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Effect of different media on the mycelial growth, colony characters and sclerotia formation of *Rhizoctonia solani* Kuhn causing web blight disease of groundnut

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Abstract
Rhizoctonia is primarily a soil borne fungus that does not readily produce spores. It grows as hyphae in the soil feeding on organic matter, within/on plants, and survives as sclerotia during periods of adverse environmental conditions. Sclerotia are dense aggregates of hyphal tissue that tend to darken over-time. These structures can last live for years within the soil and continue to germinate and infect plants. Either by hyphae or by sclerotia, *Rhizoctonia* is easily spread by introducing contaminated soil from one location to another or from infected plants to healthy plants. Water splash during rainy weather can lead to some soil movement into the canopy where the fungus may begin to infect susceptible hosts. Among eight different media *Rhizoctonia solani* preferred Potato Dextrose Agar (PDA) medium for mycelial growth. Colony diameters was recorded significantly superior on PDA medium followed by Corn Meal Agar, Soil Extract Agar and Czapec Dox Agar. Richards's synthetic Agar medium showed least growth followed by Cape Dox Agar.

Keywords: Groundnut, *Rhizoctonia solani*, web blight, medium

Introduction
India is the largest producer of groundnut in the world. But average yields are low at 745 kg/ha. One of the important factors contributing to low yield is disease attack. Groundnut crop is prone to attack by numerous diseases to a much larger extent than many other crops. More than 55 pathogens including viruses have been reported to affect groundnut. Web blight of groundnut caused by *R. solani* (Kühn is able to cause the disease both by soil borne and air borne mode of infections. The fungus infects all above ground parts of the plants i.e. leaves, petioles, stem and pod but is most destructive on foliage during second to third week of plant growth causing seedling mortality. Kamel (2009) [5] studied the cultural appearances of *R. solani* AG-7 growing on malt extract agar (MEA), dextrose sabroud agar (SDA), Dox agar (DOX), potato-dextrose agar (PDA) were brown or dark brown colony with aerial mycelia and sclerotia, but without clear zonation on DOX and PDA. Ritchie (2009) [6] studied the effects of nutrient status, temperature and pH on mycelial growth, sclerotial production and germination of *Rhizoctonia solani* [anastomosis groups (AGs) 2-1 and 3] on a range of artificial media including potato dextrose (PDA), malt yeast extract (MYA), water (WA) and soil extract agar (SEA). Attaullah *et al.* (2012) [2] found differences in colony diameter of *Rhizoctonia solani* with respect to different media the highest colonies diameter (7.2 cm) was found on PDA followed by cornmeal agar (5.5cm). Colony diameter on water agar (WA) was 2.8cm while the least colony diameter 0.1cm appeared on malt extract agar culture medium. Tawfik and Mazin (2013) [8] examine the five synthetic broth media on the growth response of *R. solani*. Were used including Potato Dextrose (PD), Czapecks, Dox (CD), Rose Bengal (RB), Trypto Soyo (TS) and Malt Extract (ME).

Materials and Methods
Eight different media Czapec Dox Agar, Corn Meal Agar, Oat Meal Agar, Richards synthetic Agar, Soil Extract Agar, Cape Dox Agar, Malt Extract Agar, and Potato Dextrose Agar were tested to understand the cultural behavior and to find out the best mycelial growth and sclerotia formation supporting medium. Twenty ml of melted medium was poured into each sterilized Petri plates.

Seven mm disc of the *Rhizoctonia solani* were cut with the help of sterilized cork borer from the periphery of 4 days old culture previously grown on PDA Petri plate and one disc was placed in the centre of each Petri plate. Three replications of each medium were maintained and incubated at 27±2 °C. The observations were noted on the basis of redial mycelial growth when the *Rhizoctonia solani* reached the rim of the Petri plates (90 mm) in any medium. Variation in the mycelial growth and sclerotia formation were also recorded after inoculation.

Results

Effect of different media on mycelial growth of *Rhizoctonia solani* of groundnut

Eight different media were tested to follow the cultural behavior and to identify the best supporting medium for growth of *R. solani*. Rate of growth on the medium which was calculated by difference in growth in subsequent days after Ist day of incubation at temperature conditions favourable for the growth of *R. solani* (Table 1a). Of eight media tested and observed for radial growth, Potato Dextrose Media (PDA) was the most preferred media (Table 1a), followed by (in the order of preference) Corn Meal Agar, Oat Meal Agar, Soil Extract Agar, Malt Extract Agar, Czepeck Dox Agar (Table 1a). In all these media *R. solani* was able to cover the plate (i.e. 90 mm) on 5th day after incubation, but the rate of growth varied determining the preference for a substrate for growth. Growth on Richards Synthetic Media was not supportive to the growth of *R. solani* and was not able to fully cover the plate even after 5th day of incubation. Cape Dox Agar media did not support the growth of *R. solani* and no growth was observed on the petri plate poured with pre-sterilized Cape Dox Agar Media (Table 1a).

There was variation in the colony characters of test organism (Table 1b, Plate 1, Fig. 1). White submerged mycelia growth was observed in Czapec's Dox Agar, Corn Meal Agar and Richards's synthetic Agar medium, while submerged scanty mycelia growth was observed in Oat Meal Agar and Soil Extract Agar Medium. White cottony mycelia growth observed in Malt Extract Agar medium. White cottony raised mycelia growth observed in Potato Dextrose Agar medium. As far as sclerotia formation was concern. Among the different medium Soil Extract Agar medium is a best sclerotial formation supporting medium followed by Potato Dextrose Agar medium (Table 1b). Weber (1931) [9] reported that the tendency of hyphae to grow embedded within the substratum or to grow aerial is also influenced by the medium. Whipps and Magan (1987) [10] observed different media has significant effects on growth rates of all fungi, but Potato dextrose agar being richest in available carbon, did not always give maximum growth. Isolates varied for their maximum linear growth on a suitable agar medium at optimum temperature after 72 hours of incubation. Potato dextrose agar, Asthana and Hawaker's agar medium supported the linear growth of all the isolates, except isolates of moong bean which was more favoured on Potato dextrose agar and Yeast extract dextrose medium. All the isolates varied within themselves for linear growth characters on different nutrient medium. Shahjahan *et al.* (1987) [7] isolated rice sheath blight pathogen from diseased rice, grass, weeds, *Eichhornia crassipes*, maize and *Pennisetum*, the cultures differed in growth rate, sclerotial production. Different isolates vary considerably in capacity to use given nitrogen and carbon sources and no single nitrogen source is consistently superior or inferior for all isolates (Forsteneichner, 1931; Elarosi, 1957; Akai *et al.*, 1960) [4, 3, 1]. Attaullah *et al.* (2012) [2] reported germination of sclerotia was best on potato dextrose agar (PDA). Ritchie (2009) [6] reported more sclerotia produced on potato dextrose agar (PDA).

Table 1(a): Effect of different media on the mycelial growth, and growth rate of *Rhizoctonia solani*

S. No.	Agar Media	Mycelial Growth (mm)**			Rate of growth		
		Days after incubation			Days after incubation		
		1st	3rd	5th	1st	3rd	5th
1	Czapec Dox	11.75	29.67	90.00	00.00	17.92	60.33 (VI)
2	Corn Meal	17.25	41.83	90.00	00.00	24.58	48.17 (II)
3	Oat Meal	13.50	37.17	90.00	00.00	23.67	52.83 (III)
4	Richards synthetic	08.50	28.83	53.33	00.00	20.33	24.50
5	Soil Extract	11.75	35.50	90.00	00.00	23.75	54.50 (IV)
6	Cape Dox	00.00	00.00	00.00	00.00	00.00	00.00
7	Malt Extract	17.25	32.00	90.00	00.00	14.75	58.00(V)
8	Potato Dextrose	28.00	48.00	90.00	00.00	20.00	42.00(I)
SEm±				0.47			
CD at 5%				1.41			

**Average of three replications, (Roman letters in parenthesis indicate ranking)

Table 1 (b): Effect of different media on colony characters and sclerotia formation of *Rhizoctonia solani.*

S. No.	Agar Media	Colony characteristics	Sclerotia per plates
1	Czapec Dox	White submerged mycelial growth	****
2	Corn Meal	White submerged mycelial growth	****
3	Oat Meal	White submerged scanty mycelial growth	*****
4	Richards synthetic	White submerged mycelial growth	****
5	Soil Extract	White submerged scanty mycelial growth	******
6	Cape Dox	-	-
7	Malt Extract	White cottony mycelia growth	****
8	Potato Dextrose	White cottony raised mycelial growth	******

*Twenty Sclerotia (20) = * (one star); no sclerotia formation = -

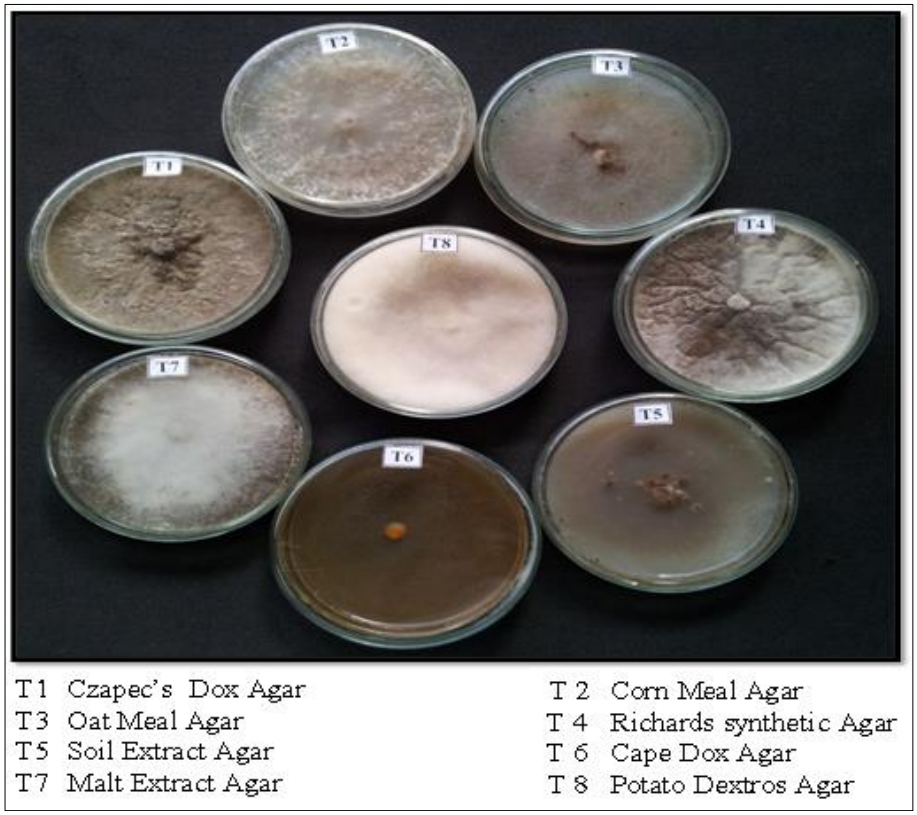

Fig 1: Effect of different media on the mycelial growth, colony characters and sclerotia formation of *Rhizoctonia solani*

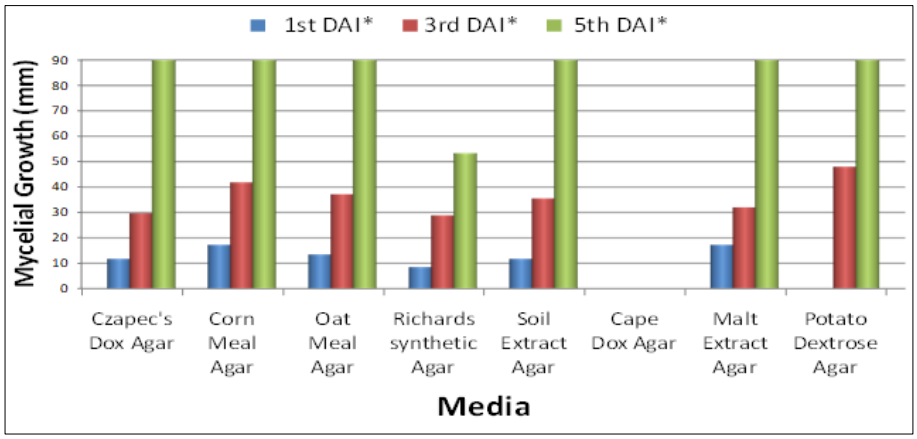

Fig 2: Effect of different media on the mycelial growth, colony characters and sclerotia formation of *Rhizoctonia solani*

Discussion

Eight different media were tested to understand the cultural behavior and to find out the best mycelial growth and sclerotial formation supporting medium. The *Rhizoctonia solani* preferred Potato Dextrose Agar (PDA) medium for mycelial growth. Colony diameters were observed significantly superior on PDA medium followed by Corn Meal Agar, Soil Extract, and Czapek Dox Agar. Richards's synthetic Agar medium showed least growth (8.5, 28.83 and 53.33) followed by Cape Dox Agar.

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