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Seed germination of wheat (*Triticumaestivum*) and the effect of textile industrial effluents on radical and hypocotyls lengths

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Abstract

Textile industries consume high quantity of water and release it as toxic effluents after some colouring processes. However, some wastewater may be recycled as fertilizers in aquaculture and agriculture, horticulture after dilutions. But industrial effluent of synthetic products like azo dyes may be harmful for germination and growth performance of crop seeds. The present paper deals with the physico-chemical parameters of textile industrial effluents and its impacts on germination and growth performance of Wheat, *Triticumaestivum* (Family: Gramineae/ Poaceae). Seeds were found more tolerant against 25% concentrated effluent.

Keywords:*Industrial effluents, seed germination, Triticumaestivum*

Introduction

Textile industrial effluent containing different colours, inorganic and organic chemicals and heavy metals are highly polluted in nature and varies in its compositions. The practice of disposing textile wastewater without any treatment affects, the adjoining land and its soil system were observed very sodic (highly alkaline) and loosing water holding capacity. In the adjoining agricultural area of textile industries sector, there is immense degradation of crops productivity being contaminated by irrigation through tube wells or directly from the water channel of village pond (Bharti, 2007).Developing countries like India, Bangladesh, etc. discharge the effluents to the surface water without any treatment or sometimes little treatment due to technological and economical limitations. Colours affect the nature of water, inhibit sunlight penetration and reduce the photosynthetic action. Some of the dyes cause rapid depletion of dissolved oxygen in aquatic ecosystem affecting aquatic life and floral diversity adversely.

Material and Methods

Textile industrial area is situated on Jatal road at Panipat, which is very famous spot for handloom business. More than 25 dye houses are situated around a common drain and discharge their effluents collectively into drain openly.Effluent was collected from main common effluents channel of textile industrial area of Panipat, Haryana and stored in tightly closed plastic container.

Four polythene bags were taken for sowing the 100 treated seeds of Wheat (*Triticumaestivum*)with 750 gm soil in Green house condition and irrigated by textile industrial common effluent for three days. 25 seeds were treated with absolute effluent, 25 seeds with 50% concentrated effluent, 25 seeds with 25% concentrated effluent and rest 25 seeds were treated with distilled water as control performance. Germination of seeds and growth performance were noticed for each poly bags everyday. Physico-chemical characteristics of effluents were analyzed according to APHA (1995) and Trivedi and Goel (1984).

Results and Discussion

The reults of various physicochemical charachterstic of common effluent of textile industry is given in table 1 while the germination activity of wheat (*Triticumaes*.) is given in table 2.Textile effluents were compositely discharged into nearest pond through a drain and in this drain the appearance of effluent was pinkish red in common effluent drain of textile industries and dye houses, which might be due to the presence of

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synthetic dyes (Malik *et al*., 2006). Mean value of effluent pH was found alkaline (8.2) at pH scale. Solids, BOD and COD values were very high, due to the presence of chemicals used in various processes. Effluents with 25% (S/4) concentration had shown positive performance of seeds germination, radical and hypocotyls growth, almost similar to control condition with distilled water, while 50% (S/2) concentration showed some negative effects on per cent seed germination and growth of seedlings. Saxena and Kaushik (2005) also reported the similar effects of effluents of wood products factory on seed germination of pigeon pea. 100 % absolute effluent (S) was found highly unfavorable for seeds germinationand growth of seedlings.

Table-1: Characteristics of common effluents of textile industries

Parameter (Unit)	Temp (°C)	TDS (mg/l)	TSS (mg/l)	Color	Odor	pH	TS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Cl (mg/l)	Alkalinity (mg/l)
Common Effluent	22.5 ±1.5	336.3 ±81.89	33.6 ±8.21	Pinkish Red	Thresh old	8.2 ±0.14	370.0 ±90.0	1.64 ±0.21	272.5 ±42.5	791.5 ±51.5	340.8 ±28.4	590 ±60

Table-2: Germination activities of Wheat (*Triticumaestivum*) during experiment

Effluents	Exposure Hour	Number of seed	% Germination	Hypocotyls (Shoot) Length (Cm)	Radical (Root) Length (Cm)
100% (S)	24	25	24	0.750	1.20
	48	25	32	1.250	1.80
	72	25	40	1.350	2.40
50% (S/2)	24	25	28	0.800	1.35
	48	25	36	1.300	2.25
	72	25	44	1.450	3.25
25% (S/4)	24	25	36	0.900	1.42
	48	25	40	1.400	2.38
	72	25	48	1.550	3.52
Control (Distilled water)	24	25	32	0.850	1.50
	48	25	44	1.425	2.45
	72	25	48	1.500	3.50

Highest root length of germinated seeds with 100% concentration effluent was found 2.40 cm on third day, which was the shortest root among all the radicals in any poly bag. 25% (S/4) concentrated effluent indicated the high growth rate and seed germination among all other concentrations and it was similar to control conditions with distilled water. Dutta and Boissay (1998) also stated that the effluent at low concentrations exhibit greater shoot and root length.Transfer values of heavy metals from soils to plants may influence the growth performance of plant species. Seeds of Wheat (*Triticumaestivum*) were found more tolerant against 25% concentrated effluent, while against 100% absolute effluent it was found too week as only 10 seeds were germinated in poly bag of 25 seeds.

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