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MORINGA OLEIFERA POTENTIALLY A NEW SOURCES OF BIOREMEDIATION FOR WATER POLLUTION

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ABSTRACT

The Moringa tree had spread to most part of Asia, nearly the whole of Africa, South America, southern part of North America and some pockets in Europe. It has been found useful in nutrition, agriculture, soil control, water purification, industrial applications, cattle feed etc. The effect of the seed oil cake of *Moringa oleifera* on the turbidity of the water and waste/effluent water samples is A considerable reduction in turbidity was obtained in the range of 25.00 – 94.64%. As far as the pH is concerned there was no evidence that fluctuations from pH range of 3.10 to 8.33 indicating that the textile waste water has the highest pH value of 8.33 before treatment with the coagulants to the range from 3.94 – 7.26 (1 hr after treatment with seed oil cake) and 4.08 – 7.16 (24 hrs after treatment with seed oil cake) The seed oil cake of Moringa reduced the turbidity of most water samples in the range of 1.84–20.65% and increased the waste samples in the range of 27.10-31.61%.

KEY WORDS: Bioremediation, *Moringa oeifera*, Seed oil cake, Water.

INTRODUCTION

Moringa (botanical name "*Moringa oleifera*") or Sahjan also called Drumstick tree or Horseradish tree is a versatile tree useful not only for human beings but also for animals and also in various industrial applications. People in India have been using it as an item of their daily food for nearly 5000 years. It has been used in the Ayurvedic for thousands of years. The ancient Egyptians, Greeks and Romans especially appreciated the healthy and cosmetic qualities of the oil that could be easily squeezed from its seeds. The Maringa tree had spread to most part of Asia, nearly the whole of Africa, South America, southern part of North

America and some pockets in Europe. It has been found useful in nutrition, agriculture, soil control, water purification, industrial applications, cattle feed etc and also for treating various types of illnesses in humans and livestock. The main constituents of Moringa plant are : deic, palmitic and stearic acid, saponins, glycoside, gum, protein Vitamins: A (8855 IU per 100g), B1, B2, B3, C Minerals: calcium, iron, phosphorus, magnesium.

The leaves, flowers and pods are used as significant sources of vitamins A, B and C, riboflavin, nicotinic acid, folic acid, pyridoxine, ascorbic acid, beta-carotene, calcium, iron, and alpha-tocopherol (Dahot, 1988). The Moringa tree has great use medicinally both as preventative and treatment. .Sahjan (*Moringa oleifera*) bark, sap, roots, leaves, seeds, oil, and flowers are used in traditional medicine in several countries. A folk remedy for stomach complaints, catarrh, cancer, gastric ulcers, skin diseases, lowering blood sugar, increasing bone density, nervous conditions, diabetes, fatigue, increase lactation, hay fever, impotence, edema, cramps, hemorrhoids, headaches, sore gums; to strengthen the eyes and the brain, liver, gall, digestive, respiratory and immune system, and as a blood cleanser and blood builder.

However, the nutritional content of the leaves varies significantly depending on whether they are consumed dry or fresh, meaning that you get additional benefits if you consume both. Gram-for-gram dried leaves measure up against other foods as follows:

10*x* the Vitamin A of carrots

0.5*x* the vitamin C of oranges

17*x* the Calcium of Milk

15*x* the potassium of Bananas

25*x* the iron of spinach

9*x* the protein of yoghurt

Water treatment

Seeds crushed to a powder are used to clarify turbid, dirty water. The cleansing takes place by a process of electrical charges established between the muddy particles suspended in the water and the pulverized seeds, and gradually, after about an hour, the muddy particles are pulled to the bottom of the water by the force of gravity. Research shows that the seed not only settles the mud, but can carry with it over 90% of bacteria and viruses.

Therefore the present study based on the objective

To Study of Bioremidiation of terbit water treatment using seed oil cake of *Moringa oleifera.*

MATERIALS AND METHODS

Dry seeds of *M. oleifera* were collected from the different locations in the Jabalpur.

Water Sample Collection.

Samples of 5 different ponds viz. Hanumantal, Supatal, Sangramsagartal, Gangasagartal, Bhansinghtal were collected at different location in Jabalpur. Water samples representing different turbidities were collected in sterile two water plastic containers. The samples were taken to the laboratory and were analyzed within 6 hours (maximum transit time - 4 hours, maximum process time - 2 hours), before treatment with the coagulant. Raw water samples were analyzed for physiochemical and bacteriological quality. Physical tests of water were carried out using the human sense organs to determine the physical characteristics to the various absorbance of the sample at 540nm wavelength using colorimeter (MODEL 6025 JENWAY, UK) as described by Kareem *et al.* (2002). The turbidity absorbance readings at 540 nm wavelengths were taken immediately after collection of raw water and waste water samples.

The microbial load of the water samples were determined by the pour plate method using both plate count agar (PCA) and nutrient agar (Arinatu *et al*, 1999). The coliform count and faecal coliform count was determined by the multiple tube fermentation technique/ method (Prescott *et al*., 1999, Lamikanra, 1999, Fawole and Oso, 2001), for Most Probable Number (MPN) / Colony Forming Unit (CFU) counts of the water samples the results obtained were compared with the MPN index. Seeley and Demark, (1981) to estimate the number of coliform to estimate the number per ml (Edema *et al*., 2001).

Seed & Root Oil Extraction

Within households, value-added oil can easily be extracted from *Moringa oleifera* seed. The following procedure is adapted from Price (1985).

Materials

Moringa oleifera Lam. mature fruit pods, Boiling water, Household spice crusher (grinding stone or mortar), Skillet, Pot, Skimmer utensil (e.g., ladle), Cotton filter cloth, Clean containers.

Processer

1. Harvest mature (brown) fruit pods from tree.
2. Crack fruit pods along seam and pluck out seeds.
3. Remove the seed coat and the wings from the white/yellowish seed kernels (cotyledons).
4. Roast the seed kernels in a skillet.
5. Mash the seed kernels thoroughly.
6. Place the seed cake in boiling water for a total of 5 min.
7. After boiling, strain liquid through a cotton filter cloth into a clean container. Retain the seed cake from the cotton cloth.
8. Dry seed cake (presscake) for 2 to 3 days in direct sunlight.
9. Leave liquid in container overnight.
10. Next day, skim off the oil that has risen to the surface.
11. Filter the oil through a cotton cloth and store in a clean container.
12. Store dried seed cake.

RESULTS AND DISCUSSION

Experiment No.1. (a) The Effect of the seed oil cake of *Moringa* on the Turbidity of different water samples

The effect of the seed oil cake of *Moringa oleifera* on the turbidity of the water and waste/effluent water samples is shown in (Table -1). A considerable reduction in turbidity was obtained in the range of 25.00 – 94.64%. As the time interval after treatment with the coagulant increased, so did the degree of the clarification until the maximum time above which there was no further decrease in turbidity. The maximum time varied for the different coagulant to the samples treated but for these two coagulants it was 24 hrs.

Thus, this reduction of turbidity by 25 to almost 100% was also found by application of conventional coagulants. The degree of reduction seemed to depend on the time intervals after treatment as can be seen from the figures with seed oil cake of *M. oleifera*. With a lower time (1 hr) the reduction was less because it was probably below optimum time interval than was found for 24 hrs interval after treatment.

Table 1: The Effect of seed oil cake of *Moringa oleifera* on Total Viable Count (TVC) Cfu/ml of Water and Waste Water Samples 1 Hr and 24 Hrs Intervals after Treatment

Sample	Initial	Final-1 hr	% Reduction/ Increment	Final - 24 hrs	% Reduction/ Increment
HT	$1.6x10^3$	$2.0x10^2$	87.50	$0.0x10^2$	100.00
ST	$1.5x10^4$	$0.0x10^2$	100.00	$6.0x10^2$	96.00
SST	$1.7x10^4$	$2.0x10^2$	98.82	$7.0x10^2$	95.88
DT	$1.2x10^4$	$5.0x10^2$	95.83	$0.0x10^2$	100.00
GST	$1.8x10^4$	$5.0x10^2$	96.11	$5.0x10^2$	97.22

HanumanTal (HT), SupaTal(ST), Sangram SagarTal(SST), DevTal(DT), Ganga SagarTal(GST)

Experiment No. 1.(b)Effect of pH of different water samples

The Effect of the seed oil cake of *Moringa oleifera* on the Odour and Colour of the samples. The seed oil cake of *Moringa oleifera* reduced the objectionable odour associated with domestic effluent as well as the colour of the waste samples while the colourless samples remain very clear.

Table 2 :The Effect of seed oil cake of *Moringa oleifera* on pH of the Water sample.

Sample	Initial	Final-1 hr	% Reduction/ Increment	Final - 24 hrs	% Reduction/ Increment
HT	8.01	7.11	11.24	6.84	14.61
ST	8.57	6.94	19.02	6.8	20.65
SST	7.05	6.92	1.84	6.86	2.70
DT	8.22	7.26	12.85	6.87	17.53
GST	5.51	7.2	30.67	7.12	29.22

pH reading at 25^0C seed oil cake of Moringa.

HanumanTal (HT), SupaTal(ST), Sangram SagarTal(SST), DevTal(DT), Ganga SagarTal(GST)

As far as the pH is concerned there was no evidence that fluctuations from pH range of 3.10 to 8.33 indicating that the textile waste water has the highest pH value of 8.33 before

treatment with the coagulants to the range from 3.94 – 7.26 (1 hr after treatment with seed oil cake) and 4.08 – 7.16 (24 hrs after treatment with seed oil cake) indicating a decrease from alkalinity to near neutral pH except for the Sangram Sagar Tal and Hanuman Tal water samples where an increase in pH was recorded in all the samples measured 1 hr and 24 hrs after treatment. The generally low pH values obtained in the raw water samples before treatment with the *M. oleifera* seed oil cake, might be due to the high levels of free CO_2, in the water samples, which may be consequently affect the bacterial counts as indicated by Edema *et al*. (2001).

Experiment No. 1. (c) The Effect of the seed oil cake of *Moringa* on theTurbidity of the Water samples

A reduction in the turbidity (at 25^0C) was obtained in the range of 0.92-20.65% and an increased in turbidity of some waste water sample was also obtained in the range of 27.10-32.90 %. The seed oil cake of Moringa reduced the turbidity of most water samples in the range of 1.84–20.65% and increased the waste samples in the range of 27.10-31.61%. As the time interval after treatment increased, so did the degree of turbidity reduction and increment increases .

Table 3: The Effect of seed oil cake of *Moringa* on Turbidity of the Water and Waste Water Samples after 1 Hr and 24 Hrs Intervals after Treatment

Sample	Initial	Final-1 hr	% Reduction/ Increment	Final - 24 hrs	% Reduction/ Increment	Final/ Increment	% Reduction/ Increment
HT	0.08	0.06	25.00	0.04	50.00	0.07	12.5
ST	0.13	0.07	46.15	0.03	76.92	0.12	7.69
SST	0.45	0.17	62.22	0.14	98.89	0.44	2.22
DT	1.00	0.20	80.00	0.02	98.00	0.98	2.00
GST	0.56	0.12	78.57	0.03	94.64	0.54	3.57

Turbidity (Absorbance Reading at 540 nm)

HanumanTal (HT), SupaTal(ST), Sangram SagarTal(SST), DevTal(DT), Ganga SagarTal(GST)

SUMMARY AND CONCLUSION

The present study was conducted to obtain *Moringa oleifera* is a new source of *Bioremediation* of Water pollution.The effect of the seed oil cake of *Moringa oleifera* on the turbidity of the water and waste/effluent water samples is shown in (Table -1). A considerable reduction in turbidity was obtained in the range of 25.00 – 94.64%. As the time interval after treatment with the coagulant increased, so did the degree of the clarification until the maximum time above which there was no further decrease in turbidity. The maximum time varied for the different coagulant to the samples treated but for these two coagulants it was 24 hrs.The degree of reduction seemed to depend on the time intervals after treatment as can be seen from the figures with seed oil cake of *M. oleifera*. With a lower time (1 hr) the reduction was less because it was probably below optimum time interval than was found for 24 hrs interval after treatment.

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