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Cultural, nutritional and physiological characterization of *Colletotrichum capsici,* the incitant of gerbera leaf spot

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The cultural study of *Colletotrichum capsici* was undertaken on seven different solid media *viz.* potato dextrose agar, malt extract agar, Czapek's dox agar, corn meal agar,rose bengal agar,Richard's agar and oat meal agar at 10 days of inoculation. Potato dextrose agar supported maximum growth (8.3 cm) followed by malt extract agar (7.2 cm). Czapek's dox agar was found superior in terms of sporulation followed by potato dextrose agar. For nutritional study of the fungus, different carbon sources such as sucrose, dextrose, glycine, glucose, starch, xylose, maltose and differnt nitrogen sources such as asparagine, ammonium sulphate, ammonium oxalate and ammonium carbonate were included along with the control. The preferred carbon and nitrogen sources for growth of the fungus were found to be sucrose and asparagine respectively with mean dry weight of 287.23 and 448.53 mg at 10 days of inoculation. Different pH and temperature levels were taken for physiological characterization of the fungus. The optimum pH for growth of the fungus was recorded to be 6.0 with mean dry mycelial weight of 420 mg. The temperature that supported the vegetative growth of the fungus was found to be 30°C.

Key words: *Colletotrichum capsici,* gerbera, cultural, nutritional, physiological study

INTRODUCTION

Floriculture is a blooming industry of India where the flower production is done mostly for export purpose. In India, the liberalization of industrial and trade policies paved the way for development of export oriented production of cut flowers. In 2012-13, in India, the area under floriculture was 232.74 thousand ha, with production of 1.729 million tones loose flower and 76.73 million tones cut flowers. Gerbera (*Gerbera jamesonii* Bolus) is an important cut flower of family Asteraceae, and ranks 5th in global market. The flower has vibrant colours, great vase life and many medicinal properties. Gerbera sufferes from a number of diseases caused by fungi, bacteria, viruses and abiotic stresses. *Colletotrichum* leaf spot caused by *Colletotrichum capsici* is one of the catastrophic disease found in majority of locations in state of Odisha. It causes spots on stalks, stems amd leaves of the plant leading to decrease in quality and market price of the flower. To develop effective management practice package for the disease, a comprehensive understanding of the causal or-

ganism with reference to cultural, nutritional and physiological characterization is essential. The present study is focussing in this aspect.

MATERIALS AND METHODS

Cultural study

The pathogen was grown in seven different media *viz*. potato dextrose agar, malt extract agar, Czapek's dox agar, corn meal agar, rose bengal agar, Richard;s agar and oat meal agar. All the media were sterilized at 121°C for 20 minutes. After sterilization, each medium was poured into 90 mm Petridishes. Each treatment was replicated thrice. After pouring they were allowed to cool to 28 ±1°C. Colony diameter was recorded by averaging linear growth of the colony in three directions for each plate after 10 days of inoculation. The colour of the fungal colony, surface elevation and sporulation were also recorded. The recorded data were analysed statistically.

Nutritional study

The carbon and nitrogen requirement of the fungus was studied in Richard's broth. The amount of carbon and nitrogen compounds used were calculated according to their molecular weight so as to provide the equivalent amount of carbon as sucrose and nitrogen as sodium nitrate present in the basal medium (Richard's broth). Carbon sources used in the experiment were dextrose, glycine, glucose, starch, xylose, maltose and the nitrogen sources used were asparagine, ammonium sulpahte, ammonium oxalate and ammonim carbonate. Each treatment was replicated thrice. One set was maintained as control without adding any carbon and nitrogen source.

Thirty ml of the medium was poured to each 100 ml conical flask. These were sterilized in autoclave at 121°C for 20 minutes. The flasks were inoculated with 5mm mycelial disc of culture and incubated at room temperature for 10 days. After that the mycelial mats were harvested and dry weight was recorded and the data were analysed statistically.

Physiological study

Richard's broth was taken for the study. Different pH levels i.e. 3.0,4.0,5.0,6.0,7.0,8.0 and 9.0 and different temperature levels (10,15,20, 25,30,35,40,45°C.) were taken as two parameters for study. Other procedures were same as dscribed previously.

RESULTS AND DISCUSSION

Among different nutrient media evaluated. potato dextrose agar supported maximum growth (8.3 cm) of the fungus 10 days of inoculation followed by malt extract agar (7.2 cm) However, Czapek's dox agar was found to be superior in terms of sporulation followed by potato dextrose agar medium (Fig. 1).

The optimum pH for the growth of the fungus was recorded to be 6.0 with the mean dry mycelial weight of 420 mg. The appropriate temperature that supported the vegetative growth of the fungus was observed to be 30°C.

Evaluation of various carbon sources on the growth of *Colletotrichum capsici* revealed sucrose was the best carbon source followed by glucose, starch,xylose and maltose in respect of mean dry mycellal weight(mg). However,carbon sources like dextrose and glycine were not efficient growth promoters as recorded in the investigation (Fig. 2). Verma (1979) also reported sucrose as the carbon source that supported excellent vegetative growth, maximum conidial germination and appressoria formation in *Colletotrichum capsici* which is in agreement with the present investigation.

The study on the effect of nitrogen source on the growth of *Celletotrichum capsici* revealed that asparagine was superior among all the four nitrogen sources evaluated in terms of the mean dry mycelial weight (9 mg) of the test fungus. Ammonium oxalate, ammonium sulphate and ammonium carbonate were found non-stimulatory nitrogen sources for the growth as well as sporulation of the test growth habit of *Colletotrichum capsici* of chilli in different nitrogen sources.

Incubation temperature plays an important role in facilitating the growth and sporulation of various plant pathogens resulting in failure or success of disease outbreak. In this context, right temperature regimes were subjected to the growt of *Colletotrichum capsici.* It was observed that a temperature range of 25-35°C was optimal in produc-

Table 1 : Studies on growth and cultural characters of *C.capsici* as influenced by different nutrition

Medium	Type of growth	Colony colour	Distribution of acervulus	Mean colony
Malt extract agar	Spreading. flat	Light grey	Sparse, scattered	7.2
Oat meal agar	Restricted, cottony	Light grey	Numerous,.scatterd	4.3
Rose Bengal agar	Restricted, filliform	Dark brown	Not prominent	5.3
Czapeks dox agar	Spreading, cttony	Dark brown	Ireregularly scattered	6.8
Corn meal agar	Restricted,flat	Light Grey	Arranged in horizontal ring	5.4
Richrards agar	Restricted, cottony	Light Grey with a brown rin	Arranged in horizontal ring	4.6
Potato dextrose agar	Spreading, cottony	Dark brown	Irregularly scattered	8.3
S.Em±				0.266
C.V. (%)				7.67
C.D. (at 5%)				0.818

Table 2 : Effect of carbon and nitrogen sources on the growth of *C. capsici*

Carbon source	Mean dry mycelia weight (mg)	Nitrogen source	Mean dry mycelial weight (mg)
Sucrose	287.23	Asperagine	448.53
Dextrose	187.00	Ammonium oxalate	149.23
Glycine	120.00	Ammonium sulphate	135.80
Glucose	270.43	Ammonium carbonate	70.56
Starch	243.86	Control	138.56
Xylose	270.30		
Maltose	231.06		
Control	72.00		
S.Em±	21.709	S.Em+	11.71
C.D (at 5%)	65.83	CD at 5%	38.198
C.V.(%)	17.88	C.V. (%)	10.76

Table 3 : Effect of pH and temperature on the growth of *Colletotrichum capsici*

pH of the medium	Mean dry mycelia weight (mg)	Temperature(C)	Mean dry mycelia weight (mg)
3	60.0	10	14.16
4	246.6	15	24.50
5	416.6	20	42.53
6	420.0	25	74.80
7	336.6	30	84.33
8	373.3	35	76.13
9	370.0	40	44.66
		45	6.50
S.Em+	43.23	S.Em+	0.81
C.D. (at 5%)	131.12	C.D. at 5%	2.47
C.V.(%)	43.23	C.V.(at 5%)	3.07

ing the maximum mean dry mycelial weight of 74.8-84.33 mg. Temperature below or above this range were, however, found sustainable (Fig.3).

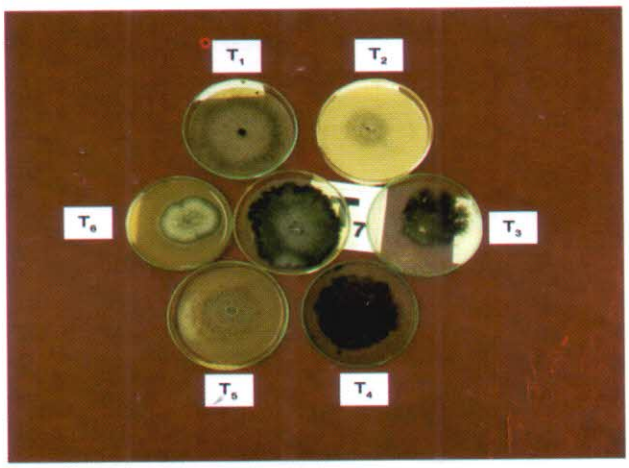

Fig. 1 : Growth of *C.capsici* in different growth media

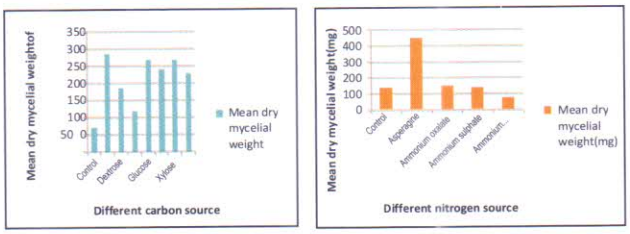

Fig. 2 : Effect of carbon and nitrogen sources on the growth of *C.capsici*

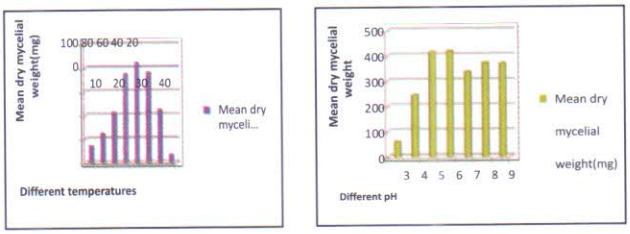

Fig. 3 : Effect of pH and temperature on the growth of *Colletotrichum capsici*

These findings are in agreement with the findfings of Singh and Singh (1977); Mazlan and Sariah (1980); Ouyang and Liu (1993) Muruganadam *et al.,* (1987) and Kumara and Rawal (2008).

The favourable reaction (pH) of the nutrient medium for tHe growth of the test fungus was in different pH regimes from 3.0 to 9.0 the data revealed that a pH range of 5.0 to 6.0 was ideal for growth of the fungus, through the alkaline range (7.0-9.0) was found statistically at par in respect of the production of the biomass by the test fungus. The highly acidic range (3.0-4.0) was found inferior for growth and sporulation. Ouyang *et al.* (1993) reported that the growth of *Colletotrichum capsici* was best at pH 6.0-7.0. The pH 6.0 was found to be the most ideal for growth which also supports the present investigation.

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