

RESEARCH ARTICLE

Development and Standardization of Neem and Aloe Vera based Herbal hand wash using Low Cost Indigenous Technology

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ABSTRACT:

Hand-washing is an important practice for healthcare in home and daily life preparations. Herbal based hand wash preparations are the most promising hand wash with natural antimicrobial effect. The present study was aimed to development and standardization of herbal hand wash with natural ingredients. In this study, two types of herbal hand wash were formulated with Neem and Aloe vera methanol extract. The herbal hand-wash A and herbal hand wash B, containing plant extract and other natural herbal ingredients in different compositions of ingredients. Herbal hand wash formulations were further evaluated for some parameters such as odor, color, pH, viscosity, foam height, foam retention and spreading potential. The quality of hand wash formulation was evaluated by skin irritation test, greasiness grittiness and homogeneity. The results indicated that all the developed formulations of hand wash A and B were in acceptable limits. The results of present study proved that the effective herbal hand wash were developed successfully by incorporating the herbal extracts using low cost indigenous technologies for better effect.

KEYWORDS: Herbal hand wash, herbal formulations, Neem, Aloe vera, low cost technology.

INTRODUCTION:

Skin is the most exposed part of our body. Hands are primary mode of transmission of microbes and infections¹. Hand hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent the infections. Hand hygiene is the single most important, simplest, and least expensive mean of preventing nosocomial infections². Hand washing is the act of cleaning hands with the purpose of removing soil, dirt, pathogenic microorganisms and avoid transmitting of transient micro organism. Hand Washing removes visible dirt from hands and reduces the number of harmful microorganisms such as *E. coli* and salmonella can be carried by people, animal or equipment and transmitted to food. To defend the skin from harmful microorganism and to avoid spreading of numerous contagious diseases, hand washing is extremely significant precaution³.

Plants have provided a good source of anti-infective agents^{4,5}. Plant extract have a potential as antimicrobial compounds against several pathogenic microorganisms which cause infections disease and resistance towards synthetic drugs^{6,7}. The main advantage of using natural source is that they are easily available cheap and harm less compared to chemical product⁸. Use of plants as source of medicine has been inherited and is an important component of the health care system in India. In these systems of Indian medicine, most practitioners formulate and dispense their own recipes; hence this requires proper documentation and research^{9,10}.

In spite of anti-microbial sensitivity, commercial detergents are less likely to be accessible or affordable to poor people in remote rural areas. These people traditionally use some plant parts as a detergent even though their antibacterial activity has not been yet investigated. Therefore, this study aims to produce hand wash with less price. Therefore, research has been increased tremendously towards making natural products with improved quality yet less in cost and no side effect over chemical agents^{11,12}.

In the present context, Neem plant leaf (*Azadirachta indica*) and Aloe vera (*Aloe barbadensis*) are selected in preparing herbal hand wash. Neem, *Azadirachta indica* is native to the arid regions of the Indian sub-continent, where it grows to 12-24 m high at altitudes between 50 and 100 m with 130mm of sufficient rainfall per annum for its normal growth. Neem is also called 'arista' in Sanskrit- a word that means 'perfect', complete and imperishable'. The Sanskrit name 'nimba' comes from the term 'Nimbati Syasthyamdadi' Which means 'to give good health'. The seeds, bark and leaves contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, anti-ulcer and antifungal uses^{13,14}.

Aloe vera plant has a strong global recognition due to its widespread usage in cosmetic industry¹⁵. Aloe vera is acclaimed to cure ailments ranging from mild fever, gastrointestinal disorders, diabetes, sexual vitality, fertility problems and cancer¹⁶. Aloe vera is used particularly to treat burns and sunburn, to aid wound healing, and to fight against cell aging. Aloe vera plants has important role in increasing the immune power and improving blood circulation.

In the present study, a Neem and Aloe Vera based herbal based product is produced as handwash. This study is aimed to design and standardize the product.

MATERIAL AND METHODS:

Chemicals and Plant parts:

Neem leaves, foaming agent, Aloe vera, lemon water, glycerine, vitamin E oil.

Glassware and plastic ware Requirement:

Conical Flask, plastic bottle, measuring cylinder.

Equipment Requirement:

Mixer grinder, Weighing balance, Soxhlet extraction unit, pH meter, viscosity meter.

Collection of plant samples and Preparation of Plant extracts:

The neem plant and aloe vera plants were collected from the campus of Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan. Neem leaves and aloe vera were washed with tap water. Gel was collected from the Aloe vera plant and remaining part was shade dried at room temperature until complete loss of moisture. Neem leaves and dried aloe vera were grinded into a fine powder separately using mixer grinder. The plants powder was extracted in methanol using Soxhlet extraction unit^{17,18,19}.

Table 1: Function of ingredients used in herbal hand wash formulations

Ingredient	Function
Neem extract	Antimicrobial
Aloe vera extract	Antimicrobial
Reetha water	Foaming agent/Antimicrobial property
Vitamin E oil	Preservative
Glycerine	Moisturizer
Salt powder	To increase viscosity
Essential oil	Fragrance/antimicrobial
Lemon water	Natural preservative
Aloe vera gel	Gelling agent/Antimicrobial property

Preparation of herbal hand wash A:

To the plant extract, different concentration of foaming agents was added in plant extract in various proportion for increased efficiency of herbal hand wash. Salt powder was added to the mixture to increase the viscosity of the hand wash. Glycerine, essential oil and Vitamin E were added in fix proportion. Herbal color was added in sufficient quantity (Table 2). The mixture was incubated the for six hours.

Preparation of herbal hand wash B:

Different proportion of neem extract and aloe vera extract were added. To the plant extract, different concentration of reetha powder was added, followed by addition of various proportion of aloe vera gel. Lemon water, Essential oil and Vitamin E were added in fix proportion. Herbal color was added in sufficient quantity (Table 2). The mixture was incubated the for six hours.

Phytochemical Analysis of plant extract:

The phytochemical analysis of *Azadirachta indica* and *Aloe barbadensis* methanol extract was conducted using standard method as described by Edeoga et al., (2005) and Harborne (1973)^{20,21}. The parameters which were selected for phytochemical study include alkaloids, terpenoids, tannins, saponins, flavonoids, glycosides, sterols and reducing sugar²².

Physical analysis:

The Poly-Herbal hand wash A and B were subjected to Physical evaluation visually. The hand wash gel combinations were analyzed for color, texture and odor²³.

Appearance and Homogeneity:

The Poly-Herbal hand wash A and B were analyzed for homogeneity and appearance. The herbal hand wash were analyzed for equal distribution of all ingredients, clumping and transparency²⁴.

Grittiness:

1ml of gel was taken on finger tips and rubbed between two fingertips then the formulation was evaluated.

Skin test:

Two drop of hand wash gel was dropped on hand and analyzed for any irritation.

pH analysis:

1ml of each hand wash sample was taken and dissolved into 100ml distilled water. The pH of each hand was taken using digital pH meter²⁵.

Viscosity:

The viscosity of Poly Herbal Gel Based hand wash was determined by using digital viscometer²⁶.

Foam Height:

One ml each herbal hand wash sample was taken and dispersed in 50ml distilled water. The mixture was further transferred into a 500ml volume stoppered

measuring cylinder. Volume of sample was made up to 100ml by adding distilled water. 25 stokes was given to measuring cylinder. After stokes, the volume of foam (other than sample volume i.e. 100ml) is measured²⁷.

Foam Retention:

25ml of the 1% each hand wash gel sample was taken into 100ml measuring cylinder and shaken 10 times. The cylinder was placed on a surface and volume of foam was recorded in every one minute for four minutes²⁸.

Spread ability:

0.5ml of each sample was placed between two slides and pressed for five minutes. At the time, where, spreading stops, the diameter of sample was measured. The results were taken as the average of three samples²⁹.

Table 2: Formulation and standardization of herbal hand wash A

Ingredient composition	Formulation A			
	A1	A2	A3	A4
Neem extract	90 ml	90 ml	90 ml	90 ml
Aloe vera extract	40 ml	40 ml	40 ml	40 ml
Sodium Lauryl Sulphate	50 gm	55 gm	60 gm	60 gm
Glycerine	10 ml	10 ml	10 ml	10 ml
NaCl	6 gm	6 gm	6 gm	7 gm
Essential oil	1 ml	1 ml	1 ml	1 ml
Vitamin E oil	1 ml	1 ml	1 ml	1 ml
Colour	0.1 gm	0.1 gm	0.1 gm	0.1 gm
Formulation B				
	B1	B2	B3	B4
Neem extract	40 ml	40 ml	40 ml	40 ml
Aloe vera extract	18 ml	18 ml	15 ml	15 ml
Lemon water	10 ml	10 ml	10 ml	10 ml
Aloe vera gel	12 ml	14	15	17 ml
Reetha water	13 ml	15	17 ml	15 ml
Vitamin E oil (As preservative)	2 ml	2 ml	2 ml	2 ml
Essential Oil/ Fragrance	0.5 ml	0.5 ml	0.5 ml	0.5 ml
Food color	Sufficient quantity	Sufficient quantity	Sufficient quantity	Sufficient quantity

RESULTS AND DISCUSSIONS:

The present study was carried out to develop and standardize herbal hand wash from plant extract having antimicrobial property using low cost technology. The plant used for antimicrobial activity was Neem plant leaf (*Azadirachta indica*) with Aloe vera with moisturizing effect using gel base as carriers². The formulation was prepared by using generally approved compositions that are compatible with any similar hand cleansing formulations³⁰. Two types of hand wash were prepared in this study. Herbal hand-wash A and Herbal hand-wash B.

The herbal hand-wash A, as well as, herbal hand wash B were prepared using plant extract and other natural herbal ingredients in different compositions of ingredients.

After preparation of the hand wash A and B. The hand wash was analyzed for physical parameters such as pH, colour and appearance. Physical analysis (color, odor) was done by sensory and visual inspection and compared with the marketed hand wash gel³¹.

Phytochemical screening of *Azadirachta indica* and *Aloe barbadensis* methanol extract was carried out for the presence of alkaloids, terpenoids, tannins, saponins, flavonoids, glycosides, sterols and reducing sugar using standard protocol³². *Azadirachta indica* methanol extract was found positive for the presence of Alkaloids, flavanoids, glycosides, reducing sugar, tannins, saponins and phenols³³ (Table 3). Similarly, *Aloe barbadensis* methanol extract was also found positive for the presence of Alkaloids, flavanoids, tannins and saponins, sterols and phenols³⁴.

Table 3: Phytochemicals screening of leaf extract *A. indica* and *Aloe barbadensis* in methanol extract

Test	<i>A. indica</i>	<i>Aloe barbadensis</i>
Alkaloids	+	+
Flavonoids	+	+
Glycosides	+	-
Reducing Sugar	+	-
Tannins	+	+
Saponins	+	+
Terpenoids	-	-
sterols	-	+
Phenols	+	+

Physical parameters:

The prepared herbal hand wash gel was evaluated for its appearance, color and odor. The hand wash formulation A produces characteristic Cinnamon odor whereas formulation B produces Rosemary odor. All the formulations are green in color and transparent in appearance (table 4).

Table 4: Results for physical properties of hand wash formulations

Formulation Code	Odor	Color	Appearance	Consistency
A1	Cinnamon	Green	Clear transparent liquid	Semi solid
A2	Cinnamon	Green	Clear transparent liquid	Semi solid
A3	Cinnamon	Green	Clear transparent liquid	Semi solid
A4	Cinnamon	Green	Clear transparent liquid	Semi solid
B1	Rosemary	Green	Clear transparent liquid	Semi solid
B2	Rosemary	Green	Clear transparent liquid	Semi solid
B3	Rosemary	Green	Clear transparent liquid	Semi solid
B4	Rosemary	Green	Clear transparent liquid	Semi solid

Table 5: Chemical and physical properties of prepared herbal hand-wash

Formulation Code	Greasiness	pH	Homogeneity	Grittiness	Wash ability	Viscosity (Poise)	Foam height	Foam retention (in ml)	Spreadability (cm)
A1	Not greasy	6.15	No aggregate	No	Fine	42	119	16.5	14.6
A2	Not greasy	6.18	No aggregate	No	Good	46	132	17.1	13.9
A3	Not greasy	6.27	No aggregate	No	Good	51	142	18.8	11.1
A4	Not greasy	6.36	No aggregate	No	Good	55	162	20.2	10.5
B1	Not greasy	6.22	No aggregate	No	Fine	40	64	10.1	18.3
B2	Not greasy	6.15	No aggregate	No	Good	41	86	10.3	16.1
B3	Not greasy	6.07	No aggregate	No	Good	46	112	12.4	14.2
B4	Not greasy	5.96	No aggregate	No	Good	48	95	11.6	13.4

Consistency:

The prepared hand wash formulations produce semi solid consistency and confirmed by visual observation (Table no 4).

Greasiness:

The prepared herbal hand wash A and B formulations were not found to show any greasiness upon application on the skin (table 5).

PH analysis:

The pH of formulation was found to be satisfactory and in the range of 5.96-6.36 which indicates that the prepared formulations can be compatible with skin (Table 5).

Homogeneity:

Under visual inspection of the prepared formulation indicated no lumps and to have uniform color dispersion, free from any fiber and particle (Table 5).

Grittiness:

The prepared formulations were found to have no grittiness (table 5).

Wash ability:

Prepared formulations were found to be washed easily with water (table 5).

Viscosity:

Viscosity of the prepared hand wash was variable. Viscosity of hand wash type A was higher than hand wash type B. Hand wash type A formulations showed the viscosity range of 42-55 P indicating that formulation No. A4 had highest viscosity range. In type B hand was formulation no B4 showed highest viscosity than other formulation (Table 5).

Foam height:

Prepared hand wash formulations showed various range of foam height depending on the gelling agent and foaming agent used (Table 5).

Foam retention:

Prepared hand wash formulations were analyzed for foam retention after five minutes. Different formulations showed variable foam retention after five minutes (Table 5).

Table 6: Results for skin irritation test of formulations

Formulation Code	Skin Irritation Test				
	6 hours	12 hours	24 hours	48 hours	72 hours
A1	No irritation	No irritation	No irritation	No irritation	No irritation
A2	No irritation	No irritation	No irritation	No irritation	No irritation
A3	No irritation	No irritation	No irritation	No irritation	No irritation
A4	No irritation	No irritation	No irritation	No irritation	No irritation
B1	No irritation	No irritation	No irritation	No irritation	No irritation
B2	No irritation	No irritation	No irritation	No irritation	No irritation
B3	No irritation	No irritation	No irritation	No irritation	No irritation
B4	No irritation	No irritation	No irritation	No irritation	No irritation

Spreadability:

The herbal hand wash formulations A and B showed remarkable spreading in the test which indicate that these herbal hand wash can spread evenly on the skin. The spreadability was found in the range of 10.5 cm to 18.3 cm (Table 5).

Skin Irritability test:

Small amount of the gel was applied on the skin and kept for few minutes. The test was conducted for three days and the formulations were found to show no redness, Inflammation and irritation (Table 6). It indicates that formulations are safe to use.

CONCLUSION:

Use of plant based herbal products has been increased considerably in the last few years. Herbal products are more demanding in global market as they are safe with fewer side effects. The present study was conducted to develop and standardize two types of herbal hand wash from Neem and Aloe Vera extracts with different formulations. Prepared hand wash formulations were evaluated for physical parameters, chemical parameters and health parameters. It is concluded from the result that different formulations come into the acceptable range for hand wash formulation with effective wash ability and no side effect on human skin.

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CONFLICT OF INTEREST:

The authors express no conflict of interest.

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