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Impact of textile waste water on seed germination and growth development of *Vicia faba* L. at Jaipur, Rajasthan, India

Ajit Kumar Sharma[1], Nidhi Parashar (Sharma)[2] and Ravi Sharma[3]
[1]Department of Botany S.S. Jain Subodh Girls Degree College, Sanganer, Jaipur 302029
[2] Department of chemistry K.R. P.G. Collage, Mathura (U.P.)
[3] Principal ESS ESS collages of Education Dayal Bagh Agra U.P.
Corresponding Author Email - ajit2612@gmail.com

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Abstract

The study has been focused on the investigation on the effect of textile waste water on seed germination and seeding growth of *Vicia faba* L. plant under laboratory conditions. The effect of textile waste water compared to that of control (distilled water). Concentration used for both the waste water were 0, 25, 50, 75 and 100% minimum relative toxicity percentage was in 25% concentration and increase gradually as the concentration and increases. A textile effluent has more toxicity. Number of seed also deceases with the increase in concentration. The recorded observation it is concluded theat. The textile waste water diluted to 25% concentration for irrigation of *V. faba* enhances germination of seeds.

Keywords: Broad bean (*Vicia faba*), textile waste water, seed germination, growth, seedling

Introduction

Textile industries plays a very significant role to our country's economy, science it is contributes about 1/3rd of the foreign exchange by exports and provides jobs to about 25% labor force in the country (Paul 1997, Chavan 2001). Amongst leading textile printing centers in country Pali, Balothra, Bagru and Sanganer in Rajasthan are famous for their traditional textile printing word over.

Textile printing and dyeing industry is a water intensive industry, requires large volumes of fresh water at different steps of printing and it is discharge untreated effluents in the nearby drain and pools (Bharadwaj 1999, Rastogi 1999). These effluents are the soup of bleaching agents, salts, acids/alkalis as well as heavy metals such as Cu, Cr, Fe, Cd and dyes containing mainly azo dyes. These materials concentration are more than the permissible limits (CPCB 1989).

The disposal of waste water is a major problem faced by municipalities particularly in the case of large metropolitan areas, with the limit space for land based treatment and disposal. On the other hand, waste water is also recourse that can be applied for productive uses science waste water contain nutrients that have the potential for use in agriculture. Thus, waste water can be considered as both a resource and a problem. The effluents' from textile industrial source in water are creating great problems as for as the disposal is concerned, directly or indirectly. They are hazardous to plants, animals and human beings and are of immediate concern in the existing environment. The main problem is of their safe disposal with out any consequences. They can affect the soil and vegetation. The effluents of textile industries are stored in may small and large dilches and the innocent farmers directly pump this waste water of very poor quality in the wells with the help of pipeline system and irrigate the crops by diluting the effluents.

In addition to providing large quantities of water some of the effluents may contain considerable amounts of essential nutrients which may prove beneficial to plants. Although some

worker has been done on the performers of various crops irrigated with effluents discharge from various sources (Gautam & Bishnoi 1992, Pathak *et al.* 1998, Pathak *et al.* 1999, Lubello *et al.* 2004, Nath *et al.* 2009). The use of industrial effluents for irrigation has emerged in the recent past as an important way of utilizing waste water. There are several advantage and disadvantage in using. This waste water for irrigation purpose (Lata 1983, Sisodia & Bedi 1985, Dixit *et al.* 1986, Ramana *et al.* 2002, Sharma 2004, Moorthy *et al.* 2007, Panaskar & Pawar 2011, Dash 2012, Verma & Sharma 2012, Sinha & Paul 2013).

Seed germination is a critical stage that ensures reproduction and controls the dynamics of plant population. So it is a critical test of probable crop productivity (Radosevich *et at.* 1997). A laboratory experiment was designed to determine the effect of different concentrations 25, 50, 75 and 100% of textile industry effluents on seed germination in *V. faba*.

Material and Methods

The waste water sample was collected from the textile mill at Jaipur (Sanganer) in polythene bottles and stored in dark place. The sample was analyzed for various physico-chemical characteristics as per the standard methods described by APHA (1998). The effluents were stored at 4 ºC during storage period to avoid changes in its characteristics. The effluents colour was blackish and had pungent smell. The other properties are described in Table 1. Effluents diluted to control, 25%, 50%, 75% and 100% (pure waste water with out dilution).

The seeds of *V. faba* were sterilized with 0.1% w/v aqueous solution of mercuric chloride for 5 minutes to remove the microbes followed with repeated washing by using sterilized double distilled water. A laboratory experiment of Petridisc culture was designed the 50 seeds sterilized seeds were arranged in sterilized petridisc lined with double layer of filter paper. Plates were labeled as per type concentration of the effluent. The 25, 50, 75 and 100% concentrations of untreated effluents were prepared while distil water taken as control. The germination percentage was observed in each pertidisc for 24 hr to 120 hr. The growth parameter like germination, plumier and radical lengths were observed on 1st day to 7th day after seedling. Emergence during the germination period. The growth parameters like germination percentage, root length, shoot lengths were measured and noted.

Result and Discussion

DO level was recorded poor with 2.5 mg/l and neutral pH was observed (Table 1). TDS and COD were estimated very level. Blackish color water was observed. The presence of synthetic organic chemicals (fuels, detergents, paints, solvents etc.) impacts objectionable and offensive tastes, odors and colors to fish and aquatic plants even when they are present in low concentrations (Nollet 2000). The rate of seed germination for Broad bean (*V. faba*) cultivars increases progressively with increasing concentration of textile waste water up to 50% and then it decreases (Table 2). The effect of waste water on germination of *V. faba* was discourage able to words higher concentrations 60% to 80% inhibition rate with treatment of 75% to 100% waste water (Fig. 1). The similar opinion was recorded by Khan *et al.* (2011) in their experiment on impact of textile waste water on seed germination found that in higher concentration, the germination of seed is affected. Dash (2012) found that at higher concentration of domestic waste water on seed germination efficiency decreases. Varma & Sharma (2012) a found that at high concentration of dairy and textile waste water on growth of plant wheat is decrease. Nagda *et al.* (2006) observed that the seed germination efficiency decreases with higher concentration of industrial effluent. Osmotic pressure of the effluent

increases at higher concentration of total salt making inhibition more difficult and retarded germination efficiencies. The ability of seeds to germinate under high osmotic pressure differs with variety as well as species (Unger 1987). Lower concentration of effluents supports 100% seed germination in Kidney bean and millet, but osmotic pressure associated with higher concentration of sugar factory effluent were found to reduce the germination in Kidney bean and millet (Ajmal & Khan 1983). The treatment with polluted water also delayed seed germination in broad bean (*V. faba*). This may be due to decrease in water uptake at higher label of salinity in view of toxicity of high osmotic pressure of the seedling medium. In the present study difference in the rate of seed germination in broad beam (*V. faba*) may be due to higher soluble salt in the waste water. Khan & Sheikh (1976) have reported significant reduction and delay in the germination of *Capsicum annum* seed with the treatment of sewage. They revealed that, this is due to decrease in water uptake at higher label of salinity in view of toxicity of high osmotic pressure due to high soluble salts.

The data presented here also depicted significant declined in seedling length with treatment of textile waste water at the concentration (75% to 100%). However, treatment at lower concentration (25% to 50%) seedling length in broad beam (*V. faba*) increases (Table 3, Fig 2).

Table 1Physico-Chemical parameters of textile waste water

SN.	Parameters	Textile waste water
1.	Colour	Blackish
2.	pH	8.5
3.	TDS Mg/L	2482
4.	BOD. Mg/L	315
5.	COD. Mg/L	820
6.	Total jeldal Nitrogen	10.5
7.	D.O. Mg/L	2.5
8.	Sodium Mg/L	610
9.	Potassium Mg/L	28
10.	Sulphate Mg/L	409
11.	Magnesium Mg/L	64.4
12.	Chloride Mg/L	418

Table 2 Effect of different concentration of textile waster water on seed germination percentage (%) of broad beam (*Vicia faba*)

Water concentration %	% of germination
25%	98%
50%	93%
75%	83%
100%	72%
Control	95%

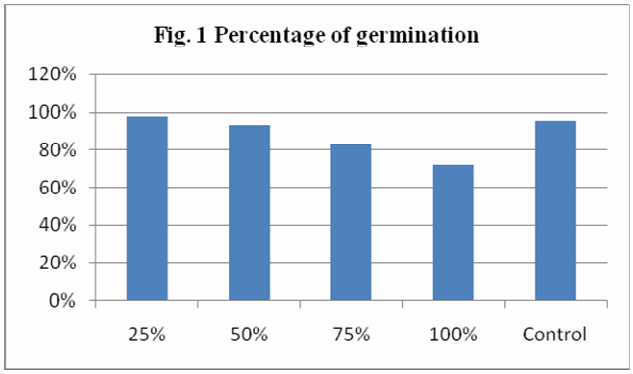
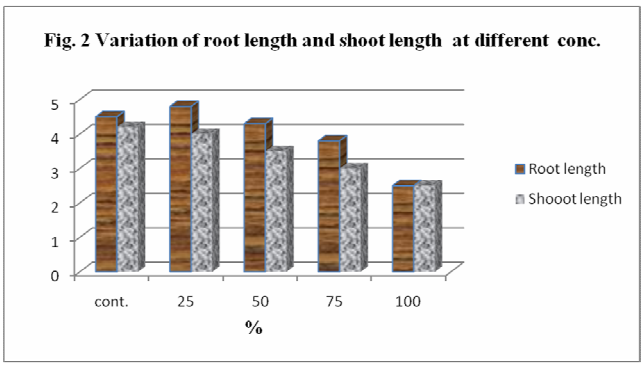


Table 3 Variation of root length and shoot length

Con. of waste water	Root length (cm)	Shoot length (cm)
25%	4.8	4.0
50%	4.3	3.5
75%	3.8	3.0
100%	2.8	2.5
control	4.5	4.2



Conclusion

The findings of present study may be proved useful in agriculture for large scale irrigation of diluted effluent. The results of the present findings showed that the germination percentage and best seedling growth occurred in 25% to 50% effluent concentration. It is also indicated that, treatment of textile waste water necessary to minimize the pollution effects before it is discharged to the land.

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