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Growth and Seed Germination of *Triticum aestivum* Effected by Sugar Factory Effluent

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Abstract

The effect of different concentrations of sugar factory effluent were carried out on germination percentage and seedling growth of Triticum aestivum. There is an increase (at lower concentration i.e. 1%) and inhibition (at all higher concentration i.e. 5% to 10%) of seed germination and seedling growth of Triticum aestivum. Promotion and inhibition were studied in Triticum aestivum linn.cv.PBW-373. Studies were carried out in light and dark. Observations were on the basis of mean (central tendency) and standard deviation (as the measure of dispersion)of 15 seedlings.

The results noted the higher concentration and lower concentration of sugar factory effluent .

Keywords : Effluent, Concentration, Promotes, Inhibits, Seedling Growth, Seed Germination.

Introduction Industries play an important role in the economy of our country, these industries discharge huge amounts of effluent without any treatment to the environment during their working season. Sugar factories are the main economic base due to the agricultural system in our country. India is the second largest sugarcane producer in the world. These carbonaceous sugar factory effluents are the reason for pollution. Due to rapidly growth in industrialization increased the level of heavy metals such as lead, cadmium, Mercury , (which are non- essential in crop plants) in environment and involving in food chain also.

Disposal of these sugar mills is big problem in urban areas, applying sewage waste water to agricultural fields instead of disposing off in lakes and rivers can make crops grow better due to presence of various nutrients like N, P, Ca, Mg, etc. there can be both beneficial and damaging effects of irrigation with waste water on various crops. Continuous use of irrigants may result in reduction in the infiltration rate, pore space which may affect the movement of air and water in soil column. In addition, regular supply of air and water may also show a gradual accumulation of certain heavy metals up to toxic levels and it also spoils the mineral composition and Ph. However, wastewater has essential nutrient elements for plant functions but these concentrations pollute the environment . (Faizan and Kausar,2010).

In India 453 sugar mills are located out of which 121 are present in U.P. In contrast to many other countries where beet roots are used as the raw material , sugar is produced in India from sugarcane. The Physicochemical Properties of sugar mill effluent discharge are available in the record of “The sugar mills”. The sugar mills wastes are also concentrated with a number of inorganic substances (Anderson and Wilson 1976). Being non-degradable, these metals persist in the environment and accumulate in the living organisms through the food chain (Nriagu, 1979).

The disposal of waste water on land produces an efficient and cheap method of prevention of water pollution, but it results in transferring the pollution hazard to soil and decreases the yield of crop plants in higher concentration .This industrial waste water can be used for irrigation after proper dilution. The present study was undertaken to study the effects of sugar mill effluents on the seed germination, seedling growth, adult growth, yield, total nitrogen,total phosphate, and total heavy metal uptake and distribution in Triticum aestivum.

Objective of the Study To determine the effect of different concentrations of sugar factory effluent on germination percentage,seedling growth and dry matter transfer in Triticum aestivum.

Material and Methods

The effect of different concentrations of sugar factory effluent were carried out on-

1. Germination percentage and seedling growth and dry matter transfer in *Triticum aestivum*.
2. Plant growth and yield of *Triticum aestivum.*
3. The uptake and distribution of nitrogen, phosphate, and total heavy metal during seedling growth and further adult plant growth in materials and suitable concentration selected from above studies.
4. Analysis of pure and selected concentration of sugar factory effluent for total nitrogen, phosphate and heavy metal contents. The seeds of certain cereals viz. *Triticum aestivum* were procured from Indian agriculture research institute New Delhi and government horticulture research and training center Saharanpur (U.P.) for studies.

Growth studies method for germination and seedling growth

For the growth studies, experiments were performed in 1%,5% and 10% concentrations of sugar factory effluent in *Triticum aestivum* . Sugar factory effluent was collected from the source at the point of discharge. The collected effluent was stored at 10°c & then kept at room temperature , before use in the experimentation the effluent was sterilized and then diluted with distilled water to get 1%,5% and 10 % concentrations . The distilled water set alone as such served as a control set.

Uniform healthy seeds (criteria being the size & colour of seeds) were selected, surface sterilized with 0.1% $Hgcl_2$ solution and washed thoroughly with distilled water. These seeds were transferred on moist filter paper in desiccators containing 1%, 5% and 10% concentration of sterilized effluent. Simultaneously, a control soaked in distilled water supply to the seedling is maintained through a filter paper dipping in effluent and water of the lower chamber of desiccators. The level of effluent in desiccators was maintained regularly. The germination and subsequent seedling growth were carried out in dark as well as in light.

Germination percentage was recorded after 24 hrs for seedling growth, samples were collected on 3^{rd},5^{th} & 7^{th} day of radical emergence. These seedlings dissected out into root , shoot & cotyledons in Triticum aestivum .

Effect of sugar factory effluent on seed germination and seedling growth

The effects of different concentrations viz. 1%, 5% and 10 % of sugar factory effluent on seed germination and subsequent seedling growth were studied in *Triticum aestivum*, Linn cv.PBW 373. Studies were carried out in light and dark. Observations were(central tendency) and standard deviation(as the measure of dispersion) of 15 seedlings.

Seed germination in *Triticum aestivum*

It is observed that lower effluent concentration promotes germination. Thus in 1% effluent concentration germination was promoted while there was a gradual decline in it as the concentration of the effluent increased. In 5% and 10% effluent concentration germination gradually inhibited. In 1% effluent germination was ca.103.3%of the control in dark, Whereas as in 5% and 10% effluent these values were 98.8% and 94.4% respectively of the control in dark. The decline in percent germination was significantly low in higher concentration i.e. in 10% concentration. Nearly similar promotion and inhibition noted in light. Thus in 1% effluent treat set germination is 103.2% of the control in light.

Seedling growth of *Triticum aestivum* in dark

According to the table study on the basis of sugar factory effluent concentration. The lower concentration promotes the seedling growth and germination and higher concentration inhibits the seedling growth and germination. In 1% effluent concentration on 5^{th} day root and shoot lengths are 121.0% and 116.3% of the control respectively. Similarly fresh weights of root and shoot on 5^{th} day in the same concentration are 131.0% and 115.0% respectively of the control. Further in 5% effluent concentration on 5^{th} day root and shoot lengths are 94.7% and 76.3% of control. Fresh weight of roots and shoots on the same day in the same concentration are 71.0% and 76.0% respectively of control. However, on the 5th day in 10% effluent concentration, root and shoot lengths are 81.5% and 61.8%, likewise, in the same concentration on 5^{th} day the fresh weight of root and shoot are 50.0% and 60.0%of the control. Thus 10%sugar factory effluent inhibited the seedling growth of *Triticum aestivum* cv.PBW-373, grown in the dark.

Seedling Growth of *Triticum Aestivum* In Light

The results show in the tables that the seedling growth of *Triticum aestivum* cv. PBW- 373 increases in the lower concentration while it decreases in higher concentrations of sugar factory effluent. Results show that at 5th day root lengths in 1%,5% and 10% effluents are 118.3%, 66.6% and 66.6% respectively grown in light. On the same day shoot length in 1%, 5% and 10% effluent in light is 125.0%, 75.0% and 65.0% respectively over the control. Nearly similar pattern seen with fresh weight . Thus these results indicate that in the light grown seedling root and shoot lengths are more in 1% effluent as compared to control. However root and shoot lengths in light are inhibited in 10% concentration of sugar factory effluent as compared to control. Result further shows that in 10% effluent concentration, root and shoot lengths are inhibited more in dark grown seedlings than those grown in light.

Conclusion

In view of above studies the following investigations were carried out in *Triticum aestivum*. There is an increase (at lower concentration i.e. 1%) and inhibition (at all higher concentration i.e. 5% to 10%) of seed germination and seedling growth of *Triticum aestivum*. Similar promotion and inhibition in seed germination and seedling growth was observed in this plant. Further in lower concentration of sugar factory effluent the dry matter increase in seedling part is induced with simultaneous increase in dry matter transfer/loss from cotyledons. However in higher concentration of sugar factory effluent the dry weight increase in seedling parts is suppressed with simultaneous decrease in dry matter transfer/loss from the cotyledons to different plant parts studied.

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