I J P S INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume 7 | Issue 2 | July, 2012 | 282-284

RESEARCH ARTICLE

Impact of distillery effluent on growth of (*Zea mays* L.)

■ R. K. SHARMA

SUMMARY

Impact of distillery effluent of different concentrations on growth of two varieties *i.e.* hybrid 4640 and DMH– 849 of *Zea mays* was investigated. Variable behaviour on pattern of seed germination, shoot length, root length and root- shoot ratio was recorded on various concentrations of effluent. Maximum growth was observed in the plants irrigated with 60 per cent of the effluent and above that deleterious effect was recorded.

Key Words : Distillery effluent, Growth, *Zea mays*

How to cite this article : Sharma, R.K. (2012). Impact of distillery effluent on growth of *Zea mays* (L.). *Internat. J. Plant Sci.*, **7** (2) : 282-284.

Article chronicle : Received : 06.12.2011; **Revised :** 30.04.2012; **Accepted :** 14.05.2012

Due to explosion of population, change in attitude of life and development of high degree of scientific research have yielded rapid growth of industrialization to fulfill the human need in the last two decades of twentieth century. This phenomena has generated laterally most serious problem centered with human health and other welfare. Albeit water consumption in the industries has third rank, but industries are generating effluent not only high amount but they contain high level of organic components which acts as suitable media for growth and multiplication of virulent and a virulent microorganism. Besides this several industries are concerned with such type of products having high toxicity level in their effluent due to existence of chemical or heavy metal salts.

Even after proper treatment effluent should not be discharged in any aquatic system or nearby recreation point in order to control outbreak of any kind of epidemic. But as in our conditions where maximum number of cities and industries do not possess adequate treatment plants and it is customary to discharge untreated raw sewage either in aquatic reservoir or/and land surface. Since this raw sewage contains high amount of organic components and even treated effluent possesses certain amount of organic components. Both may serve the need of nutritional requirement to the plants as fertilizer. Therefore, in order to find out alternative means of safer sewage disposal as well as minimizing the investment in agricultural cost.

In the light of above and in the welfare of the society efforts have been made to utilize the effluent for irrigation in several agricultural crops all over the world based on the report made by several workers (Dutta and Boissya, 1999 and Kumar Prasanna *et al.,* 1997). But certain industrial effluent may contain toxic components, which may inhibit the germination of seed or retard the growth of crop plants (Rajannan and Oblisami, 1979; Sahai and Srivastava 1986; Swaminathan *et al.*, 1989; Arora *et al.,* 2005). In the present study an effort has been made to find out influence of distillery effluent on seed germination and seedling growth of *Zea mays* var. hybrid-4640 and DMH- 849.

MATERIALS AND METHODS

Composite sample were collected from distillery effluent of M/s Divans Breweries (Pvt.) Ltd. Talab Tillo Bohri, Jammu and brought to laboratory for analysis. The effluent samples were analysed for various physico-chemicals and was further used for the treatment of seeds. Various concentrations of effluent (20,40,60,80 and 100%) were prepared by using tap water separately.

The tested seeds of *Zea mays* varieties DMH-849 and Hybrid-4640 of NAFED company were procured from local

AUTHOR TO BE CONTACTED

R.K. SHARMA, Department of Botany, S.P. College, SRINAGAR (J&K)) INDIA
Email: raj66a@gmail.com

market, Jammu. Five seeds were germinated in each polyethylene perforated bags filled with 2 kg of garden soil and farmyard manure (1:1) and were watered on alternative day with various concentrations of effluent. Data on shoot height and root length was recorded at an interval of 15 days up to 75 days and seed germination was observed at an interval of 2 days. The experiment was repeated twice with five replications.

RESULTS AND DISCUSSION

The quality and composition of effluent depends upon the type of industry. The colour of the effluent was light brown. The temperature is basically an important factor for its effects on chemical and biological reactions in water. The mean value of temperature recorded was 45± 1^{0}C. Electrical conductivity is an indication of dissolved solid and suspended solid. The mean value of electric conductivity was 0.250± 0.007 µ mhos/ cm. The ability to transmit an electric current depends on the concentrations of charged ionic species in the water (Trivedy and Goel, 1986). The mean value of pH of effluent recorded was 8.7 and this was within acceptable range for industrial effluent (ISI).

Mean value of biochemical oxygen demand (BOD) was 2300 mg/l. BOD can be defined as the rate of renewal of oxygen by microorganisms in aerobic degradation of the dissolved or even the particulate organic matter in water and it is used as an indices of organic pollution in water (Saxena, 1994).

Significant seed germination , with maximum percentage was observed on 40 and 60 per cent of the effluent (Table 1). Growth parameter of *Zea mays* var. Hybrid- 4640 and DMH 849 at different concentrations of effluent presented in Table 2. The different growth parameters *i.e.* root length, shoot length, root –shoot ratio were observed having highest values at 60 per cent effluent concentration and lowest at 100 per cent effluent concentration. It was observed that there was an increasing trend in growth parameters from control to 60

Table 1: Effect different concentrations of effluents on maize seed germination after 10 days of sowing

Variety	Effluent Conc.(%)	Per cent seed germination (mean ± s.d)
Hybrid-4640		
	Control	82.5 ±3.5
	20	86.4±3.3
	40	92.2±4.1
	60	96.1±4.5
	80	64.3±5.1
	100	60.4±3.2
DMH-849		
	Control	
	20	80.2±3.5
	40	90.2±2.9
	60	94.4±3.4
	80	94.4±2.8
	100	70.3±2.8
S.E.±		66.4±3.4
C.D. (P=0.05))		1.321

Table 2: Effect of different concentrations of effluent on growth responses in *Zea mays*

Effluent conc. (%)	Shoot length (cms) DAS						Root length (cms) DAS						Root/ shoot ratio
	15	30	45	60	75	Mean± SE	15	30	45	60	75	Mean	
Var. DMH-849													
Control	9.7	18.4	26.6	40.1	45.8	28.2	9.3	14.6	15.0	15.5	18.3	14.54	0.51
20	10.7	18.9	30.2	48.1	51.3	27.0	10.7	16.2	17.2	18.7	21.1	16.78	0.62
40	11.0	19.4	33.8	50.2	58.5	34.5	11.1	16.9	19.4	22.0	24.2	18.72	0.54
60	11.8	22.9	35.5	60.6	63.3	38.8	12.2	21.7	21.3	26.8	26.4	21.68	0.55
80	8.3	17.3	22.7	35.1	-	20.8	7.8	13.0	12.7	13.5	-	11.75	0.56
100	6.6	16.6	21.4	32.0	-	15.3	6.1	12.4	11.5	12.2	-	10.55	0.63
Var. Hybrid, 4640													
Control	9.9	23.9	30.3	42.2	53.3	31.9	9.6	15.6	13.0	16.4	19.9	14.9	0.46
20	10.3	24.1	36.3	49.1	58.3	35.62	10.0	15.9	16.3	19.3	22.1	16.72	0.46
40	10.9	24.9	39.4	51.2	64.3	38.14	11.0	16.5	17.9	21.1	24.6	18.22	0.47
60	11.2	25.3	43.0	55.4	72.0	41.38	11.5	17.3	20.1	23.1	28.0	20.00	0.48
80	8.7	23.3	27.7	38.0	-	24.94	8.0	14.3	11.7	14.5	-	12.12	0.48
100	7.6	19.1	25.5	-	-	10.0	6.5	11.5	10.5	-	-	5.1	0.49
S.E.±	0.543	0.422	0.481	0.378	0.428	0.387	0.442	0.485	0.523	0.389	0.434	0.524	
C.D. (P=0.05)	1.294	1.321	1.089	1.322	1.342	1.243	1.424	1.422	1.042	1.011	1.231	1.297	

per cent efficient concentration and there after decreases. This may be attributed to the presence of optimum level of micro and macro-nutrients present in effluent that may serve an additional source liquid fertilizer for favourable seedling development and the reduced growth at higher concentrations effluence treatment (>60%) may be attributed to decrease in cation exchange capacity of soil due to increase in inorganic substance in the soil with increasing concentration of effluence. It was also observed that growth parameters of variety DMH- 849 showed slightly better results as compared to those of hybrid 4640. Sahai and Srevastava (1986) reported that increased concentration of distillery effluent causes gradual decreases in germination percentage and seed germination index in *Cajanus cajan* and Naidu and Raman (1995) studied the effect of distillery effluent on *Arachis hypogea* and reported higher concentrations inhibit germination and seedling growth.

Thus, it can be concluded that the controlled irrigation during course of study, it was found that the plant were healthy and increase in biomass was up to 60 per cent effluent whereas higher concentrations of effluent retarded the biomass. The study has shown that effluents can be successfully used in irrigation after dilution but there are various constraints that the result could be different at field level and further studies at field level should be conducted. Thus, potentiality of effluent for irrigation and also as a source of fertilizer can be recommended only after conduction comprehensive studies.

Acknowledgement :

Author is thankful to principal G. G. M. Science College Jammu for providing facilities.

REFERENCES

Arora, S., Chopra, A.K. , Prasad, G. and Joshi, N. (2005). Influence of star paper mill effluent on biomass production and yield at harvesting time of different agricultural crops. *Environ. Conserv.* J., **6**: 83-85.

Banerjee, A.C., Bajwa, I. and Behal, K.K. (1999). Effect of distillery effluent on growth of *Casuarina euisetifolia*. *J. Industrial Pollution Control*, **20**: 199-204.

Dutta, S.K. and Boissya, C. L. (1999) . Effect of paper mill effluent on germination of rice and growth behavior of its seedlings *J. Indust. Pollution Control ,* **13**:41.

Kumar Prasanna, P.G., Pandita, B.R. and Kumar Mahesh, R. (1997). Effect of dairy effluent on seed germination, seedling growth and pigment content of green gram (*Phaseolus aureus*) and black gram (*Phaseolus mango* L.). *Adv. Plant Sci.,* **10**: 129-136.

Naidu, M.K. and Raman, G.K. (1995). Distillery waste impact of *Arachis hypogea* L. *J. Env. Biol.,* **16**:181-186.

Rajanan, G. and Oblisami, G. (1979). Effect of paper factory effluent on soil and crop plants. *Indian J. Environ. Hlth.,* **21**: 120-130.

Sahai, R. and Srivastava, C. (1986). Effect of distillery waste on the seed germination and seedling growth and pigment contents of *Cajanus cajan* L.*J. Indian Bot-Soc.,* **65**:208-211.

Saxena, M.M. (1994). In: *Environmental analysis water, soil and Air.* Argo Botanical Publishers India Pvt Ltd., NEW DELHI (INDIA).

Swaminathan. K., Arjunan, J. and Guruswamy, R. (1989). Effect of glucose factory effluent on seed germination and seeding development of ground nut (*Arachis hypogaea*). *Environ. Biol.,* **4**: 81-87.

Trivedy, R.K. and Goel, P.K. (1986). Physico –chemical analysis of water. In: *Chemical and biological methods for water pollution studies*. Environmental Publication Karad, India pp. 1-25.

****
*****