline. Infected plant tissues were cut into small bits (~0.5 cm), surface sterilized with 1 % sodium hypochlorite solution for 30 sec rinsed three times with sterile distilled water, and blotted dry. Three sections are placed at equidistance per plate containing PDA medium. The plates were incubated in a BOD incubator at 28±2°C in the dark. Plates were checked regularly for hyphal growth. Hyphae resembling Rhizoctonia were identified under a microscope and pure cultures were obtained using the hyphal tip technique. The emerging edges of the mycelium were transferred to PDA medium-amended plates. All isolates were maintained on PDA slants and stored in a refrigerator at 4°C. Totally twenty isolates were isolated and were designated as Rs1 to Rs20 respectively.The sheath blight pathogen was isolated from diseased samples collected during the survey and isolated by tissue segment method (Rangaswami and Mahadevan, 1999) Then purified by single hyphal tip method and were identified as R. solani based on morphological characters using the descriptions given by (Banniza, 1996). These observations were in accordance with (Sneh et al., 1991) who described hyphal branching at right angle, constriction at the point of branching of the mycelium and presence of a septum near the branching junction.

**Table 1: Survey and Isolation of rice sheath blight caused by *Rhizoctonia solani*  from different districts of Telangana and Tamil Nadu.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Isolation** | **Area** | **Districts** | **Variety** | **Soil type** | **Crop stage** | **Per cent Disease Incidence (PDI)\*** |
|  | Rs1 | Kadthal | Ranga Reddy | BPT -5204 | Clay | Flowering | 57.41e (49.48) |
|  | Rs2 | Achampet | Nagarkurnool | MTU-1010 | Clay loam | Milky stage | 52.03 g (46.16) |
|  | Rs3 | Makthal | Mahabubnagar | TN-1 | Clay | Panicle stage | 46.07hi (42.74) |
|  | Rs4 | Rajendranagar | Ranga Reddy | BPT-5204 | Clay | Tillering stage | 25.66m (30.43) |
|  | Rs5 | Polasa | Jagtial | BPT-5204 | Clay | Hardening stage | 74.23a (59.49) |
|  | Rs6 | Makulapet | Mancherial | TN-1 | Clay loam | Tillering stage | 48.02h (43.86) |
|  | Rs7 | Gangadhara | Karimnagar | JGL-24423 | Clay loam | Milky stage | 17.26op (24.54) |
|  | Rs8 | Atmakur | Warangal | WGL-1368 | Clay loam | Panicle stage | 55.63ef (48.23) |
|  | Rs9 | Eligedu | Peddapalli | MTU-1010 | Clay | Flowering stage | 51.01g (45.57) |
|  | Rs10 | Dharmaram | Nizamabad | MTU-1010 | clay | Milky stage | 27.95l (31.85) |
|  | Rs11 | Thidalveli | Cuddalore | BPT 5204 | Clay | Active tillering | 71.43b (57.99) |
|  | Rs12 | Saliyanthoppu | TRY 1 | Clay | Active tillering | 42.08j (40.44) |
|  | Rs13 | Sivapuri | ADT 36 | Clay | Active tillering | 64.67d (53.55) |
|  | Rs14 | Kadavacheri | ADT36 | Clay loam | Panicle initiation | 28.09l (32.00) |
|  | Rs15 | Usuppur | ADT36 | Clay | Flowering | 21.19n (27.40) |
|  | Rs16 | Vallampadugai | CR 1009 | Clay loam | Booting | 29.05l (32.61) |
|  | Rs17 | Velakudi | ADT 36 | Clay | Panicle initiation | 69.08c (56.24) |
|  | Rs18 | Perampattu | ADT 36 | Clay loam | Heading | 34.55k (35.99) |
|  | Rs19 | Pathupullividuthi | Ariyalur | ADT 43 | Clay loam | Active tillering | 54.75f (47.72) |
|  | Rs20 | Thirumanur | Thanjavur | ADT 43 | Clay | Active tillering | 44.73i (41.88) |

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