WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 8, Issue 12, 771-775. Research Article ISSN 2277– 7105

DEVELOPMENT AND EVALUATION OF ALCOHOL FREE HAND SANITIZER USING ZINC GLUCONATE & HERBAL EXTRACTS

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Article Received on
05 Sept. 2019,
Revised on 26 Sept. 2019,
Accepted on 16 Oct. 2019
DOI: 10.20959/wjpr201912-15912

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ABSTRACT

The present study was developed alcohol free hand sanitizer using zinc gluconate. Zinc gluconate was shown the antimicrobial activity against *Staphylococcus aureus*, Gram-negative, *Pseudomonas aeruginosa*. Numerous of the antiseptic hand wash available in the market are alcohol based sanitizers which have some adverse effects. To avoid these adverse effects like itching, drying, irritation, dermatitis etc., of the synthetic hand wash formulations an attempt has been made to formulate a alcohol free hand sanitizer using zinc gluconate & various propylene glycol (PG) base extract of aloe vera & Neem. The formulation was evaluated for its physical parameters & in-vitro antimicrobial study (Zone of Inhibition).

KEYWORDS: Hand hygiene, antimicrobial activity, Zinc gluconate.

INTRODUCTION

Hand hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent the nosocomial infections.[1] The most common skin disorders are eczema (atopic dermatitis), warts, acne, rashes, psoriasis, allergy etc. To protect the skin from harmful microorganisms and to prevent spreading of many skin infection.[6] Hand washing is absolutely an important precaution. The aim of the present work is to prepare and physically evaluate an alcohol free hand sanitizer from commonly available plants extract & zinc

gluconate. Hand sanitizer is an antiseptic and supplement to the hand washing with soap and water.[8] There are different preparations in hand sanitizer like gel, foam, liquid solution etc.[2]

In the current scenario of mechanized life style; a consumer will always prefer ready-made formulation of alcohol free hand sanatizer rather than hand washing (application of a non-antimicrobial or antimicrobial soap; and mechanical friction is generated by rubbing the hands together for 1 minute, followed by rinsing with water, and then drying thoroughly with a disposable towel).[3] Only Zinc gluconate was devoid of antifungal activity whereas the other salts showed antimycotic activity but, it was significantiy lower than their respective activities against tested bacterial strains.[7]

MATERIAL AND METHODS

PG based extract of Aloe vera & Neem was purchased by Phyto life science pvt. Ltd., Gujarat Zinc gluconate was obtained as a gift sample from ONS pharmaceutical pvt. Ltd., Jaipur Lemon fragrance provided a gift sample by flavaroma flavours & fragrances private limited, Gujarat.

Bacterial strains[5]

1. *Pseudomonas aeruginosa* (gram–ve) ATCC 25619
2. *Staphylococcus aureus* (gram +ve) ATCC 6538.

Formulation of hand sanitizer

Preparation of hand sanitizer

The preparation of hand sanitizer was carried out by mix on the behalf of solubility. First of all take 50 % deionised water and heat at not less than 70^{o}C and add zinc gluconate according to table no. 1 and properly mix to obtain a clear solution then cool at 25-35^{o}C. Pour the both extract in cooled clear solution. After the proper mixing then add preservative & lemon fragrance according to formulation and volume make up with deionised water.

Table 1: Composition of Hand sanitizer (%).

Ingredients (mg)	F1	F2	F3
Ex. Aloe *(Aloe barbadensis)*	3	3	3
Ex. Neem *(Azadirachta indica)*	7.5	7.5	7.5
Zinc gluconate	13	16	19
Preservative	1	1	1
Lemon Fragrance	3	3	3
Deionised water	75.5	75.5	75.5

EVALUATION

Physical Evaluation: The herbal based hand alcohol free hand sanitizer subjected to physical evaluation visually. The test parameters were Colour and Odour.[4]

Colour: Determined by visually.

Odour: Determined by manually.

pH: Take 10 ml of hand sanitizer and measure the pH by previously calibrated digital pH meter.

In-vitro Antimicrobial activity by Agar plate diffusion method

In present study the antimicrobial activity of developed sample was carried out by the agar plate diffusion method. The activity were determined on different concentrations into an agar medium in a Petri dish. Replicator device was used to inoculate multiple specimens on to a series of plates with varying concentration of sample. Responses of organisms to the trial drugs were measured and compared with the response of the standard reference drug[3].

RESULT AND DISCUSSION

Physical evaluation & pH: The result of physical evaluation in table no. 2

Table 2: Results of Physical evaluation & pH.

Name of Parameter	F1	F2	F3
Colour	Clear, transparent Liquid	Clear, transparent Liquid	Clear, transparent Liquid
Odour	Characteristic	Characteristic	Characteristic
pH	6.26	6.35	6.54

In-vitro Antimicrobial activity

Total two bacterial species were selected for the present study to evaluate the antimicrobial activity of the hand sanitizer Different concentrations of the products were incubated and observed for the zone of inhibition (Table 3). The concentrations 1000 µg/ml was observed in two bacterial species (*P. aeruginosa, S. aureus).* This indicates that the hand Sanitizer has anti-bacterial activity particularly against *S. aureus* and *P. aeruginosa* at minimum concentration of 1000 mcg/ml. The resistant organism may respond to the test drugs in further concentrations.

Table 3: Result of antimicrobial activity of Hand Sanitizer.

Organism	Zone of inhibition (mm)		
	F1	F2	F3
P. aeruginosa	15-16	19	20
S. aureus	17-18	18-19	21

Figure 1: *P. aeruginosa* (F1)

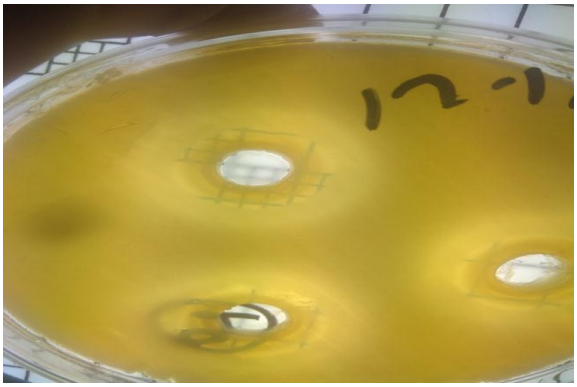

Figure 2: *S. aureus* (F1)

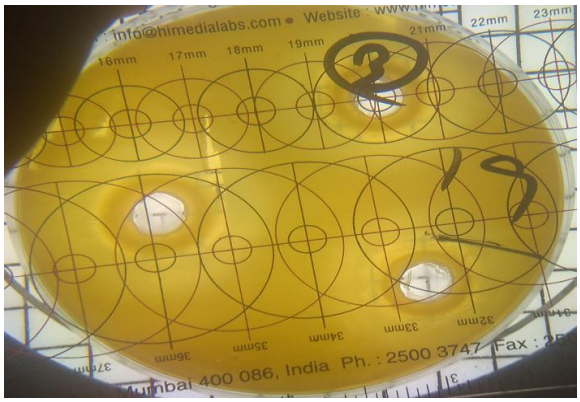

Figure 3: *P. aeruginosa* (F2)

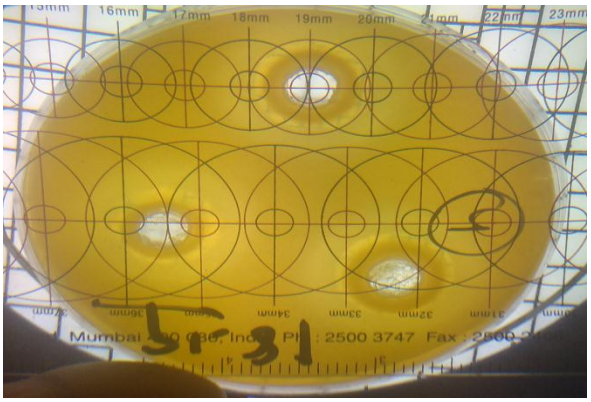

Figure 4: *S. aureus* (F2)

Figure 5: *P. aeruginosa* (F3)

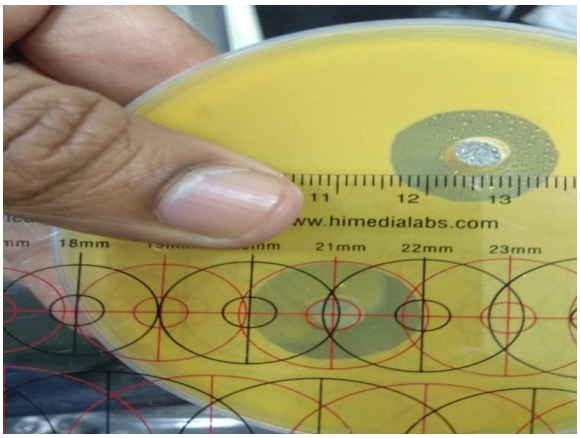

Figure 6: *S. aureus* (F3)

CONCLUSION

Natural remedies are more acceptable in the belief as they are safer with fewer side effects than the synthetic ones. Herbal formulations have emergent demand in the global market.

The prepared formulation of alcohol free hand sanitizer showed the significant result at 19 % zinc gluconate concentration. The In-vitro antimicrobial activity shown against two species *Staphylococcus aureus*, *Pseudomonas aeruginosa*. The maximum zone of inhibition is observed F3 formulation that is 20-21 mm. This formulation is less adverse effect comparison to alcohol based hand sanitizer. The alcohol based hand sanitizer show mainly these adverse effects like itching, drying, irritation, dermatitis. This formulation is not showing any itching like adverse effect.

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