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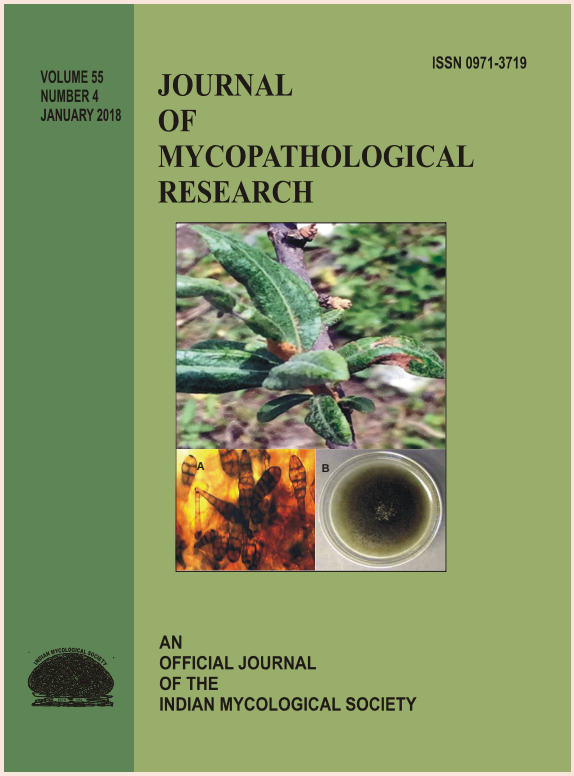

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Morphological variability among isolates of *Sclerotium rolfsii* Sacc.

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Morphological variability of ten isolates of *Sclerotium rolfsii* were studied based on their growth rate, colony colour, mycelial dispersion and appearance and sclerotium formation, colour, weight and number of sclerotia, arrangement using solid media viz; PDA.Wide range of variation was noticed with respect to various attributes studied. Growth rate ranged from 0.75 to 1.25 mm per hour, based on this attribute isolates were grouped in to three groups: Group I- 3 isolates with faster growth viz., lentil, linseed and potato (1.25 mmh^{-1}); Group II - five isolates with medium growth rate (0.94 mmh^{-1}) viz., chickpea, mungbean, soybean, rice and tomato; Group III had isolates from pea and lathyrus with slow growth rate (0.75 mmh^{-1}). Average size of sclerotia for most of the isolates were >1mm in diameter, whereas for some isolates like linseed and potato produced small sclerotia of <1mm diameter. Colour of sclerotia was generally light to dark brown at maturity. The morphological characters of *S. rolfsii* isolates tested were highly variable. The variability among isolates observed in the present study could be attributed to physiometabolic differences among isolates arising from different crop production systems and also some biochemical variability to adapt to their ecological and environmental conditions.

Key words: *Sclerotium rolfsii*, isolates, morphological variabiliy

INTRODUCTION

Sclerotium rolfsii Sacc. is a devastating soil-borne plant pathogenic fungus with a wide host range. The fungus was placed in form genus *Sclerotium* by Saccardo, as it form differentiated sclerotia and sterile mycelia. Although there are several sclerotia producing fungi, the fungi characterized by small tan to dark brown or black spherical sclerotia with internally differentiated rind, cortex and medulla were placed in the form genus *Sclerotium* (Punja and Rahe, 1992). However the teleomorphic state was discovered late (Punja, 1988), conforming that the fungus was a basidiomycete. *S. rolfsii* can over winter as mycelium in infected tissues or plant debris. Sclerotia serve as the principal over wintering structure and primary inoculum for disease persisting near the soil surface, sclerotia may free in soil or in association with plant debris. Those buried deep in soil may survive for a year or less, whereas those at surface remain viable and may germinate in response to alcohols and other volatile compound released from decomposing plant material.

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Variation is a rule in most of the root infecting fungi. The variation may arise following change in crop cultivation, genetic modification of hosts, physical or chemical modification of the soil, environment or accidental introduction of new genetic material into a region or local gene pool. It may also be a way of survival of the pathogen under adverse conditions. Cultivation of resistant varieties is the ideal and feasible management of the disease and resistant source against this disease but stable resistance could not be achieved due to the prevalence of virulent isolate of *S. rolfsii.* Hence, there is a need to identify variability in *S. rolfsii* so that, the breeding for disease resistance can be taken up to a specific and highly virulent race of the locality in any crop.

MATERIALS AND METHODS

Fungal isolates and culture maintenance

Ten isolates of *Sclerotium rolfsii* were prepared from different hosts and purified by hyphal tip method. Isolates were maintained in Potato dextrose Agar (PDA) medium. These isolates were collected from field of Plant Pathology, Indira Gandhi Krishi Vishwavidyalay(IGKV), Raipur.

Morphological variability

The experiment was conducted to study the variation in the morphological characters of isolates of *S. rolfsii* isolated from different host. Fifteen ml of PDA was poured into Petri plates. A mycelial disc (5mm) of seven days old culture of the respective isolates was placed at the centre of the plate (Ansari and Agnihotri, 2000). Three replications were maintained for each treatment at room temperature (27±1°C) for 3 days. Colony characters like, growth rate and colony appearance were recorded. To get matured sclerotial bodies the cultures were further incubated up to thirty days. Diameter of sclerotial bodies was recorded in each treatment with the help of screw gauge and observations were statistically analyzed. Colour, shape and size of sclerotia of individual isolates were also recorded and data were analyzed statistically.

RESULTS AND DISCUSSION

Morphological characters of each of the isolates of *S. rolfsii* on potato dextrose agar were studied and observations were recorded. The characters like growth rate per hour, shape, size and diameter of sclerotial bodies and test weight of sclerotial bodies were recorded. Growth rate ranged from 0.75 to 1.25 mm per hour, based on this attribute isolates were grouped in to three groups: Group I- three isolates with faster growth viz., lentil, linseed and potato (1.25 mmh^{-1}); Group II - five isolates with medium growth rate (0.94 mmh^{-1}) viz., chickpea, mungbean, soybean, rice and tomato; Group III had two isolates from pea and lathyrus with slow growth rate (0.75 mmh^{-1}) (Table 1). Similar results with respect to variation in radial mycelial growth rate have been reported by many workers (Manjappa, 1979). Out of ten isolates, 5 were fluffy and 5 show compact growth whereas colony colour of 6 isolates were white, 2 were dim white and 2 were cottony white in colour (Table 2).

Table 1: Variability on growth rate of different isolates (mm/hour)

Isolates	Colony growth (mm)						Growth rate mm h^{1}
	24 h	36 h	48h	72 h	96 h	120h	
Le	16	38	76	90			1.25
Ls	17	39	78	90			1.25
Po	14	35	72	90			1.25
Cp	9	19	40	81	90		0.94
Mu	10	22	43	86	90		0.94
Sb	10	21	42	83	90		0.94
Rc	11	27	52	88	90		0.94
To	9	17	36	75	90		0.94
Pe	-	10	23	48	71	90	0.75
La	-	13	33	61	80	90	0.75

*Average of three replications
N.B.: Lentil (Le), Linseed (Ls), Potato (Po), Chickpea (Cp), Mungbean (Mu), Soybean (Sb), Rice(Rc), Tomato (To), Pea(Pe), Lathyrus (La)

Table 2: Variability in colony appearance and colour of different isolates of *Sclerotium rolfsii* on PDA

Isolates	Colony appearance	Colony colour
Le	Fluffy	White
Ls	Compact	Dim white
Po	Compact	White
Cp	Fluffy	Cottony white
Mu	Fluffy	Dim white
Sb	Compact	White
Rc	Compact	Cottony white
To	Fluffy	White
Pe	Fluffy	White
La	Compact	White

N.B.: Lentil (Le), Linseed (Ls), Potato (Po), Chickpea (Cp), Mungbean (Mu), Soybean (Sb), Rice(Rc), Tomato (To), Pea (Pe), Lathyrus (La).

With regard to sclerotial colour, three types of colour were observed visually among the isolates. Isolates Mu, Sb, Po and To had brown colour sclerotia, isolates Cp, Ls and Rc had light brown colour sclerotia , remaining three isolates had dark brown coloured sclerotia. Isolates Sb and Rc showed oval shape whereas remaining isolates were spherical in shape. The variation in size of sclerotial bodies of isolates under study was found significant. Rc isolate produced biggest sclerotia with mean diameter of 2.2 mm followed by Sb isolate (1.67mm). The isolates of Ls produced smallest sclerotia with mean diameter of 0.83mm (Table 3); however, range of 0.60-1.44 mm (Manjappa, 1979) and 0.40-2.50 mm (Singh and Srivastava, 1953) were reported for sclerotial size. The test weight of sclerotial body revealed that there was significant difference in sclerotial weight of different isolates. Maximum weight was recorded in Rc isolates (195 mg) and minimum in Ls isolates (80 mg) (Table 3). In this way hundred sclerotial weight of different isolates studied on the PDA showed highly significant variation. This may be due to strainal variation in *S. rolfsii*. Similar type of study was conducted by Sulladmath *et al*. (1977), Palaiah *et al*. (2002). They reported that, the variation existed in sclerotial weight among the isolates of *S. rolfsii*.

Table 3: Variability in morphology of sclerotial bodies of different isolates of *Sclerotium rolfsii* on PDA

Isolates	Morphology of sclerotia					
	Colour	Shape	Position in culture	Number of bodies present in one position	Size of sclerotia(mm)	Weight of 100 sclerotia(mg)
Le	Dark brown	Spherical	Uniform	Group	1.40 bc	120 bcd
Ls	Light brown	Spherical	Scattered in plate	Single	0.83 ghij	80 fghi
Po	Brown	Spherical	Scattered in plate	Single	0.95 efghi	130 bc
Cp	Light brown	Spherical	Near edges	Group	1.20 cdef	95 defg
Mu	Brown	Spherical	Near edges	Group	1.25 cde	175 a
Sb	Brown	Oval	Peripheri in plate	Single	1.67 b	140 b
Rc	Light brown	Oval	Near edges	Group	2.2 a	195 a
To	Brown	Spherical	Scattered in plate	Group	1.10 cdefg	88 fghi
Pe	Dark brown	Spherical	Center	Group	1.37 cd	115 bcde
La	Dark brown	Spherical	Near edges	Group	1.00 efgh	108 cdef

*****Figure sharing same latter are non-significant at 5% level of significance
N.B.: Lentil (Le), Linseed (Ls), Potato (Po), Chickpea (Cp), Mungbean (Mu), Soybean (Sb), Rice(Rc), Tomato (To), Pea(Pe), Lathyrus (La)

REFERENCES

Ansari, M. M. and Agnihotri S. K. 2000. Morphological, physiological and pathological variations among *Sclerotium rolfsii* isolates of Soybean. *Indian Phytopath*. **53**; 65-67.

Manjappa, B.H. 1979. *Studies on the survival and variation in Sclerotium rolfsii Sacc*. M.Sc.(Agri.) Thesis, University of Agricultural Sciences, Bangalore, pp.72-74.

Palaiah, P. and Adiver, S. S., 2006. Morphological and cultural variability in *Sclerotium rolfsii* Sacc. *Karnataka J. Agric. Sci*.**19** : 146-148.

Punja, Z.K. 1988. *Sclerotium rolfsii, a pathogen of many plant species*. In: Sidhu, G.S., ed. Genetics of plant pathogenic fungi. Vol. 6. London: Acedemic Press. p 523-534.

Punja, Z.K. and Rahe, Z.E. 1992. *Sclerotium*. pp. 166-170. In: Singleton, LL, Mihail JD, Rush CM, eds. Method for research on soil borne phytopathogenic fungi. ST. Paul: APS Press.

Singh, B. and Srivastava, H.C. 1953. Damping off of tomato seedlings. *Journal of Indian Botanical Sciences*, **32**: 1-16.

Sulladmath, V.V., Hiremath, P.C. and Anil Kumar, T.B. 1977. Studies on variation in *Sclerotium rolfsii*. *Mysore Journal of Agricultural Sciences*, **11**: 374-380.