

## Effect of Temperature and $p^H$ 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 temperature and  $P^H$ . Therefore the present work was undertaken to study the effect of temperature and  $p^H$  on the growth of *Taphrina maculans*. The effect of temperature and  $p^H$  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  $30^0c$  temperature. Below and above that temperature the growth of fungus was get reduced. The results also revealed that at  $p^H$  5.5 growth of fungus was maximum. Below and above that  $p^H$ , there was decrease in growth of pathogen.

**Keywords:** *Taphrina maculans*,  $p^H$ , 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 temperature and  $p^H$ . 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. Kommula *et al.*, (2017) observed that the temp. range of 25-30°C and pH range of 6.50 to 7.00 is favourable for the luxuriant growth of *Colletotrichum capsici* isolated from infected chilli.

### **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 (Cook 1972, Mayee 1995 and Gangavane 1997). Then the culture was maintained on Czapek-dox-agar medium.

### **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°C, 20°C, 30°C, 40°C and 50°C for 8 days. The plates were observed at regular interval (daily) and the linear growth was then recorded in millimeter (mm).

#### **I. Effect of pH :-**

For the present research work, the sterile Czapek-dox agar medium having different pH was prepared by adding 0.1N NaOH and 0.1N HCl. The different pH was taken from pH 3.5 to 7.5. The pathogen was inoculated at the center of the sterile agar plates. The plates were then incubated at room temperature and the growth was measured in millimeter (mm) every day for 8 days. Observation Table:

**Table 1: Effect of Temperature on linear growth of *Taphrin a maculans* Butler**

Temp. °C	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

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

pH	Linear growth (mm)							
	Incubation period (Days)							
	1	2	3	4	5	6	7	8
3.5	10	12	16	24	27	29	33	38
4.5	12	18	24	32	40	48	52	62
5.5	15	26	44	52	60	76	84	90
6.5	11	18	23	28	36	41	46	56
7.5	8	10	14	20	23	25	30	34
control	12	23	30	39	46	52	60	75
S.E.±	0.902	1.990	3.077	4.235	5.642	6.748	8.079	9.730
C.D.at P=0.01	3.999	9.842	15.177	20.560	27.026	32.911	39.968	47.830
C.D.at P=0.05	2.804	6.599	10.360	13.932	18.342	22.318	27.066	32.315

## Results and Discussion:

### 1)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<sup>0</sup>C (optimum temperature). There was decrease in growth of pathogen below and above this optimum temperature. Least growth was obtained at 50<sup>0</sup>C.

The growth of the pathogen at 30<sup>0</sup>C occurred from 1<sup>st</sup> to 8<sup>th</sup> 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<sup>st</sup> to 8<sup>th</sup> 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 1 and fig.1

### 2)Effect of different pH:

The effect of different pH values was studied on growth of *Taphrina maculans*. pH in the plates were adjusted from pH 3.5 to 7.5.The optimum pH for the growth of fungal pathogen was found 5.5. At 5.5pH there was maximum growth of *Taphrina maculans* (15, 26, 44, 52, 60, 76, 84 and 90) mm from 1<sup>st</sup> to 8<sup>th</sup> day of incubation. The pH values 3.5, 4.5, 6.5 and 7.5 were not favourable for the growth of *Taphrina maculans* as shown in the table 2 and figure 2.

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