Research Article

Germination and Early growth Responses of *Glycine max* varieties in Dairy effluents

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ABSTRACT

Present investigation was carried out to assay the effects of Dairy effluents on different varieties of Glycine max. For that purpose dairy effluent were chosen. Concentrations were used are 0, 10, 20, 30, 40 5 and, 60%.On the other hand varieties of Glycine max viz., JS-335, JS-71-05, JS-93-05, NRC-7, and NRC-37 were used. Maximum improvement in seedling length was found in 60% of dairy effluent. On the basis of present studies it can be concluded that Dairy effluent which is discharge as waste can be used for irrigation purpose, after proper dilution.

Keywords: Glycine max, dairy effluent, seed germination, seedling growth.

INTRODUCTION

Soybean (*Glycine max)* is a major crop grown during the Kharif, or monsoon, season (July-October) in the rain-fed (dry land) areas of central and peninsular India. Madhya Pradesh (MP) is known as the "soybean state" of India, comprising 55% of the total national area of soybean cultivation. It is a common observation that common man is using effluents of industries or polluted water for irrigation .However different type of effluents have different characteristics which may are may not be beneficial before its use. Here author studied the effect of Dairy effluents at different concentration on seed germination and growth of plant Glysin max varieties. Dairy technology has been defined as that branch of diary science which deals with processing of milk and the manufacture of milk products on an Industrial scale. During the past few years, many agro based industries have come up in India. The milk processing industry is one such industry during the last two decades due to enormous increase in the milk production. The number of the diary plants of medium and large size has increased. For the efficient handling and processing of milk. Consequent to the increased milk production and processing waste water generation has also increased. The dairy industry in India on an average has been reported to generate 6-10 liters of waste water per liter of the milk processed. Depending upon the process employed, product manufactured and house keeping exercised. The waste water of diary contain large quantities of milk constituents such as casein, lactose, fat, inorganic salt, besides detergents & sanitizers used for washing[1].

MATERIALS AND METHODS

For the present study the effluent samples were collected from nearby dairy processing unit at the sources and were analyze the parameter in the laboratory. Color of the effluents was noted by visual observation. Temperature is measured at the site of collection by using thermometer. pH is recorded in immediately at the site of effluent collection with the help of pH by Hanna instruments physico-chemical parameters[2] were analyzed according to APHA, Trivedi and Goel[3]. Certified seeds of different varieties of *Glycine max* viz. JS-335, JS-71-05, JS-93-05, NRC-7, and NRC-37 were used in the present study .Healthy and equally sized seeds of all five varieties were sterilized with 0.1% $HgCl_2$. After repeated washings with sterilized distilled water, seeds were soaked in the same water for 4hrs. Then ten sterilized seeds were arranged in sterilized Petri dishes, lined with double layer of filter paper. Plates were labeled as per type, concentration of the effluent and variety of soybean. These were then supplied with respective effluent concentration and incubated for three days at $26\pm2^{o}C$ for germination. Daily observations were made for the germinated seeds, and then were shifted to light (10kLux) for next 7 days. Before shifting, 15 ml of nutrient solution (Hewitt, 1963) was provided with the same concentration of effluent. After seven days, seedlings were harvested; root, shoot & seedling lengths were recorded. Data was subjected to statistical analysis to see the significance. The data of the analysis of the effluent are shown in table 1 and seed germination and seedling growth in Table 2, 3, 4, and 5.

RESULT AND DISCUSSION

For most of the Glycine max verities, the percentage germination was significantly improved in the presence of different concentrations of the dairy effluents, though there was no particular trend (Table 2). Few seeds were able to grow at 80 & 100% concentrations but they could not survive (data not shown) so these concentrations were not used further. The effect of various concentration of effluent was studied in order to find out the suitable concentration of effluents, which could increase the germination of seeds and could be recommended for application as irrigation in of glycine max the findings of the present study are presented in Table 2,3,4,5. It is revealed that the effect of different concentrations of dairy effluent on germination was highly significant. The observation shows that effect of effluent has remarkable effects, which were promotive in comparison to control. After 10days of observations it was found that in petridishes trial, the maximum growth of plumule and radical was observed in 60% effluent treatment. There was variation in percentage of seed germination in different concentration [0%, 10%, 20%, 30%, 40%, 50% and 60% effluent]. These values decrease corresponding with increase of effluent concentration. Suppression of seedling growth by effluent dilutions more than 10 % observed in the present study is in reference with the earlier studies of Imrana Yousaf et al. and Gaikar B. Rajendra et al in soyabeen[4], S. Dhanam in Paddy[5], Singh Anoop et al in *Triticum aestivum L*[6]. Tomer BS, Tomer SK and Singh Yogendra in Sunflower[7]. Panse V.G. and Sukhatme P.V. (1978), Pandey D.K. and Soni P. (1994) also suggested that the interaction between the various constituents of the effluent and native microbes might be responsible for the inhibition of seedling growth[7,8]. Dhanam (2009) also documented increased percentage germination of paddy in low concentrations of dairy effluent, though the higher concentrations were injurious. In normal conditions (0% effluent), variety NRC-7 proved to be the best variety followed by NRC-37 and JS-93-05. When different concentrations of both effluents were added, almost all varieties showed improved seedling length at 10% and 20% effluent concentration of the effluents, as compared to the control. Higher concentrations (40& 60%) also improved the seedling lengths with few exceptions (Table 3). Many researchers documented improved seedling lengths of various crops/plants under different concentrations of textile, paper, marble, dairy and brewery effluents[9-11] etc. Reasons for increased seedling growth towards higher concentrations might be that the effluents contain appreciable amount of nitrates and sulphates (Table 1), which stimulate the protein production and other organic molecules such as chlorophyll, required for the growth of plants. In diluted concentrations those nutrients might not have been available in sufficient amounts to enhance the seedling growth. Orhue *et al* also reported enhanced growth of maize plant as well as its chlorophyll content with brewery effluent treatments[12]. Root lengths for all varieties increased under various concentrations of effluents as compared to control (0% effluent).The increase were some times more than two folds (Table 4). Behaviors of seedling's roots were variable for the effluents, for example NRC-37, JS-93-05 and JS-71-05gave maximum root growth in effluent at 60% concentration, while the improvements of shoot lengths were very less as compared to roots (Table 5). All cultivars showed better seedling growth at higher concentrations than in more diluted treatments. Vijayakumari also observed a reduction in various growth parameters of Soybean in various concentrations of textile dying effluent[13]. Seedlings grown in lower concentrations had light green and soft cotyledons and fleshy shoots. In higher concentrations, seedlings had dark green cotyledons with deep slits, while there was no set pattern for the parameters.

CONCLUSION

Present study revealed that Dairy effluents may be used after appropriate dilutions, which may enhance various parameters of Glycine max growth. Response of various varieties was dilution/effluent type dependent. Use of these effluents in agriculture may be a step towards water shortage solution. However further work is required to understand the long term effects of these effluents on various biochemical parameters of Glysinemax.varieties.

Table 1: Physio-chemical analysis of dairy effluents

S.No.	parameter	Raw effluent	Treated effluent	I.S.I. value
1	color	Milky	colorless	-
2	Odor	unpleasant	-	-
3	Temperature	280c	250c	
4	pH	8.12	7.4	6.5-8.0
5	Total Solids	2395	560	1100
6	**a.** Total suspended solids	506	80	450
7	**b.**total dissolved solids	1889	480	1500
8	Dissolved Oxygen	Nil	3.5	4-6
9	Biological oxygen demond	1189	28.55	50
10	Chemical oxygen demond	2692	94	250
11	Oil and grease	62	2.5	10
12	Ammonical Nitrogen	0.18	-	-
13	nitrite	0.14	-	-
14	nitrate	0.03	-	-
15	Phosphate(as P)	0.24	-	-
16	Chloride (as Cl)	225	90	600
17	Calcium hardness	76	-	600
18	Magnesium Hardness	10	-	-
19	Sulphate (as SO_4)	263	2.5	1000

All parameters were expressed in mg/l except pH, color and odor

Table 2: Effect of Dairy effluents on the % germination of *Glycine max* varieties

Glysin max varieties	Dairy effluents percentage						
	0	10	20	30	40	50	60
JS-335	60±5.2	60±7.2	60±0.0	50±5.2	55±6.2	65±3.2	70±5.2
JS-71-05	65±3.5	70±5.0	70±5.2	60±5.2	70±5.2	70±5.2	85±5.2
JS-93-05	92±3.5	95±3.5	95±3.5	95±3.5	90±3.5	90±3.5	95±3.5
NRC-7	95±3.5	90±0.0	95±3.5	85±3.5	90±3.5	90±3.5	95±3.5
NRC-37	75±3.5	90±0.0	75±3.5	75±3.5	85±3.5	80±3.5	95±3.5

± Standard deviation

Table 3: Effect of Dairy effluents on the seedling length (cm) of *Glycine max* varieties

Glysin max varieties	Dairy effluents percentage						
	0	10	20	30	40	50	60
JS-335	11.8±0.4	11.5±0.4	11.0±0.4	11.0±0.4	13.0±0.4	11.6±0.4	11.0±0.4
JS-71-05	16.8±0.4	16.8±0.4	14.9±0.4	14.6±0.4	14.5±0.4	13.8±0.4	13.8±0.4
JS-93-05	17.2±0.4	16.0±0.4	15.0±0.4	13.9±0.4	14.0±0.4	14.2±0.4	13.0±0.4
NRC-7	17.8±0.4	14.5±0.4	14.3±0.4	13.9±0.4	13.4±0.4	15.0±0.4	13.0±0.4
NRC-37	17.0±0.4	14.5±0.4	14.4±0.4	13.4±0.4	13.6±0.4	13.4±0.4	12.4±0.4

± Standard deviation.

Table 4: Effect of Dairy effluents on the root length (cm) *Glycine max* varieties

Glysin max varieties	Dairy Effluents Percentage						
	0	10	20	30	40	50	60
JS-335	3.8±0.02	5.3±0.02	7.8±0.02	6.8±0.02	4.9±0.02	3.8±0.02	6.8±0.02
JS-71-05	6.2±.0.02	7.5±.0.02	7.2±.0.02	6.2±.0.02	7.8±.0.02	7.6±.0.02	9.2±.0.02
JS-93-05	6.8±0.02	7.8±0.02	5.8±0.02	5.6±0.02	6.8±0.02	6.8±0.02	9.8±0.02
NRC-7	5.8±0.02	7.8±0.02	4.8±0.02	5.8±0.02	5.4±0.02	5.8±0.02	8.8±0.02
NRC-37	4.6±0.02	4.9±0.02	6.3±0.02	6.5±0.02	6.9±0.02	8.9±0.02	10.0±0.02

± Standard deviation

Table 5: Effect of Dairy effluents on the shoot length (cm) of *Glycine max* varieties

Glysin max varieties	Dairy effluent percentage						
	0	10	20	30	40	50	60
JS-335	7.1±0.06	6.3±0.06	6.2±0.06	6.1±0.06	7.1±0.06	7.1±0.06	7.8±0.06
JS-71-05	7.7±0.06	7.3±0.06	7.5±0.06	7.7±0.06	7.7±0.06	7.7±0.06	8.3±0.06
JS-93-05	8.7±0.06	8.9±0.06	8.7±0.06	8.8±0.06	8.6±0.06	8.9±0.06	9.7±0.06
NRC-7	7.3±0.06	7.3±0.06	7.6±0.06	7.8±0.06	7.9±0.06	7.8±0.06	8.6±0.06
NRC-37	6.3±0.06	8.3±0.06	7.3±0.06	7.1±0.06	6.3±0.06	7.5±0.06	8.3±0.06

± Standard deviation

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