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Pathogencity Test of Some Saprophytic Fungi Isolated from Different Water Sources and Cultivated Crops at Allahabad Region

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ABSTRACT

The present study was conducted to investigate the isolation of fungi from Ganga river, Industrial water and Sewage water. Different kinds of fungi were isolated in which *Fusarium* spp. and *Alternaria alternata* were found to be dominant. The maximum numbers of fungal species were isolated from sewage water and it was followed by Ganga water and industrial water due to presence of high organic load. Plant pathogenic fungi like *Fusarium* spp. and *Alternaria* spp. were found in all water samples. In this way, it may be concluded that, the irrigation of agricultural fields with polluted water not only affects the growth of crop plants but it also increases the chances of various fungal contamination and disease development. The sewage water may be used for irrigation purposes after proper treatment. It will be highly useful, if sewage water diluted with tube well water.

Key words: Polluted water, fungi, plant parts cultivated crops

INTRODUCTION

Allahabad is one of the most important cities of India and it is the center of cultural, religious and educational activities. It is situated between 25°23' north latitude and 81°50' east longitudes towards the eastern boundary of Uttar Pradesh, with an estimated population of more than fifty lacks. The climate of the city is hot and humid. In Allahabad Ganga river is known as Holy River in India. Most of the Indian rivers receiving urban and industrial effluents are heavily polluted due to point pollution at downstream of large cities and industrial centers. Among all of these rivers Ganga is one of them. The industrial effluent generally contains various contaminants in the form of organic and inorganic chemicals. Plant pathogens induce reaction in the body of their hosts. As the results of these reactions certain abnormalities appear on the plants. In addition, the pathogen itself may become visible on the host surface giving it an abnormal appearance. In the one month long festivities organized on the banks of river Ganga during the auspicious occasion of Ardh Kumbh Mela of 2004 at Allahabad, the solid waste leftovers comprised of 62.20% biodegradable, 17.14% non biodegradable and 13.61% miscellaneous components (Gangwar and Joshi, 2008). It is hither to proven fact that improper or injudicious disposal of solid waste not only impacts the soil quality by increasing the concentration of various hazardous elements in the soil but is the source of further ground water pollution that is primarily used for drinking and agricultural purposes (Ahel *et al*., 1998). Solid waste management needs thorough administrative supervision, financial flexibility and availability to the cause, legally binding measures, long term

policy and planning going hand in hand with latest technological developments as improper disposal of solid waste pollutes all the vital components of the living environment such as air, land and water.

METHODS AND MATERIALS

Diseased samples were collected from different localities of Allahabad. Isolations of the fungal isolates were conducted from water samples, soils, roots and plant parts of water melon, tomato and marigold. Soil samples were taken out from all the three sides of the pits from other different depths (0.06", 7-10" and 13-18"). The samples from all the depths of a locality were mixed together. They were packed in sterilized polythene bags and brought to the laboratory.

Direct observation: The waste decomposing fungi were isolated by the help of binocular microscope from the decomposing temple wastes by the method of Garrett (1981).

Dilution plate technique: The fungi were isolated by dilution plate technique (Waksman and Fred, 1922). The 10 g sample of decomposed waste were taken from the pit and suspended into 100 mL of sterilized water in a 200 mL of conical flask. Further dilution series (1:102, 1:103, 1:104 and 1:105) were prepared. About 1 mL of dilution was poured in sterile petri plate and 15-20 mL of pre-sterilized PDA media was added. Three replications of each treatment were prepared and all the plates incubated at 25±2°C for a week.

RESULTS AND DISCUSSION

Pathogenicity test of the fungi isolated from different water sources and their pathogenicity is listed in Table 1 and 2.

Table 1: Pathogenicity test of fungi isolated from different water sources

		Pathogenicity test		
Water sources	Isolated fungi	Test plants	Result	Disease developed
Sewage water	*Fusarium oxysporum*	Watermelon	+	Wilt and root-rot
		Tomato	+	Wilt and root-rot
		Marigold	+	Fusarium wilt
	Fusarium solani	Watermelon	+	Seedling-rot and root-rot
		Tomato	+	Seedling-rot
		Marigold	-	
Industrial water	*Fusarium oxysporum*	Watermelon	-	
		Tomato	-	
		Marigold	-	
	Fusarium solani	Watermelon	-	
		Tomato	-	
		Marigold	-	
Ganga water	*Fusarium oxysporum*	Watermelon	+	Wilt and root-rot
		Tomato	+	Wilt and root-rot
		Marigold	-	
	Fusarium solani	Watermelon	+	Seedling-rot and root-rot
		Tomato	-	
		Marigold	-	

Table 2: Pathogenicity test of fungi isolated from different cultivated crops

	Pathogenicity test	
Fungi isolated from soil	Test crop	Result
Fusarium oxysporum f.sp. niveum	Watermelon	+
Fusarium solani	Watermelon	+
Fusarium oxysporum f.sp. *lycopersici*	Tomato	+
F. solani	Tomato	+
F. equiseti	Tomato	+
Fusarium oxysporum	Marigold	+
Alternaria alternata	Marigold	+

Pathogenicity test of fungi isolated from different water sources: Species like *Fusarium oxysporum* and *Fusarium solani* were isolated from sewage water, industrial water and Ganga water. In pathogenicity tests, *Fusarium oxysporum* and *F. solani* which were isolated from sewage water, *F. oxysporum* showed positive effects on all selected crops whereas *F. solani* showed pathogenic effect on watermelon and tomato but it has negative effect on marigold. *Fusarium oxysporum* and *F. solani* were isolated from industrial water, showed negative effects on all the selected crops. The *Fusarium oxysporum* and *F. solani* which were isolated from Ganga water, *F. oxysporum* showed positive effects on watermelon and tomato but it has negative effect on marigold whereas *F. solani* showed positive effects on watermelon and has negative effects on tomato and marigold.

Pathogenicity test of fungi isolated from cultivated field: A number of fungi were isolated from infected plant parts of watermelon viz., *Fusarium oxysporum, F. niveum, F. solani* and *F. bulbigenum,* isolated fungi from infected plant parts of tomato viz., *Fusarium oxysporum* f.sp. *lycopersici, F. solani, F. moniliforme, F. accuminatum, Fusarium* spp. and isolated fungi from infected plant parts of marigold viz., *Fusarium oxysporum, Rhizoctonia solani, Alternaria tagetica, Alternaria alternata.* Result found that pathogenicity of all fungi on test crops were found to be positive.

Among all sources, Ganga water proved best suitable for irrigation, because there was less number of fungal colonies and less amount of heavy metals. In industrial water less number of fungal colonies were observed but it proved toxic effects to the plants. The chances of disease development in most of the test plants were observed greater at the high concentration of sewage water. The maximum numbers of fungal species were isolated from sewage water and it was followed by Ganga water and industrial water due to presence of high organic load.

Plant pathogenic fungi like *Fusarium* spp. and *Alternaria* spp. were found in all water samples. In this way, it may be concluded that, the irrigation of agricultural fields with polluted water not only affects the growth of crop plants but it also increases the chances of various fungal contamination and disease development. The sewage water may be used for irrigation purposes after proper treatment. It will be highly useful, if sewage water will be diluted with tube well water. The fungal pathogens are considered as damaging agents causing a considerable reduction of its production. Several soil born fungi attack watermelon, tomato and marigold plant causing wilt disease and root-rot including *Fusarium* spp., *Verticilium dahlia* and *Rhizoctonia solani* (Sneh *et al.*, 1991; Awad, 1996; Ioannou, 2000). These fungi are limiting factors for production of tomato fruits is good quality and high quantity (Larkin and Fravel, 2002; Ioannou, 2000). Moisture

content plays an important role in microbial activity in the soil. Increasing moisture contents helps in increasing microbial activities. Madge (1965) has shown marked effect of moisture on the number of soil fungi. Moisture content is chiefly responsible for the colonization of microorganisms (Dunn *et al*., 1985; Christensen, 1989; Sinha *et al*., 1998; Vijay and Naidu, 1995; Fioretto *et al*., 1998; Pandey and Sinha, 2008). The pH of the soil varied from 6.5-7.2. Increase in pH due to higher biomass and bioactivity occurs when wood ash is incorporated in the soil as organic amendments (Zimmermann and Frey, 2002).

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