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Valorization of waste obtained from oil extraction of *Moringa oleifera* seeds

Krutika Vijay Shenmare
Faculty of Agriculture and Veterinary Sciences, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

Abstract
The dairy business is perhaps the biggest wellspring of wastewater beginning from food handling ventures. The dairy effluents are not generally connected with major a natural issue, which mostly comprises of solvent organics, follow organics and suspended solids. All means in the dairy business, including creation, preparing, bundling, transportation, stockpiling, circulation and advertising, greatly affect climate. (Strydom, Mostert, & Britz, 1993). Dairy handling squanders contains natural substances like proteins, starches and lipids, high organic oxygen interest (BOD) and synthetic oxygen interest (COD), high nitrogen focus, high suspended oil and additionally oil substance, and huge varieties in pH, which requires treatment prior to releasing to limit ecological issues. Dairy wastewater removal typically brings about one of three issues:
(a) High treatment demands being charged by nearby experts for modern wastewater;
(b) Pollution may be caused when untreated wastewater is either released into the climate or utilized straightforwardly as water system water; and
(c) Dairy plants that have just introduced an oxygen consuming organic framework are confronted with the issue of slime removal.
As the dairy business are significant water clients and is a contender for wastewater treatment and reuse. In house wastewater treatment the Executives decreases squander age at the source, in this manner assists diminishing with costing or improves downstream handling offices.

Keywords: *Moringa*, oleifera seeds, dairy business, dairy waste water, ecological issues

Introduction
The wastewater from food processing industries has distinct characteristics that set it apart from municipal wastewater around the globe. The effluent standards set dairy wastewater given by the managing authorities are shown in Table 1.

Table 1: Dairy Effluent Standards

Parameter	Concentration (Upper Limit)
pH	6.5-8.5
BOD at 27ºC, 3 days	100 mg/ml
Suspended Solids	150 mg/ml
Oil and Grease	10mg/ml

Moringa oleifera
Moringa oleifera (Moringaceae) is a fast-growing softwood tree indigenous to India but now spread throughout the
Tropical areas at altitude up to 2000 m. It is one of 14 species within the same genus. (Leone, Spada, Battezzati, Schiraldi, Aristil, & Bertoli, 2015) [6] All pieces of the Moringa tree (leaves, seeds, roots and blossoms) are appropriate for human and creature utilization. The seeds all things considered, have stood out because of the reality of containing great structure of unsaturated fats and subsequent to refining oil being impervious to oxidative disintegration. Prior examinations likewise show a non-food use of Moringa seeds, as a coagulant for wastewater treatment. (Amagloh & Benang, 2009) [1]
Apart from being non-toxic, use of Moringa has an added advantage as it is biological and proved to be edible. The cost of this natural coagulant will be less as compared to conventional chemical coagulants used for water purification due to its easy availability in Indian subcontinent.
Coagulation is a water treatment cycle of settling colloid particles to encourage the development of particles, while flocculation is a cycle of water treatment in which contact between colloidal particles that have been destabilized is expanded so the size of the particles develops into bigger particles and can be handily isolated out of the water. (Kiely G, 1998) [5]

Materials and Methods
Preparation of *Moringa oleifera* Seed Powder
Moringa oleifera seeds were collected locally. The wings and coat from seeds were removed and fine powder was prepared using mortar and pestle.

Proximate Analysis of Moringa Seed Powder
Moringa oleifera seed powder was analysed initially for moisture content, total ash content, protein content, fat content, crude fibres content and total carbohydrates content using oven method, protein digestion method, Soxhlet method and Fibra plus hot extraction unit respectively. (AOAC, 2005) [2]

Physico-Chemical Analysis of Moringa Seed Oil:-
Using the standard methods of analysis of oil samples the physico-chemical characteristics were determined. Saponification value and iodine number was worked upon to check the oil quality. (AOAC, 2005) [2].

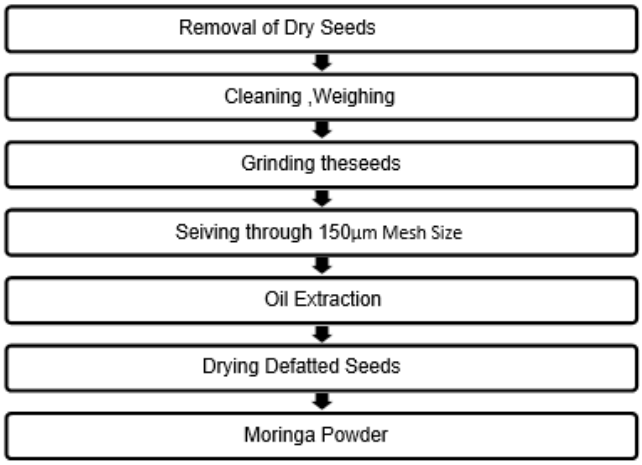

Fig 1: Flow sheet for Preparation of Moringa Seed Powder

Dairy wastewater treatment

Jar test apparatus was used for proper mixing of *Moringa oleifera* seed powder in the dairy wastewater sample. The apparatus was run for 45min at 30rpm speed followed by 1hour settling time. The dairy effluent samples were treated with varying concentration of MO seed powder of 2.5 mg, 10mg, 50mg, 100mg, 150mg and 200mg in 200ml of wastewater sample.

Treated wastewater analysis

After completion of jar test all the samples were tested for various characteristics including pH, turbidity, total solid content, hardness, COD (chemical oxygen demand) and BOD (biological oxygen demand). For determination of these characteristics following equipment and methods were used as pH meter, turbidity meter, and modified Winkler's method for BOD at 27ºC for 3days. (APHA, AWWA, WEF, 2005) [3] (Maithi, 2004) [7]

Results and Discussion

In the present investigation, efforts have been made to study the effect of different dosages of MO (*Moringa oleifera*) seed powder on the water quality of Dairy Industry Wastewater. An optimum dosage is also selected as per the results.

Proximate Analysis of Moringa Seed Powder

Proximate analysis of seed powder was done using standard analytical methods. The data obtained are presented in Table no. 2.

Table 2: Proximate Analysis of Moringa Seed Powder

Parameters	Percentage Content
Moisture Content	9
Total Ash	3.05
Fat Content	33.98
Protein Content	29
Crude Fibre Content	11.25
Carbohydrates Content	13.72

Physico-Chemical Properties of Moringa Seed Oil

The oil obtained from Soxhlet extraction was analysed for the physico- chemical properties. The volume of oil obtained was 5ml from 12.48gms of Moringa seeds. The data obtained is given in Table no. 3 below.

Table 3: Physico-Chemical Properties of Moringa Seed Oil

Parameters	Values
Iodine Value	90
Saponification Value	176.43
Free Fatty Acid	2.24

Treated wastewater analysis

pH

The values obtained are given below in Table no. 4. It was found that pH of the untreated sample was found to be slightly acidic. When samples were treated with different concentrations of Moringa seeds powder a slight increase in pH was observed, which was maximum for 150 mg/200 ml.

Turbidity

Turbidity was noted for each example, values got are given underneath in Table no. 4. It was discovered that turbidity was diminishing consequently with expanding grouping of *Moringa oleifera* seed powder. There was critical decline in turbidity with most noteworthy for 200 mg/200ml with rate decrease to be 92.01%.

Hardness

10 ml of each sample was taken for analysis using Complexometric titration to measure permanent hardness of wastewater. With increasing the concentration of MO seed powder, reduction in permanent hardness was observed. At the concentration of 200 mg/ 200 ml showed the maximum reduction of 29.85%. The data obtained from analysis is shown in Table no. 4 below.

Solid Content

20 ml of each of the samples was analysed for measurement of total solids, total dissolved solids and total soluble solids. It was observed that initially there was slight decrease in the solids present but further increase in concentration of the MO seed powder as coagulant the solids content increased. It is evident from the data represented in Table no.4 depicted below.

Chemical Oxygen Demand (COD)

Standard laboratory procedure was used to measure the COD of various wastewater samples. It was found that COD was decreasing with increasing concentration of coagulant. Maximum reduction in COD was obtained at concentration of 150 mg/200m. The percentage reduction was 81.54%. The values obtained for COD are given below in Table no. 4.

Biological Oxygen Demand (BOD)

3days BOD at 27ºC determined by standard laboratory method for each of the samples. It was found that the BOD decreased with increasing concentration of MO seed powder. 87.77% of highest percentage reduction was seen at the concentration of 150mg/20ml. the obtained BOD data is given below in Table no.4.

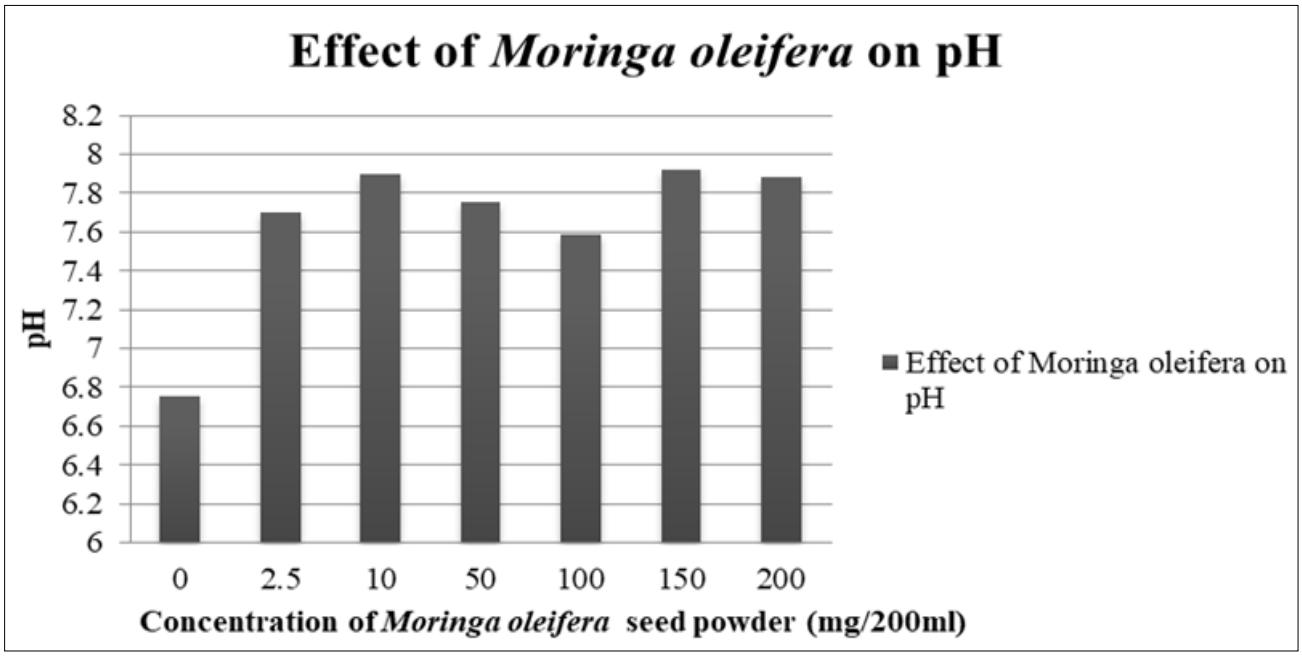

Fig 2

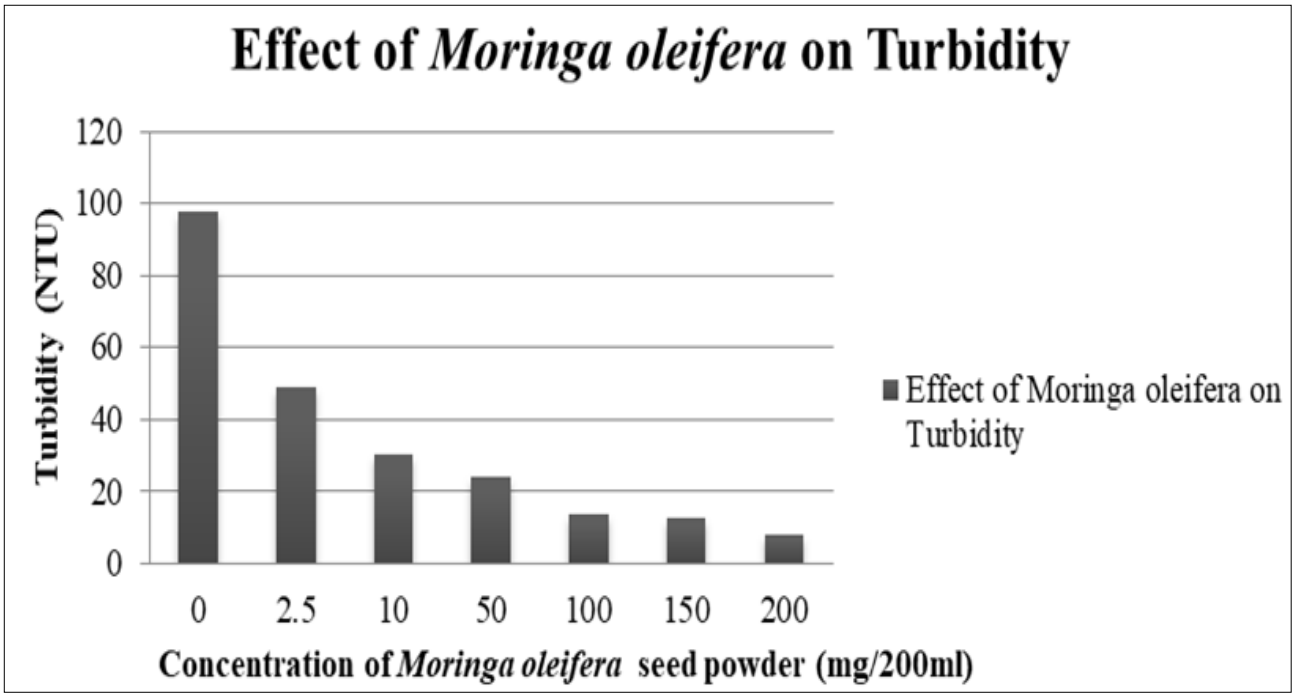

Fig 3

Table 4: Effect of Different Dosages of MO seed Powder on Various Parameters of Wastewater of Dairy Industry

Different Dosages (mg/200 ml)	pH	Turbidity (NTU)	Hardness (mg/l))	Total Solids (mg/100 ml))	Total Dissolve d Solid s (mg/100ml)	Total Suspended Solid s (mg/100ml)	COD (mg/l))	BOD3 (mg/l))
0	6.75	97.7	335	0.9	0.79	0.11	764.4	360.6
2.5	7.70	49.1	290	0.8	0.76	0.04	7.44.8	254.8
10	7.90	30.2	275	0.7	0.595	0.105	588.8	210
50	7.75	24.2	270	0.825	0.6	0.225	533.1	166
100	7.59	13.4	269	1.025	0.9	0.125	290.1	103.6
150	7.92	12.6	240	1.205	1.026	0.179	141.1	44.1
200	7.88	7.8	235	1.165	1.04	0.125	145	51.8

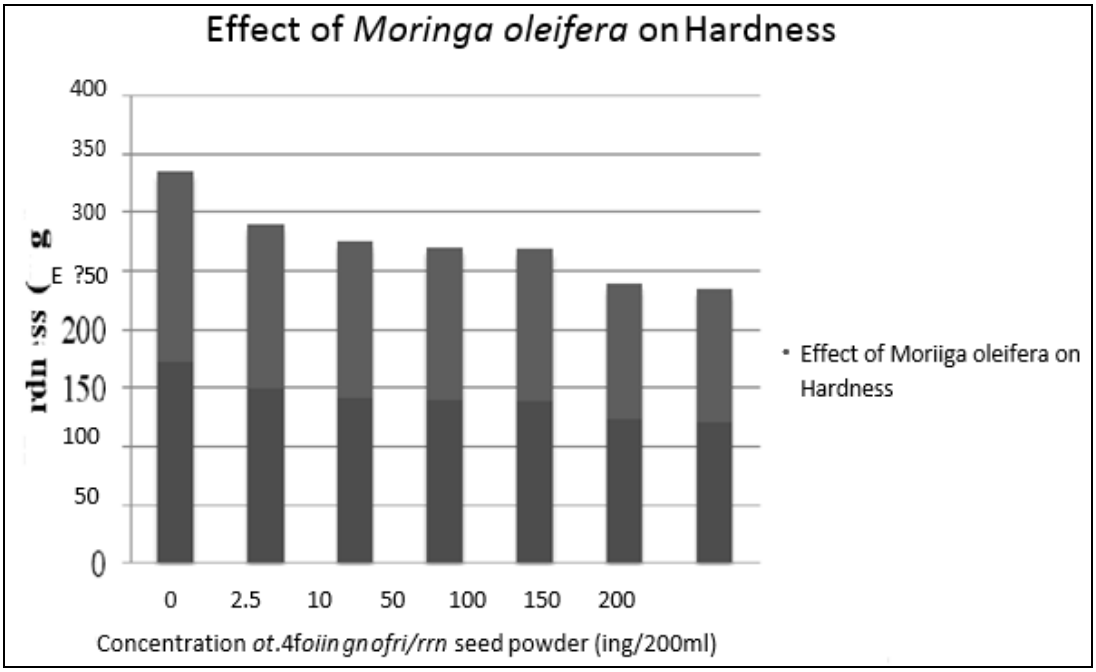

Fig 4

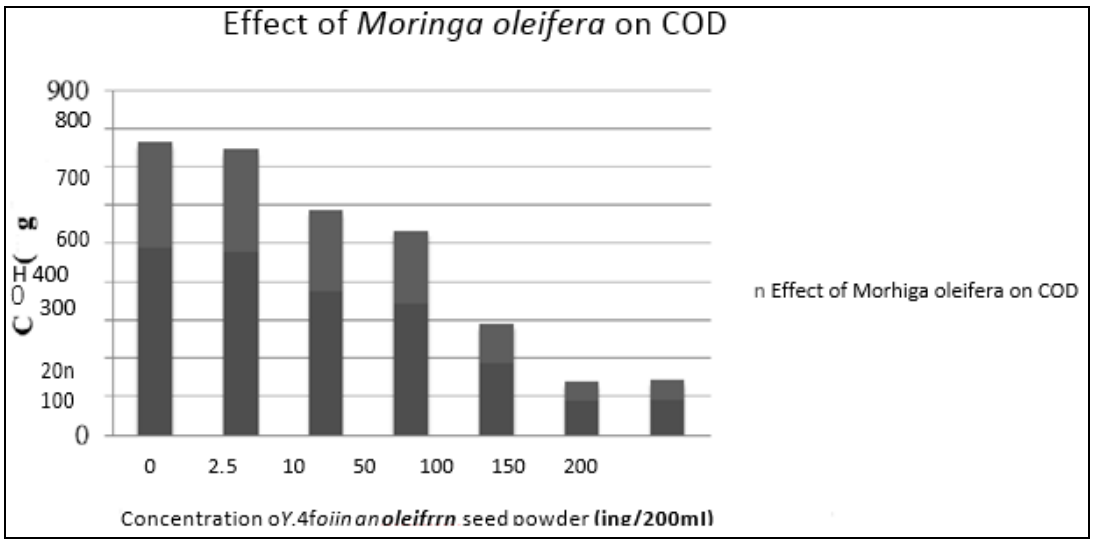

Fig 5

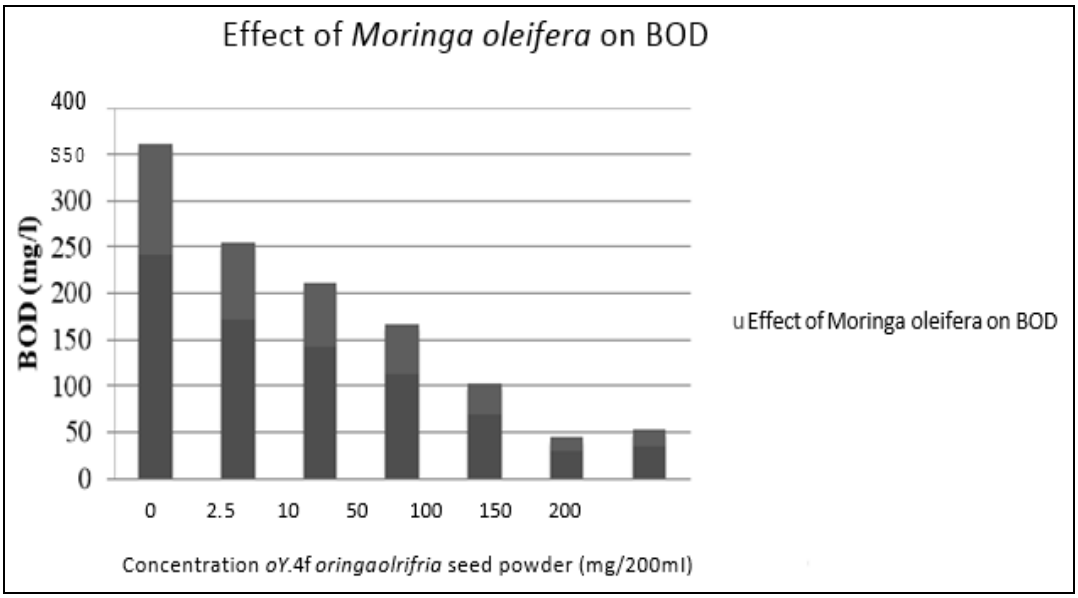

Fig 6

Conclusion

From the above discussion we can conclude that the use of natural coagulant from plant origin represents a vital development in sustainable environment technology as it focuses on improvement of wastewater quality from dairy industry. Result showed that the yield of oil from *Moringa oleifera* seeds is 33.98%. The defatted *Moringa oleifera* seed waste can act as good coagulant for the treatment of dairy effluent as it showed maximum decrease in COD, BOD and permanent hardness of the waste water due to the presence of water soluble proteins in M. oleifera seeds which acts as a good coagulant.

The coagulation effect of Moringa seeds can be even better than other chemical coagulants as it exhibits strong antimicrobial activity. Thus, exploiting the potential of plants may offer cheap, environment friendly and non-toxic methods of water purification. This may overcome the hazards possessed by using synthetic chemical compounds in water purification. (Talnikar, 2017)

Thus, the seeds can be used to obtain Moringa oil and defatted seed powder can be valorised as coagulant for treating dairy industry wastewater.

References

1. Amagloh FK, Benang A. Effectiveness of *Moringa oleifera* seed as coagulant for water purification. African Journal of Agricultural Research, 2009:4(1):119-123.
2. AOAC. Official Methods of Analysis (18th ed.). Maryland, United States of America, 2005.
3. APHA, AWWA, WEF, 2005.
4. Standard Methods of Examination of Water and Wastewater (20 ed.). Washington DC.
5. Kiely G. Environmental Engineering. Boston: Irwin McGraw-Hill, 1998.
6. Leone A, Spada A, Battezzati A, Schiraldi A, Aristil J, Bertoli S. Cultivation, genetic, ethnopharmacology, phytochemistry and pharmacology of *Moringa oleifera* leaves: An overview. International Journal of Molecular Science,2015:16:12791-12835.
7. Maithi SK. Handbook of Methods in Environmental Studies (2nd ed.,). Jaipur: ABD, 2004, 1.
8. Strydom J, Mostert J, Britz T. Effluent production and disposal in the South African dairy industry- a postal survey. Water SA,1993:19(3):253-258.
9. Talnikar TD. Natural Coagulant for Wastewater Treatment: Review. Pravara Journal of Science and Technology,2017,38-42.