



EFFECT OF INDUSTRIAL EFFLUENT ON SEED GERMINATION OF SOLANUM MELONGENA.

Environmental Science

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ABSTRACT

Industries consume large amount of water and generates contaminated effluent which affect the normal quality of the environment. The objective of present study was to examine the effect of industrial effluent with different concentrations on the seed germination of *Solanum melongena*. The results show that the *Solanum melongena* has higher tolerance capacity against the effluent because seed germination percentage is highest at 50% concentration of the effluent and seed germination reduces when the concentration of the effluent increases more than 50% which collected from Okhla Industrial Area phase-1, New Delhi-110025. The chemical composition of effluents contains higher concentration of pollutants. The study suggested that the effluent concentration should be less and then the effluents may be used for agriculture or other purposes.

KEYWORDS

Effluent, Pollutant, Seed germination, *Solanum melongena*.

Introduction:

The pollution of environmental pollution due to the toxic metals has begun to cause concern now in most major cities. The toxic metals entering the ecosystem may lead to geoaccumulation, bioaccumulation and bio magnification (Lokeshwari et al. 2006). Normally wastewater is used for irrigation purposes in many countries which are suffering from low availability of water (Al-Ansari et al. 2013., Arora et al. 2008). Irrigation by effluent is harmful because due to this practice there occurs accumulation of pollutants in the edible part of plants and through food chain reach in consumers and cause several harmful effects (Azad et al. 2010). Pollution is a matter of great concern because of its adverse effects on human health, animals, plants and various exposed materials (Nawaz et al. 2006). Industrialization play an important role in the development process but the wastewater disposal has become a global dilemma for the industries because of generation of high volume of effluents, limited space for land based treatment & disposal and high cost of treatment technologies (Kumar & Chopra). Effluents affect the time of flowering and fruiting number of fruits, weight of fruits and effect on vascular bundles (Uaboi-Egbenni et al. 2009). The utilization of industrial effluents for irrigation of crop plants is a highly beneficial solution to control the pollution (Medhi et al. 2008). Industrial waste contains very poisonous salts, alkalis, acids, odour, gases, heavy metals, insecticides etc. These polluted wastes are thrown into the canals, streams or rivers affecting the quality of water, making the water unfit for irrigation purposes and for other uses (Malik et al. 2003). Seed germination is a fascinating process. The industrial effluents possess various organic and inorganic chemical compounds. The presence of these chemicals will show detrimental effects on the development of plant, germination process and growth of seedlings (Wins and Murugam. 2010, Vijaakumari and Kumudha. 1990, Vijayarengan and Lakshyamanachary. 1993). Treated industrial effluents can be used for irrigation purposes but when the effluent is used without any treatment, toxic substances present in the effluent reduces crop growth and gives severe adverse effect on soil properties (Medhi et al. 2008). Temperature lays an important role in seed germination (Mishra.2016). Effluent released with high temperature can raise the temperature of water bodies, reducing the solubility of oxygen in the water and increasing the pH value of the receiving body (Ara begum et al. 2010, Rao et al. 1983).

2. Materials and Method:

In the present study attempts have been made to investigate pollutants of wastewater effluents of Okhla Industrial Area Phase-I, New Delhi and their effects on seed germination and plant growth of *Solanum melongena*. The present study was conducted with five different concentrations of effluent collected from industrial area phase-I New Delhi situated at 28.5223° N Latitude and 77.2849° S Longitude. Industrial effluent which collected mainly generated from textile, plastic moulding and printing press industries. The physico-chemical properties of the effluent were analyzed by the procedure of APHA

(1992) in the Environmental Science Laboratory, Department of Applied Sciences and Humanities, Faculty of Engineering and Technology, Jamia Millia Islamia, New Delhi, India since 02 May 2016 to 02 August 2016. The sets were made by dissolving calculated amount of effluents in tap water i.e. Tc, T25, T50, T75, T100 and by maintaining the ratio of effluent and tap water as-0:100, 25:75, 50:50, 75:25, 100:0 respectively as shows in table-01.

Table 1: Different dilution levels of industrial effluent with different ratios.

S.N	Volume of effluent %	Volume of tap water %	Concentration V/V Effluent : Water	Final Concentration	Symbol
1	0	100	0:100	0	Tc
2	25	75	25:75	25	T25
3	50	50	50:50	50	T50
4	75	25	75:25	75	T75
5	100	100	0:100	100	T100

Industrial effluent of different concentrations was used to investigate the effect of effluent on seed germination and yearly growth of *Solanum melongena* (Variety PK-123). During experiment thirty seeds of *Solanum melongena* were collected and sterilized by 0.1 % of mercuric chloride solution which helped to remove the microbes. The seed were then spread on the Petri dishes lined with cotton and covered with filter paper. The seeds were irrigated with equal Volumes (30 ml) of different concentration of each set of three replicates at certain time interval. The germinated seeds were taken out from petri-dishes when there was no further germination. Three replications were maintained for each level of concentration of effluent.

Germination Percentage: Germination percentage of seed refers to the initial appearance of the radicle. It was calculated by using the following formula (Mahalingum et al.2014).

$$\text{Germination percentage} = \frac{\text{Number of seed germination}}{\text{Total number of seed swon}} \times 100$$

Results and Discussion:

The physicochemical characteristics of the effluent are presented in Table-2.

Table 2: Physico-Chemical characteristics of the effluents.

S.N	Parameters	value
1.	Colour	Dark brown
2.	Temperature(Celsius)	30
3.	pH	8.0
4.	EC(μS)	1.54
5.	TDS(mg/l)	670

6.	BOD(mg/l)	244
7.	COD(mg/l)	432
8.	Alkalinity(mg/l)	50
9.	Chloride(mg/l)	2223
10.	Sulphate(mg/l)	72

The effluent had dark brown color and was alkaline in nature (pH 8.0). The electrical conductivity (EC) value and temperature were recorded as 1.54 $\mu\text{S}/\text{cm}$ and 34°C. The values of BOD, COD, TDS, Alkalinity, chloride and Sulphate of the collected effluent were determined as 244, 432, 670, 50, 2223 and 72 mg/L respectively. The values of BOD, COD and Chloride ions exceeded the ISI tolerance limit, which affect the water quality of receiving bodies and thus were found unfit for irrigation purpose.

The results of seed germination of the *Solanum melongena* are presented in table-3

Table 3: Percentage seed germination with different concentration of the effluent.

Effluent Concentration	Germination Percentage
Zero	77.66
25%	82.33
50%	89.00
75%	71.00
100%	69.00

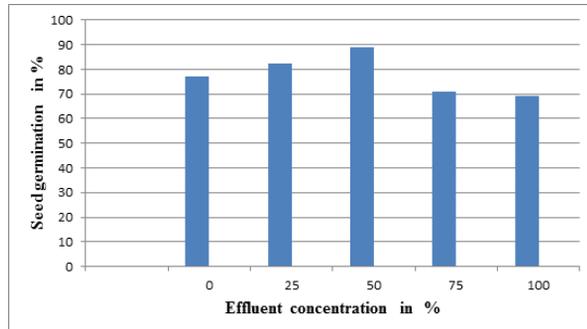


Fig:1: Effect of effluents on percentage germination

The results show that seed germination of 89.0% was recorded with 50% effluent concentration, this is the highest percentage for the seed germination. The germination of seed using control, 25, 75 and 100% industrial effluent were recorded as 77.66, 82.33, 71, and 69 percent respectively. More than 50% concentration of the effluent shows the percentage gradually declines. Results indicating that the some concentration of the effluent had a marked germination promoting effect on the *Solanum melongena*. Higher concentration of the effluent decreases the seed germination so the direct use of this industrial effluent is not fit for the *Solanum melongena*.

Conclusion:

Industrial development produces the waste that affecting the environment and public health. Various ions and compounds which generated from different industries which can be beneficial for plant growth but its excessive level could be toxic retard for the proper growth of plants. In study the results showed reduced the germination of the seed after the concentration of the effluent 50%. It was concluded that the effluents up to 50% is fit to the growth of *Solanum melongena* because low concentration of effluent is less toxic and found suitable for seed germination.

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