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RESEARCH ARTICLE :

Assessing the effects of varied temperature, pH and wave length of light on the growth and sclerotial formation of *Rhizoctonia solani* Kühn

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SUMMARY : An experiment was conducted to find out variation in isolates of *Rhizoctonia solani* Kühn collected from six different district of Chhattisgarh,based on radial mycelial growth and sclerotial production. Five isolates of *Rhizoctonia solani* were grown at different levels of temperature, pH and wave length of light on potato dextrose agar (PDA). It was observed that optimum temperature and pH for growth and scierotial production varied among the isolates.The maximum mycelial growth of all isolates was found at 30°C. At 35°C, only RS-CG-16-04 produced maximum microsclerotia/plate. The optimum temperature for sclerotial production of the isolates RS-CG-16-01, RS-CG-16-05, RS-CG-16-06 and RS-CG-16-07was 30°C and for the isolate RS-CG-16-06 and RS-CG-16-07 was 35°C. The optimum pH for maximum radial growth was pH 8 and closely followed by pH 7 for all the isolates.On an average among all the isolates maximum number of sclerotia was produced at pH 7.White light was most suitable for radial growth and sclerotia formation of this fungus and is closely followed by green and blue light because there was significant difference in radial growth and sclerotia formation of different isolates of *Rhizoctonia solani* at different colour or spectrum or wave length of light.

KEY WORDS :
Rhizoctonia solani, Temperature, pH, Wave length of light

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BACKGROUND AND OBJECTIVES

Rice (*Oryza sativa* L.) is the second most important cereal crop and the staple food for more than half of the world's population. The production of rice to be achieved by 2020 is 128 Million tonnes to feed the growing population in India. To meet the global demand, it is estimated that about 114 Million tonnes of additional milled rice needs to be produced by 2035 with an increase of 26% in next 25 years. The Chhattisgarh state is popularly known as "rice bowl" of the country as rice is the principal crop of this state and about 70 per cent of net sown area is covered under rice. Sheath blight of rice is caused by *Rhizoctonia solani* Kühn (Teleomorph: *Thanatephorus cucumeris* (Frank) Donk), which is major constraint to rice production during the last two decades (Kobayashi *et al.*, 1997). In rice,

Rhizoctonia solani causes significant declines in crop quality and yield (Su'udi *et al*., 2013).

Temperature plays an important role in the development of fungal mycelia and spores which in turn influence the ability of the pathogen to incite infection in the host plant and the subsequent spread of the infection (Amborabé *et al.*, 2005).Most fungi are able to grow in a wide pH range with an optimum between 5.5 and 8.0 (Deacon, 1984). The pH of the medium of the fungal growth is important for the secretion of various fungal excreta necessary for the invasion of the host cell and the establishment of the disease.Different wavelengths of visible spectrum influence on pigment and biomass production in *Chaetomium cupreum.* The study observes that green light incubation induced maximum pigmentation whereas yellow and white light incubation recorded low intensity and reduced pigment yield. In contrast, white and blue wavelength exhibited increased biomass production and red wavelength showed least biomass yield Soumya *et al*. (2014).

Keeping all these in mind, the present study has been designed to understand the effects of variable temperature, pH and wave length of light on the growth and sclerotial formation of the pathogenic fungi, *Rhizoctonia solani* directly isolated from field of sevendistrict of Chhattisgarh under laboratory conditions. We hope that the results of this study might be useful for controlling the growth and development of this disease through manipulating the prevailing temperature and pH of the paddy field in coming future.

RESOURCES AND METHODS

The pathogenic fungus *Rhizoctonia solani* was isolated from sevenmajor rice growing districts of Chhattisgarh *viz.*,Raipur (RS-CG-16-01), Surguja (RS-CG-16-02), Rajnandgaon (RS-CG-16-03), Bastar (RS-CG-16-04), Durg (RS-CG-16-05), Gariyaband (RS-CG-16-06) and Dhamtari (RS-CG-16-07). The isolated pure culture of the fungus was maintained on full strength potato dextrose agar (PDA) medium, at 25 ±1°C. The fungus was subcultured every 7 days to maintain vigor and vitality on half strength PDA, in dark, at 25 ±1°C.

To study the effect of different levels of temperatureson the growth and sclerotial formation of 7 isolates of *Rhizoctonia solani*, steriled Petri plates containing 20 ml medium with three replications were inoculated with 3mm culture disc of each isolate of *R. solani* taken from periphery of actively growing colony on PDA. The inoculated petriplates were kept in incubator at 15, 20, 25, 30, 35 and 40ºC temperatures. The radial growth and sclerotia formation of different isolates of *Rhizoctonia solani* at different levels of temperatures was recorded after 72 hr. and 7 days of incubation, respectively.

Radial growth and sclerotia formation of 7 isolates of *R. solani* were studied at pH 4.0, 5.0, 6.0, 7.0, 8.0 and 9.0. The desired pH values of PDA medium were maintained by adding required amount of 0.1 N HCl or 0.1 N NaOH with help of digital pH meter. Three mm diameter mycelial discs were transferred from margin of the 2-days-old colonies to the centre of each PDA plate. Each pH level was maintained in three replications for each isolateat 27$\pm$2ºC temperature. Observations on radial growth/diameter of the colony and sclerotia formation were recorded at 48 hr and 7 days of incubation respectively.

To study the effect of different colors of lighton the growth and sclerotial formation of 7 isolates of *Rhizoctonia solani*, steriled Petri plates containing 25 ml medium with three replications were inoculated with 3mm culture disc of each isolate of *R. solani* taken from periphery of actively growing colony on PDA. The inoculated Petri plates were kept in growth chamber and wrapped with color glass papers of blue, green, yellow and red colors. A set of plates were covered with black art paper to completely cut off the light and hence incubated in darkness. Another set of plates were exposed completely to light source torecord the effect of white light. The principle behind the use of colored glasspapers was that a colored glass paper allows only its particular color of light topass through it whereas it filters out the other colors of the spectrum. All the plates were placedat equidistant (60 cm) from the illuminated light source. Observations on radial growth/diameter of the colony and sclerotia formation were recorded at 24 hr and 7 days of incubation, respectively.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Effect of temperature on colony growth :

All the seven tested isolates of *R. solani* grew well

on PDA at the temperature range from 15 to 40°C and the observation as recorded at 72 hours of incubation are presented in Table 1 from the data it is quite apparent that 30°C is most favourable temperature for growth of this fungus and is closely followed by 25°C. At lower temperature of 15°C and higher temperature of 35°C the fungus growth was slower even at 40°C temperature there was no growth of any isolate of *Rhizoctonia solani* after 72hr of incubation.At 30°C temperature the significantly highest (90.00 mm) radial growth was showed by all the isolates of *Rhizoctonia solani*. In case of isolates RS-CG-16-03 and RS-CG-16-05 the colony diameter (90.00 mm) was identical at 25 and 30°C temperature. While in case of isolate RS-CG-16-04, the colony diameter (90.00 mm) was identical at 30 and 35°C temperature. In case ofisolates RS-CG-16-01, RS-CG-16-02, RS-CG-16-06 and RS-CG-16-07 the highest colony diameter was observed at 30°C temperature followed by 25°C temperature and 20°C temperature whereas, it was minimum (00.00 mm) at 40°C temperature (Table 1).

These results were in accordance with the findings of Dutta *et al.* (2012) they reported that temperature being one of the components of the weather plays a pivotal role in growth and sclerotial production of *R. solani*. There was no mycelial growth andsclerotial production at 15°C whereas, maximum at 30°C followed by 25°C.

Table 1 : Effect of different levels of temperature on radial growth of *Rhizoctonia solani* after 72 hours of incubation

Isolates	Radial growth (mm)*at different levels of temperatures in ℃						
	15	20	25	30	35	40	Mean A
RS-CG-16-01	37.00	56.16	86.83	90.00	12.33	0.00	47.05
RS-CG-16-02	46.33	72.00	82.00	90.00	28.50	0.00	53.13
RS-CG-16-03	29.66	46.00	90.00	90.00	20.33	0.00	46.00
RS-CG-16-04	30.00	36.50	65.66	90.00	90.00	0.00	52.02
RS-CG-16-05	70.50	76.00	90.00	90.00	29.50	0.00	59.33
RS-CG-16-06	22.33	38.33	71.66	90.00	32.83	0.00	42.52
RS-CG-16-07	40.50	61.16	82.00	90.00	0.00	0.00	45.61
Mean B	39.47	55.16	81.16	90.00	30.50	0.00	
		S.E.±			C.D. (P=0.05)		
Isolates		0.65			1.84		
Temperature		0.60			1.70		
Isolates×Temperature		1.60			4.51		

*Average of three replication

Table 2 : Effect of different levels of temperature on sclerotia formation of *Rhizoctonia solani* after 7 days of incubation

Isolate	No. of sclerotia/plate at different levels of temperatures ºC						
	15	20	25	30	35	40	Mean A
RS-CG-16-01	0.00 (1.00)	14.00 (3.86)	18.66 (4.32)	31.66 (5.70)	19.00 (4.46)	0.00 (1.00)	13.88 (3.39)
RS-CG-16-02	5.66 (2.53)	20.66 (4.64)	16.66 (4.18)	37.66 (6.19)	57.33 (7.63)	0.00 (1.00)	23.00 (4.36)
RS-CG-16-03	0.00 (1.00)	0.00 (1.00)	86.00 (9.31)	31.66 (5.68)	38.33 (6.27)	0.00 (1.00)	26.00 (4.04)
RS-CG-16-04	0.00 (1.00)	0.00 (1.00)	493.66 (22.21)	905.00 (29.17)	1254.00 (34.97)	0.00 (1.00)	427.3 (14.89)
RS-CG-16-05	0.00 (1.00)	19.00 (4.47)	32.00 (5.72)	67.00 (8.24)	65.00 (8.11)	0.00 (1.00)	30.50 (4.76)
RS-CG-16-06	0.00 (1.00)	30.66 (5.62)	32.33 (5.75)	61.66 (7.91)	48.00 (6.99)	0.00 (1.00)	28.77 (4.71)
RS-CG-16-07	0.00 (1.00)	34.00 (5.90)	63.66 (7.92)	83.00 (9.15)	44.00 (6.70)	0.00 (1.00)	37.44 (5.28)
Mean B	0.80 (1.22)	16.90 (3.78)	106.13 (8.49)	173.94 (10.29)	217.95 (10.73)	0.00 (1.00)	
		S.E.±			C.D. (P=0.05)		
Isolate		(0.12)			(0.34)		
Temperature		(0.11)			(0.32)		
Isolates× Temperature		(0.30)			(0.84)		

*Figures in the parenthesis square root transformed values

Effect of temperature on sclerotia formation :

From the data it is quite apparent that 30°C is most favourable temperature for sclerotial production of *Rhizoctonia solani* and is closely followed by 35°C because out of 7 isolates, 4 isolates namely RS-CG-16-01, RS-CG-16-05, RS-CG-16-06 andRS-CG-16-07 produced maximum number of sclerotia at 30°C while 2 isolates RS-CG-16-02 and RS-CG-16-04 produced maximum number of sclerotia at 35°C and only one isolate RS-CG-16-03 produce maximum number of sclerotia at 25°C. At lower temperature of 15°C and higher temperature of 40°C no sclerotia was produced by any isolate of *Rhizoctonia solani* after 7 days of incubation, except for isolate RS-CG-16-02in which sclerotia was formed (5.66 sclerotia/plate) at minimum temperature of 15°C.On an average among all the isolates, RS-CG-16-04 produced maximum (427.83 microsclerotia/plate) number of sclerotia at all the different levels of temperature followed by RS-CG-16-07 (37.44 sclerotia/plate) whereas, the minimum number of sclerotia was produced by isolate RS-CG-16-01 (13.88 sclerotia/plate) followed by RS-CG-16-02 (23.00 sclerotia/plate) at all the levels of temperature (Table 2).

Goswami *et al.* (2011)were observed that optimum temperature for sclerotial production of the isolates GAZ-9, JES- 16, GAZ-18 SYL-26 was 30°C and for the isolate DIN-8 was 25°C. At 35°C, only GAZ-9 and GAZ-18 showed initiation of growth, but the rate was very slow.

Effect of pH on colony growth :

There was significant difference in radial growth of different isolates of *R. solani* at different pH levels under study. On an average the highest colony growth was obtained at pH 8 (88.42 mm**)** in case of all the isolates except for isolate RS-CG-16-02 and RS-CG-16-06 where best growth was observed at pH 7 and 6 respectively followed by pH 7 (88.23 mm) in which all the isolates gave highest colony growth except for isolates RS-CG-16-04 and RS-CG-16-06 where best growth was observed at pH 8 and 6, respectively. The lowest growth of all the isolates was observed at pH 4 except for isolate RS-CG-16-07 in which lowest growth was observed at pH 9 (39.66 mm). In case of isolates RS-CG-16-01,RS-CG-16-03,RS-CG-16-05 and RS-CG-16-07the colony diameter was identical at pH 7 and 8. In case of isolate RS-CG-16-06, the highest colony growth was observed at pH 6 and the growth at pH 7 and 8, also at pH 5 and 9 were statistically similar (Table 3).

Effect of pH on sclerotia formation :

There was significant difference in sclerotia formation of different isolates of *R. solani* at different pH levels under study. On an average the highest number of sclerotia/ plate was obtained at pH 7 (232.56 sclerotia/ plate**)** in case of all the isolates followed by pH 6 (201.37sclerotia/plate) and pH 8 (154.37 sclerotia/plate) whereas, it was minimum (71.33sclerotia/plate) at pH 9. In case of all the isolates, RS-CG-16-04 produced highest (714.66 microsclerotia/plate) number of sclerotia at different levels of pH followed by RS-CG-16-06 (73.66 sclerotia/plate) and RS-CG-16-03 (61.38 sclerotia/plate) whereas, it was minimum in RS-CG-16-02 (19.66

Table 3 : Effect of different level of pH on radial growth of *Rhizoctonia solani* after 48hours of incubation

Isolates	Radial growth at different levels of pH (mm)*						
	4	5	6	7	8	9	Mean A
RS-CG-16-01	42.00	54.50	67.50	90.00	90.00	87.16	71.86
RS-CG-16-02	50.50	56.66	71.66	90.00	87.66	85.33	73.63
RS-CG-16-03	57.66	58.00	77.66	90.00	90.00	87.66	76.83
RS-CG-16-04	37.00	50.33	61.00	83.33	90.00	81.66	67.22
RS-CG-16-05	52.33	59.00	77.33	90.00	90.00	84.00	75.44
RS-CG-16-06	56.33	75.66	90.00	84.33	81.33	77.33	77.50
RS-CG-16-07	41.33	50.00	67.66	90.00	90.00	39.66	63.11
Mean B	48.16	57.73	73.26	88.23	88.42	77.54	
		S.E.±				C.D. (P=0.05)	
Isolates		0.41				0.59	
pH		0.38				0.54	
Isolates×pH		1.02				1.44	

(*) - Average of three replication

sclerotia/plate).I n case ofisolates RS-CG-16-03, RS-CG-16-04, RS-CG-16-05 and RS-CG-16-07 the maximum number of sclerotia was identical at pH 7 whereas, it was minimum at pH 9 except for isolate RS-CG-16-07 and RS-CG-16-04, it was minimum (24.66 sclerotia/plate and 44.30 sclerotia/plate, respectively) at pH 4 (Table 4).

Goswami *et al.* (2011) observed that the optimum pH for maximum radial growth for *Rhizoctonia solani* was 6 for DIN-8 and *7* for other fourisolates. The maximum number of sclerotia was produced by DIN-8, GAZ-9, and SYL-30 at pH 8, 4, and 7, respectively. The optimum pH for sclerotiaformation in JES-16 and GAZ-18 was pH 6.

Effect of different wave length of light on colony growth :

The experiment was conducted to study the effect of six different colour or wave length of light (blue, green, yellow, red, white/transparent and black) on colony diameter of the seven isolates of *R. Solani*,grew well on PDA medium and the observation as recorded after 24 hours of incubation are presented in (Table 5). From the data, it is quite apparent that transparent/white light was most suitable for radial growth of this fungus and is closely followed by green and blue light because there was significant difference in radial growth of different isolates of *Rhizoctonia solani* at different colour or spectrum orwave length of light under study. In white/transparent light there was significantly highest radial growth

Table 4 : Effect of different levels of pH on sclerotia formation of *Rhizoctonia solani* after 7 days of incubation

Isolates	No. of sclerotia/plate at different levels of pH						
	4	5	6	7	8	9	Mean A
RS-CG-16-01	25.66 (5.15)	72.66 (8.35)	95.66 (9.81)	91.00 (9.56)	25.00 (4.81)	4.33 (2.26)	59.38 (6.66)
RS-CG-16-02	5.00 (2.42)	15.66 (4.07)	19.66 (4.51)	31.66 (5.69)	46.00 (6.85)	0.00 (1.00)	19.66 (4.09)
RS-CG-16-03	58.66 (7.72)	47.66 (6.88)	72.66 (8.58)	96.33 (9.83)	49.00 (7.05)	44.00 (6.59)	61.38 (7.78)
RS-CG-16-04	44.30 (21.05)	530.33 (23.03)	1017.33 (31.88)	1170.33 (34.21)	784.66 (28.01)	342.33 (18.49)	714.66 (26.11)
RS-CG-16-05	15.33 (4.03)	21.33 (4.72)	68.33 (8.32)	79.33 (8.94)	28.00 (5.31)	0.00 (1.00)	35.38 (5.39)
RS-CG-16-06	52.00 (7.27)	59.33 (7.76)	66.00 (8.18)	76.66 (8.81)	105.33 (10.29)	82.66 (9.14)	73.66 (8.57)
RS-CG-16-07	24.66 (5.04)	57.33 (7.63)	70.00 (8.42)	82.66 (9.14)	42.66 (6.60)	26.00 (5.17)	50.55 (7.00)
Mean B	32.23 (7.53)	114.90 (8.92)	201.37 (11.39	232.56 (12.31)	154.37 (9.85)	71.33 (6.24)	
		S.E.±			C.D. (P=0.05)		
Isolates		(0.20)			(0.56)		
pH		(0.18)			(0.52)		
Isolates×pH		(0.48)			(1.37)		

*Figures in the parenthesis square root transformed values

Table 5 : Effect of different spectrum/colour of light on radial growth of *Rhizoctonia solani* after 24 hour of incubation

Isolates	Radial growth at different spectrum of Light (mm)*						
	Blue	Green	Yellow	Red	White	Black	Mean A
RS-CG-16-01	41.66	39.00	36.00	36.66	43.33	34.66	38.55
RS-CG-16-02	52.16	54.00	51.50	48.66	53.16	47.00	51.08
RS-CG-16-03	45.66	45.50	41.00	39.50	49.00	38.00	43.11
RS-CG-16-04	24.00	23.50	21.83	23.33	24.83	17.50	22.50
RS-CG-16-05	43.83	54.83	52.50	41.00	57.83	37.66	47.94
RS-CG-16-06	38.66	45.66	38.50	39.66	45.50	43.66	41.94
RS-CG-16-07	54.83	51.00	47.83	51.66	54.83	46.66	51.13
Mean B	42.97	44.78	41.31	40.07	46.92	37.88	
		S.E.±			C.D. (P=0.05)		
Isolates		0.70			1.99		
Light		0.65			1.84		
Isolates×Light		1.73			4.89		

(*) - Average of three replication

observed in 5 isolates (RS-CG-16-01, RS-CG-16-03, RS-CG-16-04, RS-CG-16-05 and RS-CG-16-07) of *Rhizoctonia solani*, while isolate RS-CG-16-02 and RS-CG-16-06 has maximum radial growth at green spectrum of light. On an average among all the isolates, RS-CG-16-07 hasthe maximum colony growth (51.13 mm) at all the different spectrum or colour of light, closely followed by RS-CG-16-02 (51.08 mm) and RS-CG-16-05 (47.94mm) whereas, the minimum colony growth was observed in isolate RS-CG-16-04 (22.50 mm) followed by RS-CG-16-01 (38.55 mm) at all the different spectrum/colour of light. On an average among all the different spectrum or colour of light, transparent/white light was the best spectrum or colour for maximum colony growth (46.92 mm) among all the isolates followed by 25°C green spectrum or colour (44.78 mm) whereas,

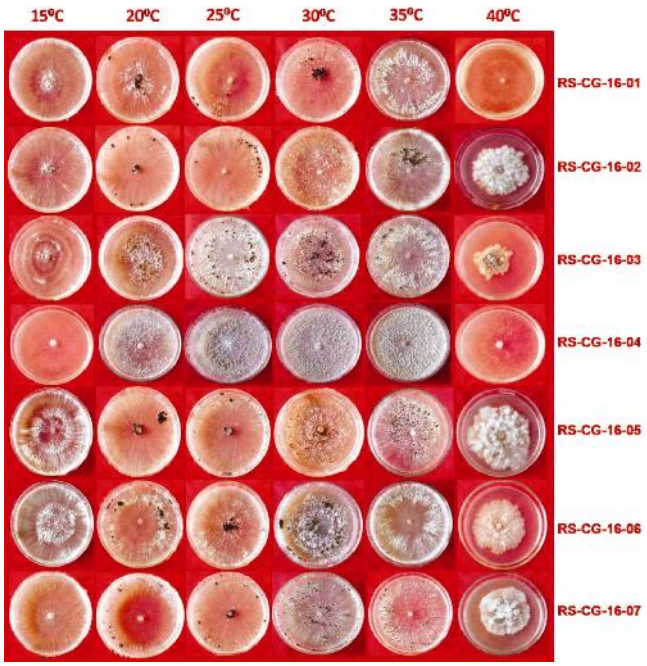

Fig. 1 : Effect of different levels of temperature on sclerotia formation of different isolates of *Rhizoctonia solani* after 7 days of incubation

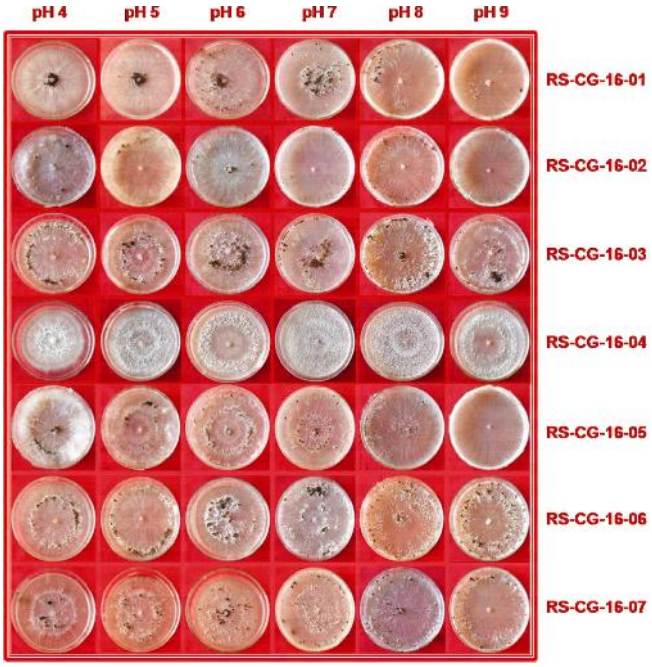

Fig. 2 : Effect of different levels of pH on sclerotia formation of different isolates of *Rhizoctonia solani* after 7 days of incubation

Table 6 : Effect of different spectrum/colour of light on sclerotia formation of *Rhizoctonia solani* after 7 days of incubation

Isolates	No. of sclerotia/plate at different spectrum of light						
	Blue	Green	Yellow	Red	White	Black	Mean
RS-CG-16-01	74.66 (8.66)	79.00 (8.93)	63.00 (7.98)	70.66 (8.46)	105.00 (10.29)	58.33 (7.70)	75.11 (8.67)
RS-CG-16-02	82.66 (9.14)	100.00 (10.04)	82.33 (9.12)	85.66 (9.30)	90.66 (9.57)	59.00 (7.72)	83.38 (9.15)
RS-CG-16-03	98.00 (9.90)	90.66 (9.52)	76.33 (8.77)	78.66 (8.90)	129.66 (11.42)	79.66 (8.97)	92.16 (9.58)
RS-CG-16-04	927.66 (30.43)	1081.00 (32.88)	941.33 (30.68)	878.00 (29.62)	1081.33 (32.89)	871.00 (29.51)	963.38 (31.00)
RS-CG-16-05	85.33 (9.28)	75.33 (8.73)	90.33 (9.53)	80.66 (8.93)	112.66 (10.65)	50.66 (7.18)	82.49 (9.05)
RS-CG-16-06	57.66 (7.65)	90.00 (9.51)	71.33 (8.46)	50.66 (7.17)	97.33 (9.90)	76.66 (8.81)	73.94 (8.58)
RS-CG-16-07	76.00 (8.76)	115.33 (10.78)	86.66 (9.32)	65.66 (8.15)	87.33 (9.39)	61.33 (7.88)	82.05 (9.05)
Mean	200.28 (11.97)	233.04 (12.91)	201.61 (11.98)	187.13 (11.51)	243.42 (13.44)	179.52 (11.11)	
		S.E.±			C.D. (P=0.05)		
Isolates		(0.18)			(0.50)		
Light		(0.16)			(0.46)		
Isolates×Light		(0.44)			(1.24)		

*Figures in the parenthesis square root transformed values

Fig. 3 : Effect of different spectrum/colour of light on sclerotia formation of *Rhizoctonia solani* after 7 days of incubation

the minimum colony growth was observed in black spectrum or colour (37.88 mm) followed by redspectrum or colour (40.07 mm) among all the isolates.

Effect of different wave length of light/colour on sclerotia formation :

All the seven tested isolates of *R. solani* grew well on PDA at the different colour or wave length of light (blue, green, yellow, red, white/transparent and black) on sclerotia formation and the observation as recorded after 7 days of incubation are presented in (Table 6) from the data it is quite apparent that transparent/white light was most suitable for sclerotial production of *Rhizoctonia solani* and is closely followed by green colour of light because out of 7 isolates, 5 isolates namely RS-CG-16-01, RS-CG-16-03, RS-CG-16-04, RS-CG-16-05 and RS-CG-16-06 produced maximum number of sclerotia in transparent/white light, while 2 isolate RS-CG-16-02 and RS-CG-16-07 produced maximum number of sclerotia in green light. But the black spectrum was not suitable for slcerotial production of this fungus because out of 7 isolates, 5 isolates RS-CG-16-01, RS-CG-16-02, RS-CG-16-04, RS-CG-16-05 and RS-CG-16-07 produced minimum number of sclerotia in black spectrum/colour of light, followed by red spectrum/colour (RS-CG-16-06) and yellowspectrum/colour (RS-CG-16-03). On an average among all the different spectrum/colour of light, the highest number of sclerotia/ plate was produced at transparent/white light (243.42 sclerotia/plate**)** in case of all the isolates, it was closely followed by green light (233.04 sclerotia/plate) and yellow (201.61 sclerotia/ plate)whereas, it was minimum (179.52 sclerotia/plate) at black colour followed by red colour (187.13 sclerotia/ plate). On an average among all the isolates, RS-CG-16-04 produced maximum (963.38 microsclerotia/plate) number of sclerotia at all the differentspectrum/colour of light followed by RS-CG-16-03 (92.16 sclerotia/plate) whereas, the minimum number of sclerotia was produced by isolate RS-CG-16-06 (73.94 sclerotia/plate) followed by RS-CG-16-01 (75.11 sclerotia/plate) at all the different spectrum/colour of light.

Zhu *et al*. (2013) used red, green, blue and white lights to investigate their effects on the growth and development of *Botrytis cinerea*. Green light suppressed conidial germinationand mycelial growth rate of *B. cinerea*; however, these phenomena were not observed in *Alternaria alternata*, *Fusarium oxysporum* and *Magnaporthe grisea*.

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