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Impact of Temperature and Relative Humidity on the Development 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 atmospheric humidity.Therefore the present work was undertaken to study the effect of temperature and relative humidity on the growth of *Taphrina maculans*. The effect of temperature and humidity 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 humidity range from 56.60% to 87.50% was most favourable for the growth of fungus.Below and above that relative humidity,there was decrease in growth of pathogen.

Keywords: *Taphrina maculans*, Temperature, Relative Humidity, leaf spot

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.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 atmospheric humidity.

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.

Ahmed and Kulkarni (1968b) observed that the disease incidence increased with any decrease in mean temperature from September to December. Relative humidity during this period ranged from 77-90%.

Lida *et al*., (1977) found that the temperature of 20-25˚C was optimum for the development of ascospores from mycelium in infected leaf tissues of cherry infected by *Taphrina weisneri.*

Nagrajan and Muralidharan (1995) reported that the disease severity depends upon the multiplicity of environmental factors such as temperature, rainfall, cloudness, relative humidity and wind at a short period of time like a day.

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 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).

2)Effect of Relative Humidity :-

For the present research work,the sterile Czapek-dox agar medium was prepared. The sterilized media were then poured in all sterilized petriplates. Each plate in the centre having the 5 mm disc of fungal pathogen was inoculated. Furthermore, the plates were kept for the incubation at different humidity. All these plates were then observed at regular intervals for how humidity is adjusted and maintained the growth was measured in millimeter (mm) for 8 days at different humidity level.

Observations:

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

Temp. ^{0}***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

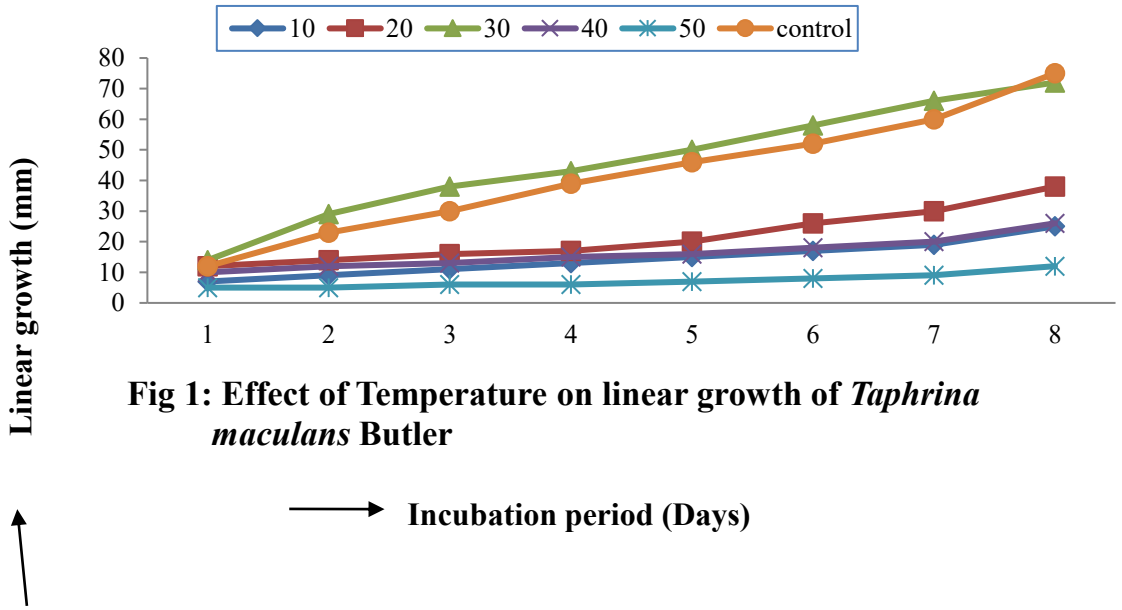

Fig 1: Effect of Temperature on linear growth of *Taphrina maculans* Butler

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

Relative Humidity (%)	Linear growth(mm) Incubation period (Days)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5.75	5.00	5.00	5.00	5.00	6.33	7.00	8.33	12.66
17.00	6.00	8.33	11.00	13.66	17.33	21.00	24.33	27.66
56.60	6.33	11.66	15	20.33	24	30.66	34.33	40.00
87.50	11.00	21.00	28.00	35.00	43.00	49.00	57.00	72.00
Control	12.00	23.00	30.00	39.00	46.00	52.00	60.00	75.00
S.E.±	1.066	2.642	4.538	6.484	8.035	9.605	11.346	12.492
C.D.P.= 0.01	6.926	16.778	28.920	41.632	52.212	61.936	73.242	80.720
C.D.P.= 0.05	4.239	10.090	17.532	25.114	31.642	37.412	44.222	48.912

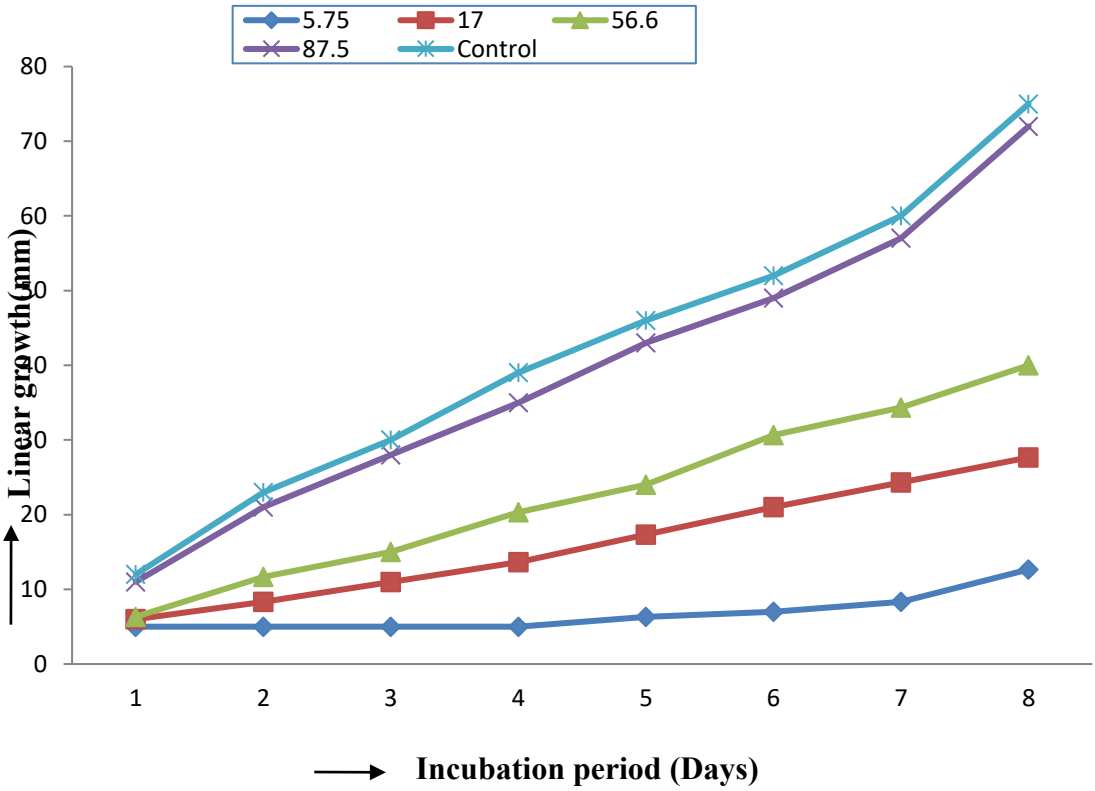

Fig. 2: Effect of Relative Humidity on linear growth of *Taphrina maculans* Butler

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 30^0C (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°C occurred from 1st to 8th 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 1st to 8th 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 Relative Humidity**:

The effect of relative humidity on growth of *Taphrina maculans* was studied. There was variation in the growth of fungus with different humidity. Results in the table 2 and fig.2 indicates that the humidity from 56.60 to 87.50% was most favourable for the growth of the pathogen. Where as 5.75 and 17.00% was unfavourable for the growth of fungus.The growth of pathogen at 56.60% humidity occurred from 1st to 8th day of incubation was 6.33,11.66,15.00,20.33,24.00,30.66,34.33 and 40.00mm respectively. At 87.50% humidity the growth occurred from 1st to 8th day of incubation was 11.00, 21.00, 28.00, 35.00,43.00,49.00,57.00 and 72.00 mm respectively whereas control shows 12.00, 23.00,30.00,39.00,46.00,52.00, 60.00,75.00mm growth respectively from 1st to 8th day of incubation.

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