



Effect of sugar industry effluents on soil and seed germination on RT-46 (*Sesamum indicum* L.)

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ABSTRACT : This paper evaluates the physico-chemical properties of effluent of Baghpat Co-Operative sugar Mill Ltd. Baghpat (U.P), India. The effects of sugar mill effluent on soil and seed germination. The effluent was high in various solids, COD, BOD, chlorides, sulphates and had nil dissolved oxygen and moderately alkaline pH. The effluents disturbed the pH, Nitrogen, Phosphorous, Calcium Carbonate and organic matter of the soil. The greatest perturbation was observed in the potassium in the soil when effluent was used for irrigation. The effluent was applied to cultivar R.T. 46 seeds of *Sesamum Indicum* L. in four concentration (25%, 50%, 75%, 100%) germination was observed 93.30% in water irrigated soil and 100% in soil irrigated with 25% concentration of effluent. The water irrigated soil and the soil irrigated with 25% effluent were found most suitable for germination. Thus, it is suggested that the sugar industry effluent must be used for irrigation after proper dilution.

Keywords : Sugar mill effluent, physico-chemical characteristics, Sesame seed, Soil, Germination percentage

INTRODUCTION

Water and soil pollution due to industrialization are a cosmopolitan problem, creating acute insanitation as well as affecting the soil and crops when waste waters are used for irrigation. Since many sugar industries discharge their waters on to open lands because of the high cost of dilution and in adequate sewage treatment facilities, effective and profitable utilization of the effluents of the sugar industries need greater attention. The utilization of sewage for the irrigation of crops has been studied by Heukelekian (1957) and Dunlop *et al.* (1961). It has been reported that the effects of tannery effluents when utilized for irrigation purpose (Thabaraj *et al.*, 1964). The effects on the yield and mineral nutrition of oats resulting from the disposal of paper mill sludge on soil was reported by Dolar *et al.* (1972). Rjannan & Oblisamy (1979) observed the effects of pulp and paper factory effluents on the soil and plants. A other study was conducted by Kumar (2000) on reclamation of soil polluted by industrial effluents using herbaceous flora. The present paper deals with the effects of Baghpat co-operative sugar mill effluent on certain physico-chemical properties of soil, seed germination pattern when irrigated by the effluent in different concentration.

MATERIALS AND METHODS

The effluent samples of Baghpat co-operative sugar mill were collected at the outlets of the factories using plastic bottles and analyzed for colour, pH, total solids, suspended solids, dissolved oxygen, BOD, COD, chlorine, sulphate, magnesium, potassium based on the standard methods. The factory was using sugar cane for manufacturing sugar.

The present studies were conducted to assess the immediate impact of sugar industry effluents on the chemical changes in soil, with undiluted and diluted effluents before and after sowing the seeds. Gain and loss of N, P, K, Ca were estimated by standard techniques adopted by Subbiah & Asija (1956) and Olsen *et al.* (1964).

RESULTS AND DISCUSSION

The Physico-chemical characteristics of the effluents are given in Table 1. The large amounts of suspended, dissolved and volatile solids were responsible for the high BOD and COD. Considerable amount of chlorides, sulphates and phosphorus were also present.

The effect of undiluted and diluted effluents on the soil with and without crops are shown in Table 2 and respectively. A slight upward change was noted in pH, but water holding capacity N,P,K and organic matter while the remaining parameters showed a downward trend when the soil were irrigation with 100% effluent followed by 75%, 50% and 25% of effluent.

The organic matter and the nutrients present in the effluent might be responsible for such increase in the soil. The concentration of water soluble salts increased with increasing effluent concentration. As did the potassium phosphorus Nitrogen and organic water.

The pH of soil increased gradually with increase in the concentration of the effluent. Hence this alkaline effluent may be used for fields having acidic soils. For best results it is suggested that sugar factory effluent must be diluted before use (Table 3).

Table 1 : Analysis of sugar industry effluent.

S.No.	Factors	Minimum	Maximum
1.	Odour	Organic	Organic
2.	Appearance	Clear	Clear
3.	Temperature	29.5° C	36.0° C
4.	pH	6.8	7.3
5.	DO	Nil	Nil
6.	BOD	660 mg /l	1648 mg /l
7.	COD	680 mg /l	2265 mg /l
8.	Total Nitrogen	1.4 mg /l	6.0 mg /l
9.	Phosphate	0.53 mg /l	1.2 mg /l
10.	Total solids	2818 mg /l	5000 mg /l
11.	Suspended solids	1800 mg /l	3235 mg /l
12.	Dissolved solids	955 mg /l	1375 mg /l

All values except temperature, appearance, odour and pH are in mg/l.

Table 2 : Physico- chemical characteristics of the soil of different bags of *Sesamum* before sowing the crop.

Characters	C	E ₁	E ₂	E ₃	E ₄
pH	7.17	7.27	7.04	7.24	7.29
Water Holding Capacity	28.33	28.02	27.98	28.40	28.30
Nitrogen %	0.059	0.060	0.062	0.063	0.062
Phosphorous %	1.108	1.102	1.106	1.097	1.106
Potassium %	1.040	1.045	1.098	1.055	1.050
Organic Matter %	0.362	0.342	0.370	0.364	0.355

Table 3 : Physico-chemical characteristics of the soil of different bags of *Sesamum* after harvesting the crop.

Characters	C	E ₁	E ₂	E ₃	E ₄
pH	7.26	7.29	6.89	6.85	6.80
Water Holding Capacity	28.70	29.00	30.23	32.20	33.85
Nitrogen %	0.060	0.083	0.114	0.170	0.290
Phosphorous %	1.105	1.190	1.220	1.280	1.350
Potassium %	1.050	1.190	1.260	2.165	2.205
Organic Matter %	0.382	0.430	0.447	0.490	0.576

The effects of four concentrations of the effluent on the germination of RT-46 the cultivar of *Sesamum Indium* L. is summarized in Table 4. Germination in water irrigated soil was 93.30% whereas germination in the concentration of 25% effluent was 100% (*i.e.*, all of the seeds shown germinated) whereas it ranged between 92.40% to 78.40 in the various concentration of effluent. Germination was quickest in water-irrigated soil and soil treated with 25% effluent whereas the seeds treated with 100% effluent germinated last.

Table 4 : Seed germination percentage recorded for *Sesamum* (Til).

Treatment	R.T.-46
Control	93.30
E1	100.00
E2	92.40
E3	87.40
E4	78.70

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