WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 12, Issue 19, 1518-1528. Research Article ISSN 2277–7105

STUDY OF EFFECT OF DAIRY EFFLUENT ON SEED GERMINATION, GROWTH AND BIOCHEMICAL PARAMETER OF FENUGREEK (TRIGONELLA FOENUM-GRAECUM)

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Article Received on
21 September 2023,

Revised on 11 October 2023,
Accepted on 01 Nov. 2023

DOI: 10.20959/wjpr202319-30310

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ABSTRACT

Effluent generated by various processes in factories is directly discharged without any end point treatment into drains and used for irrigation purposes. The present study was carried out to assess the effects of dairy industry effluent on seed germination and seedling growth of fenugreek plant. The effect of different concentration of treated dairy effluent on physico-chemical properties of soil, seed germination, seedlings growth dry matter production and biochemical parameters like protein and chlorophyll content of fenugreek was studied. The effluent used in different concentration 20 %, 40 %, 60 %, 80 %, 100 %. The physico – chemical properties of treated dairy effluent was also analyzed. From present study it was concluded that treated dairy effluent has favorable effect on soil properties and the higher concentration of treated dairy effluent show favorable effect on growth of Fenugreek plant the all concentration show more favorable for growth of Fenugreek plant.

1. INTRODUCTION

Water resources are most often affected by industrial pollution. Pollution caused by industrial and dairy effluents is a serious concern in throughout the world. Dairy effluent has high organic loads as milk is its basic constituent with high levels of chemical oxygen demand, biological oxygen demand, oil & grease and nitrogen and phosphorous content. (Macoon, B., 1948) To recycle nutrients through land application of dairy waste effluent requires the

use of crops capable of utilization these nutrients. Industrial effluents rich in organic matter and plant nutrients are finding agricultural use as cheaper way of disposal. Many workers reported beneficial effect of dairy effluent. (Zabek 1976) working on Soils observed that the irrigation with dairy effluents increased NPK in soils and crops, green Fodder and wheat grains. (Braio, V 2007, Banupriya G. 2012) A series of experiments were carried out by Jenson 1981 in which Dairy effluent was supplied to crops cultivated in sandy soils and received positive response.Ajmaletal.in 1984 observed that the plant height was reduced by the use of 100% dairy. (Aroraetal 2005) researcher worked on the organic pollution load of Aachal dairy mill effluent

In terms of physicochemical and bacteriological characteristics and their effects on seed germination of certain agricultural crops. Gautam and Bishnoi in 1990 carried out experiments on germination of wheat seed with undiluted and diluted (1:1) dairy effluent and found more growth in diluted effluent. Panditetal In 1996 found that the 25% diluted dairy Effluent is beneficial for the cultivation of Sorghum bicolor. Graeme L. and McKenzie in 2004 studied the effect of dairy effluent on dry matter yield, nutritive characteristics and mineral Content of perennial pasture.

2. MATERIALS AND METHODS

2.1 Collection of dairy effluent: The dairy effluent for experiment purpose was collected from Kolhapur city.

2.2 Collection of Fenugreek sample: fenugreek samples were collected from local market of Kolhapur city.

2.3 Characterization of Dairy effluent: Table no 1.Various physicochemical properties of effluent was analyzed and their methods as follows.

Sr. No.	Parameters	Unit	Method
1	pH	-	pH meter
2	Electric conductivity	Micro mhos/cm	Electric conductivity meter
3	Dissolve Oxygen	Mg/lit	Titration
4	Turbidity	NTU	Titration
5	Hardness	Mg/lit	Titration
6	COD	Mg/lit	Titration
7	BOD	Mg/lit	Titration
8	Chloride	Mg/lit	Titration
9	Oil and Grease	Mg/lit	Gravimetric
10	TS and TDS	Mg/lit	Gravimetric
11	MPN	-	Biological method

2. 4 Effect of Dairy effluent on seed germination studies

2.4.1 Seed germination studies

Different concentration of dairy effluent i.e. 20%, 40%, 60%, 80%, 100%, and control were prepared and used for germination experiment. In this experiment 20 seeds of Fanegreek are sterilized with 0.1% mercuric chloride solution to remove the microbes after through wash. Seeds were irrigated with equal volume of different concentration of dairy effluent. Number of seed germination was counted on 6^{th} day and total 10^{th} day and seed germination percentage was counted. The early seedling growth shoot length, root length was also recorded at 10^{th} day. Fresh weight and dry weight also calculated on 10^{th} day. Seventh day old seedlings were separated in to shoot and root and were used for estimation of chlorophyll and protein content.

2.4.2 Estimation of protein content in plant

Protein content from the plant was estimated by Lowery's (1951) method. plant extract 0.5 gm leaves was crushed and 5 ml phosphate buffer was added and centrifuge it at 10,000 rpm for 10 min. at 40c. Supernatant was used for detection of protein. The standard protein solution was prepared and taken 0.2, 0.4, 0.6, 0.8, 1.0 ml and also 0.5 ml sample in test tube.3 ml Lowery reagent add waited for 15 min. at room temp and 0.5 ml folin phenol reagent added and again incubated for 30 min. O.D. was checked at 660 nm

2.4.3 Estimation of chlorophyll content in plant

Chlorophyll content of plant was estimated by Aron (1949) method.0.5 gms leaf sample was used for it. grind it and 15 ml 80% acetone and pinch of mgco3 was added. Centrifuge at 2000 rpm for 5 min. transfer supernatant to 100 ml volumetric flask. cover up the volume 100 ml by 80% acetone and recorded the absorbance 663 nm and 645nm.

2.5 Effect of Dairy effluent on soil characteristics

Table 2: The Physico-chemical parameter of soil were analyzed before and after treatment.

Parameter	Method
PH	PH Meter
E.C.	Electric conductivity meter
Texture	Sieves method
Field capacity (%)	Gravimetric
Water holding capacity (%)	Gravimetric
Organic carbon (%)	Titration
Organic matter (%)	Titration

3. RESULT AND DISCUSSION

Effect of Dairy effluent on soil characteristics

The effect of different concentration of dairy effluent on soil properties was studied and It was observed that the pH, E.C. of soil was decreases after dairy effluent treatment given to Fenugreek at 100% concentration pH was high 7.1 and E.C. at 100% concentration i.e. 2391 Micro mhos/cm, the pH and E.C.

The texture of soil was found to be same as before and after dairy effluent treatment given to Fenugreek Plant. The field capacity and organic carbon was decreases after dairy effluent treatment given to Fenugreek seeds and Field capacity at 20% concentration was high 26.3%.

In case of organic carbon, organic matter also decreases after treatment of dairy effluent given to Fenugreek seed and it was show that at 20% concentration it was high i.e. 0.2289%. the water holding capacity of soil was increases after diary effluent treatment and increases as concentration of dairy effluent increases at 80% concentration W.H.C. high 45.56%.

Effect of Dairy effluent on seed germination studies

The effect of different concentration of dairy effluent on plant growth of fenugreek was studied. It was observed that the germination percentage at 80% concentration observed high i.e. 97.39%. The seedling growth increases as concentration of dairy effluent increases at 100%. It was high i.e. 20.2 cm. The fresh wt. and dry wt. was observed at 100% concentration i.e. 2.16 and 1.96 respectively. The protein and chlorophyll content increases as concentration of effluent increases and at 100% concentration it shows high 0.43 and 20.7 respectively.

Table 3: Physiochemical Properties of Treated dairy Effluent.

Sr.No.	Parameters	Unit	Values	Method
1	pH	-	8.4	pH meter
2	Electric conductivity	Micro mhos/cm	9719	Electric conductivity meter
3	Dissolve Oxygen	Mg/lit	4.8	Titration
4	Turbidity	NTU	5.4	Titration
5	Hardness	Mg/lit	4.7	Titration
6	COD	Mg/lit	60	Titration
7	BOD	Mg/lit	80	Titration
8	Chloride	Mg/lit	66.07	Titration
9	Oil & Grease	Mg/lit	4.3	Gravimetric
10	TS & TDS	Mg/lit	400 200	Gravimetric
11	MPN	-	147.041/100ml	Biological method

Table 4: Physiochemical Properties of soil before Dairy effluent Treatment given to Plant.

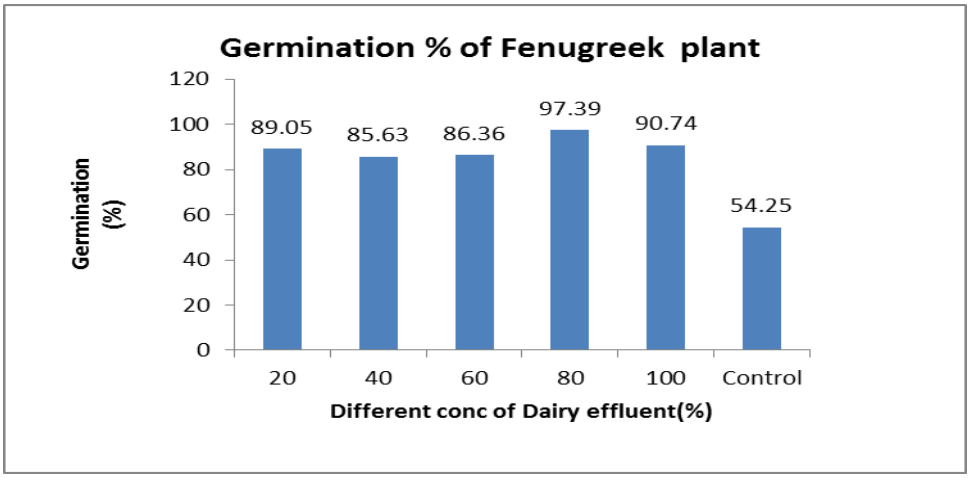
Sr. No.	Parameters	Values
1	pH	7.93
2	Electric conductivity (Micro mhos/cm)	991
3	Texture	Gravel
4	Field capacity (%)	20 %
5	Water holding capacity (%)	40.10 %
6	Organic carbon (%)	0.1127%
7	Organic Matter (%)	0.2010 %

Table 5: Effect of treated Dairy Effluent on seed Germination, Seedling Growth, Dry matter production, Protein, chlorophyll content of Fenugreek Plant.

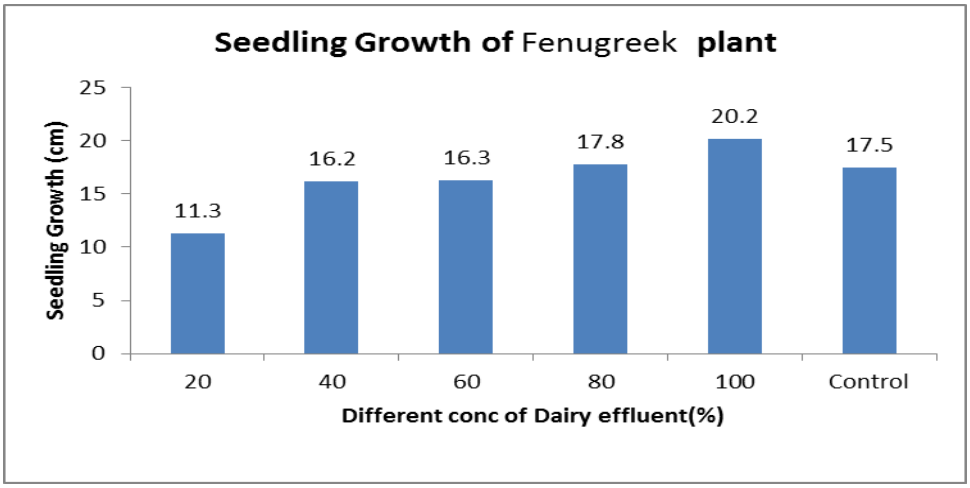
Effluent Conc. (%)	Germination (%)	Seedling Growth (cm)			Fresh Weight gm/plant	Dry Weight gm/plant	Protein content	Chlorophyll content
		Shoot Length	Root Length	Total Length				
20	89.05±0.02	8.0	3.3	11.3±0.1	2.01±0.02	1.79±0.01	0.11±0.01	13.3±0.02
40	85.63±0.02	10.9	5.3	16.2±0.1	1.74±0.01	1.49±0.01	0.35±0.01	16.4±0.01
60	86.36±0.01	11	5.3	16.3±0.1	2.2±0.02	1.90±0.01	0.4±0.01	18.4±0.01
80	97.39±0.02	11.9	5.9	17.8±0.1	1.15±0.01	1.12±0.01	0.41±0.01	19.2±0.01
100	90.74±0.01	13.5	6.7	20.2±0.1	2.16±0.01	1.96±0.01	0.43±0.02	20.7±0.01
Control	54.25±0.01	12	5.5	17.5±0.1	1.88±0.01	1.02±0.01	0.51±0.04	13.6±0.01

Table 6: Physiochemical Properties of soil after Dairy effluent Treatment given to Fenugreek Plant.

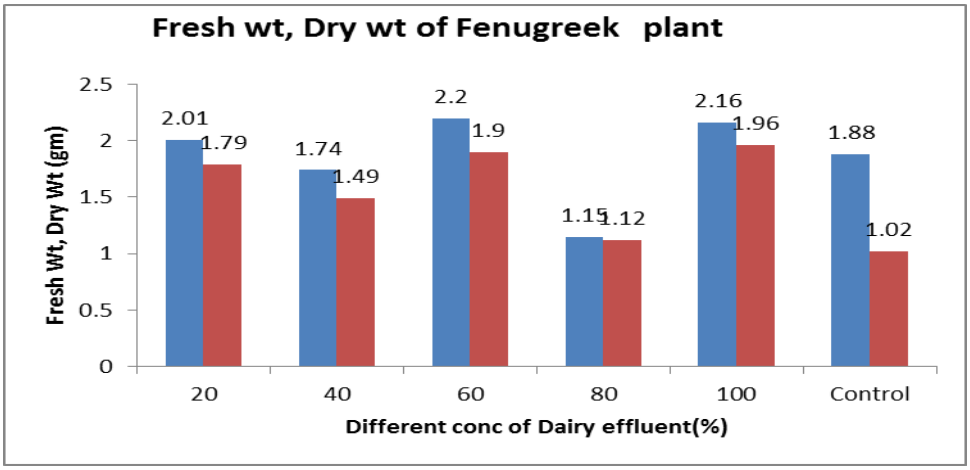
Sr. No	Parameters	Effluent Concentration (%)					
		20%	40%	60%	80%	100%	Control
1	pH	6.4	6.6	6.8	7	7.1	6.3
2	Electric conductivity	2156	2208	2348	2345	2391	95.5
3	Texture	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel
4	Field capacity (%)	26.3	25.5	25	24.1	23.3	20.8
5	Water holding capacity%	44.22	44.74	44.78	45.56	47.07	40.4
6	Organic carbon (%)	0.1394	0.1340	0.1338	0.1278	0.1273	0.1270
7	Organic Matter (%)	0.2273	0.2271	0.2268	0.2261	0.2289	0.2148



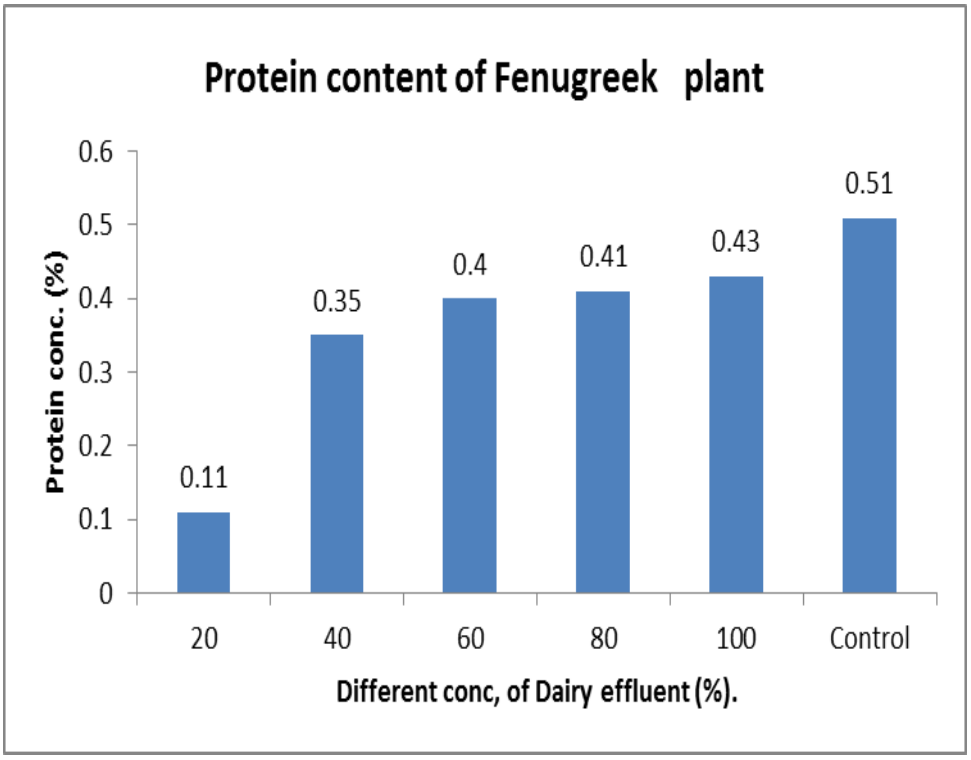
Graph No. 1: Effect of treated Dairy Effluent on seed Germination of Fenugreek (*Trigonellafoenumgraecum*) Plant:



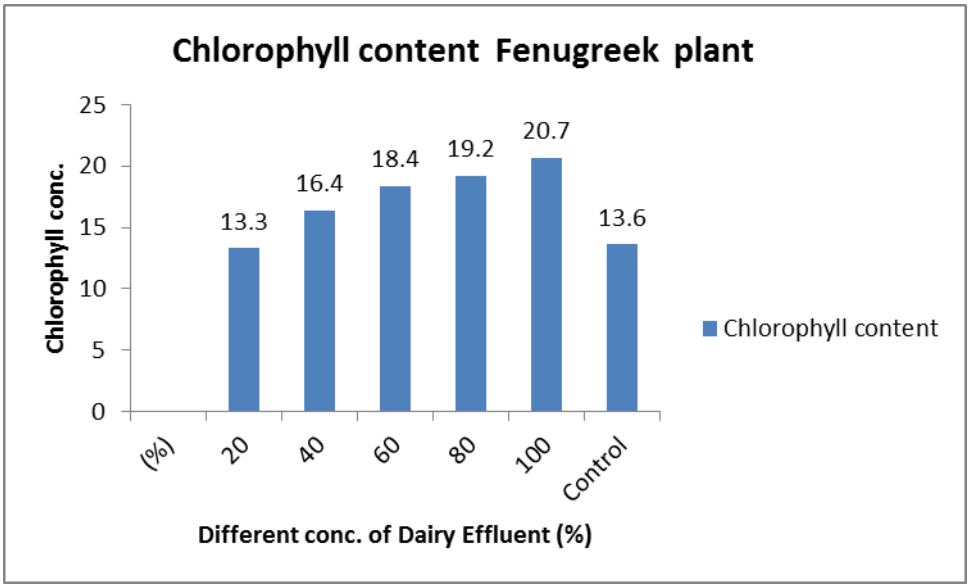
Graph No. 2: Effect of treated Dairy Effluent on Seedling Growth of Fenugreek (*Trigonella foenumgraecum)* Plant.



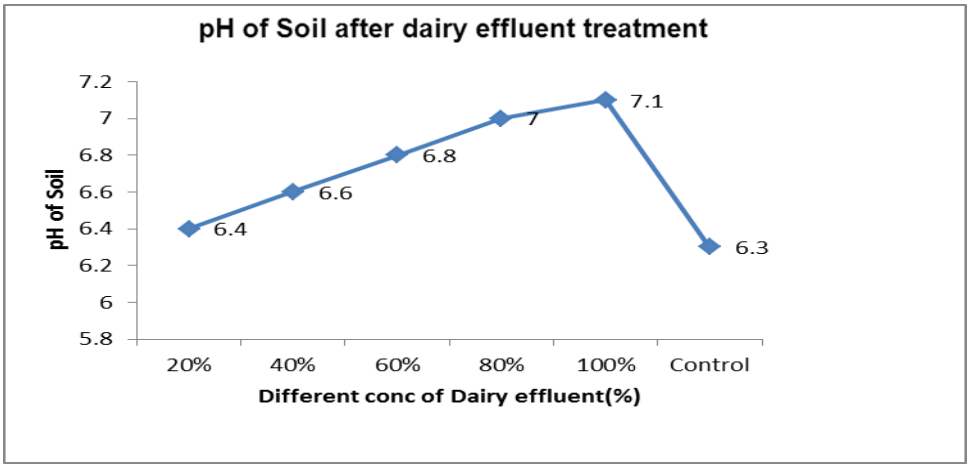
Graph 3: Effect of treated Dairy Effluent on Fresh wt. & dry wt. of Fenugreek (*Trigonellafoenumgraecum)* Plant.



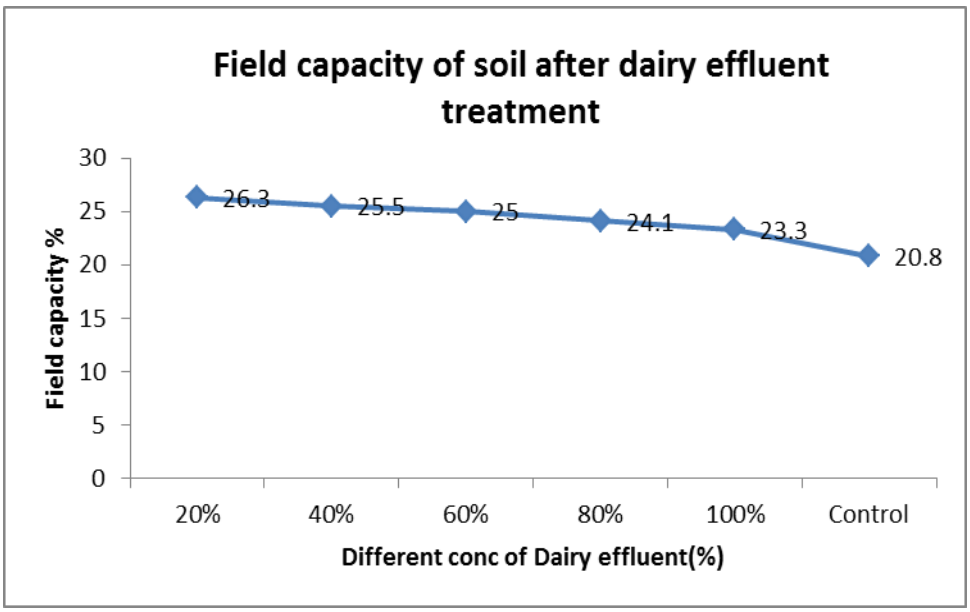
Graph 4: Effect of treated Dairy Effluent on Proteincontent of Fenugreek (*Trigonellafoenumgraecum*) Plant.



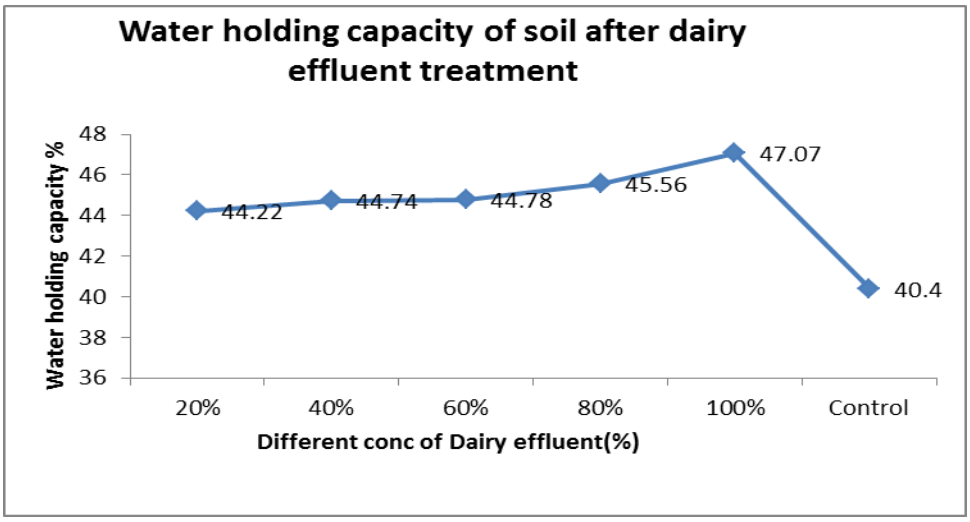
Graph 5: Effect of treated Dairy Effluent on Chlorophyll content of Fenugreek (*Trigonellafoenumgraecum*) Plant.



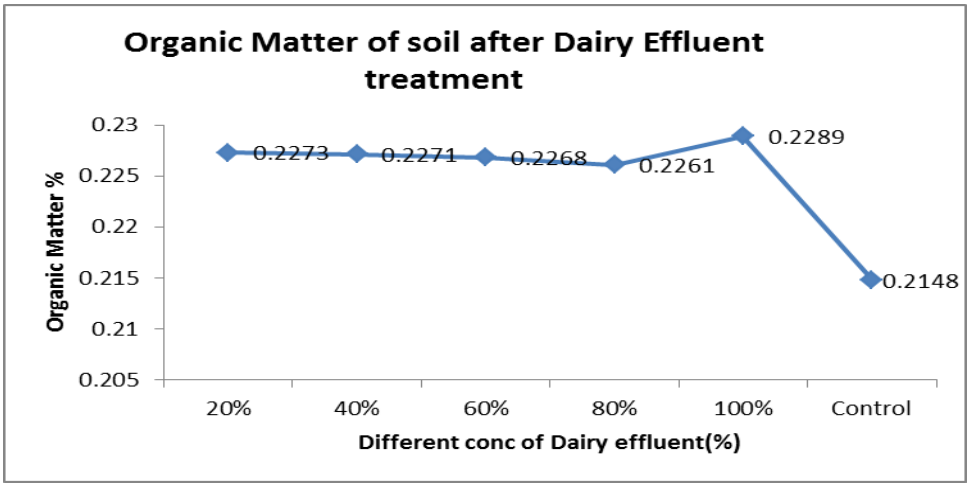
Graph 6: PH of soil dairy effluent treatment.



Graph 7: Field capacity of soil after dairy effluent treatment.

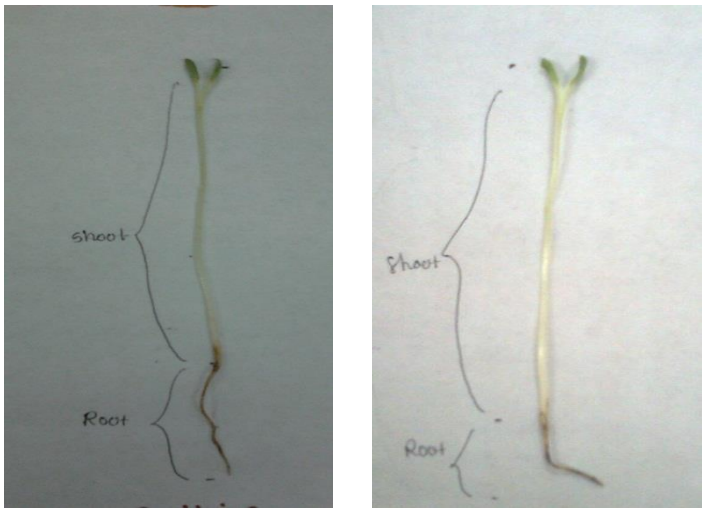


Graph 8: Water holding capacity of soil after dairy effluent treatment.



Graph 9: Organic Matter of soil after Dairy Effluent treatment.

Seedlings growth of Fenugreek as shoot, root length on 10th day



100 % Control

Figure 1: Fenugreek (*Trigonella foenumgraecum*).

Figure 2: Germination pot of fenugreek.

CONCLUSION

From the above experiment it was observed that the concentration of treated dairy effluent increases which shows increases in seed germination. Seedlings growth, fresh wt. and dry wt. Protein content, chlorophyll content of fenugreek plant. From present study it was concluded that treated dairy effluent has favourable effect on soil properties and the higher concentration of treated dairy effluent show favourable effect on growth of Fenugreek plant the all concentration show more favourable for growth of Fenugreek plant. The Fenugreek plant species shows higher growth at 100 % concentration of treated dairy effluent, from that it was concluded that 100 % concentration was found to be the best concentration for growth of Fenugreek plant.

REFERENCES

1. Arora S, Chopra AK, Joshi N, Prasad G. Physicochemical and bacteriological characteristics of Aachal dairy mill effluent and its effects on seed germination of some agricultural crops. Nature Environment and Pollution Technology, 2005; 4: 441–444.
2. Arvind Kumar Effect of Dairy on Seed Germination Seedlings Growth of Pennisetum Typhoids, International Journal of Research in science & technology, 2011; 1.
3. Bhatnagar M. and Gupta, S., Impact of dairy effluents on physicochemical, 2002.
4. Banupriya G. & S. uma Ghowrie A Study on Microbial diversity of dairy effluent & impact on growth of different plant Species .International Journal of CURR science, 2012; 2: 71-77.
5. Braio, V.B. and C.R. Granhem Taveres, EffluentFolin phenol reagent. Journal of Biological generation by the dairy industry: preventive attitude Chemistry, 2007; 193: 265.
6. Characteristics of soil. Asian Journal of Chemistry, 14: 300-304.
7. Dhanam S. Effect of Dairy on Seed Germination, Seedlings Growth and Biochemical parameter in paddy, Botany Research International journal, 2009; 2: 62-63.
8. Gaikar Rajendra b, Uphade B. k, A. G. Gadhave S.R. kuchekar Effect of Dairy Effluent on Seed Germination and Early Seedlings Growth of Soyabeans, Rasayan Journal chemistry, 2010; 3: 137-139.
9. Gautam D.D., Bishnoi S.C. Studies on the Effect of amul dairy effluent on soil characteristics & growth of wheat plant .advance in plant science, 1990; 3: 234-236.

10. Goswami Bhakti N. K., GajjarBijal, JainChirag, Soni Deepak, Patel Krishna Utilization of Amul Dairy Effluent for Agriculture Practices , International Journal of Environmental sciences, 2011; 2: 402-408.
11. Harash D. P., Hampannavar U.S., Mallikarjunaswami M.E. Treatment of Dairy waste water using aerobic biodegradation & Coagulation. International Journal of environment science & Research, 2011; 1: 23-29.
12. Kolhe A.S., Pawar V.P. Physico-Chemical analysis of effluents from dairy industry. Recent Research in Science and. Technology, 2011; 3: 29-32.
13. kushwahaJai prakash, vimal Chandra srivastava An Overview of varies Technologies for the treatment of dairy waste waters, Critical Reviews in food science & Nutrition, 2011; 5: 442-452.
14. Macoon, B., K.R. Woodard, L.E. Sollenberger, Press, New York, pp: 173. E.C. French III, M.M. Porter, D.A. Graetz, G.M. Prik10. Moore, S. and W.H. Stein, 1948. Photometric method and H.H. Van Hern Jr., Dairy effluent effects on for use in the chromatography of amino acids. herbage yield and nutritive value of forage cropping Journal of Biological Chemistry, 173: 367-388. system. Agronomy Journal, 2000; 94: 1043-1049.
15. Manu k. j., Mohan Kumar M., Mohana v. s. Effect of Dairy Effluent (treated and untreated) on Seed germination, Seedlings Growth and Biochemical parameters of Maize, International Journal of Research in chemistry & environment, 2012; 2: 62-69.
16. Summer, J.B. and G.F. Somers, Journal of Chemical Engineering and opportunities Laboratory, 1949; 24(4): 487-497.
17. Varma Lav & Sharma Jyoti Effect of Dairy & textile waste on growth of plant wheat,, Rasayan Journal chemistry, 2012; 5: 351-355.
18. Yadav, J. P. and Meenakshi, Impact of surgical effluent on germination, seedling growth and yields of selected crops, 2007.
19. Zabek S. Content of macro and micro-elements in crops irrigate with dairy plant sewage. Rockizi. Nauk Rok lniczych, 1976; 101: 71-78.