

Phytotoxic Effect of Industrial Effluent on Germination of *Triticumaestivum* following in-vitro Exposure

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ABSTRACT : Waste water from industries has concern about pollution of soil thereby affecting vegetation. Seed germination ensures reproduction in plants and has importance in agriculture. Present investigation was carried out to assess the germination of wheat (*Triticumaestivum*) seed treated with industrial effluent water. Petri plate method was used to check the germination and physiological characteristics such as root length, shoot length were observed in treated and control seed groups. A set of seeds treated with fresh water served as control group 5%, 20%, 50% and 100% as treatment group. Effect on germination with freshwater was compared with seeds treated with different concentrations. Paper discusses alterations induced in exposed seeds indicating harmful effects on germination.

KEYWORDS : industrial effluent, phytotoxic, germination, pollution.

I. INTRODUCTION

Industrialization and urbanization fulfill all our basic needs. At the same time these cause all types of pollution viz. air, water, soil affecting their natural properties. Considerable amount of effluent is generated in various processes in industries every day. Industrial waste water, if not treated properly can cause detrimental impact on biota of the area where it is released. This water is directly discharged either into nearby water bodies or on land which has its impact on soil fertility as well. When untreated effluent is discharged in to the environment it hampers the ecological niches of living organisms. Effluent can affect photosynthesis in exposed plants. At other side, organic matter present in wastes from different sources can be source of nutrient. Use of sewage waste water is emerging as way to utilize nutrients by growing tolerant species of plants (Dash, 2012). At the same time there are studies carried out to assess harmful effects on plants by various workers. Malleshappa (1979) reported reduction in the dry matter production in soybean due to irrigation with paper mill effluent diluted to (50%), when compared to that crop obtained from irrigation with river water.

Germination of seeds is important in food grain production. In agriculture germination rate describes number of seeds are likely to germinate for particular lot. It is affected by environmental conditions and vitality of the seed. Seedlings are vulnerable to environmental stresses due to presence of polluting agents in the environment especially during germination and growth. The effect of industrial effluents on growth and yield parameters of agricultural crops and soil properties has been extensively studied. But only few studies are made to find out the effect of industrial effluents on germination. (Maanunatha 2008). Industrial wastewater may contain heavy metal, CaCO₃, Ca, N, P, K these components are present in industrial water which are beneficial for crop growth but heavy metal in excess quantity affects seed germination (Mehta and Bharadwaj, 2012). It has been reported that effluent can affect seed germination and growth. Care should be taken before using any waste water for irrigation and dilution method should preferred if required which

asks for use of technological application. Sharma *et al.*, (2002) has studied the effect of fertilizer factory effluent (0, 1, 2, 5, 10, 25, 50 and 100%) on seed germination of tomato cultivars. Positive effect on growth of *Westielopsis prolific* followed by paper mill effluent treatment is observed by Dash and Mishra, (1999).

According to (Santiniketan, *et al.*, 1994) discharged effluent causes change in pH and an increase of temperature, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) of the water body. Disposal of sewage as well as industrial waste water is becoming grave problem in urban and metropolitan cities these days. Mixing of sewage in lakes leads to problem of eutrophication turning water bodies in to dead ponds. Direct mixing of untreated water in water bodies is common scenario worldwide. This water saturated with toxic chemicals is used for irrigation where water scarceness is severe.

In the view of such perspective attempt was made to determine the effect of industrial effluents on seed germination. Paper discusses results of the present study.

II. MATERIALS AND METHODS

Water samples

Wastewater was collected from industrial area around Solapur city of Maharashtra, India. Effluent was collected in plastic container and used without storage for long time to avoid delay leading change in physicochemical characteristics. Treatment of seeds with different concentration was carried with tap water as a control.

Wheat grains

Wheat grains used were procured from local seed vendor and healthy seeds were selected for experiment. Each set included 25 seeds.

Petriplates

Sterilized petriplates were used for all sets.

Germination experiment

Petriplates were autoclaved and lined with moist filter paper at its bottom. 25 seeds of wheat were taken in four sets and exposed to 5%, 20%, 50% and 100% concentration. Same set was run with tap water as control. Observations were recorded at the interval of 24 hrs and concentrations were replaced taking care of maintenance of normal photoperiod. Emergence of the radical was taken as a criterion of germination. The experiment was terminated after ten days.

III. RESULTS AND DISCUSSION

Present study was carried out to assess the impact of industrial waste water on wheat seed germination. This work is helpful in spreading awareness of treatment of industrial waste water to avoid damage to agricultural ecosystem. Choudhury *et al.* (1987) has studied effect of paper mill effluent maize seed germination. Behra and Mishra (1982) have observed effect of waste water on growth of rice seedling. Singh *et al.* 1985; wheat (Agarwal *et al.* 1995; Nagda *et al.* 2006); pine (Czabator, 1962); green gram (Subramani, 1999); mung bean (Nagda *et al.* 2006); pea, lentil and gram (Khan *et al.* 2011); lettuce (Bazai & Achakzai, 2006); *Vigna angularis*, *Vigna cylindrical* and *Sorghum cernum* (Doke *et al.*, 2011). Sparse literature is available on studies on potential of wheat seed germination industrial waste water.



Fig.1 Germination of Wheat (*Triticumaestivum*) seeds control (Top) and treatment

In present study the rate of seed germination of wheat cultivation increase progressively up to 20% concentration of treated water reduces from up to 50% and thereafter it decreases significantly. Khan *et al.* (2011) in their experiment on impact of textile waste water on pea, gram and lentil seed germination found that higher concentrations affected the germination of seeds. Nagda *et al.* (2006) found that, at higher concentration of industrial effluent decreases the seed germination efficiency. Osmotic pressure of the effluent increases at higher concentrations of total salts making inhibition more difficult and retard germination efficiencies. The ability of seeds to germinate under high osmotic pressure differs with variety as well as species (Unger, 1987).

Sr	Percent of effluent/control	Number of seeds germinated
1	Tap water/control	15
2	5% effluent	18
3	20% effluent	22
4	50% effluent	4
5	100% effluent	0

Table 1-Number of seeds germinated Wheat (*Triticumaestivum*) seeds control and treatment

The treatment with polluted water also delayed seed germination of wheat. This may be due to decrease in water uptake at higher level of salinity in view of toxicity of high osmotic pressure of the seedling medium. Khan and Sheikh (1976) have reported significant reduction and delay in the germination of *Triticum spp.* In the present study, difference in the rate of seed germination of wheat was statistically significant among different concentrations of treatment.

IV. CONCLUSION

Our findings show that higher concentration of industrial effluent inhibit the germination and growth of different cultivars of wheat. Industrial waste water at higher concentration (50% and above) significantly affect germination and growth of wheat cultivar used in present study. The findings of present investigation are significant and may be very useful for agricultural experts, farmers and Environmental consultants.

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