Research Article

Effect of Sugar Mill Effluent on Seed Germination of Peanut (*Arachis Hypogaea*) and Green Gram (*Vigna Radiata)*

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ABSTRACT

The work was undertaken to assess the waste water quality parameters of treated sugar effluent and their effect at various concentrations like 0%, 25%, 50%, 75% and 100% on germination, speed of germination, peak value and germination value of two selected seeds i.e. peanut (*Arachis hypogaea*) and green gram (*Vigna radiata*) Germination percentage decreases with increasing concentration of effluent in all the tested seeds, where as the germination speed, peak value and germination value increases from control to 25% and 50% concentration and decreases from 50% to 75% and 100% effluent. The germination percentages and germination values decrease with increasing concentration of effluent in all the seeds tested in the present study.

Keywords: Sugar mill effluent- peanut-Green gram-germination.

1. INTRODUCTION

Sugar industry is one of the most important agro based industries in India and is highly responsible for creating significant impact on rural economy in particular and countries economy in general. Sugar industries rank second amongst agro based industries in India. Diverse nature of sugar industrial effluents from various industries are disposed off in to soil and water bodies, which has been causing major pollution problem. The sugar industry plays an important role in the economic development of India, but the effluents released produce a high degree of organic pollution in both aquatic and terrestrial ecosystems (Ayyasamy *et al.,*2008) To economize the irrigation water industrial effluents are now-a-days commonly used for irrigation. So it is relevant to understand the response of industrial effluents to crops dependent on it. Sugar factory effluent that has not been treated properly has an unpleasant odor when released into the environment. Farmers using these effluents for irrigation to reduce water demand have found that plant growth and crop yield were reduced and soil health was compromised. Because sugar industry effluents are commonly used for irrigation, it is essential to determine how crops respond when exposed to industrial effluents (Gautam *et al.* (1992), Agarwal *et al.* (1995), Kumar and Rai (2001), Santiago and Bolan (2006), Saliha, B.B. (2003), Ramana *et.al.* (2002). Germination is a critical stage which ensures reproduction and consequently controls the dynamics of population. So it is a critical test for the probable crop productivity. In this regard, efforts have been made to determine the effect of industrial effluents on seed germination. A laboratory experiment was designed to know the effect of different concentration (0-100%) of sugar effluent on seed germination in Peanut (*Arachis hypogaea*) and Green gram (*Vigna radiata).*

2. MATERIALS AND METHODS

The treated sugar mill effluent was collected from the Thiru Arooran Sugar Mill, Thirumandagudi,Thanjavur, Tamilnadu . To bio-assay the different concentration of the effluent *viz.*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. Fifteen seeds of peanut (*Arachis hypogaea*) and green gram (*Vigna radiate)* were sterilized using 0.1% of mercuric chloride solution to remove the microbes after thorough wash. Seeds were spread on the sterilized petri dishes lined with filter paper. The seeds were irrigated with equal volume (~5ml) of different concentrations of distillery effluent. For each treatment three replicates (each replicate 15 seeds) were taken seed germination was recorded at a fixed interval at a fixed time until there was no further germination. Criterion for germination was visible protrusion of the seed coat and was expressed in percentage. The method of Maguire (1962) was followed for estimation of speed of germination.

Speed of germination = No. of seeds germinated/Days of first count +--+ No. of seeds germinated/Days of final count.
Peak value and germination value was calculated by the method of Czabater (1962).

Peak Value = Cumulative percentage germination on each day/No. of days elapsed since Initial inhibition.

Germination value = **Peak value × Germination percentage**

ANOVA and Bonferroni analysis was made using SPSS software version 10.0.

3. RESULT AND DISCUSSION

The speed of germination, peak value and germination value of tested vegetation also varies with respect to different concentration of effluent. The germination percentage diminishes gradually with elevation in concentration. It varies from vegetation to vegetation as mentioned in Table-2. While in case of Pea nut the speed of seed germination increases with increase in concentration from control. At the same concentration irrigated seed causes stagnant speed of germination in Green gram. The increase in effluent concentration after 50% concentration causes a common diminishing effect on the germination speed at each elevation in concentration. The pattern of peak value and germination value is increasing from control to 25% and stagnant from 25% to 50% and diminishes from 50% to 75% and 100% effluent concentration in case of Pea nut, while the pattern is diminishing in case of green gram as per elevation with concentration . The mean germination percentage was maximum (~89%) in pea nut whereas in green gram, it was ~85%. The average peak value, germination value and germination speed is showed in Table 2 for pea nut and green gram respectively. It was found that green gram is highly sensitive to the effluent treatment and the effluent is promotive for pea nut at their arranged dilutions. ANOVA analysis and multiple comparison test (Bonferroni test) of the speed of germination, peak value and germination value shows $P < 0.5$ level of significance and there is a significant difference of the responses of seed germination by the effluent concentration *viz.* 25%, 50% and 75% irrigation in all the seeds. At lower concentration of effluent the speed of germination, peak value and germination values are higher than the responses at higher concentrations. Lower concentration of effluent (25%) was shown to support 100% seed germination in kidney bean, and millet, but osmotic pressure associated with higher concentration of sugar factory effluent were found to reduce the germination in kidney bean and millet (Ajmal *et al.,*1983). It indicates that salt concentration that governs the seed germination and it varies from crop to crop because each crop has their own tolerance to the different salt concentrations.

Table 1: Percentage of seed germination and germination value with treated Sugar mill effluent

Effluent Conc.	Germination Percentage (5 Days)		Germination value	
	Peanut (*Arachis hypogaea)*	Greengram (*Vigna radiata)*	Peanut (*Arachis hypogaea)*	Greengram (*Vigna radiata)*
Zero	98.55	100	798.66	1200
25%	91.48	96.8	864.1	1150
50%	86.31	88.31	864.1	989
75%	80.26	69.13	721.6	798
100%	75.18	64.50	547.9	521

Table 2: Peak value and speed seed germination of peanut (*Arachis hypogaea*) and green gram (*Vigna radiata)* at different treated effluent concentration

Effluent Concentrations	Speed of Germination (5 Days)		Peak Value	
	Peanut (*Arachis hypogaea)*	Green gram (*Vigna radiata)*	Peanut (*Arachis hypogaea)*	Green gram (*Vigna radiata)*
Zero	1.25	2.05	8.14	12.3
25%	1.35	2.09	9.6	12.32
50%	1.07	2.09	9.2	11.26
75%	1.05	1.19	8.20	9.60
100%	0.77	0.89	6.5	6.32

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