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Research Article

Cultural studies on *Alternaria ricini* causing leaf spot of castor

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ABSTRACT

Among all the solid media tested, the maximum growth of the fungus (colony diameter) was recorded in Richard's agar (89.33 mm) whereas in liquid media, the maximum mean dry mycelial weight of the fungus was observed in Potato dextrose broth (291.00 mg). The optimum temperature range between 25°C to 30°C and pH of 6.0 favoured better growth of the pathogen. Among the different carbon and nitrogen sources were tested, the sucrose and calcium nitrate were found more effective as carbon and nitrogen sources, respectively, for better growth of the pathogen.

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INTRODUCTION

Castor (*Ricinus communis* L.) belonging to the family Euphorbiaceae is an important non-edible, export oriented industrial oilseed crop in India, India is the leading producer of castor and it has a prominent place in dry lands due to its drought resistance, quick growth, deep root system and wax coating on shoots. In India it occupies 7.87 lakh ha with an annual production of 10.54 lakh tones and a productivity of 1339 kg ha^{-1}. In Karnataka, the total area of castor was 23.00 thousand hectares with an annual production of 16.00 thousand tones and productivity of 696 kg ha^{-1} (Anonymous, 2007). Castor oil and its derivatives are used in several industries like perfumery, cosmetics, textile, paints, printing inks, adhesives, plastics, rubber, lubricants, paper, chemicals and pharmaceuticals etc. The oil also finds a place in domestic medicine as purgative. Oil cake of castor forms valuable manure for many commercial crops.

Castor plants are attacked by numerous diseases, under high relative humidity, but only a few occur in the high plains, In recent years, leaf spot caused by *Alternaria ricini* is assuming serious proportions in major castor growing areas and affecting yield as well as oil content. The earlier reports of *Alternaria* leaf spot on castor in India were made by Dastur (1913), Chibber (1914) and Dey (1945) and Pawar and Patel (1957). Hence, the present study was carried out for the effect of solid and liquid media and optimum temperature and pH for better growth of the *Alternaria ricini* causing leaf spot of castor.

MATERIALS AND METHODS

The experiment was conducted in the Department of Plant Pathology, College of Agriculture, UAS, GKVK, and Bangalore, for cultural studies on *Alternaria ricini* causing leaf spot in castor, during 2009-2010. The leaves of castor, having typical symptoms of leaf spot were collected from the field and cultured on Potato dextrose agar medium for isolation of the pathogen.

The six different solid media namely, Richard's agar, Czapek's agar, Brown's agar, Coon's agar, Sabouraud's dextrose agar and Potato dextrose agar media and eight liquid media such as Malt broth, Potato dextrose broth, Richard's broth, Sach's broth, Coon's broth, Sabouraud's dextrose broth, Czapek's broth and Glucose peptone broth were tested for effective growth of *Alternaria ricini*.

Potato dextrose agar was prepared and 15 ml of the medium was poured into the sterilized Petri plates under aseptic conditions. Inoculations were made with identical culture discs (5 mm diameter) and the inoculated plates were incubated at 10° C, 15° C, 20° C, 25° C, 30° C and 35° C in BOD incubator with three replications each. The colony diameter (mm) of the

pathogen was recorded after every 72 hours. The data thus recorded were subjected to statistical analysis for knowing the effect of different temperatures on the growth of the pathogen.

The different pH levels *viz.*, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0 and 10.0 were adjusted by adding 0.1N NaOH or 0.1N HCl. Potato dextrose broth was prepared and 50 ml of the broth was added to sterilized conical flasks of 100 ml capacity.

The sterilized media were used for inoculation of the pathogen mycelium, with the help of a sterilized inoculation loop. The fungal mycelium was inoculated into the sterilized conical flasks under aseptic conditions and each treatment was replicated thrice. The inoculated conical flasks were incubated at room temperature for seven days. After seven days the content of the flask was filtered through Whatmann filter paper and the mycelia growth thus obtained was kept for drying along with the filter paper in an oven. The initial weight of the filter paper was recorded. After drying the weight of the mycelial growth was measured along with filter paper on a digital balance and later the initial weight of the filter paper was subtracted from the final weight and thus original dry mycelial weight was obtained and recorded for further statistical analysis.

RESULTS AND DISCUSSION

Among the six different solid media evaluated, the maximum mean colony diameter of *A. ricini* was recorded in Richard's agar media (89.33 mm) followed by Potato dextrose agar (78.33 mm). However, the least mean colony diameter was found in Brown's agar media (22.33 mm). The growth of the fungus was comparatively less in other media like, coon's agar and Czapek's agar. Least growth was observed in case of Brown's agar (Table 1 and Fig. 1).

Among the eight different liquid media tested, the maximum mean dry mycelial weight of *A. ricini* was found in case of Potato dextrose broth (291.00 mg), followed by Richard's broth (155.33 mg). Whereas, lowest growth of the fungus was observed in Malt broth (58.00 mg) (Table 2 and Fig. 2).

Table 1 : Growth of *Alternaria ricini* on different solid media

Sr. No.	Medium	Mean colony diameter (mm)
1.	Richard's agar	89.33
2.	Czapek's agar	55.00
3.	Brown's agar	22.33
4.	Coon's agar	31.66
5.	Sabouraud's dextrose agar	51.33
6.	Potato dextrose agar	78.33
	S.E.±	1.17
	C.D. (P=0.05)	3.60

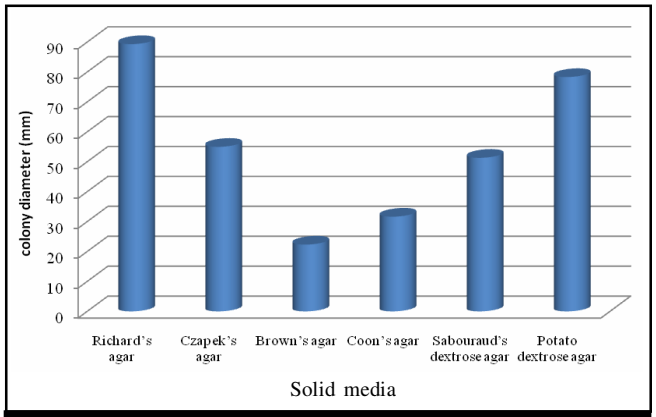

Fig. 1 : Growth of *Alternaria ricini* on different solid media

The results of different temperature levels indicated that, the growth of the fungus occurred at all the temperatures tested but there was significant difference between the different temperature levels. Maximum colony diameter of *A.*

Table 2 : Growth of *Alternaria ricini* in different liquid media

Sr. No	Medium	Mean dry mycelial weight (mg)
1.	Malt broth	58.00
2.	Coon's broth	63.66
3.	Sach's broth	73.33
4.	Potato dextrose broth	291.00
5.	Richard's broth	155.33
6.	Czapek's broth	88.00
7.	Sabouraud's dextrose broth	100.00
8.	Glucose peptone broth	95.33
	S.E.±	13.90
	C.D. (P=0.05)	41.68

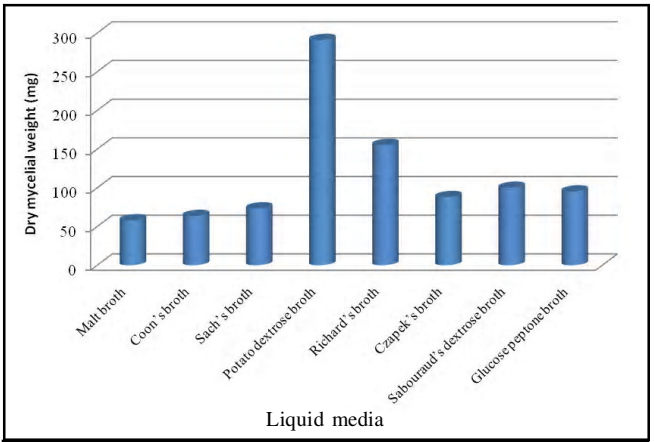

Fig. 2 : Growth of *Alternaria ricini* in different liquid media

ricini was observed at 25 ºC (88.66 mm) followed by 30 ºC. However, there was no significant difference between these two treatments. Growth of the fungus was tending to decrease at higher temperature levels *i.e.* at 35 ºC, whereas also less growth was found at lower temperatures. Hence, optimum temperature for the growth of *A. ricini* was between the range of 25-30 ºC (Table 3 and Fig. 3).

Table 3 : Effect of different temperature on the growth of *A. ricini*

Sr. No.	Temperature (ºC)	Mean colony diameter (mm)
1.	10	33.50
2.	15	35.00
3.	20	53.66
4.	25	88.66
5.	30	88.33
6.	35	24.33
	S.E.±	1.14
	C.D. (P=0.05)	3.52

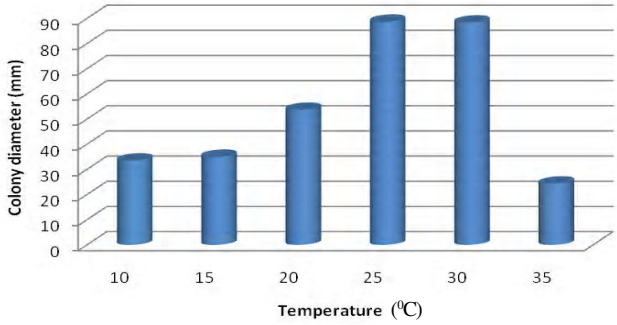

Fig. 3 : Effect of different temperatures on the growth of *A. ricini*

Table 4 : Effect of different pH levels on the growth of *A. ricini*

Sr. No	pH	Mean dry mycelial weight (mg)
1.	4.0	188.00
2.	5.0	346.00
3.	6.0	395.00
4.	7.0	320.33
5.	8.0	301.66
6.	9.0	304.33
7.	10.0	227.33
	S.E.±	15.91
	C.D. (P=0.05)	48.28

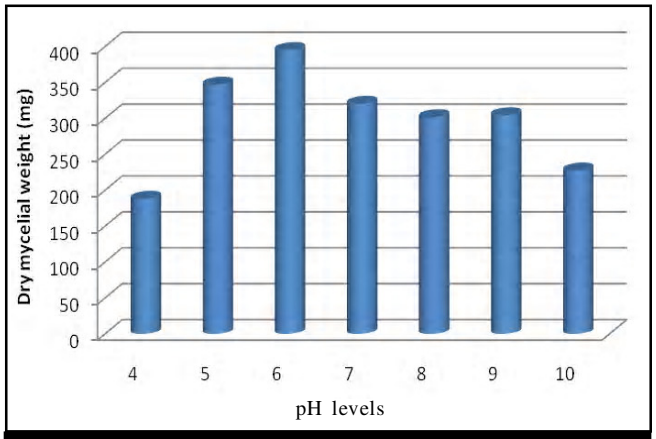

Fig. 4 : The Effect of different pH levels on the growth of *A. ricini*

The results of different pH levels indicated that the growth of the fungus varies at different pH ranges. The maximum dry mycelial weight was observed at pH 6.0 (395.00 mg) followed by pH 5.0 (346.00 mg). But, it was found that the fungus has the ability to grow even at alkaline condition. Least growth was observed at pH 4.0. (188.00 mg) Hence, pH range between 5.0-6.0 was the optimum for better growth of the pathogen. (Table 4 and Fig. 4).

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