

# Effect of Different Liquid Media on Mycelial Growth of Wilt Complex Fungi of Chickpea

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**Abstract** - Cultural characters of three associated fungi were studied on different liquid media. The maximum mycelial dry weight of *Sclerotium rolfsii* was recorded on Malt extract broth (181.40 mg) and Rice meal broth (176.60 mg) and the highest intensity of sclerotia was recorded on Potato dextrose broth. In case of *Rhizoctonia solani*, Richard's broth was best for the mycelial dry weight (564.00 mg) and sclerotial production. In case of *Fusarium oxysporum* f.sp. *ciceri*, Richard's broth was found to be best for the mycelial dry weight (853.40 mg) and sporulation. Czapek's dextrose broth found worst for the mycelial dry weight of all pathogens.

**Keywords** - Liquid Media, Fungal Growth, Wilt, Chickpea, Sclerotia, Root Rot, Collar Rot.

## I. INTRODUCTION

During the past 10 year, India accounted for 60-70 per cent world chickpea production. Rather than India was the largest importer of chickpea. Chickpea production is severely curtailed by "Chickpea wilt complex" caused by *Fusarium oxysporum* f. sp. *ciceris* (Padwick), *Sclerotium rolfsii* Sacc., *Rhizoctonia bataticola* (Taub.) Butler and *R. solani* Kuhn in most chickpea growing areas of the world. In spite of its importance, there are few quantitative assessments of the impact of "Chickpea wilt complex" on chickpea yields. Annual chickpea yield losses from "Chickpea wilt complex" vary from 10 to 15% (Trapero and Jiménez, 1985; Jalali and Chand, 1992; Dahiya, 2003).

The variability in pathogens considerably complicates varietal resistance screening efforts to counter the pathogen. Without a clear knowledge of strains present in a particular cropping ecosystem it is very difficult to select varieties for area under this ecosystem. So progress of breeding programme depends upon up-to-date knowledge of existence of physiological races or pathotypes of pathogen in the ecosystems. Earlier the morphological and cultural characters of various isolates among the wilt complex causing pathogens made the basis of variation in isolate. Presently more emphasis on cultural, morphological and pathogenic variability amongst the isolates of wilt complex causing pathogens are given. Variation among virulent isolates of these pathogens can be further classified for requirement of suitable liquid media for better mycelial growth and sclerotial/conidia formation.

## II. MATERIALS AND METHODS

The dry weight of the three wilt complex causing fungi (*Fusarium oxysporum* f. sp. *ciceris* (Padwick), *Sclerotium rolfsii* Sacc. and *Rhizoctonia solani* Kuhn) were

determined by growing on six liquid media. The liquid media used were Potato dextrose broth, Richard's broth, Asthana and Howker's broth, Malt extract broth, Rice meal broth and Czapek's dextrose broth. Fifty ml of the broth was taken into 150 ml flask and after sterilization, inoculated and incubated flasks for 10 days. Three replications of each broth were maintained for each of the pathogen and incubated at 28±2°C. The growth pattern, pigmentation, sporulation or intensity of sclerotia were recorded. The mycelial mats were separately filtered on previously weight filter paper washed and dried at 60°C till the mycelial weight recorded remained constant. Composition of the liquid media/broth used for fungal growth is given in Table 1.

Table 1. Composition of the liquid media/broth used for growing fungi.

Name of medium	Composition	Quantities
Potato dextrose broth	Potato (Pealed and sliced)	200 g
	Dextrose	20 g
	Distilled water	1000 ml
Richard's broth	Potassium nitrate	10 g
	Potassium dihydrogen phosphate	5 g
	Magnesium sulphate	2.5 g
	Ferric chloride	0.02 g
	Sucrose	50 g
	Water	1000 ml
Czapek's dextrose broth	Sodium nitrate	2 g
	Potassium dihydrogen phosphate	1 g
	Magnesium sulphate	0.5 g
	Potassium chloride	0.5 g
	Ferrous sulphate	10 g
	Sucrose	30 g
	Water	1000 ml
Asthana and Hawker's broth	Potassium dihydrogen phosphate	1.75 g
	Magnesium sulphate	0.75 g
	Potassium nitrate	3.5 g
	Sucrose	5 g
	Water	1000 ml
Rice meal broth	Rice grain	200 g
	Dextrose	20 g
	Water	1000 ml
Malt extract broth	Malt extract	20 g
	Water	1000 ml

### III. RESULTS AND DISCUSSION

#### *Influence of different Liquid Media on Mycelial Weight of the Associated Fungi*

The data presented in Table 2 indicated mycelial dry weight, colony character and sporulation or sclerotia production of the three wilt complex causing pathogens (*Fusarium oxysporum* f. sp. *ciceris* (Padwick), *Sclerotium rolfsii* Sacc. and *Rhizoctonia solani* Kuhn) on six different liquid media.

From the Table 2 it is revealed that Potato dextrose, Malt extract and Czapek's dextrose broth showed fluffy mycelial growth of *S. rolfsii*, whereas Richards, Asthana and Hawker's and Rice meal broth showed appressed mycelial growth. The fungus produced dull white to white pigmentation on all the liquid media. The maximum mycelial dry weight was recorded on Malt extract broth (181.40 mg) which was at par with the Rice meal broth (176.60 mg). But the highest intensity of sclerotia was recorded on Potato dextrose broth followed by Rice meal broth and Malt extract broth (Plate 1a). Czapek's dextrose broth was showed least mycelial dry weight (50.60 mg) and sclerotial production of *S. rolfsii*.

In case of *R. solani*, appressed mycelial growth was found on all liquid media except Potato dextrose broth and Richard's broth, which showed brownish white pigmentation, whereas rest of the liquid medium showed dull white to redish white pigmentation by the fungus. The observation clearly revealed the Richard's broth was best for the mycelial dry weight (564.00 mg) and sclerotial production by the fungus (Table 2) followed by and Asthana and Hawker's broth (174.60 mg) and Potato dextrose broth (135.00 mg), however sclerotial production was more in Potato dextrose broth as compared to Asthana and Hawker's broth. Czapek's dextrose broth (20.00 mg) showed least mycelial dry weight (Plate 1b).

Richard's broth was also found to be best for the mycelial dry weight production (853.40 mg) and sporulation by the *F. oxysporum* f.sp. *ciceri*, whereas least mycelial dry weight (50.40 mg) was recorded on Czapek's dextrose broth (Table 2). The fungus showed fluffy mycelial growth with abundant sporulation on Potato dextrose, Richard's and Asthana and Hawker's broth, while on Malt extract, Rice meal and Czapek's dextrose broth showed appressed mycelial growth with poor sporulation. The fungus produced different pigmentation on different liquid media (Plate 1c).

Pandey (1984) reported that Asthana and Hawker's medium was best for the growth and dry weight of *S. rolfsii* (101 mg), *R.* (185 mg) and *F. oxysporum* f.sp. *ciceri* (695 mg). Juarez *et al.* (2000) reported that greater mass of *F. solani* and *R. solani* was produced in Potato dextrose broth while Czapek-Dox broth was not suitable. These findings are partially in agreement with the present investigation.

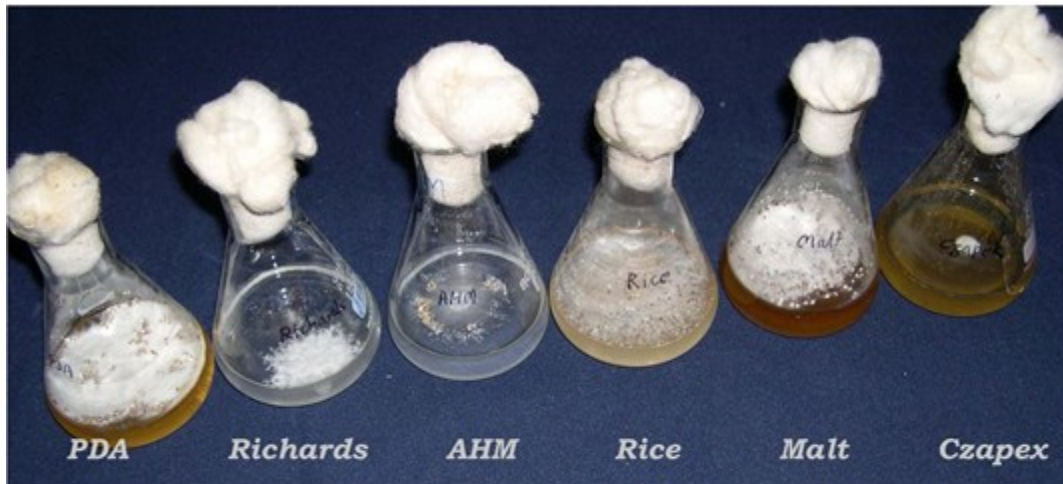
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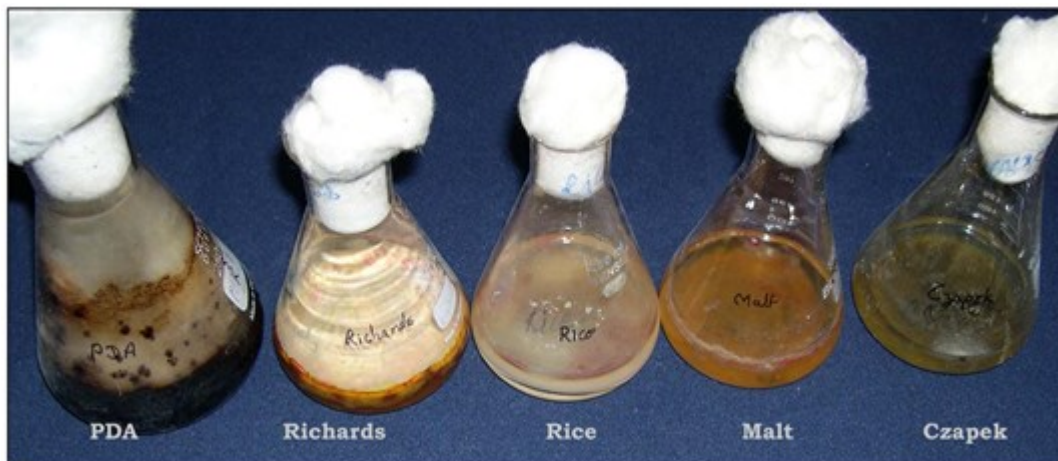
Table 2. Variation in the growth and mycelial dry weight of the three soil borne fungi on different liquid media.

Fungi	Cultural character	Potato dextrose broth	Richard's broth	Asthana and Hawker's broth	Malt extract both	Rice meal broth	Czapek's dextrose broth	SEM ±	CD (5%)
<i>Sclerotium rolfsii</i> (10 DAI)	Type of colony	Fluffy	Appressed	Appressed	Fluffy	Appressed	Fluffy		
	Pigmentation	White	White	White	Dull white	Dull white	Dull white		
	Intensity of sclerotia	88.60 (1.952)	0.00 (0.00)	36.00 (1.566)	69.40 (1.847)	72.00 (1.867)	0.00 (0.00)	0.011	0.03
	Mycelium dry weight (mg)	132.60	123.60	96.40	181.40	176.60	50.60	3.942	11.51
<i>Rhizoctonia solani</i> (10 DAI)	Type of colony	Fluffy	Fluffy	Appressed	Appressed	Appressed	Appressed		
	Pigmentation	Brownish white	Brownish white	Dull white	Reddish white	Reddish white	Dull white		
	Intensity of sclerotia	23.00 (1.377)	28.00 (1.461)	12.60 (1.131)	08.40 (0.966)	10.40 (1.044)	0.00 (0.00)	0.032	0.09
	Mycelium dry weight (mg)	135.00	564.00	174.60	76.60	86.40	20.00	5.403	15.77
<i>Fusarium oxysporum</i> f.sp. <i>cicero</i> (10 DAI)	Type of colony	Fluffy	Fluffy	Fluffy	Appressed	Appressed	Appressed		
	Intensity of sclerotia	Purple white	Yellowish white	White	Dull white yellow	Purple white	Black		
	Pigmentation	Abundant	Abundant	Abundant	Poor	Poor	Poor		
	Mycelium dry weight (mg)	94.00	853.40	76.60	116.60	170.60	50.40	8.829	25.77

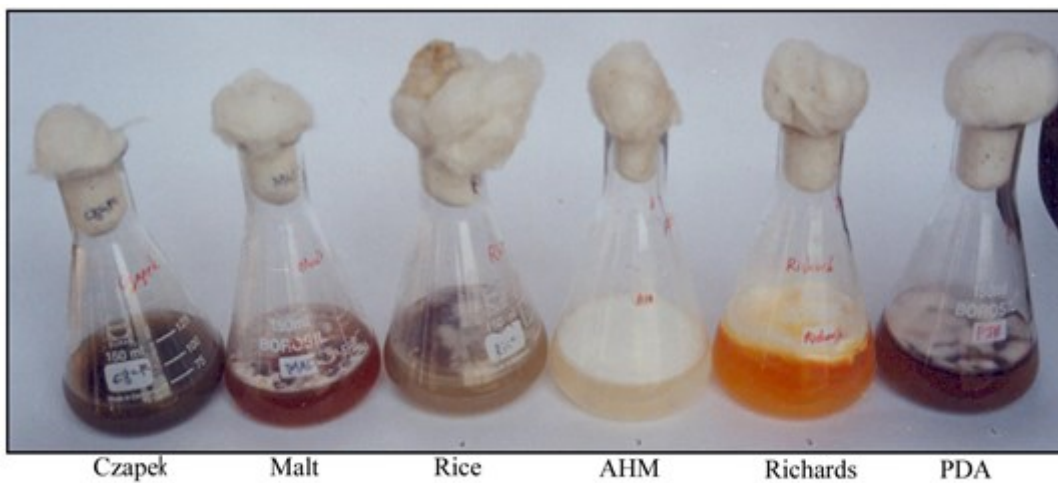
Figures in parenthesis are Log transformed values; Average of five replication; DAI-Days after Inoculation.



a. *Sclerotium rolfsii*



b. *Rhizoctonia solani*



c. *Fusarium oxysporum f.sp. ciceri*

Plate 1. Growth variation of wilt complex fungi on different liquid media.