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Survivl Ability of *Ceratocystis fimbriata* Causing Pomegranate Wilt in Different Temperature and Hydrogen Ion Concentration (pH)

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ABSTRACT

Ceratocystis fimbriata causing wilt of pomegranate, grew well in all most all hydrogen ion (pH) concentration from 2.0 to 11.0. It indicates fungus present in all soil types and locations. Maximum growth was recorded at a of pH 7.5 (9.69 g), which was on par with pH 7.0 (8.92 g) and pH 8.00 (8.28 g). The growth of the fungus decreased below from pH 5.5 onwards and above pH 9.0. Lowest growth was observed at pH 2.0 (0.04 g). Followed by pH 2.5 (0.08 g). The fungus grew well in lower temperature to highest. It shows fungus present more in dry area and cause severe disease than cool area. The maximum growth of the fungus (7.76 g) was observed at a temperature of 30˚C. Growth at 25˚C (7.47g) were found to be on par temperature at 20˚C (5.97g) and at 35˚C (5.46g). The fungus grew very little at 10˚C (1.39g), 15˚C (2.46g) and 40˚C (1.36g) and failed to grow at 45˚C (0.66 g).

Key words: *Temperature, Hydrogen ion (pH), Wilt, Ceratocystis fimbriata and growth*

INTRODUCTION

Pomegranate (*Punica granatum* L.) is an ancient fruit, belonging to the smallest botanical family punicaceae and pomegranate is a native of Iran. It is commercially an important fruit crop of both tropical and subtropical regions. In India, it is regarded as a "vital cash crop", grown in an area of 1, 16,000 ha with a production of 89,000 MT with an average productivity of 7.3 MT. Karnataka state has the distribution of cultivating pomegranate under tropical condition in an area of 12,042 ha with a production of 1, 29, 547 tonnes. Where this crop has spread across different districts *viz*., Bijapur, Bellary, Bagalkot, Koppal, Chitradurga, Belgaum, Davangere, Tumkur, Bangalore and Gulbarga. Pomegranate suffers from ten economically important diseases, among them bacterial blight or spot, fruit rot, anthracnose and wilt complex are severe and cause significant losses in recent years. Wilt caused by *Ceratocystis fimbriata* is the most severe disease in Karnataka which causes yellowing, drooping and death of pomegranate plant leading to loss to the farmers. There is no more information available on temperature and hydrogen ion concentration requirement because it gives basic information about fungus survivability in different soil types, different temperature, different locations and different hydrogen ion (pH).

MATERIAL AND METHODS

Physiological studies

Effect of pH

For the physiological studies (*C. fimbriata*) cultures were grown in potato dextrose broth in conical flasks which were incubated for 15 days at 25±2^{0}C except in case of effect of temperature on growth. The cultures grown in the broth were filtered through Whatman No.42 filter paper discs of 12.54 cm diameter were dried to a constant weight at 60^{0}C prior to filtration and pH of the filtrate was determined whenever necessary. The mycelial mat was harvested and weight was recorded. An average value of 3 replications in a treatment was worked out and used as quantitative measure for comparing growth under different treatments. Results were analysed statistically and compared.

Twenty ml of each of the potato dextrose broth was poured separately into Petriplates. Each treatment was replicated thrice, with the use of 5 mm cork borer a days old culture was taken and inoculated. Such plates were incubated at different temperature for 15 day. The dry weight was recorded. The data on dry weight were also analysed statistically.

Effect of temperature

The effect of temperature on the growth of *C. fimbriata* was studied at eight temperature levels *viz.*, 10, 15, 20, 25, 30, 35, 40 and 45^{0}C. Twenty ml of potato dextrose medium was poured into the 100 ml flasks solution was used as basal medium. Each treatment was replicated thrice. Five mm discs were cut from actively growing culture were inoculated and incubated at different temperature levels. Mycelial mat on this media was harvested on 15th day. Average value of the replication in a treatment was worked out and used as a quantitative measure for comparing the growth under different treatments. Results were analysed statistically and compared.

RESULTS

Hydrogen-ion concentration

The growth of the fungus was studied at different pH and the results were presented in Table 1 (Fig. 1).The fungus grew well at all pH levels tested. Maximum growth was recorded at a of pH 7.5 (9.69 g), which was on par with pH 7.0 (8.92 g) and pH 8.00 (8.28 g). The growth of the fungus decreased below from pH 5.5 onwards and above pH 9.0. Lowest growth was observed at pH 2.0 (0.04 g). Followed by pH 2.5 (0.08 g).

Effect of temperature

Effect of temperature on the growth of the fungus was studied and the results were presented in Table 2 (Fig. 2).The maximum growth of the fungus (7.76 g) was observed at a temperature of 30˚C. Growth at 25˚C (7.47g) were found to be on par temperature at 20˚C (5.97g) and at 35˚C (5.46g). The fungus grew very little at 10˚C (1.39g), 15˚C (2.46g) and 40˚C (1.36g) and failed to grow at 45˚C (0.66 g).

Table 1: Effect of hydrogen-ion concentration on growth of *Ceratocystis fimbriata* on potato dextrose broth

S. No.	pH of the medium	Mean dry mycelial weight (g)
1.	2.0	0.04
2.	2.5	0.08
3	3.0	0.27
4.	3.5	0.34
5.	4.0	0.48
6.	4.5	1.15
7.	5.0	2.59
8.	5.5	3.85
9.	6.0	5.56
10.	6.5	7.71
11.	7.0	8.92

12.	7.5	9.69
13.	8.0	8.28
14.	8.5	6.52
15.	9.0	3.72
16.	9.5	3.09
17.	10.0	1.83
18.	10.5	1.22
19.	11.0	0.54
Mean		3.47
SE m ±		0.11
CD @1%		0.42

Table 2: Effect of temperature on growth of *Ceratocystis fimbriata* on potato dextrose broth

S. No.	Temperature (°C)	Mean dry mycelial weight (g)
1	10	1.39
2	15	2.46
3	20	5.46
4	25	7.47
5	30	7.76
6	35	5.97
7	40	1.36
8	45	0.66
Mean		4.06
SE m ±		0.10
CD @ 1%		0.43

Fig. 1: Effect of hydrogen ion concentration on growth of *Ceratocystis fimbriata*

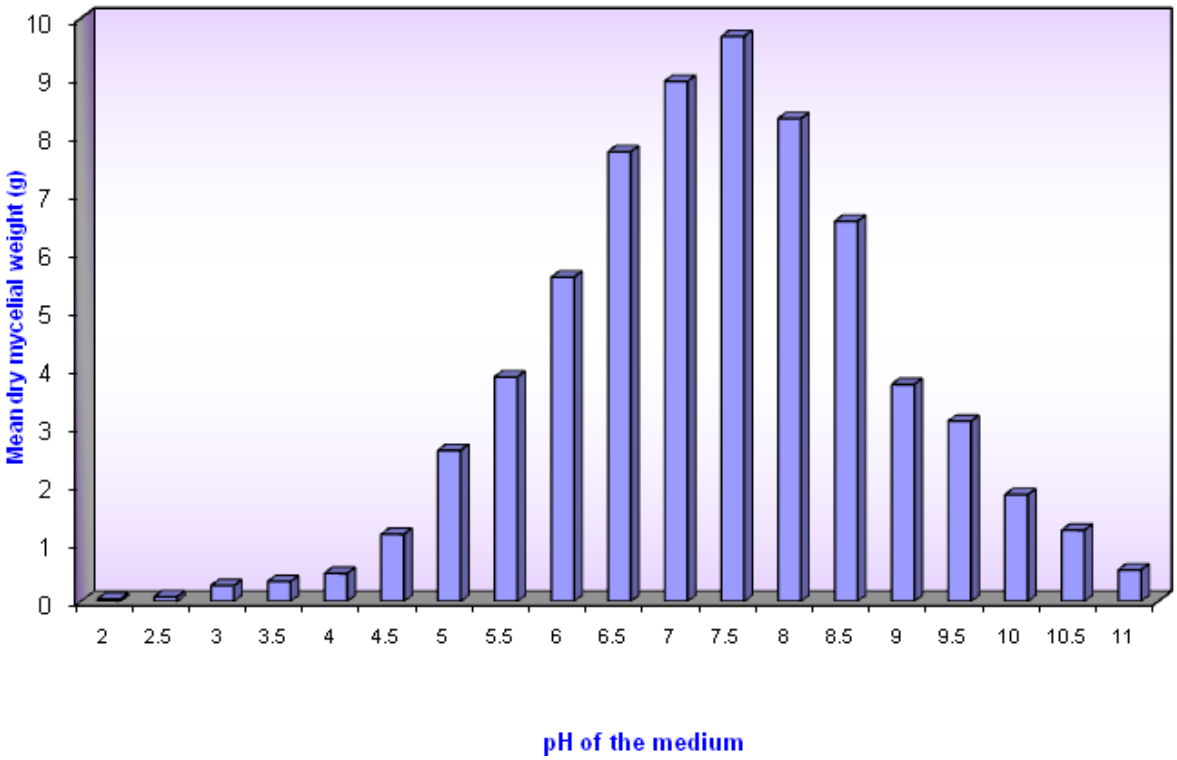
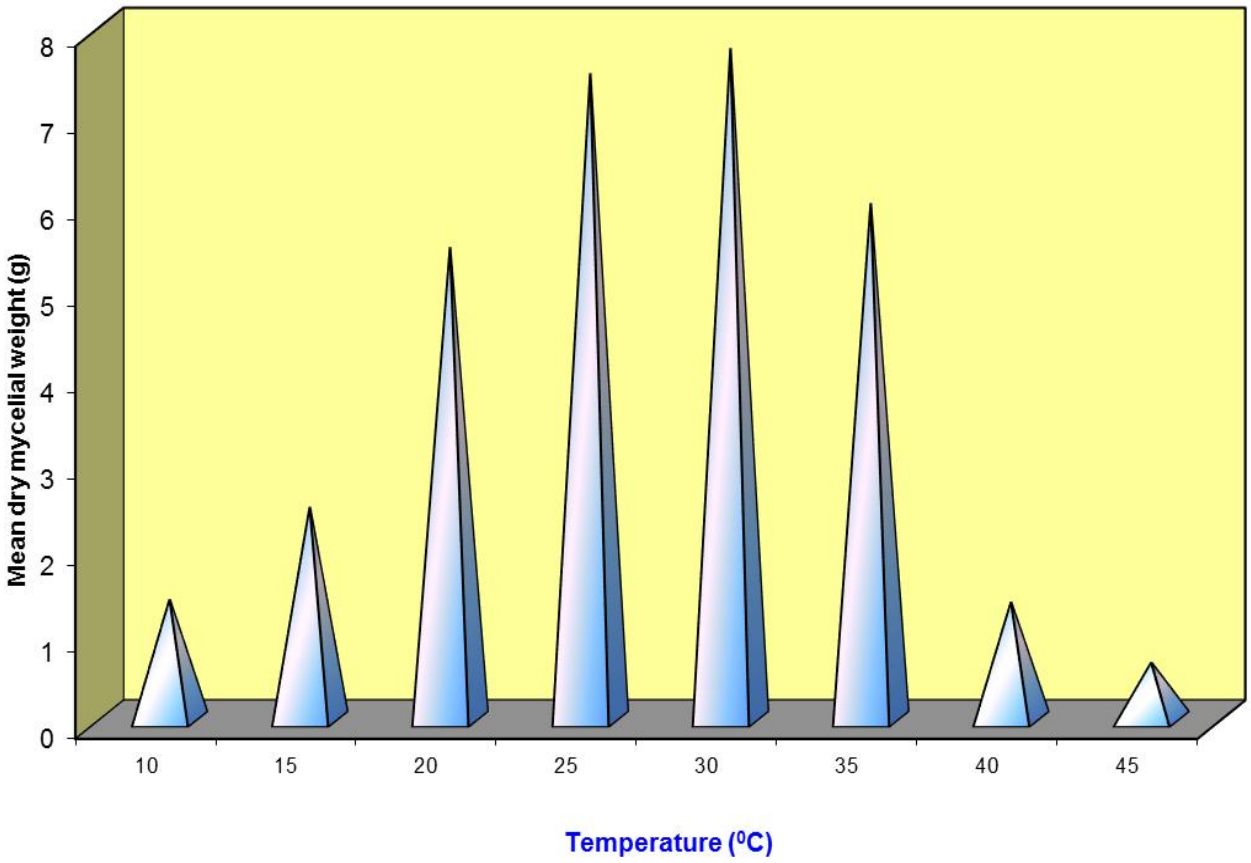


Fig. 2: Effect of temperature on growth of *Ceratocystis fimbriata*



DISCUSSION

Optimum temperature is also one of the pre-requisite for the growth and sporulation of the fungus. In the present study, fungus grew well in abundance in the temperature range of 20-35˚C. The results concur with the findings of Sastry *et al*.[5] of *C. paradoxa*. Milanes *et al*.[4] found high range of *C. paradoxa* growth between 12- 34˚C. Similar results were obtained in the investigation of Yadahalli[3].

The fungus generally grows maximally over a certain range of initial pH of the medium and will fail to grow at high and low extremes under given conditions. Many factors like temperature, time of harvest, gross changes in medium and nitrogen supply may change the shape of the pH growth curve. In the present study involving Potato Dextrose Broth with different pH, high growth was revealed in PDA at pH 7.5. The results concur with the findings of Kiryu[2] and Adisa[1]. It also reinstatates the superiority of PDA medium for growth of the fungus even at different pH.

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