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Effect of Light and Temperature *in Vitro* on the growth of *Taphrina maculans* Butler causing leaf spot of Turmeric.

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Abstract: Turmeric is a cash crop cultivated in India and other parts of the world.Turmeric was get infected by a leaf spot disease caused by a fungal pathogen *Taphrina maculans*.The fungal pathogen was greatly influenced by environmental factors like light and temperature .Therefore the present work was undertaken to study the effect of light and temperature on the growth of *Taphrina maculans*. The effect of light and temperature were determined by colony diameter method using Czapek-dox-agar medium.From the results it was clear that the maximum growth of fungus was at red light,green light showed intermediate growth and blue,white and yellow light showed least growth of fungus.

The results also revealed that the maximum growth of fungus was at 30^0c temperature. Below and above that temperature,there was decrease in the growth of pathogen.

Keywords: *Taphrina maculans*,Light,Czapek-dox-agar media

Introduction:

Turmeric (Curcuma longa L.) is one of the most sacred and ancient Indian spice crop.Turmeric is commercially cultivated for rhizome.It is traditionally used for medicinal,religious and culinary purposes in India.The ancient vedic societies of India regarded it as " The herb of Sun" because of its yellow-orange rhizome.In fact there are at least 6000 years of documented use of the spice (Ravindran *et al.*,2007).

Apart from the uses as spice,it is used as traditional medicine in Asian countries such as India,Bangladesh and Pakistan because of its beneficial properties (Chattopadhyay *et al.*,2004).Current traditional medicine claims its powder against gastrointestinal diseases especially for biliary and hepatic disorder,diabetic wounds,rheumatism,inflammation,sinusitis,anorexia and cough.

It is also used in the textile industries as a colouring dye.The colouring principle of turmeric is called curcumin,which has yellow and is the essential component of this plant (Ammon *et al.*,1992).Such an economically important crop get affected by different types of diseases.Leaf spot of Turmeric caused by *Taphrina maculans* is one of them.The growth of *Taphrina maculans* get influenced by environmental factors like light and temperature.

Hence the present work has therefore undertaken in Vitro to study effect of these factors on the growth of *Taphrina maculans* causing leaf spot of Turmeric.The effect of environmental factors on microorganisms was studied by many researchers.

Ahmed and Kulkarni (1968a) observed that *Taphrina maculans* was shown to persist as ascospores and conidia.Primary infections occurring on the lower leaves in October-November having relative humidity 80% and temperature range between 21-23°C.

Borude *et al*., (2017) observed that the growth and sporulation of saprophytic fungi gets affected by temp. and pH. The optimum temp. ranging from 25^0c to 30^0c were most favourable for the growth of pathogen while the pH ranges 5-8 were found suitable for the growth of all pathogenic fungi.

Kommula *et al., (*2017) observed that the temp. range of 25-30^0C and pH range of 6.50 to 7.00 is favourable for the luxurious growth of *Colletotrichum capsici* isolated from infected chilli. The mycelial growth was maximum when the fungus is exposed to alternate cycles of 12 hr. light and 12 hr. darkness.

Nishar Akhtar *et al*.,(2018) found that the growth of *Colletotrichum capsici* causing anthracnose of chilli was maximum at temp.30^0C. The pH 7 was more suitable. Among tested media PDA medium is suitable for the growth of fungus.

Materials and methods:

1)Isolation of *Taphrina maculans*: The infected leaves of Turmeric were collected from the Latur region.*Taphrina maculans* was isolated and purified.Further the pathogenicity test of fungus was performed by using simple detached leaf technique (Cook1972,Mayee 1995 and Gangavane 1997).Then the culture was maintained on Czapek-dox-agar medium.

1)Effect of Light:

To study the effect of light on the present pathogen, the Czapek- dox agar medium was used. The sterile medium was further aseptically poured in sterile petri dishes. 5 mm disc prepared by using fungal pathogen was then inoculated in the centre of the sterile Czapek -dox agar plates.

Each plate was enclosed with the different coloured transparent polythene sheet. The plates without polythene sheets were taken as a control. All these plates were incubated at a room temp. The

effect on linear growth of the fungal pathogen was then observed and the size was recorded in millimeter (mm) every day up to eight days.

2)**Effect of Temperature:**

The sterilized Czapek–dox agar medium was prepared. The sterilized medium was poured in sterilized petri plates.

A 5mm disc which was impregnated with the fungal pathogen is placed in the center of each plate was inoculated. Afterwards, these plates were kept for the incubation at different temperature i. e. 10^0C, 20^0C, 30^0C, 40^0C and 50^0C for 8 days. The plates were observed at regular interval (daily) and the linear growth was then recorded in millimeter (mm

Observation Table:

Table 1: Effect of Light on linear growth of *Taphrina maculans* Butler

Light	***Linear growth (mm)***							
	Incubation period (Days)							
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Red	*12.00*	*22.00*	*34.00*	*42.00*	*50.00*	*62.00*	*66.00*	*72.00*
Green	*12.00*	*16.00*	*22.00*	*26.00*	*30.00*	*33.00*	*40.00*	*42.00*
blue	*8.00*	*10.00*	*12.00*	*17.00*	*22.00*	*24.00*	*26.00*	*28.00*
Yellow	*11.00*	*13.00*	*14.00*	*19.00*	*24.00*	*26.00*	*30.00*	*31.00*
White	*11.00*	*14.00*	*20.00*	*23.00*	*26.00*	*29.00*	*34.00*	*35.00*
Control	*12.00*	*23.00*	*30.00*	*39.00*	*46.00*	*52.00*	*60.00*	*75.00*
S.E.±	*0.820*	*1.840*	*2.710*	*3.624*	*4.826*	*5.760*	*7.368*	*8.938*
C.D.P.= 0.01	*4.426*	*10.512*	*14.935*	*20.612*	*27.442*	*32.490*	*40.912*	*50.988*
C.D.P.= 0.05	*2.735*	*6.607*	*9.560*	*13.035*	*17.492*	*20.688*	*26.089*	*32.612*

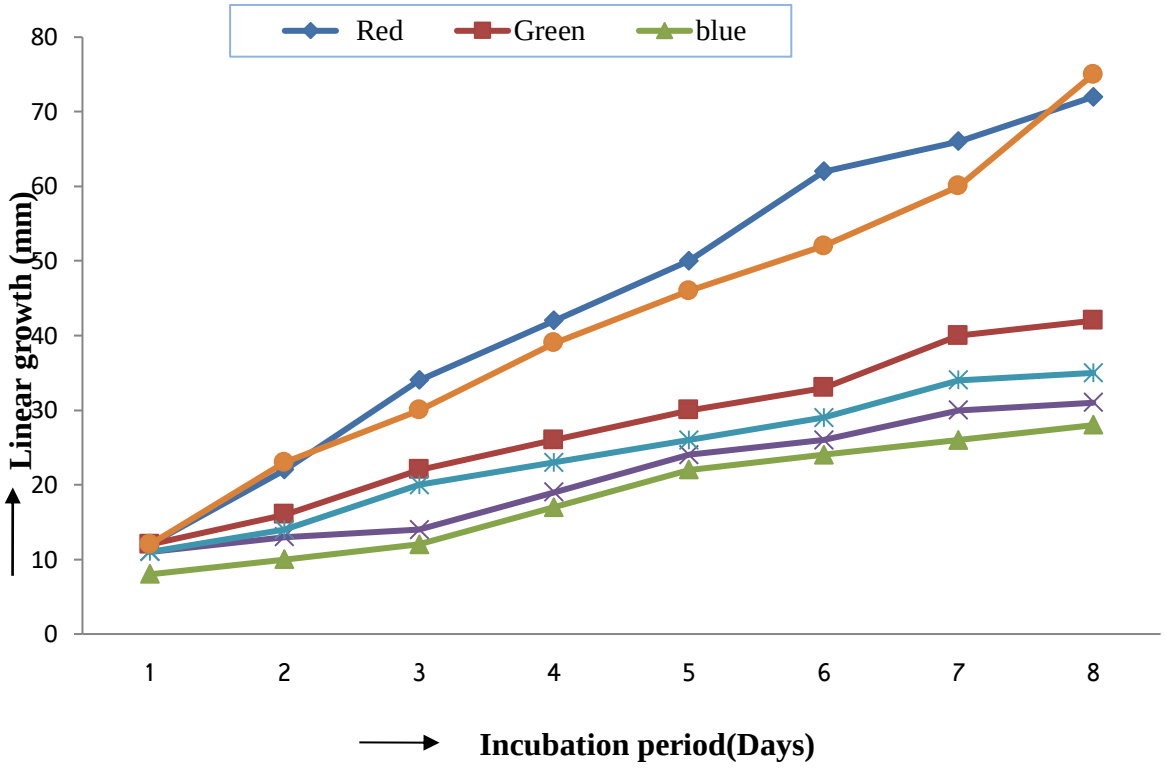

Fig. 1: Effect of light on linear growth of *Taphrina maculans* Butler

Table 2: Effect of Temperature on linear growth of *Taphrina maculans* Butler

Temp. ^0C	Linear growth(mm)							
	Incubation period (Days)							
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***
10	7	9	11	13	15	17	19	25
20	12	14	16	17	20	26	30	38
30	14	36	38	43	50	58	72	82
40	10	12	13	15	16	18	20	26
50	5	5	6	6	7	8	9	12
control	12	23	30	39	46	52	60	75
S.E.±	0.920	2.266	3.524	4.820	6.915	7.966	9.442	11.840
C.D.at P=0.01	5.189	12.625	19.624	26.880	38.910	45.240	53.492	66.136
C.D.at P=0.05	3.42	7.945	12.509	17.092	24.840	28.835	33.104	42.862

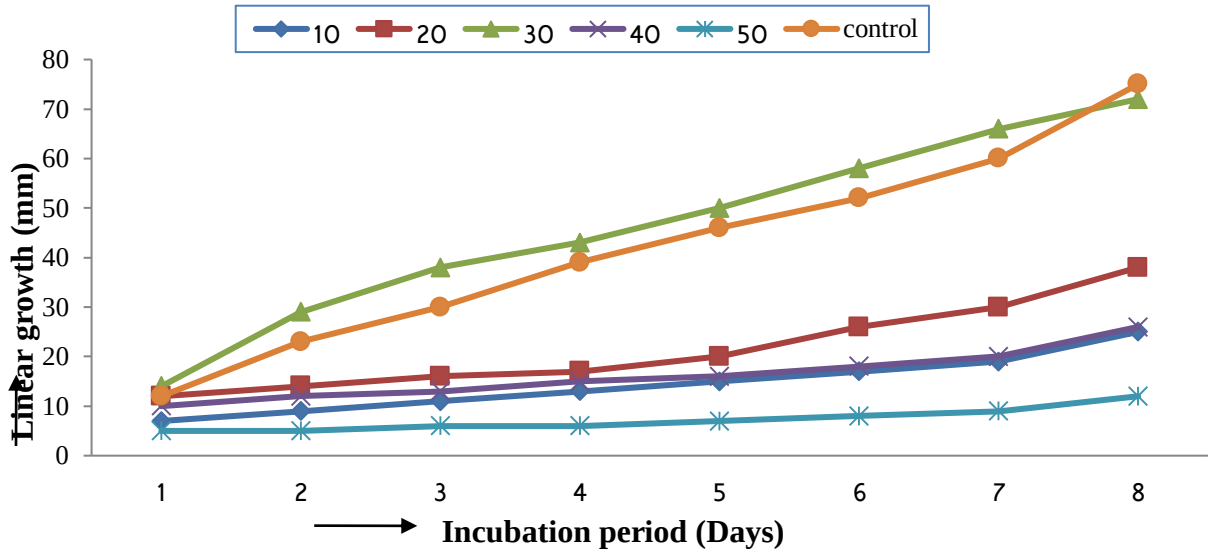

Fig 2: Effect of Temperature on linear growth of *Taphrina maculans* Butler

Results and Discussion:

1)Effect of different Lights:

The effect of different colours of light was studied by covering the plate with different coloured polythene sheets on the plate which is centrally inoculated with 5mm fungal disc. After every 24 hours of incubation period, the linear growth was measured. The plate covered with red sheet showed maximum growth (12, 22, 34, 42, 50, 62, 66 and 72 mm.), green showed intermediate and blue, white and yellow sheet showed least growth of the fungus as given in table 1 and fig.1. It was observed that different coloured light showed different effect on growth of *Taphrina maculans*.

2)Effect of different Temperatures:

The effect of different temperature was studied on *Taphrina maculans*. There was significant variation of linear growth of the fungus at different temperatures.

Maximum growth of pathogen was recorded at 30^0C (optimum temperature). There was decrease in growth of pathogen below and above this optimum temperature. Least growth was obtained at 50^0C.

The growth of the pathogen at 30^oC occurred from 1^{st} to 8^{th} day of incubation was 14, 36, 38, 43, 50, 58, 72 and 82 mm. whereas control shows 12, 23, 30, 39, 46, 52, 60 and 75 mm. from 1^{st} to 8^{th} day of incubation.

It means, the temperature values 10, 20, 40 and 50 were not favourable for the growth of *Taphrina maculans* as in table 2 and fig.2

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