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Waste Water Treatment by using Citrullus lanatus Seed as a Coagulant

[1]Neenu Surendran, [2]Athulya Rajeev, [3]Aparna K, [4]S.Reshma, [5]J.R.Anoop Raj
[1][2][3][4][5]Sree Buddha College of Engineering, Pattoor P.O, Nooranad, Alappuzha, Kerala, Pincode-690529

Abstract: ***Water is an essential commodity in our day today life. So the purity of water is an important factor for human health. There are usually a number of pollutants in water that need to be dealt with and consequently there are various water treatment steps that need to be taken to remove these pollutants, like sedimentation and filtration. Most of these solids does not get removed, so in order to accomplish this, coagulation and flocculation has to be implemented. Synthetic coagulants are used to treat water which has negative impacts on health. The treatment system should have the smallest possible environmental impact; therefore, the use of systems and natural treatment techniques, involving a natural coagulant, is an important alternative. Since natural coagulants do not consume alkalinity unlike alum, pH adjustments can be omitted and this provides extra cost savings. Natural coagulants are also non-corrosive which eliminate the concerns of pipe erosion. The advantages of using natural plant-based coagulants for water treatment is that, they are cheaper to purchase, they do not produce treated water with extreme pH and they are highly biodegradable. Water melon seed has high protein content and is considered that the active coagulant agents in plant extract are proteins. This study investigates the possibility of using spitted water melon seeds as natural coagulant for purification of turbid water and the use of extracted oil in skin care.***

Keywords: ***Natural coagulant, Water melon seeds, Synthetic coagulant, Waste water treatment.***

I. INTRODUCTION

An estimated 90% of wastewater in developing countries undergoes no treatment. Health and safety are the primary considerations for water purification. There are usually a number of pollutants in water that needs to be dealt with and consequently there are various steps that need to be taken to accomplish that purpose. Impure surface water affects human health, if consumed without purification. The cost of water treatment is increasing and the quality of river water is not stable due to suspended and colloidal particle load caused by land development and high storm runoff during the rainy seasons. During the rainy seasons the turbidity level increases and the need for water treatment chemicals increase as well, which leads to high cost of treatment which the water treatment companies cannot sustain. As a result, the drinking water that reaches the consumer is not properly treated (Muyibi *et al*., 2009). Therefore, it is of great importance to find a natural alternative for water coagulant to treat the turbidity.

Recent studies have indicated a number of serious drawbacks linked to the use of aluminium salts such as Alzheimer's disease associated with high aluminium residuals in treated water, excessive sludge production during water treatment and considerable changes in water chemistry due to reactions with the OH– and alkalinity of water. In addition, the use of alum salts is inappropriate in some developing countries because of the high costs of imported chemicals and low availability of chemical coagulants (Adejumo *et al*., 2013). In addition, monomers of some synthetic organic polymers such as acrylamide have neurotoxicity and strong carcinogenic properties and because of this, there has been considerable interest in the development of natural coagulants which are safe for human health and biodegradable (Ghebremichael, 2004).

2 METHODS

2.1 Sample collection

Spitted water melon seeds were collected from juice shop at Pathanamthitta, Kerala and raw water sample was collected during the month of January 2018.

2.2 Sample Preparation

Water melon fruits were sliced using a clean stainless steel knife, seeds were removed, washed thoroughly with distilled water and sun dried for a week. The dried seeds were then ground and sieved into fine powder using a domestic blender. 50g of the seed powder obtained was packed in a thimble and placed in soxhelet extraction apparatus. 167ml of n-hexane was used to extract oil from powdered seeds. The apparatus was left running for 3 h until the extraction was completed. The residue (cake) was collected and washed with distilled water to remove traces of n-hexane, dried in an oven until constant weight was obtained and sieved. The sieved finer particles were then used as coagulant. The oil extracted is again distilled to separate oil and n-hexane. Thus water melon seed oil is obtained (I.M. Muhammad et al., 2015)

2.2 Determination of water quality parameters

Turbidity: Turbidity of the water sample was measured before and after treatment using a turbidimeter (- +/ -2.OF FS IN 0 to 1000 NTU Ranges, Systronics) and the results was recorded (references…)

pH: The pH of the samples was taken using an electronic pH meter.

Colour: Colour of the water sample was carried out before and after treatment

Jar Test

The jar test apparatus was used to carry out coagulation and flocculation on the water samples using standard methods (I.M. Muhammad et al., 2015)Six 1L beakers were used to study the effect of coagulant dosage on coagulation, the effect of pH on coagulation and the effect of stirring time and speed on coagulation. The following parameters were then measured on the filtrate after the coagulation was completed; turbidity, colour, flocs weight, TDS and conductivity. Six different weights of the coagulant were placed in each beaker, the first having 0.1g, and the remaining five varying from 0.1-0.6g at 0.1g interval in order to determine the optimum dosage. The raw water sample was then added to make up the 250ml mark and the jars were then placed in the jar test kit and the stirrers lowered into each. The stirring speed was set at 150rpm for rapid mixing for 2 minutes and 80rpm 8minutes for slow mixing. After this was completed the samples were allowed to settle and the flocs filtered using a filter paper and the parameters listed above were measured on the filtrate. From the results obtained the dosage with the best results in colour and turbidity removal was taken as the optimum.

The procedure above was used again; however a dose of 0.1g was maintained in all six beakers. The pH was varied from 6.0-8.5 by the addition of few drops of 1M NaOH into the beakers to make it alkaline. A few drops of 1M H2SO4 solution were also added in the first beaker to make it slightly acidic at 6.0. The same speed and stirring time was used as above and the parameters listed above were measured after the coagulation flocculation and filtration process. The pH at which the best turbidity and colour removal were observed at was taken to be the optimum pH for coagulation.

Effect of coagulant dosage was also studied. The optimum dosage of 0.1g was used in all the beakers. The stirring speed was then varied ranging from 50rpm-300rpm at 50rpm interval. After the coagulation-flocculation process was completed for each, the samples were then filtered and the filtrate was used to test for the parameters. The same was done to determine the optimum stirring time, using the optimum speed to determine the best stirring time The stirring time was varied at 2mins, 5mins, 8mins, 10mins and 15mins for each beaker. After the coagulation flocculation process was completed, the samples were then filtered and the filtrate was used for the tests.

2.3 Antimicrobial activity

This study was aimed at evaluating the effect of extraction methods on the antibacterial activity of Citrullus lanatus seed extract. Anti microbial activity of seed extract is determined by agar disc diffusion method

2.3.1 Preparation of test specimens

Clinical isolates of Escherichia coli were obtained from the college laboratory. The test organisms were sub-cultured and incubated at 37°C for 24 h on nutrient agar slant medium and were stored 0-4°C till use. They were then further sub-cultured in nutrient broth at 37°C for 24 h. Standard culturing techniques were used for the isolation and sub-culturing of microorganism (Adelani-Akande Tabitha Adunola et al., 2015)

2.3.2 In-vitro antibacterial activity

5.6g of nutrient agar is weighed and dissolved in 200ml distilled water. It was heated to dissolve completely and autoclaved at 121°C for 15min for sterilization. Then the media was dispensed in plates and left the agar media to solidify.
1ml of broth culture of seed powder is poured on the Plate. Then again, 1ml of broth culture of respective bacteria poured into Petri plate and sample was spread evenly over the surface of agar. One plate is kept as control. Whatman filter paper no. 1 is used to prepare discs approximately 6 mm in diameter, which are placed in a Petri dish and sterilized in a hot air oven. Then the disc is placed in Petri plate and left for 24 hours of incubation. After incubation, the zone of inhibition for extract and the control was measured using a meter rule and recorded.

3 Results and discussion

The natural coagulant is produced by using Citrullus lanatus seed and its antimicrobial activity is also tested by using E.coli bacteria. The effect of natural coagulant is determined by jar test.

4 Conclusion

Data obtained from this work have shown that the crude extracts of watermelon seeds can be used as a safe and cost effective means of wastewater purification. This is highly recommended for water treatment in developing countries, especially in the rural communities, where people have little or no access to clean drinking water. The data obtained showed that watermelon seeds had a good turbidity and colour removal thus can be used in the treatment of wastewater.

REFERENCES

1. Adejumo, M., Oloruntoba, E.O. and Sridhar, M.K. (2013) 'Use of Moringa oleifera (lam.) Seed powder as a coagulant for purification of water from unprotected sources in Nigeria', European Scientific Journal, vol. IX, no. 24.
2. Amagloh, F.K. and Benang, A. (2009). Effectiveness of Moringa oleifera Seed as Coagulant for Water Purification, African Journal of Agricultural Research 4(1): 119-121
3. Muhammad, I.M., Abdulsalam, S., Abdulkarim, A. and Bello, A.A. (2015). Water Melon Seed as a Potential Coagulant for Water Treatment; Global Journal of Researches in Engineering,15 (1): 2-5.
4. Poornima, S. (2016).Natural Coagulants for Water Purification: An Ecofriendly Approach, World Journal of Pharmaceutical Research, 5(5): 1-5
5. R.E. Kukwa, A.A. Odumu, D.T. Kukwa, OSR Journal of Applied Chemistry (IOSR-JAC) e-ISSN: 2278-5736.Volume 10, Issue 7 Ver. II