Effect Of Sugar Factory Effluent On Nitrogen Content Of Crops

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Abstract: Rapid industrialization and constant discharge of large volume of liquid effluent has serious effect on soil quality. In the present study, experiment was carried out in order to find out nitrogen fixation in *zea mays* Linn and *Pennisetum typhoides* Rich. The seeds of these crops were sown in earthenware pots containing black cotton soil. The pots were irrigated with different concentration of effluent (5, 10, and 50 percent).Dry matter and nitrogen content was estimated after 40 days of growth. It was noted that dry matter of *zea mays* Linn was slightly increased with the treatment of increased concentration of effluent. In case of *Pennisetum typhoides* Rich the dry matter was also increased with the increase of percent effluent up to50 percent. At 100 percent it is slightly reduced. Nitrogen content in the dry matter was also increased with the increase of effluent concentration.

Keywords: Sugar factory effluent, dry matter, nitrogen content. *Zea mays*, *Pennisetum typhoides.*

Introduction

The Maharashtra sugar Industry has seen a spectacular growth owing to the different conducive in the state. Distillery and sugar factory in combination could be used for irrigation purpose after proper treatment and dilution to promote growth and yield (Nath et.al. 2007).

Pramod et. al. (2014), revealed that bio- remediated sugar factory effluent enhances seed germination in *Vigna radiata.* Thus this will not only prevent waste from being environmental hazards but also serve as an additional potential source of fertilizer for agricultural use. Dilute sugar mill effluent could be used for irrigation in nutrient deprived environment.. Nitrogen fixation in the crop plants is very important to get higher yields. Hence the effect of sugar factory effluents on N fixation of these crops was studied. Many soil micro-organisms are able to solubilize the unavailable phosphorus, increase uptake of nitrogen and also synthesize growth promoting hormones including auxin. Singh and Sharma (2009) studied microflora (fungal and bacterial) of terrestrial and marshy species of rhizosphere in response to spent wash treatment. The large number of fungal population in the vicinity of the roots of pigeon pea varied with the age of the plant (Wahegaonkar et.al. 2009). The aim of this study was to study rhizoplane mycoflora and nitrogen content in both the crops in different concentration of sugar factory effluent.

Materials and Methods

Collection of sugar factory effluent

Sugar factory effluent was directly collected from Belganga sugar factory, Bhoras, Taluka Chalisgaon, Dist. Jalgaon. Characteristics of effluent were analyzed by various physico-chemical properties (Table-1) as per methods described by APHA (1995). Seeds of *Zea mays* L. and *Pennisetum typhoides* Rich was collected from Nirmal seed company, Pachora.dist. Jalgaon.

Effect of effluent on nitrogen fixation in different crops

The experiment was carried out in order to find out nitrogen fixation in different crops like *Zea mays* Linn., *Pennisetum typhoides* Rich.. The seeds of these crops were sown in earthenware pots containing black cotton soil. The pots were irrigated with different concentrations of effluents.

The control was also maintained and irrigated with tap water. Ten seed of each crop pre-sterilized with 0,1% mercuric chloride were separately and allow to grow. The pots were irrigated with 1 L. of effluent in different concentrations (0, 10, 50, and 100 %). All the treatment sets including control were prepared in triplicate.

Dry matter- Five plants were collected randomly from each treatment and weighed and their dry weight were taken after keeping them in hot air oven at 80^{O} C for 24 hours.

Nitrogen content was estimated after 45 days of growth following Micro- Kjeldahl method (Sadasivam and Manickam ,1992)(Figs. 6 and 7).

Effect of effluents on rhizoplane mycoflora

Rhizoplane mycoflora was studied by root wash technique at different periods of growth (15, 30 45 and 90 days). Observations for rhizoplane mycoflora were made by the serial root washing techniques (Haley and Waid, 1955). The original root system was removed from the dilution flask. The root pieces of approximately 2 cm randomly selected from different regions were placed in sterile test tubes. They were washed 10 times with sterile water and were plated (05 pieces in each petri dish) on Martin's Rose Bengal Agar medium to allow the fungi to grow on the root surface. Observations for the presence or absence of the fungal species were recorded. The isolated fungi were identified on the basis of colony and morphological characters up to the species level (Barnet and Bary1998, Ellis**,** 1993)

Results and Discussion

Physio-Chemical Analysis of Effluent-

The pH, total dissolved solids, total hardness, calcium, biocarbonate, sulphate, potassium and dissolved oxygen were higher during winter, while sodium, SAR, sulphides were more in summer. Total hardness, total dissolved solids, magnesium were higher in the effluent. Of these, pH, conductivity, total dissolved solids, calcium, magnesium sulphate were less in comparison

with WHO standards while total hardness, SAR and potassium were higher than WHO standards. These results are in conformity with the findings of Senthi Kumar *et al.* (2001). They found that sugar factory effluent have variation in physico-chemical parameters such as colour, odour, total solids, COD, BOD alkalinity and florides were in excess than the ISI permissible limit. In addition the concentration of toxic metals, such as Fe, Hg, Mn and Pb content were higher than the ISI limits

Effect of effluent on nitrogen fixation in different crops

Results are shown in Table 2. It was noted that dry matter of *Zea mays* Linn.was slightly increased with the treatment of increase concentration of effluent. In case of *Pennisetum typhoides* Rich., drymatter was also increased with the increase of percent effluent up to 50 percent. At 100 percent it is slightly reduced. Nitrogen content in the dry matter was also increased with the increase of effluent concentration.

Effect of effluent on rhizoplane mycoflora

***Zea mays* L.**

A total 9 fungal species were found to be present on the rhizoplane of *Zea mays* during the different growth periods and also during the treatment of effluents. *A. niger* was found to be present at all the growth period and also in the effluent treatments. *Aspergillus flavus* was also present during all the periods of growth *A. terreus* showed its presence at 45 and 90 days, whereas *A. ustus* and *A. fumigatus* were presented at 30 days and in control respectively. *P. funiculosum* showed its presence at 30 and 90 days. *Rhizopus stolonifer* however showed its presence at 15, 30 and 90 days growth period. *Sclerotium rolfsii* showed its presence at 15, 45 and 90 days *Fusarium oxysporum* however waspresent at 45 days. The effect of effluent on the rhizoplane mycoflora was recorded in the results were calculated on an average basis. It was recorded that *A. niger, A. flavus* and *Fusarium oxysporum* were increased on the rhizoplane at 100 percent effluent. *A. terreus, A. fumigatus* and *Sclerotium rolfsii* were however reduced (Table 29) B)

Pennisetum typhoides

Altogether 12 species of fungi were recorded at different periods of growth on rhizoplane. *A. niger, Rhizopus stolonifer* and *Penicillium funiculosum* appeared almost all the growth periods. *A. niger, A. flavus, A. fumigatus., A. ustus, A. sp., Fusarium oxysporum* were found to be increase on rhizoplane due to the treatment of effluent. On the other hand *A. terreus, F. semitactum, Sclerotium rolfsii, R. stolonifer, P. funiculosum* and *Rhizoctonia bataticola* were reduced on the rhizoplane due to the effluent (Table 30). In general *Aspergillus niger* and *Aspergillus flavus* were common in the rhizoplne of all the four plant. Other species showed large variation in their appearance due to treatment of effluent.

Conclusion-

Maize and bajra commonly grown in North Maharashtra region of India. Fields near to sugar factory indirectly affected due to percolation of effluent in bore and well water. Some times in scarcity of water formers used to irrigate fields with the effluent. Therefore effluent effect was observed in vicinity of root.The micro floras associated with root surface are called rhizoplane. High microbial density in rhizosphere and rhizoplane is due to the presence of the organic compounds exuded by roots. In the present investigation dry matter was slightly increased with the treatment of increase concentration of effluent in both the crop. Aspergillus niger present in all concentration at different period of growth Compared to other species Fusarium and other species of Aspergillus were not frequent. Root exudate may cause inhibitory effect.Results indicated that higher concentration causes increase in in dry matter due to present of some dissolved substances in effluent. Higher nitrogen content was found at 50% in 100% treatment. Much work has not been done in this field.

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