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PHYSIOLOGICAL ASPECTS OF *ALTERNARIA BURNSII* (UPPAL, PATEL, KAMAT) CAUSING BLIGHT OF CUMIN

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Maximum growth and sporulation of *Alternaria burnsii* was observed on Richards and Potato dextrose agar media among the 9 media tested. Optimum temperature required for growth and sporulation was 26°C. Ninety percent humidity and 6 to 7 pH favoured growth and sporulation. Maximum growth of the fungus was under natural light condition but complete darkness enhanced the sporulation.

Keywords : *Alternaria burnsii;* Cumin; Humidity, Media; pH.

Introduction

Cumin blight incited by *Alternaria burnsii* is one of the most important disease in Rajasthan causing heavy damage to the crop. A thorough knowledge about nutrition of the pathogen has a basic significance in understanding host and parasite relationship. The kind of nutrients the pathogen utilized *in vitro* may indicate what it takes from the host plant. The physiological studies on factors influencing, growth and sporulation of fungus *A.burnsii* were studies under the present investigation.

Materials and Methods

The pathogen isolated from infected part of stem, leaf and seed of the cumin plant, grown in the field of A.R.S. Durgapura, Jaipur was maintained on Potato-dextrose-agar medium and passed through the host from time to time. The effect of different media, pH, temperature, humidity and light on the pathogen were studied as under:

Media - Nine different synthetic solid media viz. Asthana and Hauker's agar, Browns agar, Czepex agar, Cumin seed agar, Malt agar, Oat meal agar, Potato dextrose agar, Richards agar, Sabarouds agar medium were prepared. Each medium was adjusted to pH 6.5 and autoclaved. The media were sterilized at 1.045 Kg/cm^2 for thirty minutes and poured in Petriplates, which was later inoculated with mycelial bit (5 mm diam) cut from 10 days old culture of the fungus. The inoculated plates were incubated at 26±1°C for 7 days. The colony diameter and sporulation were recorded with the help of linear scale and a haematocytometer respectively.

pH - Hydrogen ion concentration of Richards liquid medium was adjusted at different levels by adding citrate buffer solution to determine the optimum pH for growth and sporulation. The pH of medium was measured before and after autoclaving. Twenty ml of medium was dispensed in each 100 ml flask and autoclaved. The bit of 5 mm diameter was transferred to each flask and incubated at 26 ± 1°C for 20 days. Dry weight of mycelium was determined by harvesting fungal growth on preweighed Watman filter paper No. 42. Drying was

done at 60^{0}C for overnight in hot air oven, cooled in desicator and weighed. The sporulation were recorded with the help of haematocytometer.

Humidity - Different levels of relative humidity (R.H.) were maintained by mixing stock solution of sulphuric acid (50%) and distilled water according to the method given by Buxton and Mellanby[1]. The sterilized inoculated plates were placed in desicator having different humidity levels at temp. 26 $\pm$ 1^{0}C. Observations were recorded after 10 days on radial growth.

Temperature - For temperature study, the sterilized pertriplates having Potato-dextrose-agar medium inoculated by 5 mm diameter of fungal bit and were incubated at different temperature i.e. 15, 20, 35 and 40^{0}C.The radial growth and sporulation were recorded as mentioned earlier.

Light - In order to find out the effect of light and darkness on growth and sporulation of the pathogen, Potato dextrose agar plates were subjected to the various light condition after inoculation. The inoculated plates were incubated at 26 $\pm$ 1°C in incubator fitted with Phillips bulbs for adjusting different exposures of light and darkness. For complete darkness the inoculated plates were wrapped in carbon paper. Plates under natural light conditions served as check. After 10 days of inoculation, the radial growth and sporulation were recorded.

Results and Discussion

The results of various experiments were recorded and presented in Table 1 to 5.

Fungi respond differentially to nutritional factors which further depends upon the reaction of the substrate and fluctuating temperature, humidity, pH and light conditions. Among the nine synthetic media tested best growth and sporulation of fungus was observed on Richard's synthetic agar and Potato-dextrose-agar. These observations confirm the findings of Uppal *et al.*[2], Patil[3] and Bandhopadhyay *et al*[4].

During the present course of study , optimum temperature required for growth and sporulation was 26°C and the growth was completely supressed at 40°C. This shows that a temperature of 40°C or above is detrimental to *A.burnsii* and its survival is difficult if it is exposed to this range of temperature during summer month. Similar results were reported by Uppal *et al.*[2] in case of *A.burnsii*.

Hydrogen ion concentration governs the metabolic activities of growing organism both in natural and in artificial cultures. The present study indicates that the fungus *A. burnsii* could grow in wide range of hydrogen ion concentrations of 4.5 to 8.5. The best one is 6.5. The results are in confirmity with Uppal *et al.*[2] and Patil[3].

It was observed that fungus showed maximum growth under condition of natural light and darkness, which is closely followed by total darkness. It indicates that total light is inhibitory for growth and sporulation of the fungus. Visible light is known to influence various processes including mycelial growth and sporulation, spore germination and disease development. This

supports the finding of Minussi *et al.*[5] who studied in *Stemphyllium solani* light inhibited sporulation. Ninety per cent humidity level was found to be the best for growth and sporulation of the fungus. Uppal *et al.*[2] and Prabhu and Prasad[6] also observed the profound effect of moisture on infection in case of *A. burnsii* and *A.triticina* respectively.

Table 1. Effect of different media on growth and sporulation of *Alternaria burnsii* after 7 days of incubation at 26^{0}C.

Media	Av.Growth* in mm	Sporulation
Asthana agar	47.75	++
Browns agar	55.75	++
Czepex agar	47.75	++
Cumin seed agar	40.00	++
Sabarouds agar	42.25	++
Malt agar	45.50	++
Oat meal agar	54.50	+++
Potato dextrose agar	64.00	++++
Richards agar	70.50	++++
SEm ±	1.40	
CD at 5%	4.06	
CD at 1%	5.48	

*Av.growth of 4 replications

Table 2. Growth and sporulation of *Alternaria burnsii* at different levels of pH.

pH before autoclaving	pH after autoclaving	*Dry mycelial weight (in mg)	Sporulation
4.0	4.1	257	++
4.5	4.7	324	++
5.0	4.9	386	++
5.5	5.6	360	++
6.0	6.0	518	+++
6.5	6.6	543	++++
7.0	7.0	491	++++
7.5	7.6	391	++
8.0	8.0	338	++
8.5	8.5	225	++
	SEm ±	16	
	CD 5%	47	
	CD 1%	63	

*Average of 4 replications

Table 3. Effect of different temperatures on growth and sporulation of *Alternaria burnsii in vitro*.

Temperature(^{0}C)	Av. growth in* mm	Sporulation
15	42.51	++
20	64.75	++++
26	77.50	+++++
30	71.50	+++
35	9.75	+
40	-	-
SEm ±	1.43	
CD at 5%	4.24	
CD at 1%	5.80	

*Av. of 4 replications.

Table 4. Effect of different levels of humidity on growth and sporulation of *Alternaria burnsii in vitro*.

% Humidity	Av.growth in mm	Sporulation
100	72.00	++++
90	81.75	+++++
80	79.25	++++
70	62.25	+++
60	51.00	++
50	42.75	+
SEm ±	1.58	
CD 5%	4.68	
CD 1%	6.42	

*Average of 4 replications

Table 5. Effect of light on the growth and sporulation of *A.burnsii* incubated at 26^{0}C.

Treatments	Linear* Growth mm	Sporulation
24 h dark + 0 h light	85	+++++
24 h light + 0 h dark	74	++
12 h light + 12 h dark	80	+++
Natural condition	90	+++
SEm ±	1.58	
CD at 5%	4.74	
CD at 1%	6.53	

* Average of 5 replications.

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