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Effect of Phosphate and Salt Sources on the Growth of *Fusarium oxysporum* f.sp. *coriandrii* causing Wilt of Coriander (*Coriandrum sativum* Linn.)

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Abstract: ***Proper nutritional source required for the growth and development of the pathogen. Phosphorous is one of the most important and essential nutrition. It is an important component of genetic material and cell membrane. The present investigation was conducted to study the effect of phosphate (Potassium dihydrogen orthophosphate, Sodium dihydrogen orthophosphate, Amonium dihydrogen orthophosphate) and salt (Sodium chloride, Potassium chloride, Calcium chloride, Cobalt chloride) source on growth of Fusarium oxysporum f. sp. coriandrii. The salts favour the growth of fungi; however, some salts inhibit the growth. 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 sources of phosphate and salt. It was observed that resistant isolate always showed higher growth rate as compared to sensitive isolate. Maximum growth of both the sensitive and resistant isolates observed on Potassium dihydrogen orthophosphate.Potassium chloride salt showed highest growth of both the sensitive and resistant isolates followed by Sodium chloride. Calcium chloride appeared to be stimulant, while Cobalt chloride salt slightly inhibit the growth of sensitive and resistant isolates of Fusarium oxysporumf. sp. Coriandrii***

Keywords: Phosphate, Salt, *Fusarium, oxysporum, coriandrii*

1. Introduction

Coriander (*Coriandrum sativum* Linn.) is also called Dhania in Hindi, Khophir in Guajarati, Dhane in Bengali, Kustumabri in Sanskrit and Kothimbir in marathi is an important spice crop belonging to Apiaceae.

The pleasant aromatic odour is present in the leaves and fruit of the coriander, which is due to an essential oil containing linalol or coriandrol., (Brown and Hall,1979). The plant 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., (Duke,1981; Huisman and Van der poel,1994). Therefore, coriander is used in many ayurevedic medicines as an ingredient.It is the richest source of proteins, essential oils and aroma., (Emenky *et al.* 2008)

The wilt of coriander caused by *Fusarium oxysporum* f. sp. *Coriandrii* Narula and Joshi is one of the most serious diseases.,(Tewari and Mukhopadhyay2003). Wilt of coriander is controlled by using fungicide benomyl, but there are several reports stating benomyl resistance in *Fusarium oxysporum* Schlec., (Kamble and Gangawane 1994).

Proper nutritional source required for the growth and development of the pathogen. Phosphorous is one of the most important and essential nutrition. It is an important component of genetic material and cell membrane.The present investigation was conducted to study the effect of phosphate (Potassium dihydrogen orthophosphate, Sodiumdihydrogenorthophosphate, Amonium dihydrogen orthophosphate) and salt (Sodium chloride, Potassium chloride, Calcium chloride, Cobalt chloride) source on growth of *Fusarium oxysporum* f. sp. *coriandrii*. The salts favour the growth of fungi; however, some salts inhibit the growth. 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 source of phosphate and salt. It was observed that resistant isolate always showed higher growth rate as compared to sensitive isolate. This research work helps to manage the growth of pathogen.

2. Material and Methods

a) Isolation of fungi:

The samples of Coriander showing wilt symptoms from different districts of Western Maharashtra 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 ± 2^0C for 8 days. The pathogen *Fusarium oxysporum*f. sp.*coriandrii* Narula and Joshi, was identified with the help of relevant mycological literature (Subramanian, 1972; Barnett and Hunter, 1972) and then followed the Kochs postulates. Pure cultures were transferred to Czapek's Dox Agar slants and maintained at 5^0C in refrigerator and used for further study whenever necessary.

b) Effect of Phosphate Sources:

The effect of different phosphate sources like potassium dihydrogen orthophosphate, sodium dihydrogen orthophosphate and ammonium dihydrogen orthophosphate

(0.1 %) each incorporated in Czapek's Dox Agar medium. 8 mm discs of sensitive and resistant isolates were grown on Czapek's Dox Agar medium and incubated at 28 ± 2^0C. Plates without phosphorus source served as control. The radial mycelial growth was recorded at specific intervals of time up to 8 days.

c) Effect of Salt Sources:

The different salt sources like sodium, potassium, calcium and cobalt chlorides each having 0.05% were amended in Czapek's Dox Agar medium. 8mm discs of actively growing sensitive and resistant isolates were grown on Czapek's Dox Agar medium and incubated at 28 ± 2^0C. Plates without salt source served as control. The linear mycelial growth was measured at specific intervals of time up to 8 days.

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

Phosphate (0.1%)	Days							
	1	2	3	4	5	6	7	8
Potassium dihydrogen orthophosphate	14.33	22.66	32.33	44.66	55.33	67.66	70.33	72.33
Sodium dihydrogen orthophosphate	11.33	16.33	26.66	34.33	41.66	55.33	61.66	69.33
Ammonium dihydrogen orthophosphate	12.66	17.33	22.33	28.33	36.66	46.66	56.33	66.33
Control	10.33	14.33	20.66	26.33	36.66	42.33	52.33	57.33

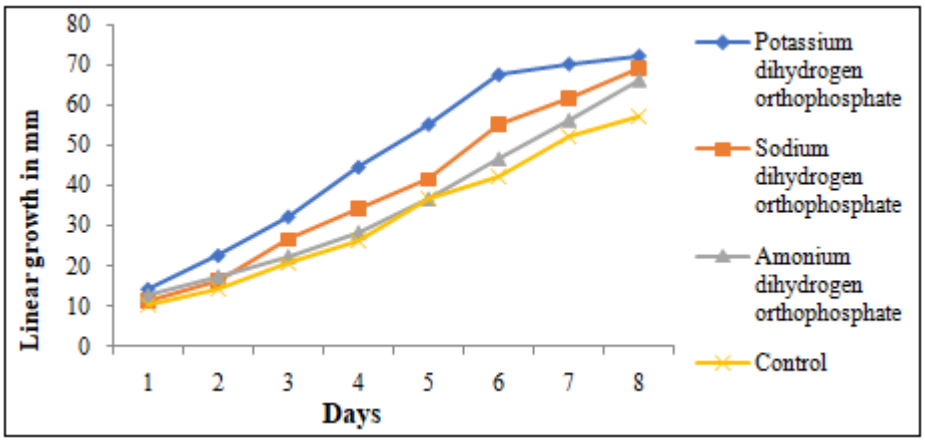

Figure 1: Effect of different phosphate sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum*f. sp. *coriandrii* Narula and Joshion Czapeck Dox agar medium

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

Phosphate (0.1%)	Days							
	1	2	3	4	5	6	7	8
Potassium dihydrogen orthophosphate	15.66	26.33	37.66	52.33	64.66	70.33	77.66	84.66
Sodium dihydrogen orthophosphate	14.66	21.66	27.66	37.33	50.66	60.33	70.33	76.33
Amonium dihydrogen orthophosphate	13.33	20.66	26.33	36.33	48.66	57.33	67.66	75.66
Control	12.66	18.33	25.66	33.33	39.66	47.33	57.66	66.33

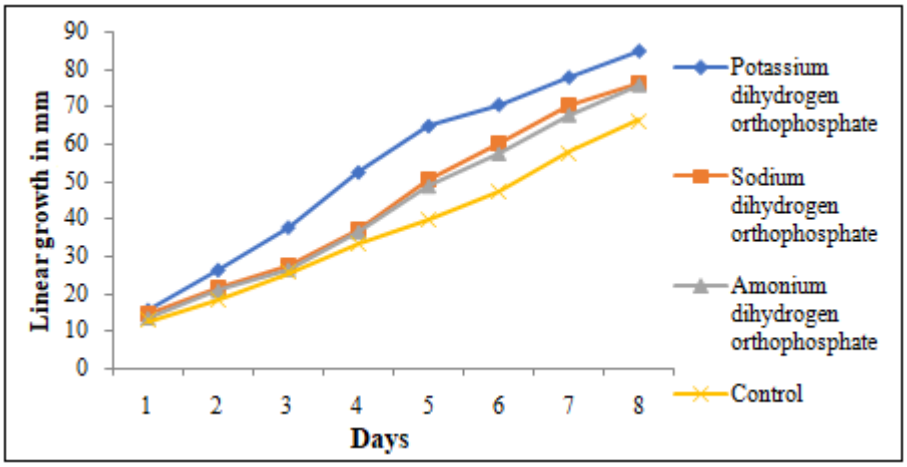

Figure 2: Effect of different phosphate sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum*f. sp. *coriandrii*Narula and Joshion Czapeck Dox agar medium.

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

Salt (0.05%)	Days							
	1	2	3	4	5	6	7	8
Sodium chloride	11.66	18.33	24.66	31.33	42.66	50.33	57.66	62.33
Potassium chloride	12.66	22.33	33.66	40.33	52.66	60.33	72.33	80.66
Calcium chloride	12.33	17.33	25.66	32.33	41.33	48.66	53.33	60.66
Cobalt chloride	10.66	14.33	20.33	25.66	30.33	35.66	43.33	51.33
Control	11.33	16.33	24.66	31.33	39.66	45.33	58.66	64.33

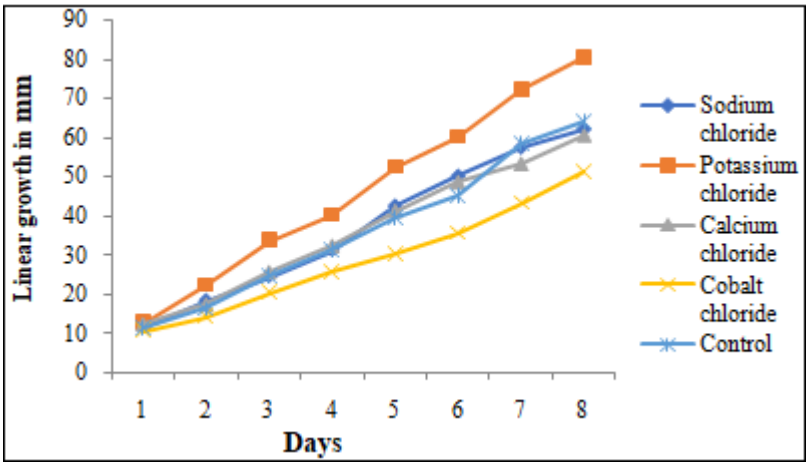

Figure 3: Effect of different salt sources on the radial mycelial growth (mm) of sensitive isolate of *Fusarium oxysporum*f. sp. *Coriandrii* Narula and Joshi on Czapeck Dox agar medium

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

Salt (0.05%)	**Days**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Sodium chloride	12.66	23.33	34.66	39.33	47.66	59.33	67.66	72.33
Potassium chloride	15.33	25.33	36.33	45.66	56.33	67.67	77.33	87.33
Calcium chloride	13.33	19.66	27.33	34.66	44.33	54.33	58.66	65.66
Cobalt chloride	11.33	17.66	24.33	30.66	37.33	49.66	53.33	58.66
Control	13.33	19.66	26.33	36.33	48.66	54.33	62.33	68.33

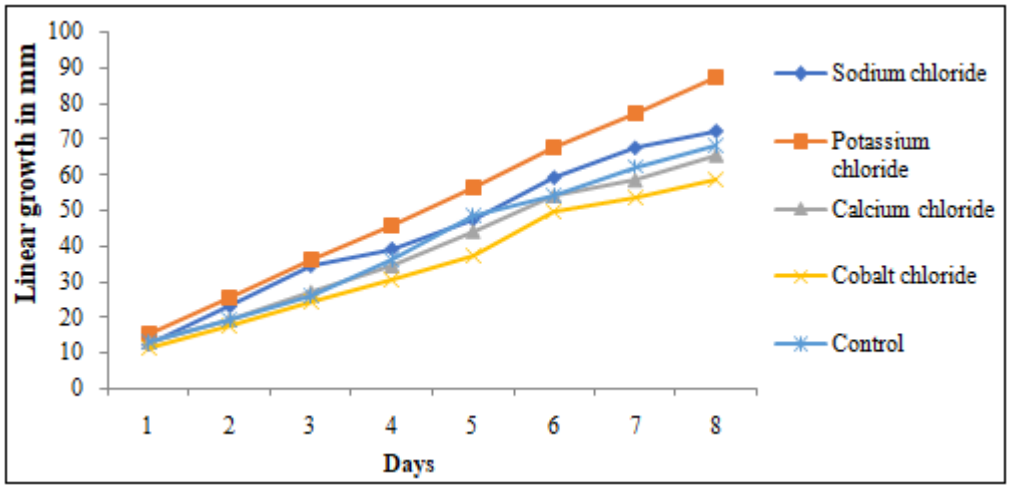

Figure 4: Effect of different salt sources on the radial mycelial growth (mm) of resistant isolate of *Fusarium oxysporum* f. sp.*coriandrii* Narula and Joshion Czapeck Dox agar medium

3. Result and Discussion

1) Three different phosphate sources were amended in the medium at 0.1 % concentration. It was observed that phosphate sources are essential for growth of sensitive and resistant isolates of *Fusarium oxysporum*f. sp. *coriandrii* Narula and Joshi. On all the sources resistant isolate showed slightly higher mycelial growth than

sensitive isolate. Maximum growth of both the sensitive and resistant isolates observed on Potassium dihydrogen orthophosphate (Tables 1 and 2, Figs. 1 and 2)

2) Different salt sources like Sodium chloride, Potassium chloride, Calcium chloride, Cobalt chloride were incorporated in Czapek Dox agar medium at the rate of 0.05% and radial mycelia growth of both sensitive and resistant isolates was recorded per day up to 8 days. It was observed that resistant isolate always showed higher growth rate as compared to sensitive isolate. Potassium chloride showed highest growth of both the sensitive and resistant isolates followed by Sodium chloride. Calcium chloride appeared to be stimulant, while Cobalt chloride slightly inhibits the growth of sensitive and resistant isolates of *Fusarium oxysporum*f. sp. *coriandrii*Narula and Joshi (Tables 3 and 4, Figs. 3 and 4).

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Author Profile

Dr. Rajiv Savanta Karpe is working as Assistant Professor in Ajara Mahavidyalaya, Ajara affiliated to Shivaji University, Kolhapur. He has 22 years teaching experience in senior college. He completed his Ph.D. in Mycology and Plant Pathology. He qualified SET in Life Science. He completed Minor Research Project and submitted to UGC. He published nine research articles in National and International Journals.