

Formulation and standardization of polyherbal hand sanitizer

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ABSTRACT

Clean hands are an essential practice for the control and preventing of infections. Anti-microbials of herbal origin represents an expanded source for medicines against all the known kinds of microbial infections. These are very potent to treat the infections besides limiting many of the side effects that are often associated with synthetic anti-microbials. Such active anti-microbial herbs can be safely incorporated in formulating polyherbal hand washes. The herbal hand sanitizer was prepared using different herbals extract and was evaluated for its anti-microbial efficacy by Disc diffusion & Turbidity method. Values showed that the formulation was non-irritant and possessed good anti-bacterial activity when compared to a standard marketed formulation and control. From the present study, the formulated Herbal hand sanitizer was shown to affect bacteria and non-irritant.

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INTRODUCTION

Skin is the primary organ in the body that covers a vast extent of the body that helps in regulating the body temperature, sensory responses and contain many bacteria and micro-organisms. Those microbes use these secretions of the body and turn them into metabolites that yield a characteristic body odour. Cleanliness of the hand is an essential requirement to prevent and in controlling infections [1-3].

The usage and investigations of herbal extracts and supplementation from plant products have been

raising for many years. Herbs are very rich in varied amounts and nature of chemical compounds like flavonoids, tannins, alkaloids and terpenoids that are found to possess anti-bacterial properties. In the ages, herbs have been providing a source of anti-infective agents. Many herbs possessing anti-microbial properties can be safely incorporated in the hand wash. Many plants like coleus, Coriandrum, citrus, Azadirachta etc. and their chemical constituents have been used for their anti-bacterial, fungicidal and antiviral properties. Various researches have documented the anti-bacterial activity of volatile oils and extracts including peppermint, tea tree, basil, bay celery and rosemary.

In the present research poly herbal hand sanitizer containing bioactive constituents such as Coriandrum sativum, Azadirachta indica and Aloe vera was formulated and its anti-bacterial efficacy was evaluated in various methods.

MATERIALS & METHODS

Materials

The plant parts that are used in the preparation of formulation were obtained from the supplier of

Table 1: Formulation composition

S.No	Ingredients	Formulation NCF	Formulation NF
1	Neem Extract	10ml	10 ml
2	Coriandrum Extract	10 ml	—
3	Aloe Vera Gel	10 g	10 g
4	Lemon Oil	5 ml	5ml
5	Alcohol	20 ml	20ml
6	Glycerin	30 ml	30ml
7	Sodium lauryl sulphate (30%)	10 ml	10ml
8	Rose oil	3 ml	3ml
9	Annatto seeds	2 ml	2ml

Table 2: pH and stability test of the prepared formulations

Formulation	Day	Temperature ⁰ c	pH
NCF	1	4	7.29
		25	7.30
		45	7.30
	7	4	7.28
		25	7.29
		45	7.30
	14	4	7.28
		25	7.29
		45	7.39
NF	1	4	7.27
		25	7.27
		45	7.28
	7	4	7.28
		25	7.27
		45	7.28
	14	4	7.28
		25	7.27
		45	7.29

Table 3: Anti-bacterial sensitivity of the formulation in disc diffusion method

Organism	Zone of inhibition (mm)			
	NCF	NF	Commercial hand wash	Control
Escherichia coli	28 ± 0.2	23 ± 0.28	15 ± 0.2	8 ± 0.6
Staphylococcus aureus	23 ± 0.12	22 ± 0.02	10 ± 0.15	6 ± 1
P. aeruginosa	15 ± 0.13	14 ± 0.8	6 ± 0.11	No inhibition

Table 4: Anti-bacterial sensitivity of the formulation in the turbidimetric method

Formulation	Absorbance *
NCF	0.1397±0.03
NF	0.1472±0.03
Commercial Hand wash	0.1968±0.04
Control	0.629±0.03

All of the values are represented as Mean ± SD (n=3)

*Mean of triplicate readings

crude herbal drugs, Tirupathi, India. All the chemicals used in the experiments were procured from SD Fine Chem LTD., Mumbai, India. Commercial available herbal hand sanitizer was of a good brand and acquired from a local retail store [4].

Extraction

The dried leaves of *A.indica* and *C.sativum* were finely powdered separately and passed through sieve #80. 500 g of each powder was extracted with ethanol and separated. The filtrate is dried and 45 g of both extracts were dissolved in 150ml of ethanol. The final volume is made until 135ml by concentrating the extract at a concentration of 300mg/ml [5].

Formulation of herbal hand sanitizer

Weighed quantities of Aloe vera gel and glycerin were taken with alcohol in a beaker. With constant stirring solutions of extracts (neem and coriander) were added and sodium dodecyl sulphate was added and mixed. Finally, the volume is made up to 100ml with distilled water. Then a little quantity of rose oil is added as a flavouring agent and annatto seed extract is added as a colour. All the formulations were made according to Table 1.

Evaluation of prepared formulations

Physicochemical evaluation

The prepared poly herbal hand washes were evaluated for their physical appearances like colour, odour and texture. pH was measured using a digital pH meter, and stability studies had been performed by freeze-thaw cycling method. The formulations were stored at temperatures 4, 25 and 45^oc for 14days and they were exposed to ambient room temperature. Then the pH, sedimentation and any change in physical appearance [6].

Invitro anti-microbial tests

Disc-diffusion

Agar medium was prepared and spread on petri plates each noted as a test, standard and control. P.

aeruginosa, *E.coli* and *S.aureus* had been used as cultures which were inoculated and incubated at room temperature for one day. Filter paper discs were cut out and saturated with sanitizer and also a marketed hand wash. These were placed in the petri plates and incubated for 24hrs. The zone of inhibition was calculated [7].

Turbidimetric method

Healthy volunteer having no sign of abrasions, physical traumas and infections are chosen for the study. Sterile cotton swabs were taken and swabbed on both hands. Two types of swabs which are noted as before (Bfr) application and after application (Aft). The nutrient broth was prepared and an equal volume of it was transferred into the sterile test tubes. One set of the test tubes was taken as control. 5 ml of sterile nutrient broth was kept aside to be used as a reference. Approx. Some 1ml of the formulation is poured out on the hands to quickly wash the hand's fingernails and palms till it dries up. After 10 sec of the washing the swabbing is done and the inoculation is followed in the tube of broth. They are incubated for one day in an incubator. The absorbance of the medium from all the test tubes was determined in a UV-Vis Spectrophotometer at 600 nm. The method was repeated for seven consecutive days and the absorbance readings were noted [8].

RESULTS

Both the prepared formulations were light green-emerald green in colour and had a pleasant, agreeable odour. The results of the pH and stability tests were tabulated in Table 2. The results of disc diffusion method (Table 3) proved that the sanitizer from the ethanol extract of the mixed plant powder had better anti-bacterial activity than that of the commercially available sanitizer. Discs of SLS was noted as control. The zone size obtained with the disc of SLS showed that significant anti-bacterial activity of the formulated herbal sanitizer is not solely due to addition of 30% SLS but is the result of the combined activity of the phytoconstituents. Table 1

The results of Turbidimetric method (Table 4) shows the high absorbance values of the control followed by the commercial handwash, with the Herbal Hand sanitizers showing least absorbance value. The higher the absorbance values, the lower the anti-bacterial efficacy. This again infers that the formulated Herbal hand sanitizer is comparatively effective against various bacterial strains.

CONCLUSION

The herbal hand sanitizer was investigated for its activity in disc diffusion and turbidimetric methods and the values showed the sanitizer which is prepared is far better active than the commercial hand sanitizer. Nimbin, Nimbolide and Nimbidin from Neem and Coriandrol and coriandryl acetate from Coriandrum may be responsible for the anti-bacterial activity of the formulation.

CONFLICT OF INTEREST

Authors declared no conflict of interest.

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