



COMPARATIVE STUDY OF THE EFFECT OF DIFFERENT CARBON AND NITROGEN SOURCES ON THE GROWTH OF *FUSARIUM OXYSPORUM* F. SP. *CORIANDRII* CAUSING WILT OF CORIANDER

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Abstract:

Different nutritional sources required for the growth and development of the fungal pathogen. Carbon is one of the most important and essential nutrition required for energy and cellular structure of pathogen. Nitrogen is also important nutrient required for protein synthesis and other vital functions. The present study has made on the comparative effect of different carbon sources (sucrose, lactose, dextrose and fructose) and nitrogen sources (sodium nitrate, ammonium nitrate, potassium nitrate and calcium nitrate) on the mycelial growth of *Fusarium oxysporum* f. sp. *coriandrii* causing wilt of Coriander. For this study wild sensitive and highly resistant isolate were selected. It was observed that, there was variation in the mycelial growth of the sensitive and resistant isolate on the different Carbon and Nitrogen sources. However, Sucrose and Sodium nitrate was found to be the best source of carbon and nitrogen respectively. Resistant isolate always shows highest growth as compared to the sensitive isolate. Comparative study of the effects of carbon and nitrogen sources on the growth of *Fusarium oxysporum* f. sp. *coriandrii* shows that both these elements are essential for the growth of pathogen. This research work helps to manage the growth of the pathogen.

Keywords: *Fusarium, oxysporum, coriandrii* Carbon, Nitroge.

Introduction

Coriander is an important spice crop belonging to family Apiaceae. The plant is used in preparing chutney and leaves used for flavouring curries, soups and savouries. Dry fruits are extensively used in pickle preparation, curry powder seasoning and sausages. The seeds are also considered to be carminative, diuretic stomatic, tonic antibilious, refrigerant and aphrodisiac (1).

The wilt of coriander caused by *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi is very serious disease in India. According to wilt of coriander caused by *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi is one of the most serious diseases (2). Pathogenic fungus, *Fusarium equiseti* was identified as a causal agent of wilt disease in *C. asiatica* (3). Wilt of coriander is controlled by using fungicide benomyl, but there are several reports stating benomyl resistance in *Fusarium oxysporum* Schlec., (4). *Fusarium* is highly pathogenic than other (5).

Different nutritional sources required for the growth and development of the fungal pathogen. Carbon is one of the most important and essential nutrition required for energy source and cellular structure of pathogen. Nitrogen is also important nutrient required for protein synthesis and other vital functions. The present study has made on the comparative effect of different carbon sources (sucrose, lactose, dextrose and fructose) and nitrogen sources (sodium nitrate, ammonium nitrate, potassium nitrate and calcium nitrate) on the mycelial growth of *Fusarium oxysporum* f. sp. *coriandrii* causing wilt of Coriander. For this study wild sensitive and highly resistant isolate were selected. It was observed that, there was variation in the mycelial growth of the sensitive and resistant isolate on the different Carbon and Nitrogen sources. However, Sucrose and Sodium nitrate was found to be the best source of carbon and nitrogen respectively. Resistant isolate always shows highest growth as compared to the sensitive isolate. This research work helps to manage the growth of the pathogen.

Material and Methods

a) Isolation of pathogen

The survey of major coriander growing regions was conducted in different districts of Maharashtra state. For collection the samples of coriander showing wilt symptoms were brought to laboratory in clean sterilized polythene bags. Infected parts were cut in to 4-5 mm pieces, these were surface sterilized with 70% alcohol for few seconds and then rinsed 3 times with sterilized distilled water to remove traces of alcohol.

The cut pieces were aseptically blotted and inoculated on Czapek Dox Agar medium plates amended with streptomycin sulphate to avoid bacterial growth and incubated at $28 \pm 2^{\circ}\text{C}$ for 8 days. The pathogen *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi, was identified with the help of relevant mycological literature (6,7) and then followed the Kochs postulates. Pure cultures were transferred to Czapek's Dox Agar slants and maintained at 5°C in refrigerator and used for further study whenever necessary. The sensitive and resistance isolates to benomyl are used to study the comparative effect of Carbon and Nitrogen. The 12 isolates of *F. oxysporum* f. sp. *spinaciae* (causing spinach wilt) for their sensitivity to Benomyl (50% WP) using the food poisoning technique (8).

b) Effect of carbon sources

The carbon sources viz. Sucrose, lactose, dextrose and fructose (3%) were added in CDA medium each at 3% concentration. 8mm discs of fungal culture were aseptically taken from an actively growing colony and were placed upside down on the agar surface and plates were incubated at $28 \pm 2^{\circ}\text{C}$. Plates without any carbon source were served as control. The linear mycelial growth was measured at specific intervals of time up to 8 days.

c) Effect of nitrogen sources

Different nitrogen sources like sodium nitrate, ammonium nitrate, potassium nitrate and calcium nitrate (each 0.2%) were added in Czapek's Dox Agar medium. 8mm discs of sensitive and resistant isolates were taken from actively growing mycelium and were placed upside down on Czapek's Dox Agar medium. Plates without nitrogen

source served as control. Plates were incubated at $28 \pm 2^\circ\text{C}$. The linear mycelial growth was recorded at specific intervals of time up to 8 days.

Result and Discussion

Various carbon sources such as Sucrose, Lactose, Dextrose and Fructose were used in this study. The growth rate of resistant isolate was always higher than sensitive isolate on all sugars. In case of both sensitive and resistant isolates higher growth was seen on Sucrose, which was followed by Fructose, Dextrose and lactose (Tables 1 and 2, Fig. 1 and 2).

Different nitrogen sources such as Sodium nitrate, Ammonium nitrate, Potassium nitrate and Calcium nitrate were incorporated in medium at the rate of 0.2% and linear mycelial growth of sensitive and resistant isolates was recorded every day up to 8 days. It was observed that nitrogen sources are much essential for growth of both the isolates of *Fusarium oxysporum* f. sp. *coriandrii*. Resistant isolate always shows highest growth as compared to the sensitive isolate. Maximum growth of both the sensitive and resistant isolates observed on Sodium nitrate. It was best source of nitrogen for both the isolates of *Fusarium oxysporum* f. sp. *coriandrii*, followed by Potassium nitrate, Ammonium nitrate and Calcium nitrate (Tables 3 and 4, Fig. 3 and 4).

Comparative study of the effects of carbon and nitrogen sources on the growth of *Fusarium oxysporum* f. sp. *coriandrii* shows that both these elements are essential for the growth of *Fusarium oxysporum* f. sp. *coriandrii*. In sucrose and sodium nitrate, the mycelial growth of both sensitive and resistant isolates shows higher growth rate.

Table 1: Effect of different carbon sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum* f. sp. *coriandrii* on Czapeck Dox agar medium

Carbon (3%)	Days							
	1	2	3	4	5	6	7	8
Sucrose	14.66	24.33	32.66	42.33	53.66	66.66	76.33	84.66
Lactose	11.33	16.66	25.33	34.66	43.33	53.66	60.33	68.33
Dextrose	10.33	18.66	25.33	35.66	45.33	55.66	65.33	72.66
Fructose	13.66	21.66	30.33	40.33	52.33	63.33	70.66	76.66
Control	11.33	15.33	21.66	27.66	34.33	44.66	53.33	61.66

Table 2: Effect of different carbon sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox agar medium

Carbon (3%)	Days							
	1	2	3	4	5	6	7	8
Sucrose	16.66	26.33	34.66	46.33	57.66	69.66	80.33	87.66
Lactose	13.33	19.66	27.33	37.66	46.33	56.66	63.33	73.33
Dextrose	14.33	21.66	29.33	39.66	49.33	59.66	67.33	75.66
Fructose	15.66	24.66	32.33	43.33	54.33	66.33	72.66	80.66
Control	12.33	15.33	22.66	29.66	36.33	46.66	55.33	63.66

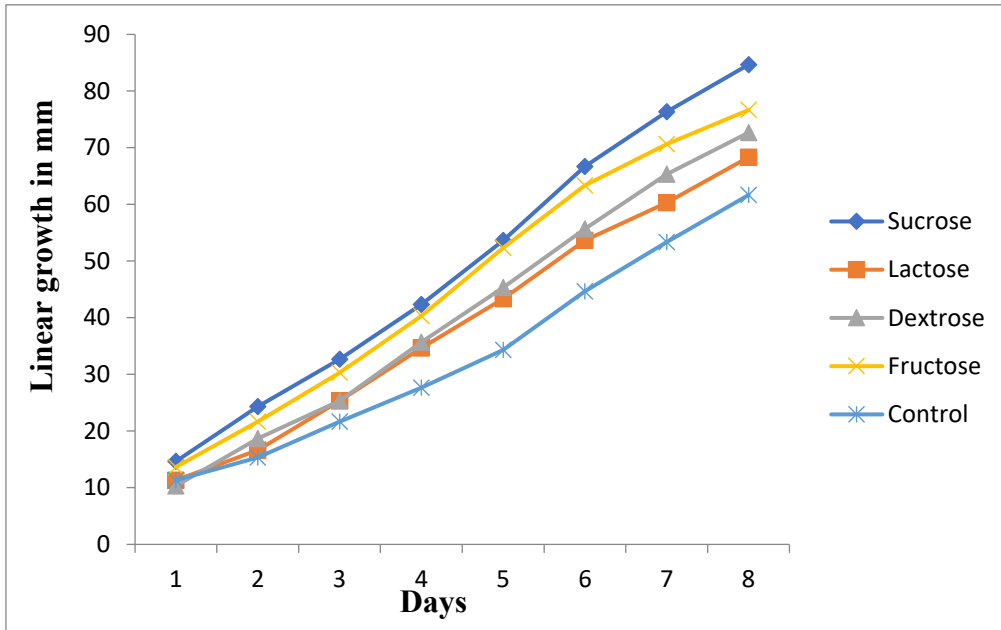


Figure 1: Effect of different carbon sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum* f. sp. *coriandrii* on Czapeck Dox agar medium

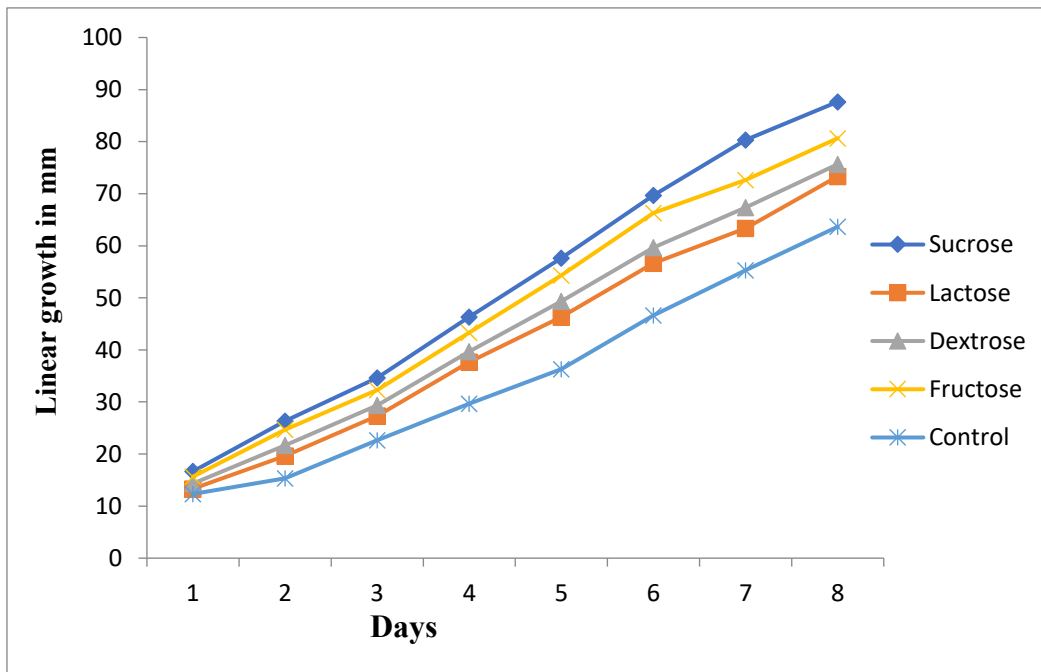


Figure 2: Effect of different carbon sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox agar medium

Table 3: Effect of different nitrogen sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox Agar medium

Nitrogen (0.2%)	Days							
	1	2	3	4	5	6	7	8
Sodium nitrate	14.66	28.33	32.66	46.66	63.33	65.66	74.66	86.33
Ammonium nitrate	14.33	16.33	24.33	32.66	40.66	49.66	60.33	67.66
Potassium nitrate	15.66	18.66	26.66	33.33	46.66	55.33	63.33	70.33
Calcium nitrate	10.33	15.33	24.33	26.66	33.33	44.33	52.33	56.66
Control	10.33	14.66	22.33	28.66	36.33	43.33	49.33	55.33

Table 4: Effect of different nitrogen sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox agar medium

Nitrogen (0.2%)	Days							
	1	2	3	4	5	6	7	8
Sodium nitrate	15.66	29.66	40.33	50.66	60.33	70.33	78.66	89.33
Ammonium nitrate	14.33	24.66	33.33	50.66	57.33	65.33	73.33	79.33
Potassium nitrate	15.33	23.66	35.66	51.33	63.66	70.33	79.66	87.33
Calcium nitrate	13.33	24.33	33.66	41.66	52.33	63.66	66.33	72.33
Control	12.66	17.33	22.66	28.66	38.33	47.66	55.33	62.66

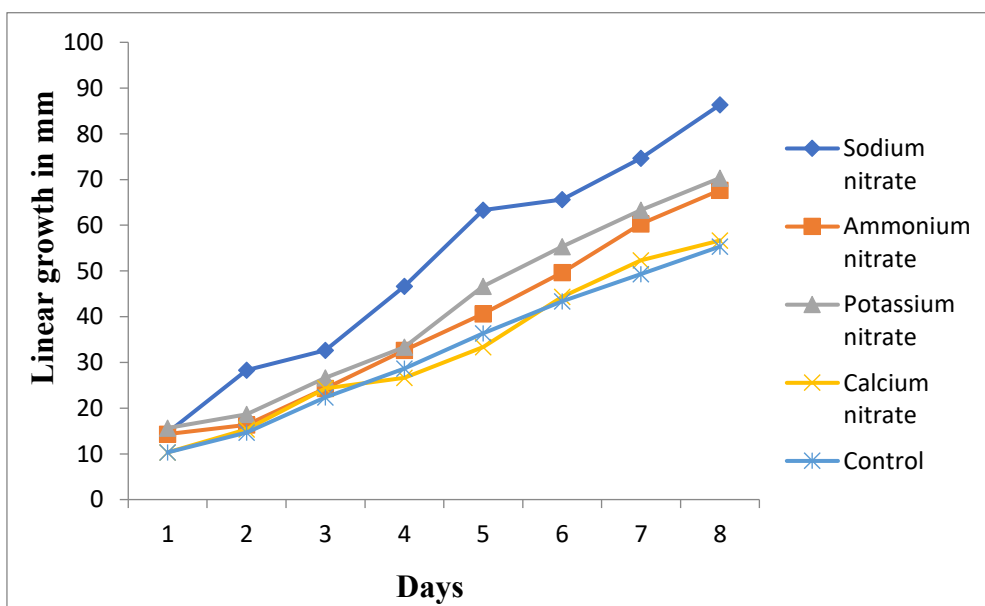


Figure 3: Effect of different nitrogen sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox agar medium

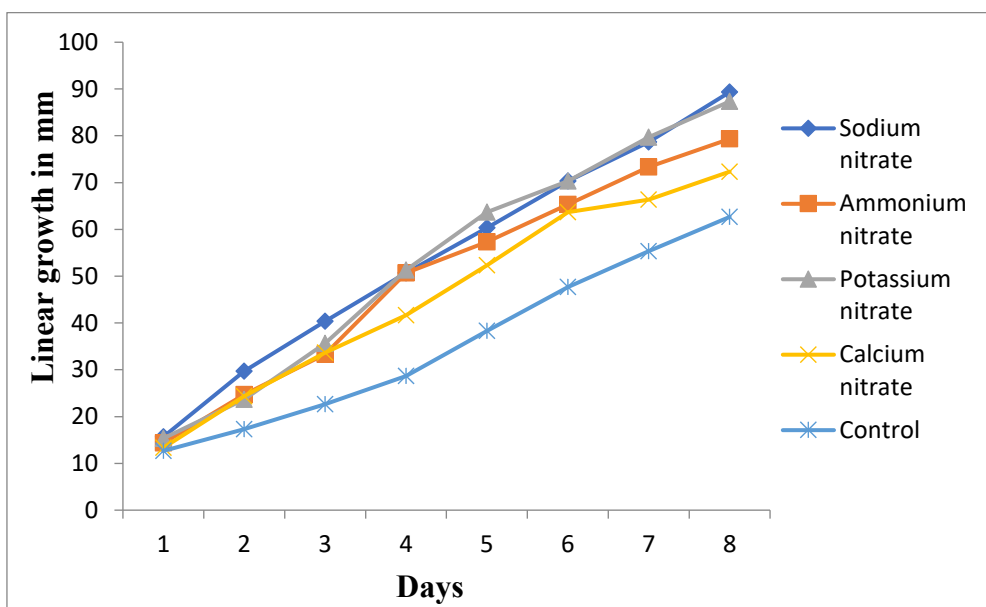


Figure 4: Effect of different nitrogen sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum* f. sp. *coriandrii* Narula and Joshi on Czapeck Dox agar medium

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