J. Phytol. Res. **17**(2) : 183-185, 2004

EFFECTS OF DYE AND DISTILLERY EFFLUENTS ON GERMINATION AND SEEDLING GROWTH ON SOME CROPS GROWN IN PANIPAT (HARYANA)

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Pure effluents collected from dyeing units inhibted germination in *Solanum melongina, Pisum sativum, S. lycopersicum , Tritium aestivum, Zea mays* and *Abellmoschus esculentus.* Effluents from distillery also inhibited germination in all the plants except *A. esculentus.* Negative effects of sugar mill effluents has also been recorded on seedling morphology .

Keywords : Dye and distillery effluents; Germination; Seedling growth.

Panipat an industrially polluted city of Haryana is situated on the bank of river Yamuna. In India 17 type of industries have been reported to be most hazardous by Ministry of Forest and Environment, out of them 8 type of industries are present in this city causing air, water and soil pollution. Simultaneously city is important from agriculture point of view as having 198 % cropping intensity and is one of the main supplier of edibles to Delhi. These crops are irrigated by river Yamuna having pollutants arising from National Fertilizer Limited (N F L), pesticide units, sugar mill, dyeing units, textile units, and other small scale industries of various kinds and nature. The object of this study is to find the effects of pollutants coming from these industries on the germination , seedling growth and pollutant (like heavy metals) present in the edible part of the produce of *P.sativum, S.melongina, S.lycopersicum , T. aestivum , Z. mays* and *A. esculantus* .

Previously the effect of different pollutants on different crops has been studied [1-9], but in isolated and segmented manner. Effects of Dye and textile efflusents on *Pisum* [1], *Cicer*[2] , *Triticum*[3], effects of flyash on *Vigna*[4], *Ficus*[5], effect of distillery effluent on *Phaseolus* and

Table 1. Analysis of water from sugar mill and dyeing units.

S.No.	Characters	Distillary Effluents Sugar Mill effluents	Dyeing Effluents
	Physical properties		
1.	Colour	blackish brown	redish brown
2.	Odour	foul-molasses	unpleasant
3.	Temperature	38-40^{0}C	38-40 ^{0}C
4.	pH	8.0-9.0	11.0-13.0
5.	Electro-conductivity	33.5	34
6.	Turbidity	highly turbid	highly turbid
	Chemical properties	(all amounts in ppm)	
7.	Solids (Total)	1950-2000	5200-5230
8.	Suspended solids	810-850	1200-1240
9.	Dissolved solids	1350-1400	4000-4080
10.	Nitrogen	1680-1850	1000-1200
11.	Phosphate	418-467	345-362
12.	Chloride	10,000-10,500	450-500
13.	Sulphate	2300-3000	2350-2400
14.	Calcium	1032-1070	900-950
15.	Potassium	8000-8050	9000-9020
16.	Sodium	470-500	600-630
17.	Magnesium	2280-2290	2000-2100
18.	BOD	5500-5750	2200-2500
19.	COD	35500-40,000	5500-6000
20.	Dissolved Oxygen	Nil	Nil

Table 2. Response of plants raised in deep bore water. (Mean value of 10 replicates)

S. No.	Plant	Germination percentage (%)	No. of Leaf Per Plant	Max size of leaf (cm)	Height of plants (cm)	Length of internote (cm)
1.	*P. sativum*	100	6	4	8	2.0
2.	*S. melongina*	96	6	4	6	1.5
3.	*S. lycopersicum*	96	4	3	6	1.5
4.	*T. aestivum*	100	6	10	7	2.0
5.	*Z. mays*	100	6	14	10	3.0
6.	*L. vulgaris*	96	6	2	10	1.5
7.	*A. esculentus*	100	6	6	15	1.5

Table 3. Effects of polluted water on different plants on germination.

S. No.	Plant	Germination Percentage	
		Dye effluents	Distillary effluents
1.	*P. sativum*	Nil	Nil
2.	*S. melongina*	Nil	Nil
3.	*S. lycopersicum*	Nil	Nil
4.	*T. estivum*	Nil	Nil
5.	*Z. mays*	Nil	Nil
6.	*L. vulgaris*	Nil	Nil
7.	*A. esculentus*	Nil	50

Table 4. Effects of Distillary effluents on *A. esculentus*.

S.No.	Plant	No of leaves/plant	Max size of leaf(cm)	Plant height (cm)	Internode Length (cm)	Death after plumule emergence
1.	*A. esculentus*	4	1.5	6.0	4.0	50%

Pennisetum[6], effects of fertilizer effluent on *Brassica*[7], effects of industrial pollutants on *Lens*[8] and effect of foam industries on *Lens*[9] has been studied in different parts of the country. This city alone have all the above mentioned type of polluting units making this city unique from this point of view.

Seeds of *P. sativum, S.melongina, S.lycopersicum, T.aestivum, Z.mays* and *A.esculentus* were procured from IARI New Delhi, which were germinated on Whatmann's filter paper lined in petri plates as well as in fields. Polluted water samples were collected from first emission point of distillery and dyeing unit in plastic canes, which were kept air tight and marked. After germination some water was used for irrigation in particular set of experiment and equal irrigations were made for every experiment. Experiments were repeated twice for confirmation, observations were recorded after 15 days of sowing. Control experiments for each crops were raised in deep bore water.

Germination : Seeds procured from IARI New Delhi were sown as discussed earlier. In control experiment there was 95-100% germination in all the plants studied and seedlings were of normal in shape and size. Pure effluents from dye industries absolutely inhibited germination in all the plants studied which may be due to various pollutants presents in effluents (Table 1). However, in effluents from sugar mill response was something different as there was no germination at all in any taxa except *A. esculentus* (Table 2 and 3) which showed 50% germination but seedlings remain smaller in size and few of the seedlings died after radicle emergence. Hence it is clear that pollutants from dye and sugar factory have negative effect on germination, however, *A. esculentus* has little resistance to such pollutants.

Earlier studies on effects of pollutants on germination and seedling growth has also been carried out in different plants [1-9]. These studies supports the previous works carried out on *P.sativum*[1], *C.arietinum*[2], *Brassica compestris*[7], *Phaseolus* and *Pennisetum*[6].

In all the above mentioned reports pure effluents has been reported to cease germination while in present studies *A.esculentus* has been found to have resistance to sugar mill effluents, while sensitive to Dye effluents.

Morphological characters: For morphological studies data on number and size of leaves, length of plants and internodes were calculed after 15 days of sowing, which

was possible only in *A. esculentus* as non other plant showed germination. In this plant there was reduction in size of leaf and size of internode (Table 4). Previously similar findings have been reported in *Vigna*[3,9] in textile effluent and *B.campestris*[7] in fertlizer effluents in diluted form.

Acknowledgements

Authors are thankful to the authorities of IARI and CPCB, New Delhi for the help rendered.

References

1. Gupta A and Nathawat G S 1992, Effects of textile effluents on germination and seedling growth of *Pisum sativum* var, R.P.G-3. *Acta Ecologica* **13** 109-112.
2. Kumawat D M, Tuli K, Singh P and Gupta V 2001, Effects of dye industries effluent on germination and growth performance of two Rabi Crops. *J.Eco. Bio.* **13** 89-95
3. Sujatha R and Krishna Swamy V 1992, Toxicity of selected dyes on *Vigna radiata L.Geobios* **19** 81-87
4. Prasad B K, Benerjee S K and Roy H 2000, Effects of flyash on germination behaviour and deedling survival on certain cultivated legumes. *Env. Eco.* **18** 210-216
5. Kashyap M K, Jain A and Banerjee S K 2001, Foliar biochemical composition of some plant species growing near thermal power plant. *Ind. J. Env. Sci.* **5** 11-17
6. Kannan 2001, Effects of distillery effluents on crop plants. *Ad. Pl. Sci.* **14** 127-132
7. Agarwal S K and Gupta Hemlata 1992, Effect of nitrogenous fertilizer factory effluent on germination and seedling growth of *Brassica campestris* and *Cicer arietenum. Acta Eco.* **14** 35-39
8. Prashanthi V and Rao K 1998, Effects of industrial effluents and polluted water on germination of crops. *Ind. J.Env. Prot.* **18** 921-923
9. Rampal R K and Dorjey P 2001, Studies on effects from foam industry effluents on *Lens esculenta. Ind. J. Env. Sci.* **21** 14-17