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Organic Soap nut Based Dish Wash Powder- A Perfect Alternative to Conventional Chemical Dish Wash Cleaners

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ABSTRACT

Synthetic surfactants are used in large amounts in a wide range of applications in industry and households. Soap nuts are nutshells that contain saponin, a kind of natural soap surfactant. The nuts are claimed to clean laundry in a natural way without leaving any chemical residues in the textiles [14]. The present study was done to develop products using soap nut and to evaluate the same. Experimental research design was used for the study. Five variations were selected and prepared incorporating soap nuts and were evaluated. Oily utensils were cleaned well by soap nut with orange peel powder (A) and soap nut with ash (B). Burnt stains were also effectively cleaned by samples A and B (soap nut with orange peel powder (A) and soap nut with ash (B). Sample C (baking powder variation) and Sample E (Combination of soap nut powder with orange peel powder, ash, and baking powder and neem leaf powder) found more effective in cleaning rusted utensils. All the samples such as soap nut powder and orange peel powder, soap nut powder and ash, soap nut powder and baking powder and soap nut powder and neemleaf powder were found to be very skin friendly and did not cause any skin problems to the users. With regard to stainless steel utensils, sample A (soap nut powder and orange peel powder) found more effective in cleaning. Sample A (soap nut and orange peel powder) and sample E (Combination of soap nut powder with orange peel powder, ash, baking powder and neem leaf powder 84.4%) were effective in cleaning iron utensils. Glass was very well cleaned by sample C (soapnut powder and baking powder). Ceramics was cleaned efficiently by sample B (soap nut powder and ash) and sample C (soap nut powder and baking powder). Sample E (Combination of soap nut powder with orange peel powder, ash, baking powder and neem leaf powder) found more effective in cleaning borosils. Plastics were very well cleaned by sample B (soapnut powder and ash) and sample C (soap nut powder and baking powder). Sample A (Soap nut powder and orange peel powder) was effective in cleaning wood. Aluminum was very well cleaned by sample C (soap nut powder and baking powder), sample A (soap nut powder and orange peel powder), and sample B (soap nut powder and ash 82.2%) and sample D). Mud pots were well cleaned by Sample B (Soap nut powder and ash). Majority of users opined that they were highly satisfied with soap nut based cleaning powders and only 2.0 % revealed that the products were not satisfactory. All the samples weighed 15 grams each. Sample A (soapnut powder and orange peel powder) costed about Rs.5, sample B (soapnut powder and ash) and sample C (soapnut powder and baking powder) came to an amount of Rs.6.26 each. Sample D (soap nut powder neem leaf powder) costed Rs.5, while sample E came to an amount of Rs.10.52.

Key Words : Synthetic surfactants, Soap nut, Dish wash cleaning powder

INTRODUCTION

Cleaning is an operation through which soil on the surface is eliminated to prevent bacterial accumulation and growth [11]. Thus, in order to control the microbial population on the surface, different approaches are used[10]. The chemical method is the most predominant action; it works by separating the contaminants from the surface and by placing them in a solution or dispersion, so-called detergency. This is done by surface active substances, also known as surfactants. Surfactants lower the surface tension, acts as detergents, wetting agent

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emulsifiers, foaming agents, and dispersants[6].

Soap nuts are well-known globally by various names such as soap nuts, soapberries, washing nuts, soap nut shells, wash shells, soapberry nut husks and several others. Soap nuts are basically the dried out shells (or husks) from the soapberry (or soap berry nut). These berries are the fruit from a unique tree species. The shells have an essence called saponin that produces a soaping effect. Saponin is a 100% organic alternative to synthetic laundry detergents and cleansers[3, 14]. It can substitute many synthetic detergents such as those containing sodium laureth sulphates (SLS) that are turning into famous by consumers for being a skin irritant and wellbeing hazard[2].

The use of many cleaning products in food processing makes it possible to control microbial populations, but this approach has a negative impact on the global environment[1]. Moreover, the problem of antimicrobial resistance and cross-resistance is not limited solely to the clinical environment; with the widespread use of cleaning products in food processing, the problem has shifted into the industrial environment[8].

Research on industrial wastewater has shown that many chemicals are deposited in the environment [15]. The growing global population and improving economies in many countries increase the global consumption of cleaning products and thereby the pressure on the environment; it is well recognized that there is an urgent need to reduce the impact per produced unit of cleaning product to sustain human needs without compromising natural resources[4]. Great potential is found in natural cleaning products based on biopolymers, plant extracts, natural surfactants, and natural acids that have a broad spectrum of activity, high efficiency, and low bacterial resistance[3].

A considerable amount of studies have analysed the antimicrobial potentials of saponins[10]. The great advantage of natural surfactants is, therefore, their antibacterial activity, non toxic residues and low production costs[13]. Accordingly, the aim of this study was to examine the potential of eco friendly natural extracts from soap nuts for application in dish washing.

Objectives of the study:

– To develop cleaning powders based on soap nut, orange peel powder, ash, and neem leaf powder for dishwashing.

– To evaluate effectiveness of the newly developed products.

– To find out the cost of developed products.

METHODOLOGY

Procurement of Materials:

The fruits of Soap nut (ritha) required for the study were procured from Koyembudu and identification was done in Natural Products Research Laboratory, Puzhal, Chennai-66.

Shade Drying of the Plant Samples:

All the collected fruit samples of soapnut, orange peel, neem leaves were cleaned, chopped and shade dried in the blotting paper.

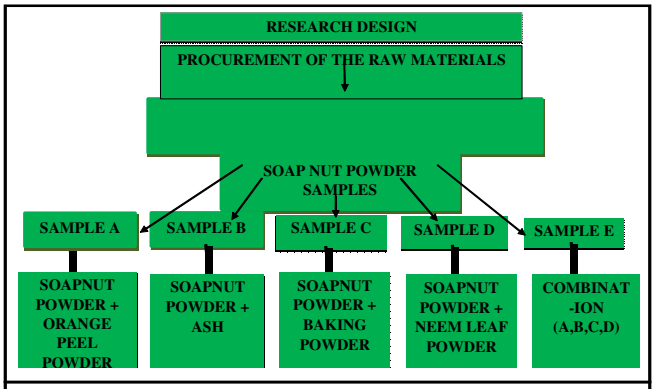

Fig. 1 : Design of the Study

Development of Cleaning Powder Samples Incorporating Soap Nuts:

Cleaning powder samples such as soap nut powder and orange peel powder (A), soap nut powder and ash (B), soap nut powder and baking powder(C), soap nut powder and neem leaf powder(D) and combination of all (E- soap nut powder, orange peel powder, ash, baking powder and neem leaf powder) were selected for the study to evaluate over the cleaning indices. The samples were prepared and three trials were subjected to evaluation by the judges.

Selection of judges:

The testing instrument for analysis is the panel of human judges who have been recruited and trained to carry out specific tasks of evaluation. In order to avoid errors due to physical, psychological, environmental and individual characteristics, a panel of judges was used rather than a single judge. Members of panel were carefully selected on the basis of their quality and cleanliness in detecting differences of the samples expected in the product being studied. Panel members must be adults and the number of members in the trained panel should be restricted within five to ten. Taking all the criteria into consideration those who know and could identify the various qualities expected in the product being analyzed were selected.

Tools used for the study:

Evaluation: Tools that were employed for analyzing the qualities of cleaning powders are as follows.

Score cards as an essential part of the evaluation process, were carefully designed for each of the product so that it permitted the judges to transmit their assessment of the sample accurately on the paper.

The score cards were clearly printed. Simple unambiguous terms and direction in the desired sequence of action were used, so that the scorecard can act as a guide for the evaluation process. The name of the samples was typed out in block letters, followed by the name of the sample products. The qualities namely effect on different types of stains, skin problems in hand, effect on different types of utensils, effect of scrubs used for utensils and cost were graded in the descending order on a three point scale, so that the most desired character owing to that particular attribute carried the maximum mark of 3 and the least desired character carried the minimum mark of 1.

RESULTS AND DISCUSSION

Table 1 presents evaluation of soap nut based dish wash cleaning powder samples on different types of stains.

From the Table 1, it can be observed that, oily utensils were cleaned well by soapnut with orange peel powder (A) and soapnut with ash (B) (88.8%, respectively). Burnt stains were also effectively cleaned by samples A and B (soapnut with orange peel powder (A) 84.4% and soapnut with ash (B) 73.3%). Sample C (baking powder variation) and Sample E (Combination

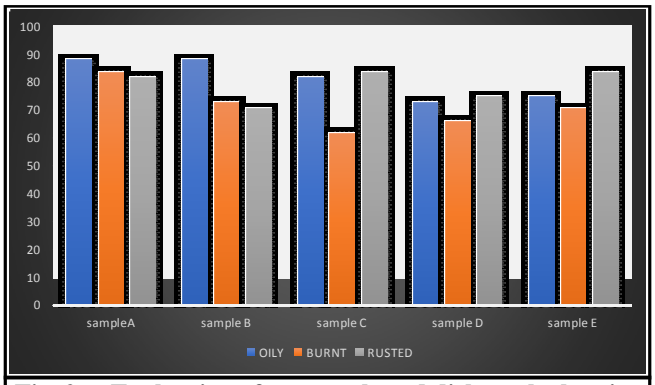

Fig. 2 : Evaluation of soapnut based dish wash cleaning powder samples on different types of stains

Table 1 : Evaluation of soapnut based dish wash cleaning powder samples on different types of stains

Attributes	Samples	Weighted Mean Score	Percentage
1. Oil utensils	Sample A	2.66	88.8
	Soapnut powder + orange peel powder		
	Sample B-Soapnut powder and ash	2.66	88.8
	Sample C-Soapnut powder and baking salt	2.46	82.2
	Sample D-Soapnut powder and neem leaf powder	2.2	73.3
	Sample E-Combination (A,B,C,D)	2.26	75.5
2. Burnt stain	Sample A-Soapnut powder and orange peel powder	2.53	84.4
	Sample B-Soapnut powder and ash	2.2	73.3
	Sample C-Soapnut powder and baking salt	1.86	62.2
	Sample D-Soapnut powder and neem leaf powder	2	66.6
	Sample E-Combination (A,B,C,D)	2.13	71.1
3. Rusted utensils	Sample A-Soapnut powder and orange peel powder	2.46	82.2
	Sample B-Soapnut powder and ash	2.13	71.1
	Sample C-Soapnut powder and baking powder	2.53	84.4
	Sample D-Soapnut powder and neem leaf powder	2.26	75.5
	Sample E-Combination (A,B,C,D)	2.53	84.4

of soapnut powder with orange peel powder, ash, baking powder and neem leaf powder) was found to be effective in cleaning rusted utensils (84.4% respectively).

Table 2 shows comparison of soapnut based dishwash cleaning powder samples with different types of stains.

It can be observed from the ANOVA Table, that there was no significant difference among the samples in cleaning oily, burnt and rusted utensils. This indicates that all the samples were effective in cleaning different stains.

Table 3 shows the effect of soapnut based dish wash cleaning powders on skin.

It can be seen from the Table 3 that all the samples such as soapnut powder and orange peel powder, soapnut powder and ash, soapnut powder and baking powder and soapnut powder and neem leaf powder were found to be very skin friendly and did not cause any skin problems to the users.

Table 4 shows the effect of soapnut dish wash cleaning powders on different types of utensils.

With regard to stainless steel utensils, sample A (soapnut powder and orange peel powder-95.5%) was found to be effective in cleaning. Sample A (soapnut and orange peel powder 84.4%) and sample E (Combination of soapnut powder with orange peel powder, ash, baking powder and neem leaf powder 84.4%) were effective in cleaning iron utensils. Glass was very well cleaned by sample C (soapnut powder and baking powder 88.8%). Ceramics was cleaned efficiently by sample B (soapnut powder and ash 88.8%) and sample C (soapnut powder and baking powder 88.8%). Sample E (Combination of

Table 2 : Comparison of soapnut based dish wash cleaning powder samples with different types of stains

Variables	Source of Variation	Sum Of Squares	DF	Mean Square	F
Burnt Utensils					
Sample A	Between Groups	3.183	5	.637	2.371
	Within Groups	2.417	9	.269	
	Total	5.600	14		
Sample B	Between Groups	3.183	5	.637	2.371
	Within Groups	2.417	9	269	
	Total	5.600	14		
Sample C	Between Groups	3.567	5	.713	2.963
	Within Groups	2.167	9	.241	
	Total	5.733	14		
Sample D	Between Groups	2.767	5	.553	2.298
	Within Groups	2.167	9	.241	
	Total	.933	14		
Sample E	Between Groups	5.733	5	1.147	5.160
	Within Groups	2.000	9	.222	
	Total	7.733	14		
Rusted Utensils					
Sample A	Between Groups	3.767	4	.942	5.136
	Within Groups	1.833	10	183	
	Total	.600	14		
Sample B	Between Groups	.317	4	.079	.38
	Within Groups	2.083	10	.208	
	Total	2.400	14		
Sample C	Between Groups	1.650	4	.412	1.980
	Within Groups	2.083	10	208	
	Total	3.733	4		
Sample D	Between Groups	.833	4	.208	.833
	Within Groups	2.500	10	.250	
	Total	3.333	14		
Sample E	Between Groups	.350	4	.087	.269
	Within Groups	3.250	10	.325	
	Total	3.600	14		

Table 3 : Effect of soapnut based dish wash cleaning powders on skin

Skin Problems	Samples	Weighted Mean Score	Percentage
1. Skin itching	Sample A-Soapnut powder and orange peel powder	0.1	1
	Sample B-Soapnut powder and ash	0.2	0
	Sample C-Soapnut powder and baking salt	0.1	1
	Sample D-Soapnut powder and neem leaf powder	0.2	1
	Sample E-Combination (A,B,C,D)	0.1	2
2. Skin dryness	Sample A-Soapnut powder and orange peel powder	0.1	3
	Sample B-Soapnut powder and ash	0.1	2
	Sample C-Soapnut powder and baking salt	0.2	0
	Sample D-Soapnut powder and neem leaf powder	0.2	3
	Sample E-Combination (A,B,C,D)	0.2	2
3. Skin rashes	SampleA-Soapnut powder and orange peel powder	0.2	1
	Sample B-Soapnut powder and ash	0.1	0
	Sample C-Soapnut powder and baking salt	0.1	2
	Sample D-Soapnut powder and neem leaf powder	0.1	3
	Sample E-Combination (A,B,C,D)	0.1	2
4. Skin boils	Sample A-Soapnut powder and orange peel powder	0.1	2
	Sample B-Soapnut powder and ash	0.2	0
	Sample C-Soapnut powder and baking salt	0.2	1
	Sample D-Soapnut powder and neem leaf powder	0.2	2
	Sample E-Combination (A,B,C,D)	0.2	0

Table 4 : Effect of soapnut dish wash cleaning powders on different types of utensils

Effect on various base materials	Samples	Weighted Mean Score	Percentage
1. Effect on stainless steel	Sample A-Soapnut powder and orange peel powder	2.86	95.5
	Sample B-Soapnut powder and ash	2.53	84.4
	Sample C-Soapnut powder and baking salt	2.26	75.5
	Sample D-Soapnut powder and neem leaf powder	2.66	88.8
	Sample E-Combination (A,B,C,D)	2.73	91.1
2. Effect on iron	Sample A-Soapnut powder and orange peel powder	2.53	84.4
	Sample B-Soapnut powder and ash	2.13	73.7
	Sample C-Soapnut powder and baking salt	2.06	78.8
	Sample D-Soapnut powder and neem leaf powder	2.46	82.2
	Sample E-Combination (A,B,C,D)	2.53	84.4
3. Effect on glass	Sample A-Soapnut powder and orange peel powder	2.6	86.6
	Sample B-Soapnut powder and ash	2.33	77.7
	Sample C-Soapnut powder and baking salt	2.66	88.8
	Sample D-Soapnut powder and neem leaf powder	2.53	84.4
	Sample E-Combination (A,B,C,D)	2.6	86.6
4. Effect on ceramics	Sample A-Soapnut powder and orange peel powder	2.53	84.4
	Sample B-Soapnut powder and ash	2.66	88.8
	Sample C-Soapnut powder and baking salt	2.66	88.8
	Sample D-Soapnut powder and neem leaf powder	2.6	86.6
	Sample E-Combination (A,B,C,D)	2.4	80
5. Effect on borosils	Sample A-Soapnut powder and orange peel powder	2.33	77.7
	Sample B-Soapnut powder and ash	2.06	68.8
	Sample C-Soapnut powder and baking salt	2.26	75.5
	Sample D-Soapnut powder and neem leaf powder	2.4	80
	Sample E-Combination (A,B,C,D)	2.46	82.2

Table 4 contd..

Contd.....Table 4

6. Effect on plastics	Sample A-Soapnut powder and orange peel powder	2.4	80
	Sample B-Soapnut powder and ash	2.53	84.4
	Sample C-Soapnut powder and baking salt	2.53	84.4
	Sample D-Soapnut powder and neem leaf powder	2.4	80
	Sample E-Combination (A,B,C,D)	2.46	82.2
7. Effect on wood	Sample A-Soapnut powder and orange peel powder	2.06	88.8
	Sample B-Soapnut powder and ash	2.13	71.1
	Sample C-Soapnut powder and baking salt	2.33	77.7
	Sample D-Soapnut powder and neem leaf powder	2.4	80
	Sample E-Combination (A,B,C,D)	2.33	77.7
8. Effect on Aluminium	SampleA-Soapnut powder and orange peel powder	2.46	82.2
	Sample B-Soapnut powder and ash	2.46	82.2
	Sample C-Soapnut powder and baking salt	2.53	84.4
	Sample D-Soapnut powder and neem leaf powder	2.46	82.2
	Sample E-Combination (A,B,C,D)	2.4	80
9. Effect on mud	Sample A-Soapnut powder and orange peel powder	2.26	75.5
	Sample B-Soapnut powder and ash	2.53	84.4
	Sample C-Soapnut powder and baking salt	2.06	68.8
	Sample D-Soapnut powder and neem leaf powder	2.4	80
	Sample E-Combination (A,B,C,D)	2.4	80

soapnut powder with orange peel powder, ash, baking powder and neem leaf powder 82.2%) was found to be effective in cleaning borosils. Plastics were very well cleaned by sample B (soapnut powder and ash 84.4%) and sample C (soapnut powder and baking powder 84.4%). Sample A (Soapnut powder and orange peel powder 88.8%) was effective in cleaning wood. Aluminium was very well cleaned by sample C (soapnut powder and baking powder 84.4%), sample A (soapnut powder and orange peel powder 82.2%), and sample B (soapnut powder and ash 82.2%) and sample D 82.2%). Mud pots were well cleaned by Sample B (soapnut powder

Table 5 : Users opinion on satisfaction of soapnut based dish wash leaning powders

Satisfaction	Percentage
Highly satisfied	92.0
Satisfied	6.0
Not satisfied	2.0

Table 6 : Cost calculation of soapnut based dish wash cleaning samples

Samples	Ingredients	Quantity Gram	Cost per kg Rs.	Cost for amount used – Rs.
Sample A	Soap nut powder	10	400	4
	Orange peel powder	5	200	1
	Total			5
Sample B	Soap nut powder	10	400	4
	Ash	5	450	2.26
	Total			6.26
Sample C	Soap nut powder	10	400	4
	Baking powder	5	450	2.26
	Total			6.26
Sample D	Soap nut powder	10	400	4
	Neem leaf powder	5	200	1
	Total			5
Sample E	Soap nut powder	10	400	4
	Orange peel powder	5	200	1
	Ash	5	450	2.26
	Baking powder	5	450	2.26
	Neem leaf powder	5	200	1
	Total			10.52

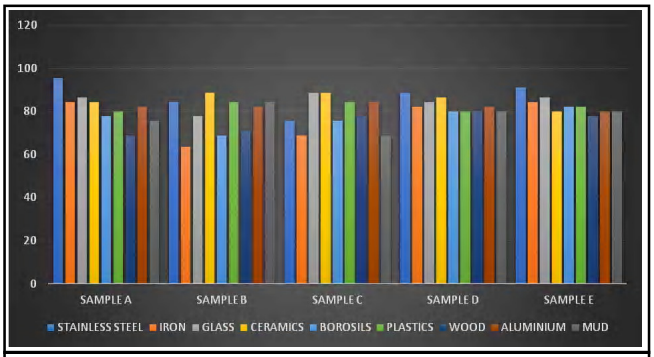

Fig. 3 : Effect on different types of utensils

and ash 84.4%).

Table 5 depicts users opinion on satisfaction of soap nut based dish wash cleaning powders.

Majority of users opined that they were highly satisfied with soapnut based cleaning powder and only (2.0 %) revealed that the products were not satisfactory.

Table 6 shows cost calculation of soapnut based dish wash cleaning samples.

It can be seen from the Table 6, sample A (soapnut powder and orange peel powder) costed about Rs. 5, sample B (soapnut powder and ash) and sample C (soapnut powder and baking powder) came to an amount of Rs. 6.26 each. Sample D (soapnut powder neem leaf powder) costed Rs. 5, while sample E came to an amount of Rs. 10.52. All the samples weighed 15 grams each.

From the results, it can be concluded that soapnut based dishwash cleaning powders were found to be effective in cleaning oily, burnt and rusted stains of various types of utensils used in households namely stainless steel, glass, iron etc. It was also found to be cost effective.

Conclusion:

It can be concluded that soapnut based dishwash cleaning powders were found to be effective in cleaning oily, burnt and rusted stains of various types of utensils used in households namely stainless steel, glass, iron, ceramics, borosils, plastics, wood, aluminium, etc. It was found to be cost effective. Since the products are biodegradable, they are eco-friendly as well and the waste water can be used to water the plants.

Recommendations for future research:

– A study on effect of natural extracts from soapnuts for application in food service establishments can be carried out.

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