



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 2613-2617
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www.thepharmajournal.com

Received: 09-02-2023

Accepted: 13-03-2023

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Effect of different media and pH on radial growth of *Alternaria ricini* causing Leaf spot in castor

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Abstract

The experiment was conducted to observe the effect of different media on the radial growth of *Alternaria ricini* causing leaf spot in castor. The present investigation was conducted in the laboratory of department of plant pathology T.D.P.G., College, Jaunpur. In year 2022-23 the most effective culture media over which maximum growth in (cm.) and sporulation was recorded on Potato Dextrose Agar Media (8.00) followed by Maltose Extarct Media (6.70), Corn Meal Media (6.50), Wheat Extract Media (5.50), Oat Meal Agar Media (5.00), Standard Nutrient Agar Media (4.70), Kirchaff's Media (3.50) and minimum were found in Leaf Extract Media (3.00). An experiment was conducted to evaluate the hydrogen-ion concentration on vegetative and reproductive growth of the fungus Seven pH level viz., 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, and 8.0 were used in the present studies, the maximum weight of dry mycelium was found on pH 7.0 (720.00 mg) and the minimum was found on 8.0 (150.20 mg).

Keywords: Cator, leaf spot, *Alternaria ricini*, different media, radial growth

Introduction

Castor (*Ricinus communis* L.) is a species of flowering plant belongs to the family; *Euphorbiaceae*, which contains a vast number of plants mostly native to the tropics. It belongs to a monotypic genus *Ricinus*. Three terpenoids and a tocopherol-related compound have been found in the aerial parts of *Ricinus communis*. The plant oils are typically composed of triglyceride molecules (technically called esters) which contain a 3-carbon alcohol (glycerol) and three 18-carbons (or 16 - carbons) fatty acids. Castor oil is unique among vegetable oils because it is the only commercial source of a hydroxylated fatty acid (ricinoleic acid). The oil contains around 90% of the fatty acid. However, the present of toxic components of castor seed (including the protein ricin and the alkaloid ricinine) have been a concern for all who handle castor seed, meal or oil extraction factories. The most notorious constituent is ricin, a deadly poison found in abundance in the seed and in smaller amounts throughout the rest of the plant.

Area under castor reported during 2021-22 was 1.484 lakh ha (3.67 lakh acres) as against 1.732 lakh ha (4.28 lakh acres) during the same period in 2020-21. Among states, Gujarat is leading with 1.022 lakh ha (2.52 lakh acres) under castor followed by Rajasthan 0.254 lakh ha (0.63 lakh acres). [(Directorate of Economics and Statistics (DES) 2021] ^[1].

Castor plant (*Ricinus communis*) is reported to suffer severe losses due to many diseases caused by fungi and bacteria. There are many pathogens which infects the castor. Leaf spot (*Alternaria ricini*), Leaf spot (*Cercospora ricinella*), Bacterial leaf Spot (*Xanthomonas ricinicola*). With the high economic value the castor they suffers lots from fungal disease to know more about the fungal morphology the laboratory test was conducted to know the effect of different media on the growth of the pathogen. The earliest reports of *Alternaria* leaf spot on castor in India were made by Dastur (1913) ^[10], Chibber (1914) ^[11], Dey (1945) ^[12] and Singh (1955) ^[13].

Material and Method

The present investigation was conducted in the laboratory of department of Plant Pathology of T.D.P.G., College, Jaunpur, During 2022-23. The cultural studies of pathogen were made on different solid media. To studies the growth and sporulation of the fungus and thereby, to find out the best suited medium for its growth and sporulation. These were as follows- Potato Dextrose Agar Media, Matose Extract Media, Corn Meal Agar Media, Wheat Extract Media,

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Oat Meal Agar Media, Standard Agar Media, Kirchaff's Media and Leaf Extract Media. The media were prepared by mixing the ingredient in the same amount as specified. The media were solidified with adding 2.0 percent agar in each medium and sterilized. For radial growth study, sterilized petridishes of 9.0 cm diameter were poured with equal amount of medium inoculation of poured petridishes were done with 5.00 mm culture disc and incubated at 28 ± 1 °C for four day. Sporulation The spores of *Alternaria ricini* are bigger in size and countable by the help of the microscope. The dilution method was followed and counting was done with the help of microscope under low and high power. For this purpose one randomly selected flask, containing the fungal growth was thoroughly shaken for each medium. From each flask, one ml fungal suspension was taken and diluted to five time with double distilled water one ml of this diluted suspension was divided into five equal drop on glass slides for counting the spores of the fungus. The number of spore in each drop was counted finally, the average number of spores was calculated.

For study the effect of different hydrogen-ion concentration on vegetative and reproductive growth of the fungus on liquid medium was used as basal medium. Different initial Ph meter and buffered by using N/10 sodium hydroxide and N/10 hydrochloric acid before autoclaving. Seven level of pH viz., 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, and 8.0 were used in the present studies. Each treatment was replicated three time. After autoclaving the final pH of the medium was maintaed. Then the average dry weight of mycelium mat and degree of sporulation were recorded after 8 day of incubation 28 ± 1 °C.

Result and Discussion

The effect of different culture media on growth and sporulation of the pathogen are being tested under *In-Vitro* condition in year 2022-23.

Linear Growth

The average diameter of fungal colonies on different media and extent sporulation were recorded Table-1, from the data represented in table and corresponding histogram (Fig.1). It is obvious that the highest radial growth of the pathogen was obtained on Potato Dextrose Agar Media (8.00 cm.) was significantly superior to other treatments. The next best media were maltose extract and Corn Meal Agar Medium which showed the average radial growth 6.70 and 6.50 respectively. These were statically at par with each other. The Wheat Extract Medium and Oat Meal Agar Medium supported good fungal growth of the pathogen 5.50 and 5.00 cm. These were also statically at par with each other. The next order of superiority were Standard Nutrient Agar Media and Kirchaff's Medium which showed 4.70 and 3.50 cm. of radial growth. Among the tested Media Leaf Extract Media showed minimum fungal growth (3.00 cm.). The poorest growth was observed in Leaf Extract Media (3.00 cm.). Similar work done on effect of different media on radial growth of *Alternaria* spp. Singh *et al.*, (2013) ^[8] and Kumar *et al.*, (2017) ^[3] and Singh *et al.*, (2001) ^[7, 9].

Sporulation

Among the tested media Potato Dextrose Agar Media showed excellent media the sporulation of pathogen. Maltose Extract and Corn Meal Media showed fair sporulation. Wheat Extract Media, Oat Meal Agar Media and Standard Nutrient Agar

Media recorded good sporulation of the pathogen. Rest two media Kirchaff's Agar Media and Leaf Extarct Media were showed poorest sporulation.

Fungal Dry Weight

It is evident from the Table-2, and its corresponding histogram (Fig.3) reveal that the maximum fungal dry weight found on pH 7.0 (720.00 mg) followed by 6.5 (600.10 mg.), 6.0 (520.50 mg.). These were statically different from each other. There was also significant reduction in growth at pH lower that of 5.5 (450.02 mg.), 5.0 (360.00 mg.), 7.5 (300.00 mg.) and minimum dry weight was found on pH 8.0 (150.20 mg.) all the treatment was found statically different with each other. The result found similar to the previous worker Singh *et al.*, (2001) ^[7, 9].

Sporulation

Generally the sporulation correspondent well with the type of fungal growth at different pH level. Among the tested pH Excelent growth was recorded at 7.0, 6.5 whereas Fair growth was recorded at 6.0, 5.5 among them Good growth was recorded at 5.0, 7.5 and Poor growth was recorded at 8.0.

Table 1: Effect of different media on radial growth and sporulation of the *Alternaria ricini*. (2022-23).

S.No.	Treatments	Avg. Fungal Growth (cm.)	Sporulation
1.	Potato Dextrose Agar	8.00	XXXX
2.	Maltose Extract Media	6.70	XXX
3.	Corn Meal Media	6.50	XXX
4.	Wheat Extract Media	5.50	XX
5.	Oat Meal Agar Media	5.00	XX
6.	Standard Nutrient Agar Media	4.70	XX
7.	Kirchaff's Media	3.50	X
8.	Leaf Extract Media	3.00	X
C.D. at 5%		1.50	

Table 2: Effect of different hydrogen ion concentration growth of the *A. ricini*. (2022-23).

S.N.	pH level	Average fungal dry weight (mg)	Sporulation
1.	5.0	360.00	XX
2.	5.5	450.02	XXX
3.	6.0	520.50	XXX
4.	6.5	600.10	XXXX
5.	7.0	720.00	XXXX
6.	7.5	300.00	XX
7.	8.0	150.20	X
C.D. at 5% level = 3.573			

Where;

XXXX- Excelent growth

XXX- Fair growth

XX- Good growth

X- Poor growth

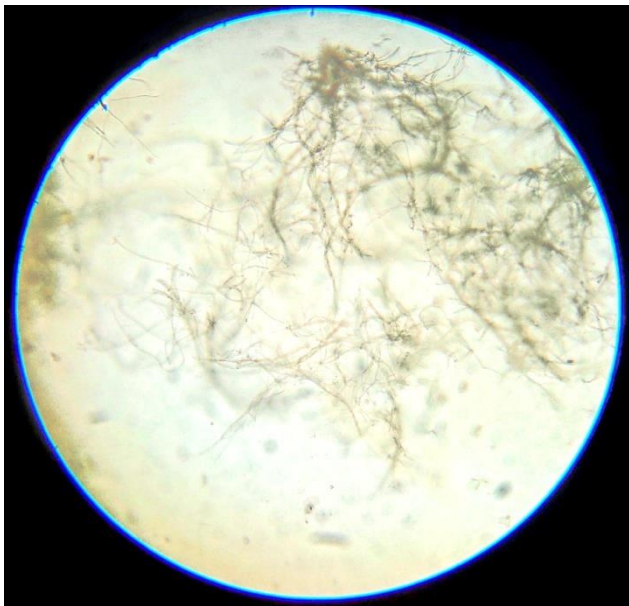


Fig A: Mycelium

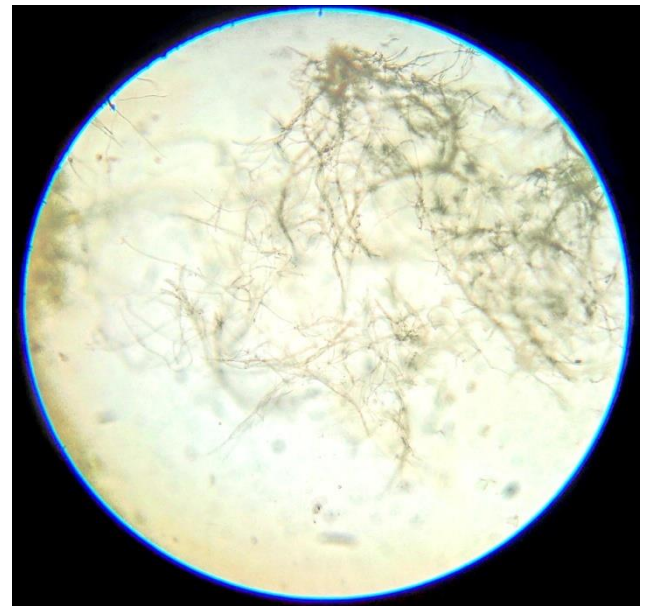


Fig B: Conidia of *Alternaria ricini*.

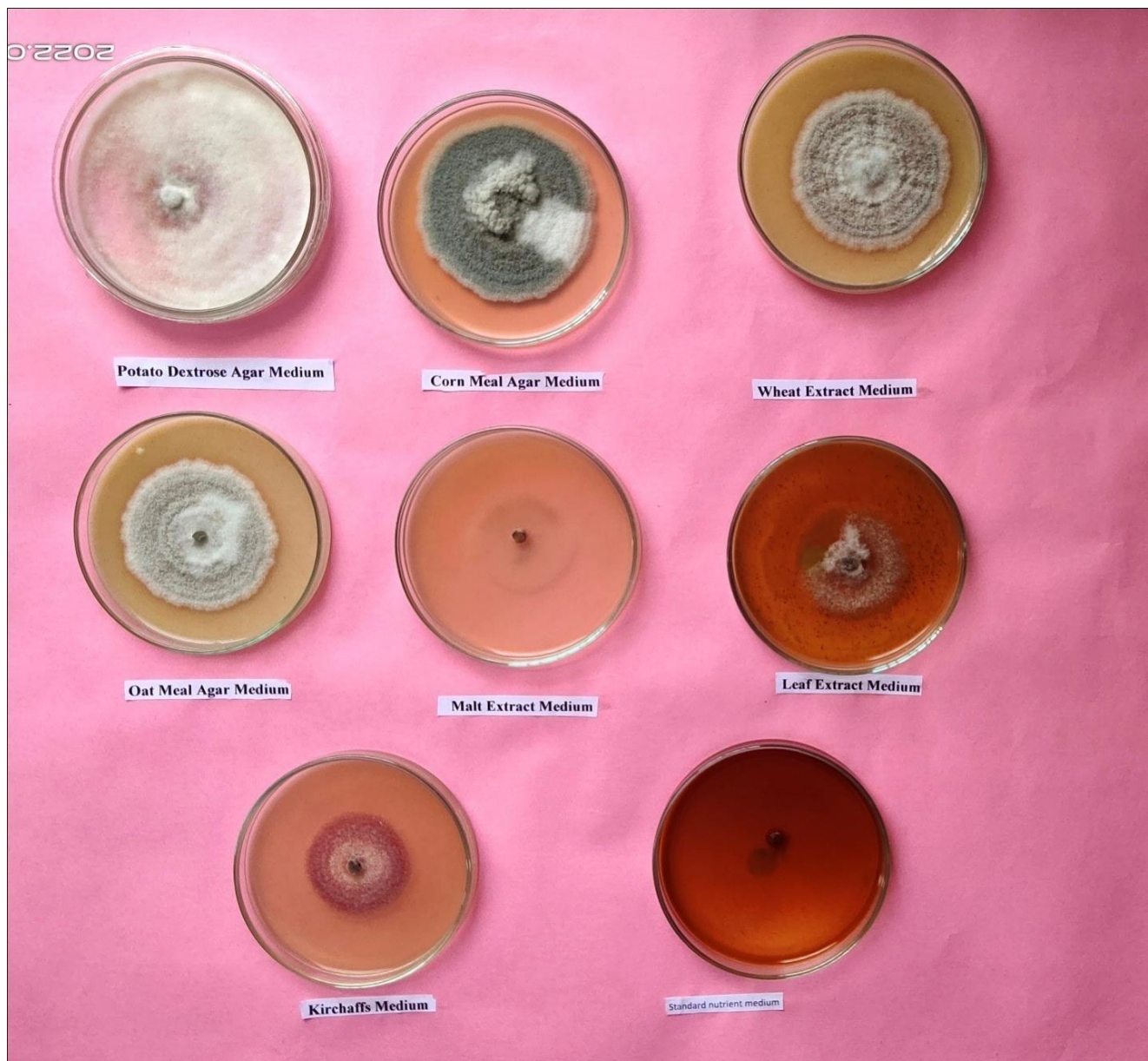


Fig 1: Mycelial growth of fungus at 15 days interval (2022-23).

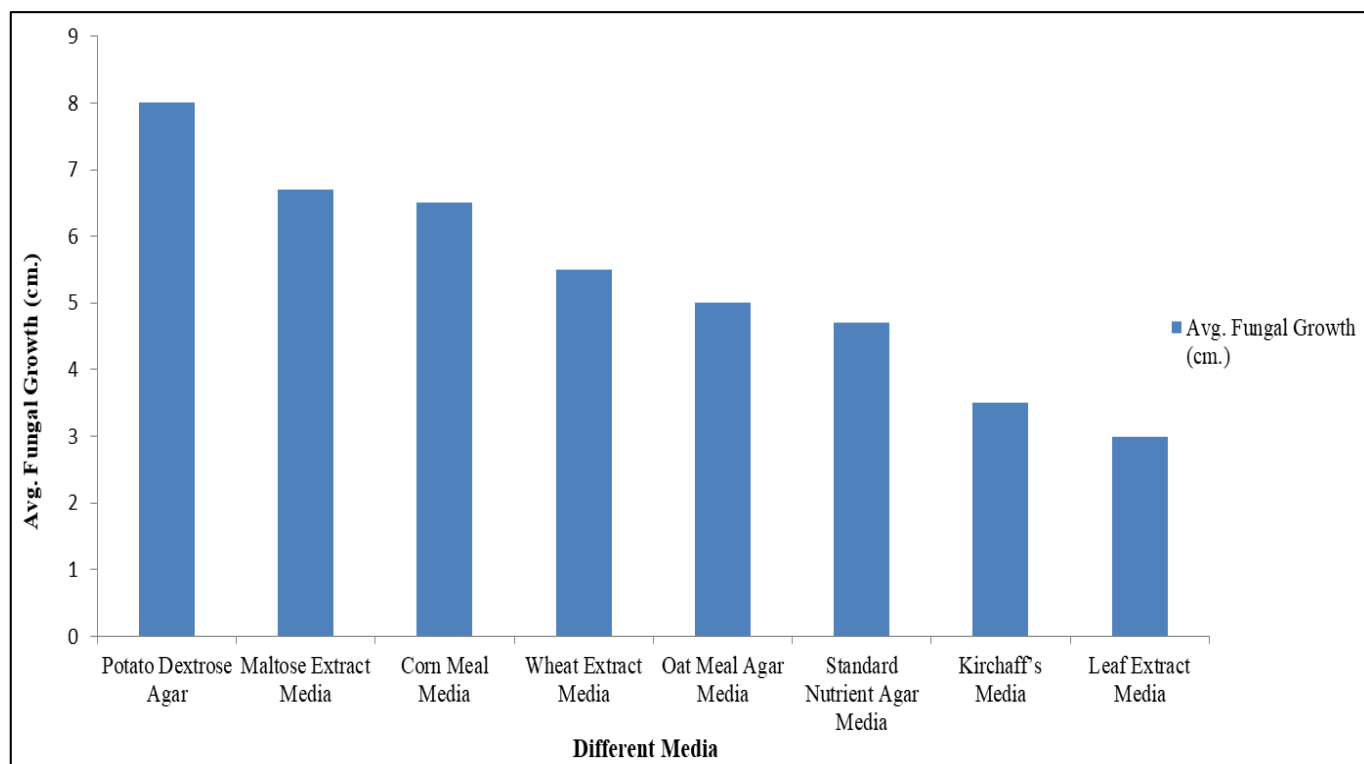


Fig 2: Effect of Different Culture Media on Radial Growth of the Pathogen (2022-23).

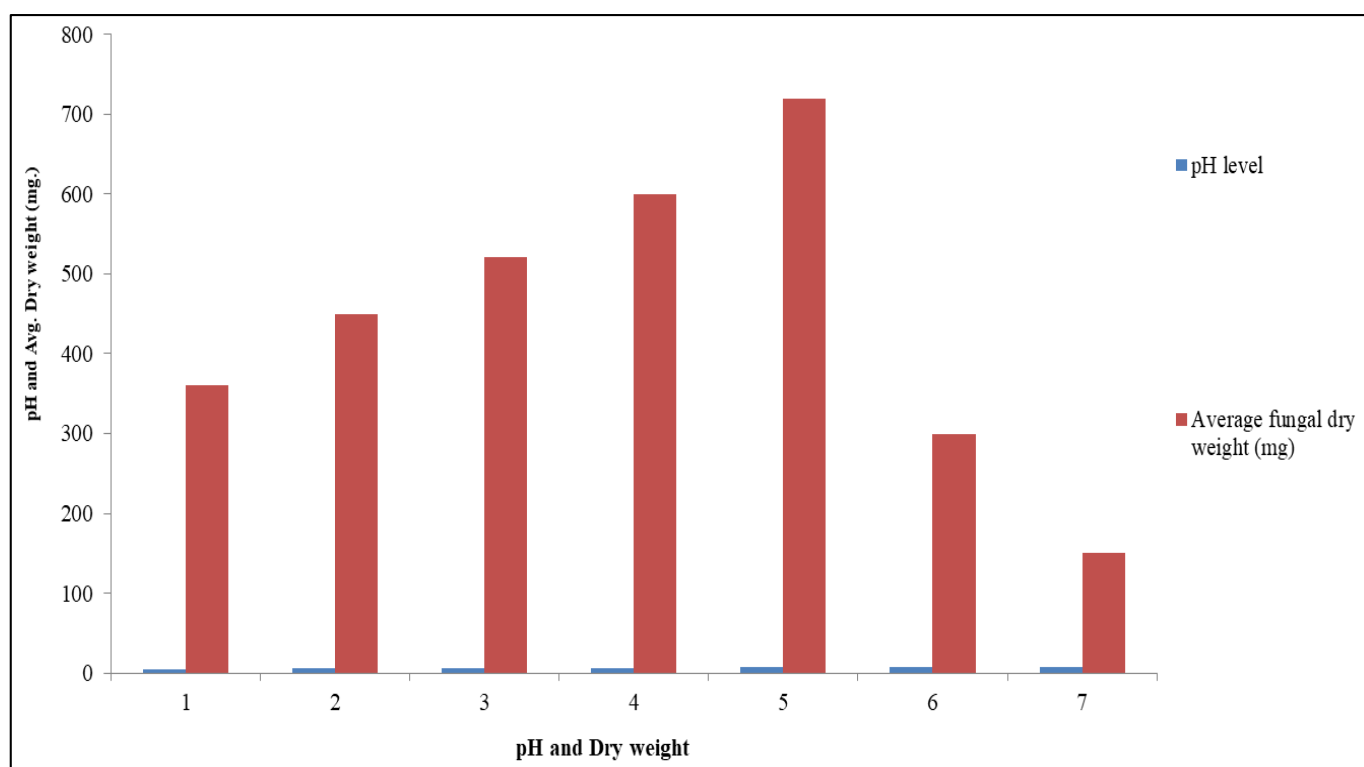


Fig 3: Effect of different hydrogen ion concentration on fungal dry weight. 2022-23

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