International Scholars Journals

International Journal of Agricultural Sciences ISSN: 2167-0447 Vol. 6 (2), pp. 949-958, February, 2016. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Impact of textile dyeing effluents on germination and seedling stage of country bean (*Lablab niger* var. typicus)

Jahidul Hassan[1], Mohammed Zia Uddin Kamal[2] and M. Z. Alam[3]

[1]Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh.
[2]Department of Soil Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh.
[3]Department of Bioenvironmental Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh.

Accepted 14 July, 2015

Abstract

An experiment was conducted on the impact of dying effluents on germination and seedling stage for the production of country bean (*Lablab niger var. typicus).* Seven stages of Dyeing effluents were used as treatment variables and compare their effect on germination attributes and early growth stage of country bean. The treatment of neutralization stage (D_5) to enhanced the germination percentage remarkably (100%) as well as statistically identical with the result of underground water (D_1) whereas the treatments of effluent from 2nd wash after Bath (D_4) & mixed effluent from ETP were showed poor germination (73.33 %) . Second wash after scouring and bleaching treatment (D_2) also showed good result. All results has been taken by considering other germination oriented parameters, such as germination energy, relative germination rate, effluent injury rate and germination velocity. On the contrary, outstanding result was showed at seedling growth stage from the treatment of D_5 except others. But D_4 treatment performed very poor among all parameters. So, it can be suggested that, D_5 stage of textile effluent might be applied as irrigation water for the purpose of crop production as well as country bean cultivation and sustainable environment.

Key words: Textile, effluents, country bean, germination, seedling growth.

INTRODUCTION

Bangladesh is an agrarian economy and country bean is one of its most important vegetables. Periphery and urban area are used by farmers for cultivation of this vegetable. Now a day, textiles dying effluents are discharging to agricultural crop areas without treatment of water. Treating waste effluents is very much significant for cultivation of crops and environment. Moreover, the economy of Bangladesh is predominantly based on agriculture but, in the race towards industrialization, industries are taking place in a gradual increasing phase. The important industries are textiles, lather tanning, fertilizer, sugar, chemical pharmaceutical, oil refining and so on. Among these, textile industries are rapidly expanding day by day. There are 1821 small and large knit dyeing industries in Bangladesh (BKMEA, 2012). These industries are major source of effluents due to the

Corresponding author: jhdalim@gmail.com; uzzalbau@yahoo.com

nature of their operations which requires high volume of water that eventually results in high wastewater generation. The most common textile wet processing setup consists of desizing, scouring, bleaching, mercerizing, dyeing as well as finishing process. Dyeing is the process of adding color to the fibers, which normally requires a large volume of water. It has been estimated that for dyeing 1 kg of cotton with reactive dyes requires an average of 70-150L water , dyes , salt , alkalis and others pretreatment and dyeing auxiliaries (Chakraborty *et al.,* 2003). The chemical reagents used in textile industries are very diverse in chemical composition ranging from inorganic compounds to polymers and organic products. Dyeing auxiliaries or organic substances which are responsible for high BOD (from 700-2000mg/L) and COD of the effluents (IFIC, 2007).The scouring effluents are strongly alkaline. Dyes are carbon based organic compounds while pigments are normally inorganic compounds often involving heavy toxic metals (i.e. chromium, copper zinc, lead or nickel). Most of the dyeing factories discharge their effluents into the environment after partial treatment or without any treatment. However, with the advent of modern wastewater treatment processes in the early 20th century, industrialized countries began to establish regulatory frameworks for controlling wastewater treatment and use for irrigation. These frameworks continued to evolve over time, but still rely heavily on capital-intensive wastewater treatment as the principal intervention for protecting public health and environment. Developing countries like Bangladesh has lack the financial and institutional capacity to build and operate sophisticated wastewater treatment facilities; indeed, universal wastewater treatment has still not been achieved in many industrialized countries due to financial constraints. So, other complementary solutions are needed to maintain the sustainability of agriculture through reutilize the discharged wastewater from industries after taking into consideration the benefit of environment, crop, and public health as well. Moreover, in many regions, as freshwater sources become scarcer, wastewater use has become an attractive option for conserving and expanding available water supplies. In principle, wastewater can be used for all purposes by given appropriate treatment. The utility of municipal and industrial waste water for irrigation of crops is well documented (Singh *et al.,* 2006; Nath *et al.,* 2007). The use of such wastewater in irrigation system definitely provide some nutrients to enhance the fertility of soil but also deposit toxicants that change soil properties in the long run. Furthermore, it also causes phyto-toxicity results from intoxication of living tissues by substances accumulated from the growth medium (Chang *et al.,* 1992). However, the adverse effects of textile effluents on plants depend on the type of species, types and concentrations of toxic materials in the effluent. This necessitates a detailed scientific study before any specific waste can be used for irrigation for particular crop and environmental conditions. Seed germination is an important and vulnerable stage in the life cycle of terrestrial angiosperms and determines seedling establishment and plant growth. Despite the importance of seed germination treated with different stages of textile dying effluents the mechanism (s) of phyto-toxicity or beneficiary influence in seeds is relatively poorly understood, especially when compared with the amount of information currently available about the reutilization of dying effluents for crop cultivation in Bangladesh. Seed germination and plant growth bioassays are the most common techniques used to evaluate phytotoxicity (Kapanen & Itavaara, 2001). Such types of works have performed in a scattered way in many countries of the world rather those in our country, for instance, Muhammad and Khan (1985) found that industrial effluent reduced the germination percentage of kidney bean (*Phaseolus aureus*) and ladies' fingers. (*Abelmoschus esculentus*).While working with *Cicer arietinum*, Dayama (1987) reported that even highly diluted industrial effluent (5% of industrial effluent) adversely reduced the seed germination. In contrast, 50% diluted textile effluent increased the seed germination, total sugars, starch, reducing sugars and chlorophyll of groundnut seedlings (Swaminathan and Vaidhecswarn. 1991). Similarly, effect of dye factory effluent was studied with respect to germination and growth of Bengal gram *Cicer arietinum* L. In lower concentration the germination percentage and growth are relatively higher than the control, but gradual decrease in the germination of seeds, seedling growth with increase in effluent concentration was observed. The best germination, seedling growth, number of root nodules, yield and biochemical attributes was observed in 20% concentration with growth promoting effect and significantly better than control. Beyond 20% effluent, root and shoot length decreased. Thus the dye factory effluent can be safely used for irrigation purposes with proper treatment and dilution at 20% (Kathirvel, P. 2012). Country bean (*Lablab niger* var. typicus) is one of the most popular legume fruit vegetable in Bangladesh that is possible to cultivate in the effluents discharged areas. The neutralization stage of effluents was better for the germination & seedling growth of country bean. It also has no impact on sustainable environment. The present study suggested that neutralization stage of textile effluent might be applied as irrigation water for the purpose of crop production as well as country bean cultivation and sustainable environment.

MATERIALS AND METHODS

Collection of Textile Effluents

Different stages of textile dying effluents were collected in pre-cleaned plastic bottle from Tex Euro Bd. Ltd., Vogra, Gazipur, Bangladesh. The effluents were stored at 4^0C temperature to avoid their changes of physiochemical properties. Various physio-chemical characteristics were analyzed at the laboratory of Dhaka University of Engineering Technology (DUET), Gazipur, Bangladesh. The name of equipments and their use are shown in Table 1.

Germination Experiments

The germination test was conducted following the prescribed method in ISTA rules (Anon., 1999) and 480 seeds were collected from the Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh. All seeds were surface-sterilized with 1% sodium hypochlorite (NaOCl) for one minute to prevent any fungal contamination, and thereafter the seeds were washed with distilled water. The Petri dishes and filter papers were sterilized in an autoclave to prevent microbial contamination. Twenty (20) seeds for each treatment were transferred to Petri dishes lined with filter paper (Whatman No. 42). This filter disc was moistened with 4 ml of distilled water for control and with the same quantity of textile effluents. The petri dishes were incubated at 20°C in the growth room. Germination was recorded daily at a fixed hour and the emergence of radical was taken as a criterion of germination. Germination percentage, germination energy, germination index, relative germination rate and relative effluent-injury rate were also determined that is showed in Table 2.

Pot Experiment

Four hundred viable seeds of country bean were randomly selected from the stock. Twenty seeds were sown in each of four plastic pots (10 cm diameter and 10 cm height) and also filled with by as required ordinary garden soil and washed well by tap water and then pour distilled water as to flush through all the salts that was present in the soil. The pots were irrigated with under ground water as control treatment and seven different stages of dying effluent. 250 ml of each stages effluent were applied. This experiment prolonged up to the standard age of transplantation (third leaf stage).
For observation of growth, seedlings was picked from each of the poly bags and then length of the root, shoot, leaf length, leaf width, as well as dry fresh weight were recorded at the termination of experiment. Then individual plant was picked up and kept at 70°C in oven for 3 days. Then their dry weights were recorded. The process was replicated for three times and the experiment was laid out following the randomized complete block design (RCBD). The values were subjected to one-way analysis of variance (ANOVA) and DMRT for comparison of means to determine statistical significance. Statistical analysis was performed using MSTAT-C program.

RESULTS

Physio-chemical parameters of textile dying effluents

All Physio-chemical parameters of textile dying effluents were detected. The pH range of textile effluent samples were permissible limit that was 6.8 to 8.8 except second wash after scouring & bleaching and mixed effluent from ETP. Chemical oxygen demand (COD) of underground water was below of standard limit but others were above. Similar trend was also found in the case of BOD except tube well water (underground water), second wash water after scouring & bleaching and second wash after soaping. Electrical conductivity exceeded limit as the treatment of second wash after BD as well as mixed effluent from ETP than that of in the standard limit of safe irrigation water (1200 ppm). The similar result was also observed for the chloride content. Total Dissolved Solid (TDS) was found within irrigation standard from 2nd wash after BD and Mixed effluent samples. Total Suspended Solid (TSS) was above from the irrigation standard in mixed effluent samples except others. Moreover, other element contents such as sulphate, nitrate, phosphate, lead, copper, nickel, cobalt, chromium and zinc were within the standard limit for irrigation purpose (Table 2).

Germination percentage at different days after sowing

Germination percentages of seeds were counted daily in specific time. At that time, those seeds were considered germinated when their radical length was more than 3 mm. Counting continued to count more germinated seeds and the results of different days of observation were converted into percentage and shown in figure 1. From this figure it has been revealed that, the highest percentage of germination was observed in D_2 treatment at three days after sowing and the lowest was in D_4 treatment which was identical with D_8 treatment for the same date of observation and the figures were 33.33 and 13.33 % accordingly. On the other hand, after four days sowing, the highest result was also found in case of D_2 treatment which was similar with D_6 (666.67%).

Table 1. Equipments and their use for detection of different parameters.

Sl.No	Name of Equipments	Model	Manufacturer	Parameters
1.	Digital P^H meter	-	HACH	P^H ,Temperature
2	Spectrophotometer	DR2800	HACH	COD, Nitrate, Phosphate ,Sulphate, Colour etc.
3	D.O meter	9071	Jenway	Dissolve oxygen
4	COD Digestion Reactor	45600	HACH	Sample digestion for COD measurement
5	Conductivity meter	EC 150	HACH	Eclectic conductivity
6	Electronic balance	WA 210Rev0298	WILDCO	TDS and TSS
7	Atomic Absorption Spectrophotometer(AAS)	ALPHA4	Chem Tech Analytical Instrument	Cu, Co, Pb, Zn

Treatment D_4 showed the lowest result (26.67 %). Moreover, after five days sowing the highest germination percentage was found in D_5 and treatment D_4 performed as the lowest and constituted as 93.33 and 53.33 %, successively. The similar trend of results was also observed after six days of observation.

Germination attributes of seed

Germination attributes of country bean affected by different stages of textile dyeing effluent. The maximum seed germination were recorded in the treatment of D5 and D_2 that's were statistically identical with control treatment and minimum at D_4 and D_8 as compared to others and the values were 100 % and 73.33 %, respectively. Considering various seed quality parameters noticed that D_2 considered as the efficient treatment as compared to others for country bean seed attributes related to germination by estimating as 0.62, 1.00, 1.00 and 61.78 of germination race, germination energy, relative germination rate and germination index, accordingly. Eventually, statistically more or less similar result was found within the treatment of D5 and D_4. Significantly least values for all parameters of seed quality were studied (Table 3).

Relative effluent injury rate

The germination process of country bean was greatly affected by different effluent treatments to compare with the control treatment of ground water. The figure 2 showed that the germination of treated seeds with D_3, D_4, D_6, D_7 and D_8 treatment were highly affected whereas zero injured were found in the treated seeds of D2 and D_5. As consequences, the germination percentage of D_2 and D_5 treated seeds were the highest and also D_4 & D_8 effluent stage possessed the lowest ranking followed by others.

Seedling growth parameters

A significant difference in shoot length, fresh weight and dry weight of individual seedling were observed whereas the rest of characteristics were shown statistically insignificant results. The highest value of shoot length (23.47 cm), root length (12.96 cm), seedling length (35.48 cm), fresh weight per plant (0.46 g), dry weight per plant (0.15 g), water percentage (78.31 %) and dry matter percentage (37.56 %) were recorded for the treatments of D_5, D_6, D_5, D_4, D_8, D_7 and $D_{8,}$ successively. On the contrary, the lowest result were performed by D_7, D_1, D_7, D_2, D_5, D_8 and D_4 accordingly and these were constituted as 17.26 cm, 10.18 cm, 28.04 cm, 0.23 g, 0.07 g, 62.44 % and 22.13 % , respectively for that of the same attributes. However, in general among the treatments D_5 performed better than that of other treatments (Table 4).

Seedling vigor index

In strong seed vigor index, had been observed that there exists a significant difference among the different stages of textile waste water (Figure 3). The highest seed vigor index was observed in D_5 treatment (3548) whereas the lowest was in D_4 treatment (2175). However, in neutralizing stage of textile dyeing (D_5) effluent was showed 22.38 % higher seed vigor than that of control treatment (2899).

Leaf length and width (cm)

Although the leaf length and width were not varied significantly treated with different studied wastewater, but

Table 2. Physio-chemical parameters of textile dying effluents.

Parameters	Irrigation std. (NEQS)	Treatments							
		D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8
		Tube well (underground irrigation water)	2^{nd} wash after scouring& bleaching	Enzyme Treatment	2^{nd} wash after BD	Neutralization Treatment	2^{nd} wash after Soaping	Fixing Treatment	Mixed Effluent from ETP
P^H	6-9	6.8	9.4	6.3	8.8	7.1	7.4	7.3	9.5
DO (mg/l)	4.5-8	4.1	5.85	6.12	4.58	5.0	5.80	4.77	0.19
Color (pt.co- unit)	7	16	97	67	477	367	171	348	1038
TDS(mg/l)	2100	300	910	650	2170	1840	470	1290	3320
TSS (mg/l)	200	30	40	50	60	60	40	40	310
E.Conductivity	1200	350	850	900	1350	550	480	700	4200
BOD (mg/l)	250	57	35	Nil	411	Nil	214	350	900
COD (mg/l)	400	310	454	1374	450	525	630	199	478
Nitrate($NO_3^{-)}$ (mg/l)	10	ND	0.8	0	0.6	0	0.3	0.8	0.8
Phosphate (PO_4^{-3}) (mg/l)	15	ND	0.52	0.81	0.23	0.27	0.19	1.06	0.40
Sulphate (SO_4^{2--}) (mg/l)	1000	ND	9.0	1.0	44	0	1.0	1.0	80
Chloride(Cl^-) (mg/l)	1000	31	08	05	2500	58	64	42	2700
Copper (Cu) (ppm)	1.0	ND	ND	ND	0.299	0.681	0.005	0.006	0.111
Cobalt(Co) ppm	NGVS	ND	ND	ND	0.369	0.138	ND	ND	0.255
Zinc (Zn) ppm	5	ND	ND	ND	0.914	0.192	0.316	0.384	0.354
Lead (Pb) ppm	0.5	ND	ND	ND	0.0236	0.008	0.0232	0.0192	0.0263
Ni ppm	1.0	ND	ND	ND	0.0045	0.0027	0.0229	0.0262	0.0237
Cr ppm	1.0	ND	ND	ND	0.0168	0.0039	0.0326	0.0406	0.0306
Cd ppm	0.1	ND	ND	ND	0.0046	0.0008	0.0022	0.0026	0.0078

ND= Not determined
NEQS= (National Environment Quality Standards)
NGVS = No guideline value set

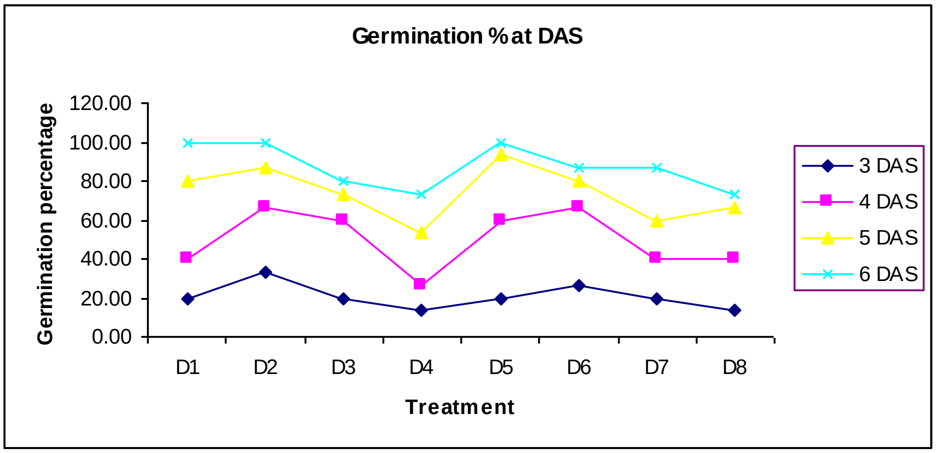

Figure 1. Germination percentage at different days after sowing.

Table 3. Effect of different stages of textile dying effluents on seed quality of country bean.

Treatment	Germination %	r	GE	RGR	GI
D_1	100.00a	0.49abc	1.00a	1.00a	49.33abc
D_2	100.00 a	0.62a	1.00a	1.00a	61.78a
D_3	80.00b	0.50abc	0.80b	0.80b	49.67abc
D_4	73.33 b	0.34d	0.73b	0.73b	34.00d
D_5	100.00 a	0.57ab	1.00a	1.00a	57.00ab
D_6	86.67 ab	0.56ab	0.87ab	0.87ab	56.00ab
D_7	86.67 ab	0.43bcd	0.87ab	0.87ab	43.11bcd
D_8	73.33 b	0.38cd	0.73b	0.73b	40.11cd
CV (%)	11.70	16.33	11.70	11.70	15.43
SE±	5.91	0.05	0.06	0.06	4.35

*Same letter present within the column shows non significant at 5% level
^{r} = coefficient velocity of germination, ^{GE}= Germination Energy, ^{RGR}= Relative Germination Rate, ^{GI}= Germination Index

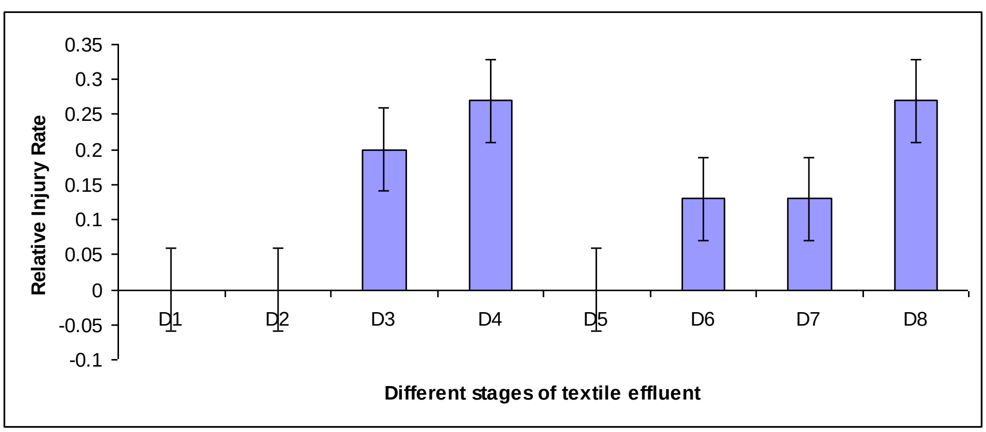

Figure 2. Effect of different stages of textile dying effluents on relative effluent injury rate.

the highest leaf length and width of country bean were found in D_3 treated plant followed by others (Figure 4).

Looking to the other sides, it has been clear that, D_4 treated seed produced the lowest leaf length and width.

Table 4. Effect of different stages of textile dying effluents on seedling growth of country bean.

Treatment	SL (cm)	RL (cm)	Seedling length (cm)	FW (g)	DW (g)	W (%)	DM (%)
D_1	18.81ab	10.18ns	28.99	0.28ab	0.09ab	66.33	33.67
D_2	20.48ab	11.19 ns	31.67	0.23b	0.08b	64.06	35.94
D_3	19.85ab	11.38 ns	31.22	0.42ab	0.12ab	71.06	28.94
D_4	17.26ab	12.11 ns	29.90	0.46a	0.09ab	77.87	22.13
D_5	23.47a	12.01 ns	35.48	0.30ab	0.07b	75.06	24.94
D_6	19.69ab	12.96 ns	32.65	0.43a	0.12ab	70.47	29.53
D_7	17.79ab	10.78 ns	28.04	0.40ab	0.08b	78.31	21.69
D_8	18.7ab	11.31 ns	30.05	0.39ab	0.15a	62.44	37.56
CV (%)	15.36	16.87	13.57	26.83	35.13	12.89	31.10
SE±	1.73	1.12	2.43	0.06	0.02	5.26	5.26

*Same letter present within the column shows non significant at 5% level.
SL= Shoot length, RL= Root length, FW= Fresh weight, DW= Dry weight, W%= Water percentage, DM %= Dry matter percentage.

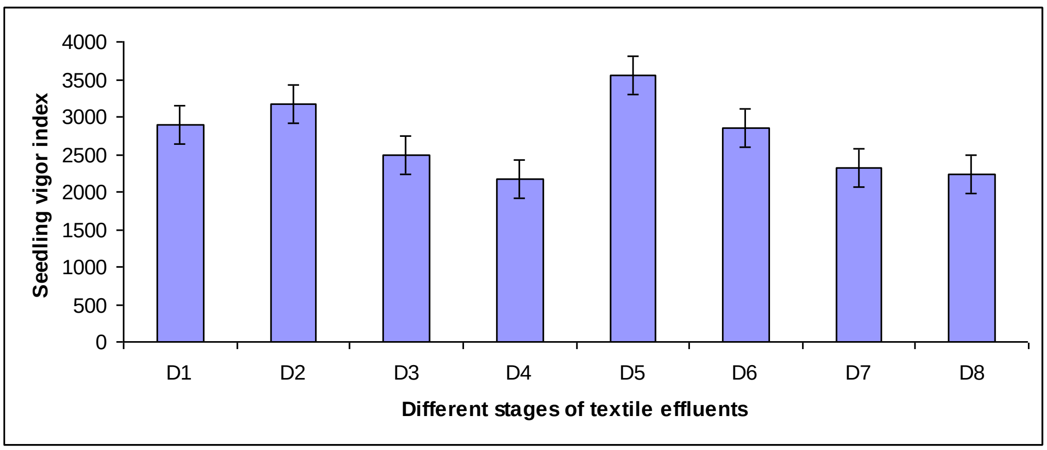

Figure 3. Effect of different stages of textile dyeing effluents on seed vigor of country bean.

DISCUSSION

Water absorption is very important for germination with seedling growth and development. Under the environmental stress conditions, the energy forming molecules may be disturbed and subsequently carbohydrates and protein metabolites of the membrane are altered (Kannan & Upreti, 2008), which may lead to reduction in absorption of water by the seeds/seedlings. In this present investigation, wide variation was observed according to the studied effluents and ground water, regarding the germination percentage as well as other germination attributes of country bean. Some researcher related this consequences of germination directly with the presence of higher salt/metal concentrations (Baruah & Das, 1997), while others were described the inhibitory (Crowe *et al.,* 2002) as well as stimulatory (Yousaf *et al.,* 2010) effects of various effluents on the germination of a number of plant species. Considering this fact, Murkumar and Chavan (1987) have reported that the higher concentration of effluent decrease enzyme dehydrogenase activity that is considered as one of the biochemical change which may have disrupt germination and seedling growth. Among the studied different dyeing effluents, Second wash water (D4 treatment) inhibited germination greatly due to presence of high level dissolved solids, which also increased the salinity and conductivity of the growing media for germination and the findings are also supported by Singh *et al.,* 2006. Even though, the similar trend was also observed from kangkong as testing plant irrigated with these same treatments (Hassan *et al.,* 2012). Generally, race and

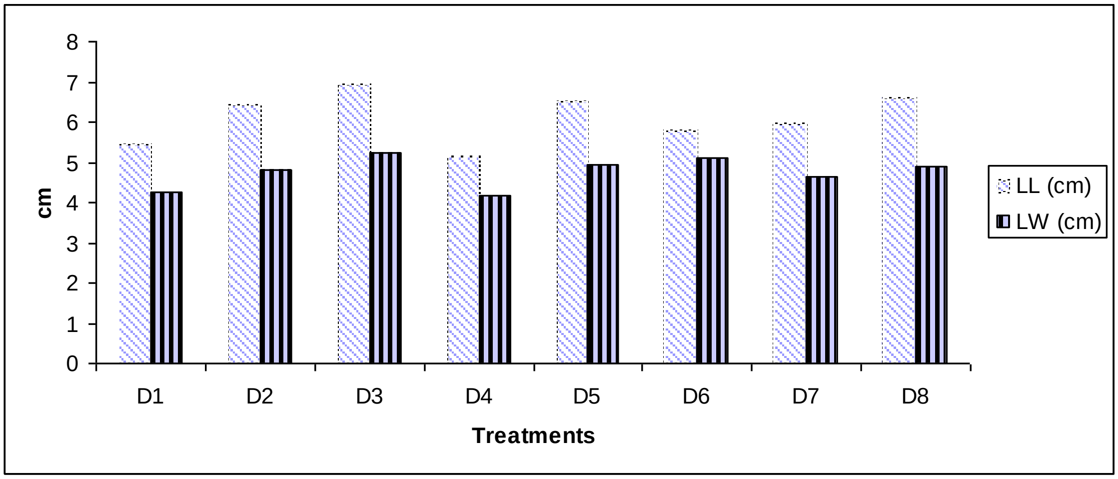

Figure 4. Leaf length and width of country bean affected by textile waste water.

percentage of germination and seed vigor index is related to special impact of ions and reduction of environmental water potential in the presence of salinity. Kader and Jutzi (2004) stated that increasing the salinity level of culturing media responsible for decreasing seed characteristics. Salinity also impact on germination process through enhancement of osmotic pressure leads reduction of water absorbance and disturbance in metabolic and physiological processes which is responsible to delay germination. Its cause could be more than usual presence of anion, cation which in addition to toxication, decreased water potential that is because of its solubability in water ion's. So plant can't absorb water and encounter to lake of water (Singah *et al.,* 1988). It can be said that this reduction in germination race relies on salinity that has also negative effect on some physiological processes which are effective on seed germination (Khan *et al.,* 2002). In addition, Etesami and Galeshi (2008) reported that salinity is the cause of reduction in germination percentage, race and homogeneity of germination and dry weight of barley (Hordeum vulgare) seedling. Massai *et al.* (2004) said that salinity is delaying plant growth under reduction of photosynthesis effects, due to closing stomata and reduction of water entrance into the plant and ultimate effect on duplicate reduction in plant weight. Redman *et al.* (1994) showed that reduction in dry weight of plumule and radicle which is the result of low water absorbance by germinated seeds for enhancing the salinity concentration. Afterwards, the application of textile dyeing wastewater into soil as an irrigation purpose that is raised the soil pH, EC and SAR values and soil turned to saline which reduce the plant ability to absorb nutrients needed for vegetative growth. As a consequence it turns to reduce the growth rate and resulting in smaller leaves, shorter height, and sometimes fewer leaves. The initial and primary effect of salinity, especially at low to moderate concentrations, is due to its osmotic effects. Roots are also reduced in length and mass but may become thinner or thicker. The degree to which growth is reduced by salinity differs greatly with species and to a lesser extent with varieties within a species. Kaker *et al.,* (2010) and Raziuddin *et al.,* (2011) also determined similar results in *B. napus* and *B. juncea*. Smits and Pilon (2002) observed that Fe^{2+} and Cu^{2+} cause oxidative stress. Physico-chemical analysis of textile dyeing wastewater was carried out in this present study, it was evident that different heavy metals like Cu, Zn, Fe, Mn, Cd and Pb were present in varying concentrations. These heavy metals became obstruction and restricted various plant physiological and growth processes. The decreased and unsatisfactory growth because of irrigation with metal contaminated wastewater has also been reported in sunflower (*H. annuus* L.) (Andaleeb *et al.,* 2008). Results indicated that the major adverse effect on plant growth emerged due to high pH and SAR whereby the heavy metals were present in higher concentration but the elevated pH is not conducive to the phyto-availability, thus the reduction might not be due to toxicity of metals. Adverse and toxic effects of municipal wastewater on the growth performance and yield of certain vegetables i.e. spinach, lettuce, carrot, radish and sugar beet was also observed by Tamoutsidis *et al.,* (2002). Ahmad *et al.,* (2011) also proved that wastewater has higher concentration of heavy metals which are potent to retard plant growth and development and adversely affect the yield. Similar findings have also been mentioned by Raziuddin *et al.,* (2011) and Ahmad *et al.,* (2011) in canola. Panda & Chowdhury (2005) observed disturbance in nutrient uptake and metabolism as a result of increased metal content in the growth environment, caused reduction in overall growth of many plants. The present investigation might be related to reduction in seedling (root & shoot) lengths with the elevated amounts of total dissolved solids at higher concentrations. This could also be related to the fact that some of the nutrients present in the effluents are essentials but at above level of a particular concentration, that was become hazardous. Hussain *et al.* (2010) found that tannery effluents caused a reduction in germination, growth of sunflower parameters along with other parameters like chlorophyll content, protein and carbohydrate content etc. Moreover, no particular relationship could be developed with the increase in the effluent concentration and the weight parameters. The outcomes of the present study also substantiate those of Kibria *et al.* (2009) who stated that shoot and root weight of *Amaranthus gangeticus* decreased significantly when Pb was applied above 40 and 60 mg kg-1, respectively, from that of the control. The decreased shoot and root biomass of *S. oleracea* might be due to interference of Pb with physiological processes of the plant. Lead phytotoxicity involves inhibition of enzyme activities, disturbed mineral nutrition, water imbalance, and change in hormonal status and alteration in membrane permeability (Sharma and Dubey, 2005). These disorders upset normal physiological activities of the plant resulting in low productivity. The reduction of biomass by Pb toxicity could be the direct consequences of the inhibition of chlorophyll synthesis and photosynthesis (Chatterjee *et al.,* 2004). Untreated effluents are highly toxic to the plant, fishes or other aquatic organisms at higher pH and the sulphide in the effluents are of environmental concern (WHO, 2000) because they can lead to poor air quality of an area if not properly taken care of thus becoming threat to vegetation, human and materials. The same was applicable to other parameters such as BOD, COD that has been identified to raise health issue if water is available for human use is not of the required level (WHO, 1993). Textile industries are major sources of these effluents due to the nature of their operations which requires high volume of water that eventually results in high waste water generation (Ghoreishi and Haghishi, 2003). Seed germination is a fascinating process. The industrial effluents possess various organic and inorganic chemical compounds. The presence of these chemicals will show detrimental effects on the development of plant, germination process and growth of seedling.Therefore, neutralization stage of effluents water should be considered for crop production, reuse for dying and sustainable livelihood. In this consequence, continuous researches on environmental hazards of effluents are very essential for every dying industry with other manufacturing areas.

CONCLUSION

It is concluded that physio-chemical characteristics of the effluents that’s were exceeded the standard limit has negative impact on germination and seedling growth. But neutralizing stage of effluent water showed positive response on the germination percentage, germination energy, relative germination rate and relative effluent injury rate of country bean seed as well as its seedling growth. Thereby, disposal of these effluents through proper treatment might have positive view from the corner of sustainable environment. Consequently, farmers of adjacent textile industries area will be benefited by using the treated effluents for production of crops that will minimize the use of fresh underground water for dying & other purpose.

ACKNOWLEDGEMENTS

The authors are immensely grateful to the Laboratory of Dhaka University of Engineering Technology (DUET) Gazipur, Bangladesh for their support in pursuing research activities. They are also thankful to laboratory of the Department of Horticulture and Department of Bioenvironmental Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706 for their suggestions and constructive guideline of this research activity.

REFERENCES

Abdul-baki AA, Anderson JD (1970). Viability and leaching of sugars from germinating barely. *Crop Science*, 10: 31-34.

Ahmad K, Ejaz A., Azam, M., Khan, Z.I., Ashraf, M., Al-Qurainy, F., Fardous, A., Gondal, S., Bayat, A.R, Valeem, E.E. (2011). Lead, cadmium and chromium contents of canola irrigated with sewage water. *Pak J. Bot.,* 43(2):1403–1410.

Andaleeb, F., Zia, M.A., Asharaf, M. and Khalid, Z. M. 2008. Effect of chromium on growth attributes in sunflower (H. annuus L.). J. Environ. Sci., 20(12): 1475-1480.

Anonymous.1999.International rules for seed testing. Seed Sci. Tech., 27: 25-30.

Baruah, B.K. and Das, M. 1997. Effect of paper mill effluent on seed germination of crop plant Oryza sativa L. Environ. Ecol., 15: 904-906.

BKMEA. 2012. Membership profile, *Bangladesh Knitwear Manufacturers & Exporters Association.*

Chakraborty.S., M.K.Purkait,S., DasGupta, S. De., and K.Basu.2003.Nanofillteration of textile plant effluent for color removal and reduction in COD.sep.purif.Technolol 31:141-151.

Chang, A.c.,T. C. Granato and A.L. Page, 1992. A methodology for establishing phyto-toxicity criteria for Cr, Cu, Ni, and Zn in agricultural land application of municipal sewage sludes. *J. Envion. Qual*.,21:521-536.

Chatterjee, C., B.K. Dube, P. Sinha and P. Srivastava. 2004. Detrimental effects of lead phytotoxicity on growth, yield and metabolism of rice. *Communications in Soil Science and Plant Analysis* 35: 255-265.

Crowe, A.U., A.L. Plant and A.R. Kermonde. 2002. Effects of an industrial effluent on plant colonization and on the germination and post germinative growth of seeds of terrestrial and aquatic plant species. *Environ. Pollu.,* 117: 179-189.

Dayama, O. P. 1987. Influence of dyeing and textile water pollution on nodulation and germination of gram (*Cicer Arietinum*). *Acta Ecologia,* 9(2), 34–37.

Etesami, M. and S. Galeshi, 2008. Assessment of 10 barely (*Hordeum vulgar L*.) genotypes reaction to salinity in germination and seedling growth stages. *Journal of Agriculture Science and Natural Resource*, 15(5).

Hassan, J., Khandaker, S., Kamal, M. Z., Saha, G. C., Osman, M. S. and Islam, S. M. A. 2012. Effect of different stages of textile dyeing effluent on seed germination of kangkong. Proceeding paper of the National Seminar on Climate Change Impact and Adaptation. Organized by Center for Climate Change and Sustainability Research, Department of Civil Engineering, Dhaka University of Engineering and Technology, Gazipur-1700, Bangladesh. 12-13 June, 2012. pp. 128-138.

Hussain, F., S.A. Malik, M. Athar, N. Bashir, U. Younis, M.U. Hassan and S. Mahmood. 2010. Effect of tannery effluents on seed germination and growth of two sunflower cultivars. *Afr. J. Biotech*., 9(32): 5113-5120.

Ghoreishi S.M and Haghighi, R. (2003). Chemical Catalytic Reaction and Biological Oxidation for treatment of non-Biodegradable Textile effluent, *Chem. Engi. J*. **95**: 163 - 169.

IFIC report, 2007: Environmental, Health, and Safety guideline for Textile Manufacturing. pp. 2-40.

Kader, M.A. and S.C. Jutzi, 2004. Effects of termal and salt treatments during imbibition on germination and seedling growth of sorghum at 42/19oC. *Journal Agronomy Crop Science*, 190: 35-38.

Kakar, S.U.R., A. Wahid, R.B. Tareen, S.A. Kakar, M. Tariq and S.A. Kayani. 2010. Impact of municipal wastewater of Quetta city on biomass, physiology and yield of canola (*B. napus L*.). *Pak. J. Bot.,* 42(1): 317-328.

Kannan, A. and R.K. Upreti. 2008. Influence of the distillery effluents on germination and growth of mung beans (*Vigna radiata*) seeds. J. Hazard. Materials, 153(1&2): 609-615.

Kathirvel, P. 2012. The effect of dye factory effluent on growth, yield and biochemical attributes of Bengal Gram (*Cicer arietinum L*.). International J of applied biology and Pharmaceutical technology, 3(1).

Kapanen, A. and M. Itawara. 2001. Ecotoxicity tests for compost application. *Ecotox. Environ. Safety., 4*9: 1-16.

Khan, M.A., B. Gul. and D.J. Weber, 2002. Effect of temperature, and salinity on the germination of Sarcobatus vermiculatus. *Biological Plant,* 45: 133-135.

Kibria, M. G., M.S. Islam and K.T. Osman 2009. Effects of lead on growth and mineral nutrition of Amaranthus gangeticus L. and Amaranthus oleracea L. *Soil & Environment,* 28 (1): 1-6.

Massai, R., D. Remorin and H. Tattini, 2004. Gas exganges, water relation and osmotic adjustment in two scion rootstock combinations of pronus under water vrious salinity. *Plant and Soil*, 259: 153-162.

Mohammad, A., & Khan, A. U. (1985). Effect of a textile factory effluent on soil and crop plants. *Environmental Pollution*, 37, 131–148 Serial A.

MurKumar, C.V. and P.D. Chavan .1987. Influence of water pollution on germination of gram (*Cicer arietinum L*.). In: Current pollution research in India (Eds.: P.K. Triveni and P.K. Goel). Environmental Publications, Karad, India. pp. 233-238.

Nath, Kamlesh, Dharam Singh and Yogesh Kumar Sharma .2007. Combinational effects of distillery and sugar factory effluents in crop plants*. J. Environ. Biol.,* 28, 577-582.

Panda, S.K. and S. Choudhary. 2005. Chromium stress in plants. *Braz. J. Plant Physiol.,* 17(1): 19-102.

Raziuddin, Farhatullah, G. Hassan, M. Akmal, S.S. Shah, F. Mohammad, M. Shafi, J. Bakht and W. Zhou. 2011. Effects of cadmium and salinity on growth and photosynthesis parameters of B. species. *Pak. J. Bot*, 43(1): 333-340.

Redmann, R.E. and M. Belyk, 1994. Growth of transgenic and standard canola (*Brassica napus L*.) varieties in response to soil salinity. Canadian Journal *Plant Science,* 74(4): 797-799.

Sharma, P. and R.S. Dubey. 2005. Lead toxicity in plants. *Braz. J. Plant Physiol*., 17(1): 35-52.

Singah, K.N., D.K. Sharma and R.K. Chillar, 1988. Growth, yield and chemical composition of different oil seed crop as influenced by sodicity. *Journal Agriculture Science Cambridge*, I(11): 459-463.

Singh, P.P., M. Manish and J. Singh .2006. Impact of fertilizer factory effluent on seed germination, seedling growth and chlorophyll content of gram (*Cicer aeritenum). J. Environ. Biol.,* 27, 153-156.

Smits, E.P. and M. Pilon. 2002. Phytoremediation of metals using transgenic plants. *Critical Rev. in Plant Sci.,* 21: 439- 456.

Swaminathan, K., & Vaidhecswarn, P. 1991. Effect of dying factory effluents on seed germination and seedling development of groundnut (*Arachis hypogea*). *Journal of Environmental Health*, 19(3), 165–175.

Tamoutsidis, E.I., S. Papadopoulos, J. Zotis and T. Mavropoulos. 2002. Wet sewage sludge effect on soil properties and element content of leaf and root vegetables. *J. Plant Nutr.,* 25: 1941-1955.

WHO. 1993. Guidelines for Technologies for Water Supply Systems in Small Communities,

World Health Organization, CEHA.

WHO. 2000. WHO Air Quality Guidance, 2nd Ed. World Health Organization, Europe Regional Office, Copenhagen.

Yousaf, I., S.M. Ali and A. Yasmin. 2010. Germination and early growth response of Glycine max varieties in textile and paper industry effluents. *Pak. J. Bot.,* 42(6): 3857- 3863.