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NOVEL VIT HAND WASH USING SPICES AND FRUITS

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ABSTRACT

Herbal medicines play an important role in healthcare sector all through the world. Herbal medications are presently broadly been used as a strong solution for the counteraction and management of multiple health conditions. The prime method of transmission of microorganisms and nosocomial diseases is through our hands. Thus, hand-washing is an essential practice in human services and household part. Various antiseptic hand wash available in the market are alcohol based sanitizers which have been reported to show some adverse effects on our soft hands. To keep away from these unfriendly impacts like itching, drying, irritation, dermatitis etc., of the synthetic hand wash formulations an attempt has been made to formulate a poly herbal hand wash. The current exploration was planned to assess the antibacterial viability of different spices and fruits such as coriander, cumin, orange, walnut, curry leaves, mint, ginger, lemon grass, rosemary, aloe Vera. Examination was done to detail and assess the polyherbal powder hand wash. The anti-microbial activity of the formulated herbal hand wash powder was tested against *Escherichia coli* and *Staphylococcus aureus* isolated from cosmetics by pour plate procedure and MIC tally. Likewise the effectiveness was checked by utilizing the hand wash powder on volunteers.

KEYWORDS: Anti-microbial activity; Cosmetics contamination*; Escherichia coli;* Fruits, Herbal hand wash; Spices; *Staphylococcus aureus*.

INTRODUCTION

Nowadays, microbial contamination of cosmetics is of great importance because it causes both economic and product losses.[1] Cosmetics provide a suitable environment for growth of microorganisms like *Staphylococcus aureus, Klebsiella pneumoniae, E.coli, Psuedomonas*

spp. etc.[2] According to Campana et.al, 10.6% of tensiolytes (shampoo, bath foam and liquid foam) are contaminated with *Staphylococcus warneri*, *Staphylococcus epidermidis* and *Pseudomonas putida*.[3] Availability of nutrients like proteins, vitamins, water and suitable warm and humid temperature conditions lead to a conducive environment for growth of microorganism and hence spoilage of that cosmetic product.[4] Even the presence of chemical preservatives can merely prevent these cosmetics from contamination.[5] Various studies have been conducted to check for presence of microorganisms in cosmetic products and they affect us.[6] The type of closure of cosmetic container and consumer use also plays an crucial part. In case of skin lotions, standard screw cap closure provides very little protection against microbial contamination up to 29%. Flip cap closure on skin lotions provide protection up to 61% whereas, pump top closure provide protection upto 90%.[7] Microbial contamination can lead to many infectious diseases such as Staphylococcal scaled skin syndrome (SSSS) and various nosocomial infections like lower respiratory tract infections and urinary tract infections.[8] According to study conducted by Alvarez et.al., skin lotions are the reservoirs of *Burkholderia cepacia* which led to an outbreak of nosocomial infections in a multidispensary intensive care unit.[9] *Pseudomonas auruginosa* outbreaks have also been reported in a neonatal intensive care unit and hand lotions have been identified as the mode of transmission.[10] Thus, it is necessary to maintain hand hygiene after the use of cosmetic products. Plants have shown to have many characteristic properties one such property is their antimicrobial nature. Spices and fruits have shown to have such a nature. As stated by Dayanand Dubey, K. Balamurugan, citrus acid is found to be the active compound in orange peels which provides antimicrobial nature to it.[11] Presence of bioactive compounds like cinnamaldehyde, in curry leaves *(Murraya koenigii*) provides them with antimicrobial and anti-inflammatory properties. Due to antimicrobial property of curry leaf extract it produces a clear zone of inhibition against *Staphylococcus aureus* and *E.coli*.[12] Menthol which is an active compound in mint leaves imparts characteristic odour and antimicrobial activity to the plant.[13] Ginger and cardamom are flowering plant widely used as a spice and a folk medicine. As work done by Wail E. Abdalla and Emad M. Abdallah, zingiberene and cineole the major compounds present in them which make them antimicrobial and medicinal in nature.[14] A. Fazilah and M.H. Norziah, showed that cymbopogon, variously known as lemongrass, has antioxidant, anti-inflammatory and antimicrobial properties because of presence of major compounds like neral and geranial.[15] Study conducted by B Bozin, N Mimica-Dukic suggested that *Rosmarinus officinalis* commonly called as rosemary, contains Alpha-pinene compound which make it antimicrobial and medicinal in nature.[16] Neem

(*Azadirachta indica*) is an ordinarily utilized medicinal plant notable for its antibacterial, anti-malarial, antiviral, and antifungal properties. Neem is a successful antibacterial specialist against different pathogens.[17] Coriander and Cumin seeds are antimicrobial, medicinal, antispasmodic and anti-inflammatory in nature. They contain compounds like linalool and cuminaldehyde which act against bacterial pathogens and food spoilage bacteria.[18] Aloe Vera is found to contain polyphenols which go about as cancer prevention agents which along with several other compounds in Aloe Vera help to restrain the development of specific microbes that can cause diseases in people as expressed by S. Arunkumar and M. Muthuselvam.[19] Soap nuts (*Sapindus Mukorossi*) are essentially the shriveled shells from the soapberry. The shells have a glycoside compound considered saponin that creates a soaping impact. Saponin is a 100% natural elective chemical which acts as a cleanser. Since soap nut has shown to impart antimicrobial activity, it is a good option to cure bacterial and other scalp infections and is a natural replacement for surfactants and cleansers. They are anti-allergic and antibacterial in nature and hence can be used in hand washes (Reddy, D. Rama Sekhara).[20]

- Check microbial contamination of cosmetic products.
- Evaluate antimicrobial property of spices and fruits.
- Prepare a hand wash based on the antimicrobial property of the extracts stated above.

MATERIALS AND METHODS

Collection of samples

Different samples like coriander, lemon grass, curry leaves, ginger, orange, rosemary, mint, cumin, walnut, neem were collected from local market of Vellore, Tamil Nadu.

Isolation of *Escherichia coli* and *Staphylococcus aureus* from cosmetic samples

In order to isolate pathogenic organisms cosmetic samples such as talcum powder, lip balm and a moisturizer were used. The isolation was done by serially diluting the sample. Dilutions (10^{-7} and 10^{-9}) were used for isolating microorganisms using spread plate technique. Further, microorganisms were plated on EMB (Eosin methylene blue) and MAC (MacConkey Agar) media selective for *E.coli* and *Staphylococcus aureus* respectively. The selective medias were incubated and they were maintained as pure cultures in nutrient agar broth. (Orús, Pilar & Leranoz, Sonia, 2005).

Preparation of extracts

The fresh samples (coriander, orange peel, coriander, mint leaves, curry leaves, walnut, lemon grass, rosemary, ginger, aloe Vera, cumin, neem and soap nut) were collected, washed and surface sterilized later dried in hot air oven at 60℃ for 2-3 days. The dried samples were powdered using a blender and stored by refrigerating it.

In order to obtain the following extracts, 0.3g of each sample was soaked in 1ml of solvents such as distilled water, petroleum ether and 70% ethanol respectively. (Lundov MD and Moesby L, 2009).

Assessment of the antimicrobial activity of the various extracts

Nutrient Agar media was prepared on which the *E.coli* and *S.aureus* cultures were aseptically swabbed on the surface of separate plates. Wells were made on the media and 50µl of the extracts with respective solvents (distilled water, petroleum ether, 70% ethanol) were transferred. The plates were brooded at 37℃ for 48 hours and the distance across of the zones of restraint was estimated in mm. (Lundov MD and Moesby L, 2009).

Determination of MIC of the various extracts

Determination of the MICs of the samples was done by well diffusion method. Different concentration (0.2g/ml, 0.3g/ml, 0.4g/ml) were prepared for distilled water and 70% ethanol. The lowest concentration that did not permit any visible growth when compared with the control was considered as the minimum inhibitory concentration. (Dayanand Dubey and K. Balamurugan, 2011).

Preparation of the hand wash

Ginger and lemon grass(0.2g), 0.3g of orange peel, coriander, mint leaves, curry leaves, walnut, rosemary, 2.5g of soap nut was mixed in 13ml of distilled water and 70% ethanol respectively. The prepared poly herbal hand wash is ready which is shown in Figure 1. The samples were heated in distilled water at 50℃ for 15 minutes and MIC for distilled water and 70% ethanol was determined, after which the the zones of restraint was measured. (Orús, Pilar & Leranoz, Sonia, 2005).

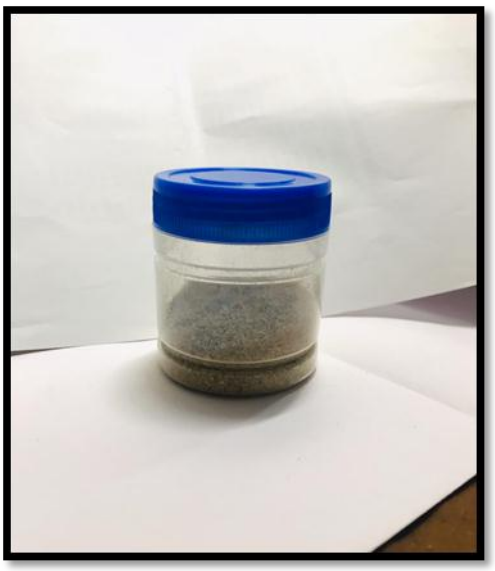

Figure 1: Poly herbal hand wash.

RESULTS AND DISCUSSIONS

The results of the experiments were carried out on the antimicrobial activity of dried leaves extract of rosemary, mint leaves, aloe Vera, cumin, lemon grass, curry leaf, dried walnut, orange peels, ginger and coriander. The extracts were processed with distilled water and solvents like ethanol, ethyl acetate and petroleum ether. These extracts were tested against *Escherichia coli* and *Staphylococcus aureus*.

Table 1[a] Zone of restraint of spice extracts in distilled water opposing *Escherichia coli.*

Plant extract	**Concentration of Plant Extract (mg/ml)**	
	Distilled water	
Extract	**50**	**100**
	Zone of restraint (mm)	
Coriander	3	5
Lemon grass	5	6
Curry leaves	5	8
ginger	6	5
Orange peels	7	8
Rosemary	Nil	3
Mint leaves	nil	4
Aloe Vera	3	5
Cumin	Nil	Nil
Walnut	6	7
Neem leaves	7	9

Table 1[b] Zone of restraint of spice extracts in different solvents opposing *Escherichia coli.*

Plant extract	Concentration of Plant Extract (mg/ml)					
	Ethyl acetate		Petroleum ether		Ethanol	
Extract	50	100	50	100	50	100
	Zone of restraint (mm)					
Coriander	4	6	5	4	7	11
Lemon grass	3	3	4	5	5	9
Curry leaves	4	7	4	5	8	10
ginger	3	6	5	5	7	15
Orange peels	4	5	3	3	6	10
Rosemary	Nil	4	5	9	Nil	6
Mint leaves	Nil	3	Nil	3	Nil	3
Aloe Vera	5	7	3	4	6	12
Cumin	Nil	3	3	4	5	11
Walnut	4	6	5	5	7	8
Neem leaves	nil	5	3	3	6	10

Table 1[c] Zone of restraint of spice extracts in different solvents opposing *Staphylococcus aureus.*

Plant extract	Concentration of Plant Extract (mg/ml)					
	Ethyl acetate		Petroleum ether		Ethanol	
Extract	50	100	50	100	50	100
	Zone of restraint (mm)					
Coriander	5	5	3	Nil	7	9
Lemon grass	3	3	3	5	5	5
Curry leaves	3	4	5	7	6	8
ginger	4	5	3	5	5	7
Orange peels	5	5	3	6	5	8
Rosemary	3	9	3	6	4	11
Mint leaves	nil	5	nil	3	5	11
Aloe Vera	5	6	3	5	8	14
Cumin	nil	5	Nil	3	5	9
Walnut	5	6	3	5	7	12
Neem leaves	5	6	4	6	9	13

Table 1[a], [b], [c] represents the zone of restraint of different spices and fruits in different solvents. The ethanol extract of lemon grass, curry leaf, dried walnut, orange peels, ginger and coriander showed maximum zone of restraint (mm) in 100 mg/ml in both *Escherichia coli* and *Staphylococcus aureus*.

Table 2[a] MIC of different spice extracts in ethanol extract opposing *Escherichia coli*.

Plant extract	Concentration of Plant Extract (mg/ml)		
	Ethanol extract		
Extract	200	300	400
	Zone of restraint (mm)		
Coriander	15	15	12
Lemon grass	16	6	10
Curry leaves	10	20	1
ginger	16	14	15
Orange peels	17	19	15
Rosemary	11	8	12
Mint leaves	6	7	6
Aloe Vera	12	12	4
Cumin	7	5	5
Walnut	8	10	6
Neem leaves	9	12	8

Table 2[b] MIC of different spice extracts in ethanol extract opposing *Staphylococcus aureus.*

Plant extract	Concentration of Plant Extract (mg/ml)		
	Ethanol extract		
Extract	200	300	400
	Zone of restraint (mm)		
Coriander	15	7	7
Lemon grass	9	7	3
Curry leaves	15	16	13
ginger	13	11	8
Orange peels	8	10	6
Rosemary	8	14	8
Mint leaves	7	7	6
Aloe Vera	7	7	3
Cumin	5	7	4
Walnut	8	10	7
Neem leaves	8	11	7

Minimum inhibitory concentration (MIC) in ethanol extract of curry leaf, dried walnut and orange peels was observed at 300 mg/ml concentration and that of ginger, lemon grass and coriander was observed at 200 mg/ml Table 2[a], [b]

According to zone of restraint hand wash powder was prepared with the combination of lemon grass, curry leaf, dried walnut, orange peels, ginger and coriander which was equally effective against both the bacteria i.e. gram positive(*E.coli*) and gram negative(*S.aureus*).It produces wider zone of restraint against *S.aureus* 13 mm than *E.coli* 11 mm in ethanol extract

Table[3]. Soap nut powder (50%) was added to the above mixture of spices which increased the antimicrobial activity of the handwash along with lathering.

Table 3: Antimicrobial activity of the hand wash powder.

Solvent	E. coli	S. Aureus
Zone of restraint(mm)		
Water	7	8
ethanol	11	13

CONCLUSION

The main objective of the above study was to prepare a fully herbal hand wash compared with other artificial hand wash available in market. In the present studies the active constituents of lemon grass, curry leaf, dried walnut, orange peels, ginger and coriander was present in its ethanolic extract. The prepared formulations when evaluated for its anti-microbial activity against microorganisms isolated from cosmetics exhibited zones of inhibition ranging from 10 to 14mm. Hence, by doing this we have found a new idea to fight with antibiotic resistance against the most common pathogens which is present in used cosmetics. These plants extract have massive antimicrobial activity and has emerging demand in global market. Subsequently powder of these plants extract can be used for the formation of Poly-herbal hand wash with significant activity having less or no reactions. This Poly-herbal hand wash can also be consistently used in future for the better hygiene. The pharmaceutical evaluation and toxicological examination are the future challenges.

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