Survey on the Sheath Blight disease of Rice in Telangana State, India

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ABSTRACT

A survey was conducted during Kharif 2016-2017 to assess the incidence of sheath blight disease in nine districts of Telangana state. The per cent disease incidence (PDI) ranged from 20 to 80 per cent. Maximum PDI (80) was recorded at Miryalaguda block, while minimum (20) was observed at Buddipally, Rudrur, Vangapally and Wyra villages. The maximum severity (9scale) was observed at Huzurnagar and Miryalaguda blocks. The disease was observed from panicle initiation to grain hardening stage.

Keywords: Sheath blight, Survey, Disease incidence, Severity and R. solani

Introduction

Rice is cultivated successfully in a wide range of climatic and edaphic conditions. Its production and productivity is affected by number of biotic and abiotic factors which causes yield losses of 20-70 percent (Naidu, 1992).

Among all the biotic constraints, fungal diseases are most predominant across the world where ever rice is grown. Sheath blight is one of the major fungal diseases in Telangana that affects rice production and contributes to severe yield reduction that continues to threaten the socio economic status of rice-farmers in the state. The disease was reported in all the districts of Telangana State from moderate to severe (30 to 50%) from 1995 to 2014 (Laha et al., 2016). Disease was spread widely in terms of both occurrence and intensity over the past twelve years. Moreover, it has become more prevalent on most of the improved varieties viz., BPT 5204, JGL1798, JGL 384, Swarna, MTU1010, MTU1061 and MTU1075 currently grown in the state (Prakasam et al., 2013).

Keeping in view the importance of the crop and losses caused by this disease, a roving survey was carried out during kharif 2016 in nine major rice growing districts of Telangana.
Materials and Methods

A roving survey was conducted in 30 major rice growing villages which represented all the nine districts of Telangana state viz. Adilabad, Nizamabd, Karimnagar, Warangal, Medak, Rangareddy, Nalgonda, Mahboobnagar and Khammam. Survey was carried out from October to November 2016. From each village randomly 3-5 rice fields were selected when the crop was at tillering to maturity stage. Three plots in each field having an area of one square meter were selected at random. Data was also collected on stage of the crop, disease severity and incidence in these areas.

Disease Incidence (DI) was recorded by using the following formula

\[
\text{Disease incidence} = \frac{\text{Number of Infected Tillers}}{\text{Total number of tillers}} \times 100
\]

Fifty samples were brought to the laboratory and washed under running tap water to remove dirt particles. Infected leaf bits were cut into pieces of 5 cm, surface sterilized with one per cent sodium hypochlorite solution for 30 seconds and were washed in three changes of sterile distilled water and blotted dry. Small samples of plant tissue (0.5 cm of length) were then cut from the lesions and transferred to an isolation medium i.e., 2 per cent water agar and incubated at 27±2 °C for 24-48 h. After 48 hours the hyphal bits from culture plate were transferred to the fresh Petri plates containing PDA and incubated at 24-28°C. The mycelial growth in plates was recorded for every 24 hours. Thirty isolates were isolated from 50 samples by single hyphal tip isolation technique. All the isolates were identified as *Rhizoctonia solani* based on the right angle branching by microscopic observation. Koch’s postulates was proved for all isolates at field conditions during *kharif* -2016 by using typha bit inoculation method. Isolates were assigned with code numbers like TS-Rs-01, where, ‘TS’ denotes Telangana State, Rs Represents the *Rhizoctonia solani* and 01 refers to sample number.

Results and Discussion

The data indicated that among all the locations the per cent disease incidence ranged from 20 to 80 percent and grouped as very high (>50), high (31-50), moderate (20 to 30) and low (<20). Very high per cent disease incidence was noticed in Miryalaguda (80), followed by Huzarnagar (75), Jabitapur (65) and Warangal-rural (60), High per cent disease incidence was observed at Khanapur (50), Tikkannapally (45), Bhanswada (45), Adilabad (40), Rampur (40), Killawarangal (40), Nandi Kandi (40), and Mahabubnagar (40), moderate per cent incidence was recorded at Nasuallabad (30), Rampuram (30), Arapally RARS (30), Polasa RARS (30), Siddipet (30), Sadashivpet (30), Miryalaguda (30), Palem (30), Rangareddy (30), Narsampet (30), Nagarkurnool (25), Suryapet (25), Buddipally (20), Rudrur (20), Vangapally (20), Wyra (20) and. None of the locations were found with low per cent disease incidence (<20). Among 30 locations, 17 per cent showed very high incidence (>50), 23 per cent location showed high per cent incidence (31-49) and 60 per cent location showed moderate per cent incidence (20-30).

Disease severity (DS) of sheath blight ranged from 3 to 9 score (SES scale). Very high severity (9scale) was recorded at Huzarnagar and Miryalaguda, high disease severity (7scale) observed at Tikkannapally, Rampur, Bhanswada, Jabitapur, Warangal–rural, Killawarangal, Arapally-RARS, Khanapur and Mahboobnagar. While moderate disease severity (5scale) observed at Adilabad, Nasullabad, Polasa–RARS, Polasa, Narasmpat, Nandikandi, Sadashivpet, Siddepat, Wyra, Suryapet, Miryalaguda and Nagerkurnool (Fig. 1, 2 and Table 1).
Table 1: Disease incidence and Severity of sheath blight from major rice growing areas of Telangana during Kharif-2016

| Isolate code | Agro ecological Zone | District | Block / Village | Altitude/ Latitude | Stage of the crop | Diseased Plant Parts | Incidence (%) | Disease severity (%) | (0-9) SES Scale |
|--------------|----------------------|----------|----------------|--------------------|-------------------|----------------------|---------------|---------------------|-----------------|
| Ts-Rs-1      | NTZ*                 | Adilabad | Adilabad/Adilabad | 265msl/19°74.42 N | Grain hardening   | Sheath & Leaf (S)   | 40            | 31-45               | 5               |
| Ts-Rs-2      | NTZ                  | Adilabad | Hazipur/Tikkannapally | 269msl/19°69.49N | Grain hardening   | Sheath & Leaf (S)   | 45            | 46-65               | 7               |
| Ts-Rs-3      | NTZ                  | Adilabad | Manchiryal/Buddipally | 154msl/18°87.82 N | Grain hardening   | Sheath               | 20            | 21-30               | 3               |
| Ts-Rs-4      | NTZ                  | Nizamabad | Rudurur | 395msl/18°978.56 N | Grain hardening   | Sheath               | 20            | 21-30               | 3               |
| Ts-Rs-5      | NTZ                  | Nizamabad | Nizamabd/Rampur | 380msl/18°32.734 N | Milky stage       | Sheath & Leaf (S)   | 40            | 46-65               | 7               |
| Ts-Rs-6      | NTZ                  | Nizamabad | Kamareddy/Bhanswada | 389msl/18°30.714 N | Grain hardening   | Sheath & Leaf (S)   | 45            | 46-65               | 7               |
| Ts-Rs-7      | NTZ                  | Nizamabad | Nizamabd/Nasullabab | 441msl/18°44.751 N | Milky stage       | Sheath (S)          | 30            | 31-45               | 5               |
| Ts-Rs-8      | NTZ                  | Karimnagar | Jagital/Chchal | 260msl/46.961N | Panicle initiation | Sheath (S)          | 20            | 21-30               | 3               |
| Ts-Rs-9      | NTZ                  | Karimnagar | Jagital/Ram puram | 285msl/18°89.29N | Panicle initiation | Sheath               | 30            | 21-30               | 3               |
| Ts-Rs-10     | NTZ                  | Karimnagar | Jagital/Jabitaapur | 274msl/18°48.412 N | Grain hardening   | Sheath & Leaf (S)   | 65            | 46-65               | 7               |
| Ts-Rs-11     | NTZ                  | Karimnagar | Polasa – RARS/ | 252msl/18°83.831 N | Grain hardening   | Sheath               | 30            | 31-45               | 5               |
| Ts-Rs-12     | NTZ                  | Karimnagar | Polasa/Polasa | 256msl/18°49.39N | Grain hardening   | Sheath               | 25            | 31-45               | 5               |
| Ts-Rs-13     | CTZ*                 | Warangal | Warangal/Warangal - rural | 263msl/17°96.98N | Grain hardening   | Sheath & Leaf (S)   | 60            | 46-65               | 7               |
| Ts-Rs-14     | CTZ                  | Warangal | Warangal/Killawarangal | 253msl/17°23.52N | Milky stage       | Sheath & Leaf (S)   | 40            | 46-65               | 7               |
| Ts-Rs-15     | CTZ                  | Warangal | Warangal/Arapally-RARS | 267msl/17°969.34N | Grain hardening   | Sheath & Leaf (S)   | 30            | 46-65               | 7               |
| Ts-Rs-16     | CTZ                  | Warangal | Narsmpat/ | 270msl/ | Milky | Sheath | 30 | 31-45 | 5 |
| Ts-Rs-17  | CTZ | Warangal | Narsampet/ Khanapur | 17°45.67N | stage | Sheath & Leaf (S) | 50 | 46-65 | 7 |
| Ts-Rs-18  | CTZ | Warangal | Warangal/ Vangapally | 243msl/ 17°928.92 N | Grain hardening | 25 | 20 | 21-30 | 3 |
| Ts-Rs-19  | CTZ | Medak | Sadashivpet/ Nandikandi | 520msl/ 17°69.34 N | Grain hardening | 50 | 40 | 31-45 | 5 |
| Ts-Rs-20  | CTZ | Medak | Sadashivpet/ Sadashivpet | 517msl/ 17°619.42 N | Grain hardening | 50 | 30 | 31-45 | 5 |
| Ts-Rs-21  | CTZ | Medak | Siddipet/ Siddipet | 483msl/ 18°101.95 N | Grain hardening | 50 | 30 | 31-45 | 5 |
| Ts-Rs-22  | CTZ | Khammam | Wyra/ Wyra | 129msl/ 17°24.275 N | Grain hardening | 50 | 20 | 31-45 | 5 |
| Ts-Rs-23  | STZ* | Nalgonda | Suryapet/ Suryapet | 245msl/ 17°18.83N | Grain hardening | 50 | 25 | 31-45 | 5 |
| Ts-Rs-24  | STZ | Nalgonda | Huzurnagar/ Huzurnagar | 179msl/ 17°135.31 N | Grain hardening | 50 | 75 | 66-100 | 9 |
| Ts-Rs-25  | STZ | Nalgonda | Miryalaguda/ Miryalaguda | 178msl/ 17°137.16 N | Panicle initiation | 50 | 80 | 66-100 | 9 |
| Ts-Rs-26  | STZ | Nalgonda | Miryalaguda/ Miryalaguda | 127msl/ 16°875.31 N | Panicle initiation | 50 | 30 | 31-45 | 5 |
| Ts-Rs-27  | STZ | Mahbubnagar | Mahbubnagar | 478msl/ 16°543.81 N | Panicle initiation | 50 | 40 | 46-65 | 7 |
| Ts-Rs-28  | STZ | Mahbubnagar | Palest/ Palest | 476msl/ 16°546.11 N | Grain hardening | 50 | 30 | 21-30 | 3 |
| Ts-Rs-29  | STZ | Mahbubnagar | Nagarkurnool/ Nagarkurnool | 456msl/ 16°49.3.94 N | Grain hardening | 50 | 25 | 31-45 | 5 |
| Ts-Rs-30  | STZ | Rangareddy | Rangareddy/ Rangareddy | 597msl/ 17°389.43 msl | Panicle initiation | 50 | 30 | 21-30 | 3 |

NTZ- Northern Telangana zone; CTZ- Central Telangana zone; STZ- Southern Telangana zone
* S- Sclerotial bodies found
Fig. 1: Disease incidence of sheath blight in rice growing areas of Telangana State during Kharif - 2016

Fig. 2: Pie chart representing disease severity of per cent locations based on SES (0-9) scale
Disease severity scale: (Source: IRRI, 2002)

| Scores | Description |
|--------|-------------|
| 0      | No infection |
| 1      | Vertical spread of the lesions up to 20 per cent of plant height |
| 3      | Vertical spread of the lesions up to 21-30 per cent of plant height |
| 5      | Vertical spread of the lesions up to 31-45 per cent of plant height |
| 7      | Vertical spread of the lesions up to 46-65 per cent of plant height |
| 9      | Vertical spread of the lesions up to 66-100 per cent of plant height |

Low disease severity (3 scale) observed at Buddipally, Rudru, Chalgal, Rampuram, Vangapally, Palem and Rangareddy. Among the locations 7% (2) showed > 65% lesion height (9score), 30% (9 locations) showed 46-65% lesion height (7score), 40% (12 locations) showed 31-45% lesion height (5score) and 23% (7 locations) showed 21 to 30% lesion height (3 score). (Laha et al., 2016) reported that sheath blight disease in all the districts of Telangana, however moderate to severe form of disease incidence (30-50%) was reported from 1995 to 2014 in three districts viz., Nalgonda, Khammam and Karimnagar.

When district averages were considered, the disease incidence (%) was found highest in Nalgonda district with 52.5% followed by Warangal (43.3%), Adilabad (35%), Karimnagar (34%), Nizamabad (34%), Medak (33%), Mahboobnagar (31%) and Khammam (30%), while low in Rangareddy (20%). High incidence and severity in Nalgonda may be due to mono culturing of rice from last two decades and movement of propagules through canal water.

Besides, this district received continuous precipitation during the survey period. These results were in accordance with the findings of Pal et al., (2015) where they observed highest per cent disease incidence of 30.19 at Bargarh district and recorded least per cent disease incidence of 21.98 in Jharsuguda district at West Bengal.

In general correlation between stage of the crop and disease incidence and /or disease severity was not observed. However, only in Karimnagar district a positive correlation between the growth stage of crop and disease severity, where disease severity was about three score at early stage and it increased to seven while attaining crop maturity. These results are in accordance with findings of Upma Dutta et al., (2012) who found that the disease was present in all the rice growing areas of Jammu and Kashmir. Maximum disease incidence of 46.6 and 85.6 percent was observed during stem elongation and maturity stages, respectively in Maal Shah in Jammu district.

Survey results indicated that disease incidence varied even at district/mandal level. Incidence ranged at Adilabad (20% to 45%), Nizamabad (20% to 45%), Karimnagar (20% to 65%), Warangal (30% to 60%), Medak (30% to 40%), Nalgonda (25% to 80%), Mahboobnagar (25% to 40%) districts. The variation in incidence might be due to differences in varietal status, time of sowing, transplanting, soil type, fertilizer dose and due to variations in weather conditions. Large scale cultivation of susceptible varieties as monocrop continuously on the same field might have increased the possibility of perpetuating the pathogen in the crop debris. \textit{R. solani} being soil borne in nature, survives as sclerotia in field and thrives in weed hosts. Sclerotia remain viable in soil up to 270 days to a depth of 10 cm at the temperature level of
Survey on occurrence and spread of sheath blight of rice in major rice growing areas of Telangana state revealed that sheath blight is a major problem in all the districts. Among the districts surveyed, Nalgonda recorded 52.5% disease incidence. Very high disease severity (>65%) was observed at Huzarnagar and Miryalaguda. The survey was conducted during the vulnerable period from active tillering to panicle initiation stage of the crop, which is highly favourable to sheath blight development. The heavy incidence of sheath blight might be due to the favourable factors like high relative humidity, low temperature and water stagnation due to continuous rain on these locations during the period of survey.

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