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EFFECT OF SUGAR FACTORY EFFLUENT ON THE GERMINATION, GROWTH AND SEED MYCOFLORA OF ARACHIS HYPOGEA

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ABSTRACT

The composition of sugar factory effluent and its effect on percent germination, growth and seed mycoflora of *Arachishypogea* were investigated. The effluent was highly acidic.The results showed that lower concentration (10 %) was in favour of germination while there was gradual decrease in germination and seedling growth on higher concentration (50 %). The maximum inhibition in seed germination and seedling growth was found in pure effluent. Percent germination and seed mycoflora were studied on moistened filter paper with different concentration of effluent (10, 50 and 100 %) in a Petri-dish in three replicates and was recorded after seven days. Five seedlings each were randomly selected from the control and the treated plants on the 45th day after planting (DAP) from the earthen-ware pot (6"and 9"). Plant part (shoot and root) was measured and biomass was taken after plants were dried in an oven at 80^0 C. A total of ten fungal species were recorded from the seeds of *Arachis hypogea* when treated with different concentration of sugar factory effluent. In 10 % effluent *Aspergillu sniger*, *A. flavus*, and *mycelia sterilea* were recorded. At 50 % seven fungal forms and in100 %, eight fungal species were observed. Percent frequency of mycoflora was increased with the increase of effluent concentration.

INTRODUCTION

Sugar industry is one of the most important agro-based industries in India and has significantly contributed to countries economy (Doke K.M. *et.al*, 2011, Siddiqui WA and Wassem M., 2012). Sugar production processing requires huge amount of water for a number of steps and released almost equal quantity of effluent which contains toxic material (Kaur A, *et.al*., 2010). The effluent contains various inorganic and organic substances in different concentration may affect the growth and germination of crop plants. The pollutants like chloride, sulphate, phosphate, magnesium and nitrate are released with the effluent (Saranraj and Stella, 2012). Higher concentration of sugar factory effluents could inhibit seed germination and seedling growth (Siva Santhi and Suja Pandian, 2012). The physico-chemical analysis of sugar factory effluent affected soil revealed the presence of higher amount of minerals, toxic pollutants and soil organic matter (Baskaran *et. al*.2009).There is an increasing interest in the agricultural use of industrial wastes because of possibility of recycling valuable components such as organic matter, nitrogen, phosphorus, potassium and other nutrients and their suitability for land application (Ramasamy *et.al*., 2007). In recent past years various studies have been made on the characteristics of effluent and their interaction with soil and different crops (Mohammadi *et.al*, 2010, Madan and Saxena, 2012). In the present investigation effect of sugar factory effluent on the growth, germination and seed mycoflora were studied to test its suitability of irrigation in Groudnut.

MATERIALS AND METHODS

Collection of effluent from the sugar factory

The effluent sample was collected in a pre-cleaned, plastic container from the point of disposal of Belganga sugar factory located at Bhoras, Jalgaon District, M. S. India, 8 km away from the college campus.The collected effluent was stored at 5^0C to maintain original characteristics.

Physico-chemical characterization of the Sugar factory effluent

Physicochemical parameters like colour, Temperature, and pH were determined immediately at the site of collection. Electrical Conductivity (EC), Dissolved Oxygen, Total dissolved solids (TDS), total suspended solids (TSS). Chloride, Calcium, Magnesium and Sulphates were measured using standard methods. (APHA1992).

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Effect of sugar factory effluent on the seed mycoflora

200 seeds of Arachis *hypogea* were placed on the moist plates for studying seed mycoflora. The seeds were dipped in the effluent for nearly 2 minutes and the filler paper was also moistened with sugar factory effluent. The seeds kept in the plates without treatment of effluent used as control. Observation for the presence of fungal species on the seeds was recorded after a week onwards. Percentage appearance was then calculated (Deshpande and Kulkarni, 1988)

Effect of Sugar factory effluent on the germination and growth

10 seeds of *Arachis hypogea* Linn were sown in the soil placed in the earthenware pots (6" x 9") and the pots were irrigated with different concentration (10, 50, and 100%) of sugar factory effluent. Pots irrigated with tap water served as control. Germination of the seed was recorded after two weeks and compared with normal tap water irrigated pots. Each set were prepared in triplicate. The height and dry matter of the plant was recorded after 45 days of growth.

RESULTS AND DISCUSSION

Physico-chemical characters of sugar factory effluent are presented in Table-1. The effluent brown in colour and had a smell of decaying molasses. Brown colour could be due to presence of melanoidin, the product of sugar amine condensation and unpleasant smell due to presence of indole and other sulphur compound (Rath *et. al*., 2010). Acidic nature of effluent may be due to use of sulphuric acid and phosphoric acid during clarification of sugarcane juice (Ayyasamy *et.al*. 2008). It contained fewer amounts of total dissolved solids 446.50mg/ml (Table-1)

reduced at 100 percent effluent treatment. In case of root length, it appears that lengths of roots were increased with the increase of Concentration of effluent (100%) Table-2

Table 2 Effect of sugar factory effluent on the growth of *Arachis hypogea*

Sr. No.	Growth Parameters	% effluent			
		100	**50**	**10**	**00**
1	Germination	03	06	08	08
2	Height	5.50	3.24	3.70	3.16
3	Number of leaves	16.09	14.69	17.71	10.54
4	Dry matter qm/plant	15.10	16.74	16.96	16.32
5	Length of root	31.12	28.20	26.00	18.20

Table 3 Effect of sugar factory effluent on seed Mycoflora on *Arachis hypogea*

Sr. No.	Fungal species	% effluent			
		100	**50**	**10**	**00**
1	*Aspergillus niger*	70	07	05	01
2	*A. flavus*	20	18	03	----
3	*Mucor sp.*	00	02	----	----
4	*Fusaium oxysporum*	01	02	----	----
5	*Penicillium verryculosum*	05	10	----	01
6	*A ustus*	01	03	----	----
7	*A fumugatus*	02	04	----	----
8	*Cladosporium oxysporum*	05	---	----	----
9	*Mycelia stenilea*	---	---	02	02
10	*Rhizopus stolonifer*	---	---	----	01

Seeds are generally associated with certain saprophytes or parasitic microorganisms which perpetuate in the seed lot on the advent of favourable conditions. Mycoflora frequency both qualitatively and quantitatively were found higher in 100 % treatment.

Table 1 Physico-chemical analysis of sugar factory effluent

Parameter	Summer	Winter	Average	WHO standard (1993)
Colour	Dark brown	Yellow	--	--
Odour	Noxious	Noxious	--	--
Temperature (°C)	45.00	38.00	41.50	--
pH	2.65	4.53	3.59	7.0 – 8.5
Conductivity (mm/cm)	1.799	1.58	1.69	500 – 1500
Total dissolved solids (µg/ml)	103.00	790.00	446.50	850 – 1500
Total hardness (µg/ml)	1700.00	2700.00	2200.00	500
Calcium (µg/ml)	72.00	88.00	80.00	100
Magnesium (µg/ml)	29.00	49.00	39.00	100
Bicarbonate (µg/ml)	980.30	1220.36	1100.33	50
Chlorides (µg/ml)	280.93	328.42	259.6	250
Sulphate (µg/ml)	49.00	50.00	49.50	250
Sodium (µg/ml)	107.00	66.00	86.50	200
SAR (mg/L)	3.49	1.92	2.705	--
Potassium (µg/ml)	58.00	61.00	59.5	5 – 10
Sulphides (µg/ml)	4.90	3.40	4.15	--
Iron (µg/ml)	2.50	0.41	1.455	--

A total of ten fungal species were recorded during the experiment. In 10 percent effluent *Aspergillus niger, A. flavus*, and *Mycelia sterelia* were recorded. At 50 % seven and at 100 percent effluent treatment 8 fungal species were recorded. Percent frequency was increased with the increase of effluent concentration.

It was noted that height was increased at 100 percent effluent irrigation. Number of leaves were found to be more at 10 and 50 percent effluent whereas dry matter of this crop slightly

Results are in agreement with Awasthi *et.al*. (2011) and Balkhande *et.al*. (2013).Germination percentage was inhibited in 100% treatment (Table-3) but length of root and height of plant were found increased at 100 % treatment. This increase over other concentration and control plant might be due increased mycoflora in the soil. Number of leaves and dry matter were found increased in 10 % treatment. The results were in agreement with the findings of Siva Santhi and Suja Pandian (2012) in peanut and green gram and Madan and Saxena (2012) in *Solanum melongena.*

CONCLUSION

From the study it was concluded that physico-chemical parameters such as total dissolved solids, calcium and magnesium were relatively high in the sugar factory effluent and it is highly acidic and affected plant growth and seed mycoflora. The untreated sugar factory effluent possibly lead to soil deterioration and low productivity. The results indicated that sugar factory effluent in low concentration has beneficial effect on number of leaves and dry matter. Thus effluent with controlled physico –chemical parameters can be utilized for irrigation with promising effect on plant growth.

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