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Saroj
Department of Botany, D.A-V. College, Kanpur, Uttar Pradesh, India.

Mahadev
Department of Botany, D.A-V. College, Kanpur, Uttar Pradesh, India.

Narendra B. Shakya
Department of Botany, D.A-V. College, Kanpur, Uttar Pradesh, India.

J. Mohan
Department of Botany, D.A-V. College, Kanpur, Uttar Pradesh, India.

N. Mohan
Department of Botany, D.A-V. College, Kanpur, Uttar Pradesh, India.

Correspondence:
Narendra B. Shakya
Department of Botany,
D.A-V. College, Kanpur, Uttar Pradesh, India.

Impact of tannery effluent on growth of tomato plants

Saroj Mahadev, Narendra B. Shakya, J. Mohan and N. Mohan

Abstract
An experiment was conducted to study the effect of tannery effluent on Tomato (*Lycopersicum esculantum* Mill.) plants raised in soil-pot culture condition and treated with different percent of tannery effluent i.e. nil (control), 20, 40, 60, 80 and 100. Maximum dry matter yield and ascorbic acid content were observed at 60 percent level in the tops of both 30 and 90 days old tomato plants, maximum dry matter yield in leaves of 90 days and at the 20 percent level of tannery effluent in fruits of 100 days old tomato plants. Maximum chlorophyll content and peroxidase activity was observed at the 40 percent level of tannery effluent in leaves of both 30 and 90 days old tomato plants, maximum peroxidase activity in tops of 90 days old tomato plants. As compared to control, all the levels of tannery effluent showed highly significant (P=0.01) increase in catalase activity of tops of both 30 and 90 days and leaves of 90 days old plants.

Keywords: Tomato, Tannery effluent, fertilizer, irrigation

1. Introduction
Water is a most precious thing in the world. The most vital, fascinating of all God created. In recent years, increasing of industrialization, urbanization and development activities to cope up with the population explosion have brought the inevitable waste crisis.
Majority of industries are water based and a considerable value of waste water is discharged to the environment either treated or inadequately treated leading to the problem of surface and ground water pollution. The capital costs and operating wastewater treatment system are rising on one hand and on the other is pressing demand for the treatment of waste water generated by increased residential and industrial development. In recent years there has been an increased interest in alternation and innovative technologies which will prove to be low cost, low maintenance and energy efficient.
Now a days safe disposal and utilization of industrial effluent is going increasing importance throughout the world. It may be paper, tanning, iron, opium, sugar, viscose, sari printing, beverage, refining, rubber, distillery or any other industry. Since the quantity of the effluents at times is very large and the availability of fresh water for irrigation is scare, it seems that one of the alternatives to dispose of effluent is to use them for irrigation. In certain areas the scarcity of water has forced the farmers to use the effluents as a substitute of irrigation water, but over the years the use of this has lead to the realization of its mineral potential also.

2. Method
Tomato (*Lycopersicum esculantum* Mill.) plants raised in soil-pot culture condition. The details of soil preparation with tannery effluent as fertilizer and culture of plants were same as described earlier by Mohan *et al.* (2007). Cultivated plants were irrigated by tannery effluent with 0, 20, 40, 60, 80 and 100 percent at different intervals. Tops at 30 days, both tops and leaves at 90 days, and fruits at 100 days were taken for estimation of dry matter yield, chlorophyll, ascorbic acid, catalase and peroxidase activities of plants. For estimation of dry matter yield and determination of chlorophyll, catalase and peroxidase activities the details of the procedure were same as described earlier by Mishra (2000)

3. Result and Discussion
Maximum dry matter yield was observed at 60 percent level in the tops of both 30 and 90 days, leaves of 90 days and at the 20 percent level of tannery effluent in fruits of 100 days old tomato plants.

As compared to control, all the levels up to 60 percent level in leaves of both 30 and 90 days showed highly significant (P=0. 01) Increase in chlorophyll content. Beyond 60 percent level all the levels showed decrease in chlorophyll content in leaves of both 30 and 90 days, except at the 80 percent level in leaves of 30 days old plants where the value of its was found equal, over control.

Ascorbic acid content of tomato plants increased with increase in tannery effluent level up to 60 percent in tops of both 30 and 90 days old tomato plants. Beyond 60 percent level further increase in the tannery effluent level decreased the ascorbic acid content in the tops of both 30 and 90 days old plants.

Catalase activity of tomato plants increased with increase in tannery effluent level up to 60 percent level in tops of both 30 and 90 days and leaves of 90 days old plants. Beyond the level of 60 percent further increase in tannery effluent level showed decrease in catalase activity in tops of both 30 and 90 days and leaves of 90 days old plants.

Increase in tannery effluent level up to 40 percent level in the tops of both 30 and 90 days and leaves of 90 days old plants increased the peroxidase activity of tomato plants. Beyond 40 percent level in tops of both 30 and 90 days and leaves of 90 days further increase in level of tannery effluent decreased the peroxidase activity of tomato plants.

Table 1: Effect of tannery effluent on yield, chlorophyll, ascorbic acid, catalase and peroxidase activities of tomato (Lycopersicum esculantum, Mill) plants.

	Days	Plants Part	Percent tannery effluent						LSD	
			Nil	20	40	60	80	100	P=0.05	P=0.01
Dry matter yield/plant	30	Tops	0.280	0.295	0.306	0.317	0.288	0.67	0.009	0.013
	90	Tops	9.95	10.20	10.63	10.98	9.96	9.73	0.12	0.17
	90	Leaves	4.96	5.08	5.32	5.48	4.96	4.82	0.07	0.11
	100	Fruits	2.82	3.58	3.32	1.89	1.71	1.65	0.06	0.09
Chlorophyll/100 g FM	30	Leaves	83	94	104	93	83	75	6	8
	90	Leaves	95	110	120	111	93	87	6	8
mg Ascorbic acid/100 g FM	30	Tops	83	94	106	112	96	83	3	4
	90	Tops	43	46	52	57	48	40	2	3
Unit Catalase/ g FM	30	Tops	6.25	6.85	7.45	8.23	7.63	6.82	0.09	0.13
	90	Tops	2.12	2.28	2.48	2.74	2.54	2.27	0.06	0.09
	90	Leaves	3.10	3.34	3.62	3.95	3.68	3.28	0.07	0.11
Δ O.D. Peroxidase	30	Tops	0.021	0.025	0.038	0.024	0.020	0.015	0.002	0.003
	90	Tops	0.031	0.038	0.055	0.036	0.029	0.024	0.002	0.003
	90	Leaves	0.026	0.032	0.044	0.030	0.024	0.019	0.001	0.002

In agreement with the results presented have Pande (1985) has observed increased chlorophyll content in leaves in responses of tannery effluent supply. The increase in total chlorophyll in response to effluent supply has been found associated with an increase in tissue Fe and soils Mn, Cu, and Zn. This is substantiated by Kanwar and Dhingra (1962). Dutt (1962) and Anand (1968) have observed increase in chlorophyll content with the increase in soil Cu and Zn. Chatterjee *et al*. (1986) have found a positive relation between tissue Fe and chlorophyll both a and b.

In the findings reported here ascorbic acid content has been found increase in responses to tannery effluent supply in accordance with observations of Pande (1985) who also reported increase in ascorbic acid content in sugar cane leaves in responses to tannery effluent supply associated with an increase in total carbohydrate and non-reducing sugar content of leaves.

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