

## Effect of physical factors on *Fusarium solani* causing dry rot of elephant foot yam

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### Abstract

The effect of Physical factors such as temperature, light and pH on the growth of *Fusarium solani* causing dry rot of Elephant Foot Yam was studied. The Benomyl sensitive Fs-09 and resistant Fs-03 isolates of *F. solani* were selected for this study. Maximum growth of both sensitive and resistant isolates was obtained at 28°C and no growth was noted at 0°C, 4°C and 10°C. The growth of sensitive and resistant isolates was maximum at pH 7.5. Among different light spectra, growth was more under red, green and blue light. Resistant isolate had higher growth rate as compared to sensitive isolate of *F. solani*.

**Keywords:** physical factors, dry rot, elephant foot yam, *fusarium solani*, isolates

### Introduction

The tropical tuber crop *Amorphophallus paeoniifolius* (Dennst.) Nicolson belongs to the Araceae family. This crop originates from Southeast Asia. The Philippines, Malaysia, Indonesia, and Southeast Asia are countries where it grows as a wild plant. This crop is grown in a number of Indian states, including Andhra Pradesh, West Bengal, Gujarat, Kerala, Tamil Nadu, Maharashtra Uttar Pradesh, and Jharkhand. The corms and cormels of this plant are usually eaten boiled. Generally, it is used to make vegetables, pickles, and ayurvedic preparations for various ailments.

An important plant such as elephant foot yam has been attacked by many fungi, but *Fusarium solani*, the cause of dry rot of yam, is the most significant pathogen. The pathogen was isolated and was tested for its sensitivity to benomyl.

Benomyl sensitive Fs-09 and resistant Fs-03 isolates of *F. solani* were selected for this study. Testing the sensitive and resistant isolates of *Fusarium solani* at varying levels of light, temperature, and pH allowed us to study how they respond to those factors and determining their suitability for supporting the mycelial growth.

### Methodology

#### 1. Effect of temperature

The sterilized Petri plates were poured with 15-20 ml of Czapek Dox agar medium. Plates were aseptically inoculated with 8 mm actively growing mycelial discs of sensitive and resistant isolates of *F. solani*. These inoculated Petri plates were incubated at different temperatures in a BOD incubator. Plates kept at room temperature (26±3°C) served as control.

#### 2. Effect of pH

Czapek Dox agar media were separately prepared and their pH was adjusted by adding either hydrochloric acid (0.1N HCl) or sodium hydroxide (0.1 N NaOH) to get the desired pH. The pH was measured using electrical pH meter and set before sterilization in autoclave at 121°C, 15lbs for 20 minutes. Thereafter, medium was warmed to 50°C and 15 ml was poured into each sterilized petriplate (80 mm diameter). Discs (8 mm) of fungal culture were taken from actively growing colony and placed upside down on the agar surface. The plates were then incubated at 26±3°C in dark.

#### 3. Effect of different light spectra

To study the effect of different light spectra on mycelial growth of both sensitive and resistant isolates of *F. solani*, petriplates containing Czapek Dox agar medium were inoculated with 8 mm discs of actively growing mycelial colonies of both isolates. Plates were wrapped with gelatin sheets of different colours and incubated at 26±3°C. Plates kept in dark were treated as control.

### Results

#### Effect of temperature

To study the effect of temperature on the growth of *F. solani*, the sensitive and resistant isolates were grown at temperatures vary from 4 to 40°C. Results showed that maximum growth of both sensitive and resistant isolates was obtained at 28°C and no growth was noted at 0°C, 4°C and 10°C. The growth of both isolates at 30°C and 40°C was also favorable. Resistant isolate showed maximum growth over sensitive isolate (Table 1).

**Table 1:** Effect of temperature on the radial growth (mm) of benomyl sensitive and resistant isolates of *Fusarium solani* on Czapek Dox agar medium

Temperature	Isolate	Days								
		1	2	3	4	5	6	7	8	
0°C	Sensitive	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00
	Resistant	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00
4°C	Sensitive	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00

	Resistant	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00
10°C	Sensitive	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00
	Resistant	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00
28°C	Sensitive	09.00	18.00	29.00	38.00	48.00	57.00	66.00	73.00
	Resistant	08.00	15.00	25.00	36.00	47.00	59.00	70.00	82.00
30°C	Sensitive	09.00	18.00	29.00	39.00	48.00	60.00	69.00	80.00
	Resistant	10.00	19.00	25.00	30.00	38.00	46.00	54.00	61.00
40°C	Sensitive	07.00	10.00	13.00	16.00	19.00	21.00	24.00	26.00
	Resistant	07.00	09.00	11.00	13.00	16.00	18.00	20.00	22.00
Control	Sensitive	09.00	23.0	36.00	51.00	65.00	71.00	80.00	88.00
	Resistant	10.00	19.00	27.00	47.00	53.00	61.00	83.00	89.00

### Effect of pH levels

In order to study the effect of temperature on the growth of *F. solani*, both the sensitive and resistant isolates of *F. solani* were cultured on Czapek Dox agar medium having different pH levels. Diameter of the colony was recorded

every day. The growth of sensitive and resistant isolates was observed in all the pH level tested but it was maximum at pH 7.5 where it was 80 mm after 8 days of inoculation (Table 2).

**Table 2:** Effect of pH on the radial growth (mm) of benomyl sensitive and resistant isolates of *Fusarium solani* on Czapek Dox agar medium

pH	Isolate	Days							
		1	2	3	4	5	6	7	8
4.5	Sensitive	10.00	16.00	25.00	32.00	39.00	46.00	53.00	59.00
4.5	Resistant	10.00	18.00	23.00	31.00	40.00	47.00	55.00	64.00
5.5	Sensitive	10.00	18.00	24.00	30.00	38.00	44.00	49.00	58.00
5.5	Resistant	11.00	19.00	26.00	35.00	42.00	47.00	52.00	59.00
6.5	Sensitive	10.00	18.00	24.00	30.00	38.00	44.00	49.00	58.00
6.5	Resistant	11.00	19.00	25.00	36.00	46.00	55.00	64.00	72.00
7.5	Sensitive	11.00	21.00	27.00	36.00	45.00	54.00	62.00	69.00
7.5	Resistant	12.00	24.00	34.00	46.00	55.00	64.00	71.00	80.00
8.5	Sensitive	11.00	18.00	25.00	34.00	41.00	46.00	54.00	62.00
8.5	Resistant	15.00	17.00	19.00	23.66	26.33	30.66	32.00	34.33
9.5	Sensitive	10.00	20.00	27.00	38.00	44.00	51.00	57.00	64.00
9.5	Resistant	12.00	22.00	28.00	37.00	46.00	53.00	62.00	70.00
Control	Sensitive	9.00	23.00	36.00	51.00	65.00	71.00	80.00	88.00
Control	Resistant	10.00	19.00	27.00	47.00	53.00	61.00	83.00	89.00

### Effect of light spectra

Effect of light spectra on the growth of both sensitive and resistant isolates was studied by using colored gelatin sheets. It was observed that resistant isolate showed more growth than that of sensitive isolate under all light spectra.

Among different light spectra, growth was more under red, green and blue light. However, under dark condition it was found best. Overall results indicated that there was little variation in growth under different light (Table 3).

**Table 3:** Effect of different light spectra on the radial growth (mm) of benomyl sensitive and resistant isolates of *Fusarium solani* on Czapek Dox agar medium

Light	Isolate	Days							
		1	2	3	4	5	6	7	8
Red	Sensitive	11.00	22.00	34.00	40.00	51.00	65.00	74.00	82.00
	Resistant	10.00	19.00	29.00	41.00	48.00	59.00	70.00	80.00
Yellow	Sensitive	10.00	22.00	34.00	43.00	52.00	62.00	71.00	81.00
	Resistant	11.00	19.00	27.00	34.00	45.00	54.00	66.00	80.00
Green	Sensitive	10.00	17.00	29.00	41.00	51.00	60.00	72.00	83.00
	Resistant	11.00	22.00	30.00	45.00	52.00	57.00	72.00	80.00
Blue	Sensitive	10.00	19.00	25.00	36.00	47.00	58.00	70.00	79.00
	Resistant	11.00	20.00	31.00	44.00	56.00	65.00	75.00	82.00
Violet	Sensitive	10.00	21.00	31.00	40.00	51.00	61.00	72.00	83.00
	Resistant	10.00	19.00	30.00	41.00	52.00	61.00	72.00	83.00
Orange	Sensitive	10.00	18.00	26.00	35.00	42.00	53.00	64.00	75.00
	Resistant	10.00	19.00	30.00	41.00	50.00	62.00	71.00	79.00
Control	Sensitive	17.66	32.00	42.00	48.00	58.33	63.00	72.00	89.00
	Resistant	19.66	34.00	44.00	50.00	60.33	65.00	74.00	90.00

### Discussion

Harveson and Rush (1998) [1] achieved maximum growth of *F. oxysporum* f. sp. *beta* isolates at 25°C. Wakle *et al.* (2007) [5] have reported that the optimum temperature for the growth of *F. coeruleum* to be 25 °C. Taber *et al.* (1968)

[3] found that *Alternaria raphani* grew well over a wide pH range of 4.8 to 7.2. Wadikar (2002) [4] reported that pH 4.5 was more favourable to the resistant isolate of *Macrophomina phaseolina* while pH 6.5 was found to be more favourable to sensitive isolate of *Macrophomina*

*phaseolina* causing charcoal rot of pigeon pea. Further he found that 40°C temperature was most favourable for both the isolates. Sensitive isolate showed maximum growth under yellow light while resistant isolate showed its higher growth under blue light.

### Conclusion

Maximum growth of both sensitive and resistant isolates was obtained at 28°C and no growth was noted at 0°C, 4°C and 10°C. The growth of sensitive and resistant isolates was observed in all the pH level tested but it was maximum at pH 7.5. Among different light spectra, growth was more under red, green and blue light. However, under dark condition it was found best. Resistant isolate had higher growth rate as compared to sensitive isolate of *F. solani*.

### References

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