COMPARATIVE STUDIES: SYNTHETIC vs ORGANIC CLEANING AGENTS:

An Environmental Biotechnology Report

submitted by

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DECLARATION BY THE CANDIDATE

I hereby declare that the Environmental Biotechnology report entitled "**COMPARATIVE STUDIES: SYNTHETIC vs ORGANIC CLEANING AGENTS:**" submitted by me to Vellore Institute of Technology, Vellore in partial fulfillment of the requirement for the award of the degree of **BACHELOR OF TECHNOLOGY In BIOTECHNOLOGY** is a record of bonafide industrial training undertaken by me under the supervision of **Mr.Ramesh Pathy M, SBST - VIT UNIVERSITY.** I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Signature of the student

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1. INTRODUCTION

Sapindus mukorossi is a species of tree in the family Sapindaceae. The fruit is commonly known as Indian soapberry or washnut, and like other species in the genus Sapindus, it is called soapberry or soapnut. It is also a native of Western coastal Maharashtra – Konkan, and Goa in India. It is one of the most important trees of tropical and subtropical regions of Asia. This tree flourishes well in deep clay loamy soil with an annual rainfall of 200 mm.

It is a medium sized tree can reach a height of 25m. The flowers are small greenish white in color and the fruits are solitary globose appears in the month of July- August. The fruit contains an active principle called saponin. The Saponin from soapnut is widely used in the medicine, Pharmaceutical industries, and also used as detergents and plays a role in environmental remediation.

The major constituents of the fruits are saponins, sugars and mucilage. The saponin can be extracted by simple chemical extraction method. The seeds contain fatty acid. The fatty acids are of arachidic, behenic, linoleic, oleic, palmitic, stearic, oleanolic acid, and sapindic acid. The seed contain trifolioside A, sapindoside C, D, E, glucopyranosides of stigmasterol, kaempferol, quercetin, B-sitosterol, hederagenin, protein, carbohydrate and starch.

Currently, synthetic detergents are widely used as commercial cleansers in many areas. However, these give rise to human skin and environmental problems. There is a growing demand for natural and green surfactants due to their excellent functional properties as well as their biological and environmental safety. Saponin is one of the most common natural surfactants and is largely found in the fruit husk of soapnut (Sapindus mukorossi). It has been used as a natural cleanser for hair and skin. In addition, it has sterilization and anti-inflammatory effects for medical applications. Therefore, the saponin content determines the quality of soapnut fruit.

Figure 1: Sapindus mukorossi (Soap nut tree)

2. MATERIALS

The Organic cleaning agent used is “soap nuts” from the Sapindus mukorossi tree was bought from a Ayurvedic Medicine shop in Chennai for 50 rupees for 250 gram. The Synthetic cleaning agent used is “Rin Antibac” is priced at 10 rupees for 125 gram.

Figure 2: Organic Detergent “Soap nuts”

Figure 3: Synthetic Detergent “Rin Antibac”

Two cropped out pieces of cotton sheet one at dimensions of 150 x 150 mm and another at 150 x 120 mm. Both cotton sheets were stained with 2 spirulina tablets 500 mg each. The tablet is mixed in water and then the cotton sheets are soaked in this mixture.

Figure 4: Spirulina stained cotton sheets

The soap nuts were weighed in a weighing balance, where each soap nut weighs on an average 5 grams and then on deseeding this soap nut, the weight reduced to 3.2 grams on average. This difference of 1.8 grams is because of the seed. The seed is not used in the process of cleaning, hence has no crucial role in the process. It can however be replanted after breaking the shell of the seed.

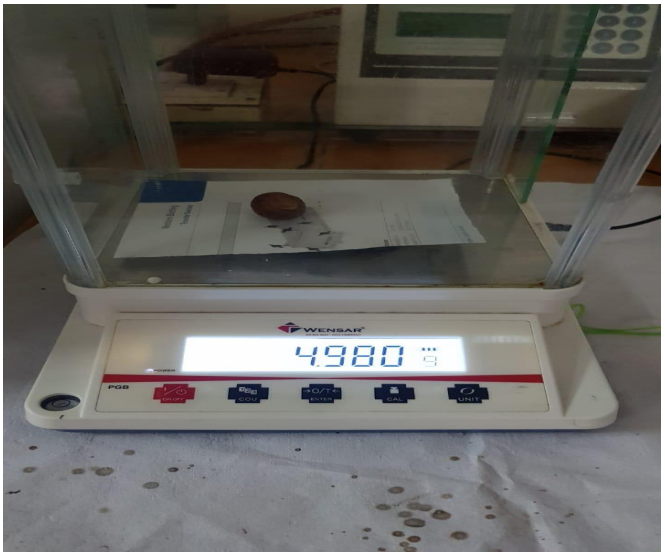

Figure 5: Weighing the Soap nuts

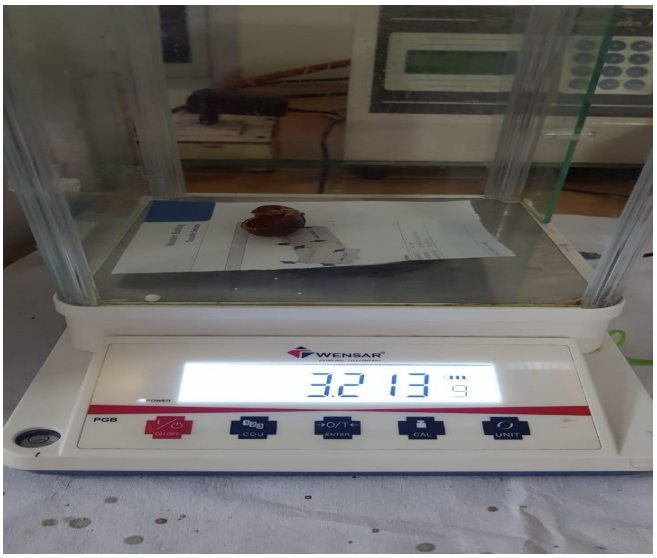

Figure 6: Weighing the deseeded Soap nuts

3. WASHING

After this, it is the cleaning process and, in this step, the cleaning effect of organic and synthetic is compared. Around 12 soap nuts were deseeded, and they were held together in a cotton cloth with the help of safety pins. This step is done to make the nuts reusable for

future washes.

Now the Synthetic detergent “Rin Antibac” is added onto a bucket with approximately 4 - 5 liters of water. To this, the cotton cloth of 150 x 120 mm is added into it. The cloth is left to soak for 10 minutes in this detergent.

The organic detergent “Soap nuts” deseeded in a cotton cloth is added onto a bucked with approximately 3 – 4 liters of water. To this, the cotton cloth of 150 x 150 mm is added into it. The cloth is left to soak for 15 minutes in this detergent as the time for lathering is slightly higher, as the saponin takes a while to leave the soap nut and to dissolve in the water.

Figure 7: Deseeded soap nuts

Figure 9: Cloth soaked in Synthetic Detergent “Rin Antibac”

Figure 10: Cloth soaked in Organic Detergent “Soap Nuts”

After soaking the sheets for the necessary period, they were scrubbed with a scrubber to remove some stain and other particles, they were immersed in the solution while scrubbing to remove most of the particles. After, both the cotton sheets are washed, they are kept for drying in room temperature in a cloth hanger.

4. RESULTS

After the clothes are dried, they were compared in order to find out which detergent was more efficient. In this step, it was understood that, the saponin rich organic detergent “soap nuts” was more efficient in removing the stain but however still had the bad odor of the spirulina. However, the synthetic detergent, even though it had a few more stains, it had a good odor. From the experiment performed, the Organic detergent had a better cleaning efficiency in comparison to the Synthetic detergent.

Figure 11: Organic detergent washed and dried sheet

Figure 12: Synthetic detergent washed and dried sheet

5. CONCLUSION

The organic detergent has better efficiency in washing the cotton sheet than the synthetic detergent, however, the odor is better in the synthetic sheet. The saponin from the soap nut can be used in preparing detergents which are environmentally friendly.

The organic detergent can be reused multiple times and is economically feasible. Hence, on usage of such detergents in large scale, this could reduce chemical pollution as the usage of these synthetic detergents reduce.

The price of the soap nuts varies based on the quality and weight of the nuts, while synthetic detergents are priced based on weight.

6. REFERENCES

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