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Growth Studies on *Acrocylindrium oryzae* Sawada an Incitant of Sheath rot Disease of Rice

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The fungus, *Acrocylindrium oryzae* Sawada, grew and sporulated well in potato dextrose agar and oats agar media. Among the four liquid media tried, maximum growth and sporulation were in Czapek's medium. The optimum temperature for growth and sporulation of the pathogen was 30±1°C and optimum pH was 6.5. Sucrose and starch were found to be the best among the carbon sources tried while ammonium nitrate and ammonium sulphate promoted better growth and sporulation among the nitrogen sources tested.

Among the major diseases which inflict rice crop, sheath rot disease caused by *Acrocylindrium oryzae* Sawada, (recently known as *Sarocladium attenuatum)* has assumed a serious proportion because of the introduction of high yielding dwarf rice varieties. With a view to elicite information on the potentialities of the pathogen, growth studies were carried out and results are presented in this paper.

MATERIALS AND METHODS

For the studies on the growth and sporulation of the fungus, the following solid media at pH 6.5 were used viz., Potato dextrose agar, Oat meal agar, Apple extract agar, Host extract agar, Czapek's-Dox agar and Richards' agar. A quantity of 20 ml of each medium was poured in a sterile petridish and 8 mm fungal disc of the Kannaki isolate was placed in the centre of each medium taken for the study and incubated at 28 ± 1°C. The radial growth of the fungus was recorded after 10 days of incubation. Four replications were maintined for each treatment.

For the assessment of sporulation, culture discs of 1 cm diameter were taken in 10 places at random in the Petridishes, transferred to 100 ml of dist. water, macerated in a waring blender for one min. and strained though a muslin cloth. Spore counts in the filtrate were recorded using a haemocytometer as per the following scale.

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Number of spores in lakhs per ml	Grade
Less 5.0	+ Poor
5.0 < 15.0	++ Fair
15.0 < 25.0	+++ Good
Above 25.0	++++ Very good

Aliquots of 50 ml of four different liquid media viz., Czapek's-Dox medium, Richards' medium, Fries' medium and Host extract medium were transferred to each Erlenmeyer flask and incubated with 1 cm fungal disc under room temperature (28 ± 1°C). Dry mycelial weights were recorded atter 12 days of incubation under static conditions. Five replications were maintained for each treatment.

The fungus was grown in oats agar medium and incubated at different temperatures viz., 20 ± 1°C; 25± 1°C; 30±1°C; 35±1°C and 40±1°C. The pH levels tried were 5.5, 6.5, 7.0 and 7.5. The pH of solid medium (PDA) was adjusted to the required level using Elico pH meter. In both the temperatures ((4 replications) and pH studies (3 replications), inoculations etc., were made as per the method described for growth under solid media.

For the studies on the utilization of carbon, sucrose was substituted with different carbon sources viz., glucose, galactose, maltose, lactose, and starch in Czapek's-Dox medium. For the growth studies under different nitrogen sources ammonium nitrate, ammonium sulphate, peptone, asparagine and potassium nitrate at 2 per cent level were substituted for sodium nitrate. Inoculation etc., were carried out as per the method described for growth under liquid media.

RESULTS AND DISCUSSION

Potato dextrose agar (PDA) and Oats agar media were found to support the growth of the pathogen significantly better than other media tried. Very good sporulation was recorded in potato dextrose agar, oats agar and apple extract agar media followed by Czapek's-Dox agar (Table I). Maximum biomass and sporulatton was recorded in Czapek's-Dox broth when compared to other liquid media tried (Table II). Prabakaran *et al*. (1973) reported PDA as the best medium for *A. oryzae* and and it was better than Czapek's, the synthetic medium. So it may be concluded that the pathogen preferred non-synthetic media for growth and sporulation.

TABLE I. Growth and sporulation of *A. oryzae* in different solid media

Media	Av. Radial growth (cm)	Sporulation
Potato dextrose agar	1.68	++++
Oats agar	1.66	++++
Richards' agar	1.49	++
Czapek's-Dox agar	1.51	+++
Apple extract agar	1.43	++++
Host extract agar	1.47	++
C. D.	0.14	

Maximum growth and sporulation of the fungus were recorded at 30±

TABLE II. Growth and sporulation of *A. oryzae* in different liquid media

Media	Av. Bio mass dry weight (cm)	Sporulation
Czapek's-Dox broth	313.25	++++
Richards' broth	189.25	++
Fries' broth	141.50	+
Host extract broth (Rice sheath extract)	177.00	++
C. D.	24.12	

1°C followed by 25 ± 1°C and 35 ± 1°C. Kawamura (1940) reported that *A. oryzae* grew well at 30-31°C while Tasugi and Ikeda (1956) stated, 20-28°C as optium temperature for this pathogen. The present study confirms Kawamura's (1 9 4 0) observations.

TABLE III. Effect of temperature and pH on the growth and sporulation of *A. oryzae*

Temperature	Av. Radial growth (cm)	Sporulation
20 ∓ 1°C	2.78	+++
25 ∓ 1°C	2.83	++++
30 ∓ 1°C	3.00	++++
35 ∓ 1°C	2.80	++++
40 ∓ 1°C	2.63	+++
pH		
5.5	2.30	++++
6.0	2.50	++++
6.5	2.70	++++
7.0	2.53	++++
7.5	2.25	+++

Growth of the pathogen was maximum at pH 6.5 followed by 7.0 and pH 6.0 levels, while poor growth was recorded at pH 7.5 and 5.5 levels. Good sporulation was recorded at pH 5.5, 6.0, 6.5 and 7.0 and comparatively less sporulation at 7.5 (Table III and IV). An initial pH of 5 to 7 is satisfactory for the majority of fungi (Cochrane, 1958). The fungus under study also exhibited similar pH requirements.

Sucrose and starch recorded a maximum growth and sporulation followed by glucose and maltose. The requirement of carbon as engergy source by fungi is well known and understood (Cochrane, 1958). The results obtained in the studies on utilisation of carbon source by *A. oryzae* indicate that it was able to uti-

TABLE IV. Effect of different carbon and nitrogen sources on the growth and sporulation of *A. oryzae*

Source	Av. Biomass dry weight (mg)	Sporulation	C. D.
Carbon			
Glucose	282.00	+++	
Galactose	222.00	+	
Maltose	271.00	++	11.61
Lactose	229.00	+	
Sucrose	304.00	++++	
Starch	296.75	++++	
Nitrogen			
Ammonium nitrate	243.00	++++	
Ammonium sulphate	234.00	++++	
Peptone	208.00	+++	8.37
Sodium nitrate	196.00	+++	
Asparagine	200.00	+++	
Potassium nitrate	187.00	++	

lize a variety of carbon sources and of this sucrose and starch were mostly preferred followed by glucose and maltose. This preferential requirement may be the cause for the increased growth of this fungus in starch rich PDA and starch and maltose rich oats medium.

The table IV reveals that maximum growth was recorded in ammonium nitrate and it was on par with ammonium sulphate and they were significantly superior. Asparagine and sodium nitrate were on par with each other and recorded poor growth. Ammonium nitrate and ammonium sulphate recorded maximum sporulation followed by peptone, asparagine and sodium nitrate. Therefore it appears that the pathogen may prefer nitrogen in the form of ammonia, which can directly enter into amino acid pool.

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