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Cultural and Morphological Variation in *Sclerotium oryzae* Catt. Isolates Collected from Major Rice Growing Areas of Telangana and Andhra Pradhesh States, India

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A B S T R A C T

Cultural and morphological characters of fifteen isolates of *Sclerotium oryzae* Catt. collected from different rice growing areas in Telangana and Andhra Pradesh states were studied. Significant differences in growth, mycelial dry weights and sclerotial characters were observed among the fifteen isolates grown on PDA and PDB. All the 15 isolates were divided into two groups based on the growth pattern on PDA. Group 1 consists of ten isolates SO2, SO3, SO5, SO6, SO7, SO10, SO11, SO12, SO14 and SO15 which exhibited fast growth rate in terms of colony diameter with a range of 80 mm to 83 mm. Group II consists of the isolates SO1, SO4, SO8, SO9 and SO13 which recorded moderate growth rate with the colony diameter ranged from 70 to 79 mm. In all the isolates the initiation of sclerotial formation was noticed after 4 to 6 days and the mycelium aggregated into a full-fledged round brown to black sclerotium after 6 to 8 days after inoculation on PDA. Significant differences were observed in sclerotial size in fifteen isolates of *S. oryzae* with a range of 308 µm to 1012 µm in diameter. In all the isolates the sclerotial formation was initiated from centre towards periphery whereas in the isolate SO1, sclerotia were scattered uniformly. The sclerotia of all the isolates were intermixed in the mycelium except in the isolate SO4 in which sclerotia were formed in circular pattern on the PDA medium.

Introduction

Rice is an important cereal food crop which serves as staple food for majority of population in Telangana and Andhra Pradesh states. Different biotic and abiotic factors affects the rice crop under field conditions leading to reduction in crop yields.

Among these, the biotic factors like fungi, bacteria and viruses are the major factors limiting the rice production. Stem rot incited by *Sclerotium oryzae* which is considered as a minor disease has become major threat in most of the major rice growing areas and causing disease in popular rice cultivars and reduces in quality and quantity of the produce (Gopika *et al*., 2011). The occurrence of the disease is observed in major rice growing districts of Mahboobnagar, Nalgonda, Warangal and Khammam of Telangana state and Nellore, East Godavari and West Godavari districts of Andhra Pradesh state.

The yield losses to an extent of 80 per cent was reported in different rice cultivars under varied agro climatic regions in India and abroad (Li *et al.*, 1984; Ou, 1985; Cother and Nicol, 1999). Continuous cultivation of rice during different seasons and usage of high dosages of nitrogenous fertilizers and prevalence of graminaceous weed species and inadequate irrigation and drainage facilities increased the stem rot disease incidence (Chen, 1971 and 1973).

Knowledge on naturally occurring pathogen populations is a prerequisite for successful development of new high yielding rice cultivars possessing resistance to stem rot under varied agro climatic situations that are prevailing in Telangana and Andhra Pradesh states. The present investigation has been taken up to study the variations in cultural and morphological characters of 15 isolates of *S. oryzae* collected from rice growing tracts of Telangana and Andhra Pradesh states.

Materials and Methods

Isolation and identification of the pathogen

Extensive roving survey was conducted in major rice growing areas of Telangana and Andhra Pradesh states during *kharif*, *2015*. Samples of rice cv. MTU-3626 (Prabhat), MTU-1010 (Cottondora sannalu), MTU- 1001 (Vijetha), JGL- 18047 (Bathukamma), NLR-34242 (91 lavulu), WGL - 3962 (Bhadrakali) and RNR -15048 (Telangana sona) exhibiting typical symptoms of stem rot disease were collected.

The infected plant samples were cut into bits of 2-3 mm size with a sterile blade. These bits were surface sterilized in 0.1% sodium hypochlorite for 1 to 2 min and then transferred aseptically to Petri plates containing potato dextrose agar medium and incubated at 25 ± 1°C in a BOD incubator for occurrence of growth and sporulation of the pathogen. The pathogen associated with the disease was identified based on morphological and colony characters as described by Barnett and Hunter (1972). The pathogen was further sub cultured by single sclerotial isolation method on PDA slants for further studies.

Cultural and morphological variability

The Petri plates containing PDA medium were inoculated with 5 mm mycelial discs obtained from the periphery of actively growing colony of five days old culture and incubated at 25± 1°C in BOD incubator maintaining three replications. The observations on colony color, colony diameter, hyphal diameter and substrate color were recorded after 5 days of incubation. The mycelial dry weights of 15 *S. oryzae* isolates

were recorded by placing 5mm mycelial discs obtained from periphery of actively growing colony of five days old cultures in 500 ml conical flasks containing 250 ml of Potato Dextrose Broth (PDB) and incubated at 25± 1°C for 10 days maintaining three replications and mycelial mats were filtered on whatman no.1 filter paper and oven dried before recording mycelial dry weights. The data on morphological characters like sclerotial initiation, maturation, color of sclerotia, position and pattern of sclerotia in all the 15 isolates were recorded. The sclerotial initiation (days), sclerotial size in (µm) was recorded by measuring 100 sclerotia from each Petri plate using ocular and stage micrometer.

Results and Discussion

All 15 isolates of *S. oryzae* recorded significant differences in radial mycelial growth of colony and mycelial dry weights on PDA medium. Marked differences were observed among the isolates in cultural characters like growth pattern and pigmentation. On the basis of these characters, all the 15 isolates were divided into two groups.

Where Group 1 consist of the fast growing ten isolates of SO2, SO3, SO5, SO6, SO7, SO10, SO11, SO12, SO14 and SO15 with colony diameter ranged from 80 to 83 mm. Group II isolates are moderately growing consisting of SO1, SO4, SO8, SO9 and SO13 with colony diameter ranged from 70 to 79 mm, respectively. The maximum colony growth was recorded in SO5 isolate (86 mm) and minimum colony diameter was recorded in SO8 isolate (70 mm).

The substrate of all the 15 isolates were found whitish to brown in color with folded mycelium on PDA media whereas the mycelium was unfolded in SO1, SO4, SO8, SO13 and SO15 isolates. The hyphal diameter ranged from 8 µm to 15 µm in all the fifteen isolates (Table.1).

The formation of sclerotia was observed 4 to 6 days after inoculation on PDA and the mycelium aggregated into a full-fledged round brown to black sclerotium in all the isolates after 6 to 8 days after inoculation on PDA. Significant differences were recorded in sclerotial dimensions with a range of 308 µm to 1012 µm.

Sclerotial formation was observed from centre towards periphery whereas sclerotia were scattered uniformly on the PDA medium in the SO11 isolate. The sclerotia were mixed in the mycelium in all 15 isolates except SO 4 isolate where as sclerotia were formed in circular pattern on the medium (Table. 2).

Significant differences in sclerotial formation was earlier reported by Ahuja *et al.*, (1987). All the isolates produced sclerotia on PDA medium but the sclerotial initiation period differed (Table. 2). Mundkur (1935) and Punter *et al.* (1984) who reported that sclerotia were usually produced after one week but it differed in some isolates which produced after 10 days and the large sized sclerotia in culture may be attributed to better availability of nutrition in the medium than on its natural host.

Similar findings in cultural and morphological characters among different isolates of *S. oryzae* were observed by Ali and Singh (1994).

The present study revealed the variation in cultural and morphological characteristics among isolates of *S. oryzae* collected from different districts of Telangana and Andhra Pradesh states.

Table.1 Cultural characters of *S. oryzae* isolates collected from different districts of Telangana and Andhra Pradesh state

Isolates	Place of Collection	Collected from Cultivar	Colony Color	Colony Diameter (mm)	Hyphal Diameter(µm)	Mycelial Dry Weight (g).	Substrate pigmentation
SO1	Jagtial	BPT-5204	white	79.07	10.07	0.95	Brown and unfolded
SO2	Dharmapuri	BPT-5204	white	81.97	12.07	0.88	Dark brown and folded
SO3	Mahboobnagar	RNR 15048	white	81.93	13.97	0.82	White with Folds
SO4	Warangal	BPT-5204	white	76.07	10.13	0.74	White without Folds
SO5	Nizamabad	BPT-5204	white	82.90	14.90	1.72	White with Folds
SO6	East Godavari	MTU 3626	white	82.07	10.07	0.93	White with Folds
SO7	East Godavari	BPT-5204	white	81.87	15.10	1.02	White with Folds
SO8	Nalgonda	BPT-5204	white	69.88	10.13	0.78	White to Brownish without Folds
SO9	Nellore	NLR 34242	white	77.93	8.07	0.82	White to Brown and Folded
SO10	Khammam	MTU 1001	white	79.87	10.00	0.74	White with Folds
SO 11	Janagam	BPT-5204	white	80.07	12.13	0.73	White with Folds
SO 12	Mahboobnagar	RNR 15048	white	79.73	15.10	0.88	White with Folds
SO 13	Ranga Reddy	MTU 1010	white	73.93	12.07	0.96	White without Folds
SO 14	Ranga Reddy	BPT 5204	white	80.13	10.07	0.79	White with Folds
SO 15	Khammam	BPT 5204	white	79.13	10.13	0.76	White to Brownish without Folds
			CD @5%	0.767	0.693	0.080	
			SE (m)	0.274	0.239	0.028	
			CV	0.578	3.566	5.313	

Table.2 Morphological characters of fifteen *S. oryzae* isolates collected from Telangana and Andhra Pradesh state

S.No.	Sclerotial initiation (days)	Sclerotial maturation (days)	Sclerotial dimensions (µm)	Sclerotial color	Sclerotial position	Pattern	Sclerotial shape
SO 1	5	7	979.28	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 2	4	6	818.23	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 3	4	6	308.17	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 4	5	7	535.33	Brown	Center towards periphery	circular pattern above the medium	spherical
SO 5	4	6	791.24	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 6	4	6	868.18	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 7	4	6	1012.25	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 8	5	7	764.44	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 9	5	7	618.20	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 10	6	8	520.22	Black	Center towards periphery	Intermixed within the mycelium	spherical
SO 11	5	7	888.18	Brown	Scattered uniformly	Intermixed within the mycelium	spherical
SO 12	5	7	380.22	Black	Center towards periphery	Intermixed within the mycelium	spherical
SO 13	5	7	919.20	Brown	Center towards periphery	Intermixed within the mycelium	spherical
SO 14	4	6	975.23	Black	Center towards periphery	Intermixed within the mycelium	irregular
SO 15	4	6	460.24	Brown	Center towards periphery	Intermixed within the mycelium	spherical
CD @5%			6.718				
SE (m)			2.315				
CV			0.555				

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