Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Pelagia Research Library

Advances in Applied Science Research, 2013, 4(4):356-359

Pelagia Research Library

ISSN: 0976-8610
CODEN (USA): AASRFC

Study on co-relation between concentration of distillery effluent and seed germination of gram nut and kidney bean

Amit Sharma

Department of Chemistry & Environmental Science, Raj Kumar Goel Engineering College, Pilkhuwa, Ghaziabad

---

ABSTRACT

Distillery effluent discharged as wastewater contains various toxic chemicals that can contaminate water & soil and may affect the common crops by using this water for agriculture irrigation. A laboratory work was undertaken to assess the co-relation between treated distillery effluent concentration and seed germination by using different concentration of distillery effluent like 0%, 25%, 50%, 75%, &100%.

Keywords: Distillery effluent, Toxic chemicals, Common crops, Agriculture irrigation, Seed germination.

INTRODUCTION

Water is one of the five elements described in "SHASTRA" to form life. The quality of water is vital concern for mankind since it is directly linked with human welfare. Various industries such as distillery, sugar industry, paper & pulp, chemical, pharmaceutical & tannery disposed off their improper treated effluent or spent wash directly into the soil and water bodies, which has been causing major pollution problem. Manufacture of ethyl alcohol in distilleries based on cane sugar molasses constitutes a major industry in Asia and South America. The world's total production of alcohol from cane molasses is more than13 million m^3/annum. The aqueous distillery effluent stream known as spent wash is a dark brown highly organic effluent and is approximately 12-15 times by volume of the product alcohol. It is one of the most complexes, worrying and strongest organic industrial effluents, having extremely high COD and BOD values. Because of the high concentration of organic load, distillery spent wash is a potential source of renewable energy. The 295 distilleries in India produce 2.7 billion litres of alcohol and generating 40 billion litres of wastewater annually. The enormous distillery wastewater has potential to produce 1100 million cubic meters of biogas. The population corresponding of distillery wastewater based on BOD has been reported to be as high as 6.2 billion which means that contribution of distillery waste in India to organic pollution is approximately seven times more than the entire Indian population. The wastewater from distilleries, major portion of which is spentwash, is nearly 15 times the total alcohol production. This massive quantity, approximately 40 billion litres of effluent, if disposed untreated can cause considerable stress on the water courses leading to widespread damage to aquatic life.

Distillery effluent is toxic in nature due to the presence of high amounts of organic & inorganic chemical load and its high acidic pH, B.O.D. (Biochemical oxygen demand), C.O.D. (Chemical oxygen demand), T.S.S. (Total suspended solids) & T.D.S. (Total dissolved solids) etc. Although distillery effluent highly toxic yet it can be beneficial in lower concentration for seed germination and plant growth if wisely used.

MATERIALS AND METHODS

The treated effluent was collected from the Rampur Distillery, District Rampur. The District Rampur is located between longitude 78-0-54 &69-0-28 east and latitude 28-25 &29-10 North spread in area of 2367 Km^2 falls in Moradabad Division of Utter Pradesh State with a population of approximately four millions.

Concentration and Application of Effluent:
Following concentration of effluent was taken for the treatment:

Concentration notation: C, E_a, E_b, E_c, and E_d.
Where:
C: 0% or Control (0parts effluent + 100parts water)
E_a: 25% (25parts effluent + 75parts water)
E_b: 50% (50parts effluent + 50parts water)
E_c: 75% (75parts effluent + 25parts water)
E_d: 100% or undiluted effluent (100parts effluent)

Table: 1 Physico-chemical characteristics of distillery effluent

Factor	Minimum	Maximum
Odour	Organic	Organic
Appearance	Clear	Clear
Temperature (^{0}C)	28.9	36.0
Viscosity (poise)	0.0101	0.0105
Surface tension (dyne/cm)	69.81	70.30
Density	1.82	1.83
pH	5.9	6.9
Electrical conductivity (Ohm^{-1})	11.29	12.07
Nitrate (mg/l)	30	70
Phosphate (mg/l)	0.52	1.1
Sulphate (mg/l)	230	340
Potassium (mg/l)	Nil	Nil
Total Suspended Solids (T.S.S.) (mg/l)	1750	3348
Total Dissolved Solids (T.D.S.) (mg/l)	978	1450
B.O.D. (mg/l)	680	1678
C.O.D. (mg/l)	690	2366
D.O. (mg/l)	Nil	Nil

To bioassay the concentration of the effluent control, 25%, 50%, 75% and 100% was made by diluting the effluent with distilled water in the ratio of 0:1, 1:3, 1:1, 3:1 and 1:0 respectively.

50 seeds of Gram Nut (Cicer arietinum) & 50 seeds of Kidney bean (Phaseolus mungo) were sterilized by 0.1% of mercuric chloride ($HgCl_2$) solution to remove the microbes. After thorough wash seeds were spread on the sterilized petridishes lined with filter paper. The seeds were irrigated with equal volume approx. 10 ml of different concentration (0%, 25%, 50%, 75% and 100%) of distillery effluent. For each treatment five replicates and in each replicate 50 seeds were taken, and recorded at a fixed interval at a fixed time the seeds germinated were counted and removed from the petridish until there was no further germination.

Criterion for germination was visible protrusion of the seed coat and was expressed in percentage.

RESULTS AND DISCUSSION

Gram Nut (Cicer arietinum): The results of the effects of different concentration of distillery effluent on seed germination of gram nut are given in table 2 & Fig. 1.

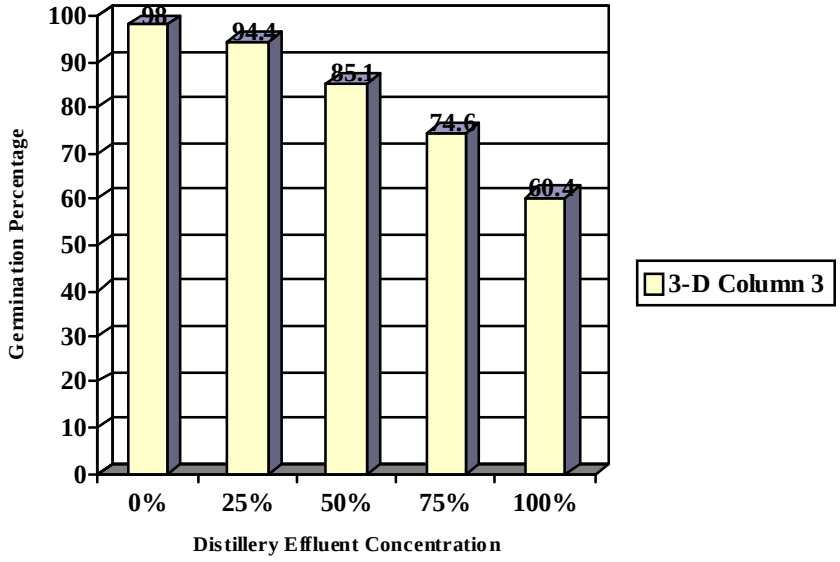
Table: 2 Effect of different concentration of distillery effluents on germination percentage of Gram Nut (Cicer arietinum)

Gram Nut (Cicer arietinum)					
Effluent Concentration	C	E_a	E_b	E_c	E_d
Germination percentage	98.00	94.40	85.10	74.60	60.40

Table 2 shows seed germination in Gram Nut was 100% in control.

The germination percentage in E_a concentration of distillery effluent in Gram Nut was recorded 94.40 followed by 85.10, 74.60 and 60.40 in E_b, E_c and E_d concentration respectively. Thus results indicated that germination percentage of Gram Nut was not inhibited in E_a concentration where as an inhibitory effect was noted in higher concentration treated seeds i.e. in E_b, E_c and E_d concentration of distillery effluent.

Fig. 1 Germination in Gram Nut (Cicer arietinum)



Kidney Bean (Phaseolus mungo): Table 3 and Fig 2 show the effect of different concentration of distillery effluent on seed germination of Kidney bean.

Fig. 2 Germination in Kidney Bean (Phaseolus mungo)

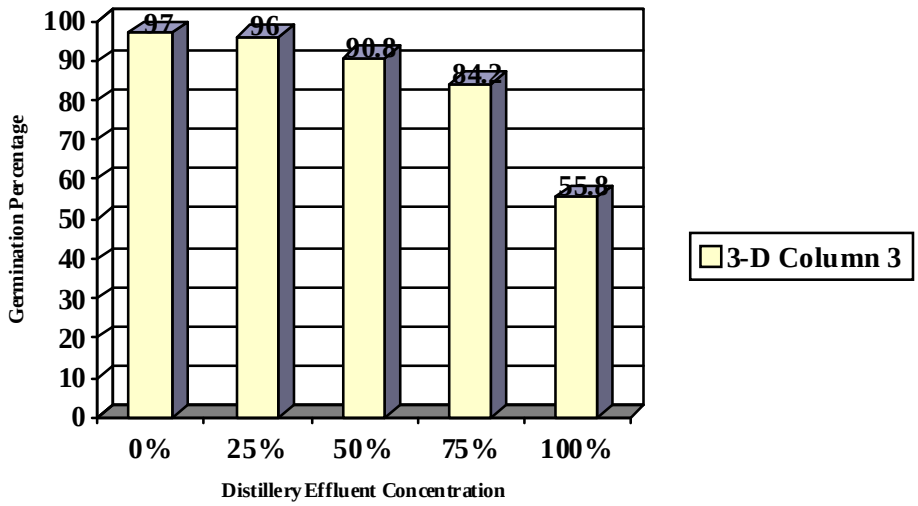


Table: 3 Effect of different concentration of distillery effluents on germination percentage of Kidney Bean (Phaseolus mungo)

Kidney Bean (Phaseolus mungo)					
Effluent Concentration	C	E_a	E_b	E_c	E_d
Germination percentage	97.00	96.00	90.80	84.20	55.80

Table 2 showed that seed germination in Kidney bean was 100% in control.

The germination percentage in E_a concentration of distillery effluent in Kidney bean was recorded 96.00 followed by 90.80, 84.20 and 55.80 in E_b, E_c and E_d concentration respectively. Thus results indicated that germination percentage of Kidney bean was not inhibited in E_a concentration whereas an inhibitory effect was noted in higher concentration treated seeds i.e. in E_b, E_c and E_d concentration of distillery effluent.

CONCLUSION

Table 1 and table 2 indicate that the germination percentage is inhibited at higher concentration both for gram nut and kidney bean. If we used lower concentration of distillery for irrigation it would be beneficial for crop yield.

REFERENCES

[1] A.K.De, A.K.Sen and D.Modak Environment International, 4 101-105 (**1980**).
[2] A.K.De, Environmental Chemistry, New age international Sixth Edition (**2006**).
[3] Agarwal, S.K., Studies on the effects of the auto exhaust emission on the Mitraguna patriflora. Master thesis, MDS University Ajmer India. (**1999**).
[4] Aggarwal M.L. and S.P.Dua, Nutritive value of distillery effluent and its effect on soil properties. Seminar on treatment and disposal of effluent from sugar and distillery Industries P. 26-29. (**1976**).
[5] Assessment of seed performance under the influence of distillery effluent. *Journal of ecophysiology & Occupational health*. Year 2007, Vol. 7, Issue 1 & 2 Print ISSN: 0972-4397. (**2007**).
[6] Bahadur, B. and B.K.Sharma, *Acta.Bot.Indica*, 17:274-278. (**1989**).
[7] Bhargava, A.K., *Biosphere*, 1(1&2) 44-46. (**1988**).
[8] Chaturvadi, A.C., *Asian Environ* Vol. 1 P. 38-42. (**1982**).
[9] Combinatorial effects of distillery and sugar factory effluent in crop plants. *J Environ Biol*. 2007 Jul.28 (3) 557-582(**2007**).
[10] Hariom, N.Singh and M.S.Arya, *J Environ. Biol*.15 (3) 171-173. (**1994**).
[11] Influence of distillery effluent on germination and growth of mung bean (Vigna radiata) seeds. *J Hazard Mater*, 2008May1, 153(1-2) 609-615.Epub 2007Sep.6 (**2007**).
[12] Khan, M.A.Ali and H.Ali, The effect of fertilizer factory effluent (VAM chemical factory, Gajraula) on the seed germination of pea, mustard and wheat, Abst. Proc., Seminar on recent research in Botany, C.C.S. Univ. Meerut, India P. 13 (**1996**).
[13] Mohammad, A. & Khan, A.U., *Environmental Pollution*, 37, 131-148 Serial A. (**1985**).
[14] Physico-chemical analysis and effect of Distillery effluent on seed germination of wheat (Triticum aestivum), Pea (Pisum sativum) and Lady's finger (Abelmoschus esculentus). *ARPN Journal of Agricultural and Biological Science* Vol. 2, No. 6Nov.2007. (**2007**).
[15] Physiological role of Nickel (Ni) and its toxic effects on higher plants. I.V.Seregin and A.D.Kozhevnikova, 2006, *Fiziologiya Rastenii*, 2006, Vol.53, No. 2, PP. 285-308. (**2006**).
[16] Regulation of growth the meristem network approach. Plant, Cell and Environment (1999), 22(5) 483-493.
[17] Review Biological approaches for treatment of distillery wastewater. Bioresour Technol. 2007 Sep; 98(12): 2321-2334. Epub. 2006Nov. 7. **(2007**).
[18] Sahai, R., Jabeen, S. and Saxena, P.K. *Indian J. Ecol*. 10(1): 7-10. (**1983**).
[19] Santiago, M. and N.S.Bolan 2006 *Jr. of Agri. And Biolo. Science*. Pp.55-56. (**2006**).
[20] Seed germination bioassay to assess toxicity of molasses fermentation based bulk Drug Industry Effluent. G.K.Nagda et al. EJEAFChe, 5(6), 2006. (1598-1603). (**2006**).