International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(5) May -2016

A GOOD HAND WASH USING LIQUID GLUCOSE BASED POLYMERIC SURFACTANT

Gawande P D, Mathane S R, Gogte B B and Yenkie M K N

THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 5, pp. 11274-11277, May, 2016

International Journal of Recent Scientific Research

Research Article

A GOOD HAND WASH USING LIQUID GLUCOSE BASED POLYMERIC SURFACTANT

Gawande P D[1]*, Mathane S R[1], Gogte B B[2] and Yenkie M K N[3]

[1]Department of Chemistry, Shri Shankar Prasad Agnihotri College of Engineering, Ramnagar, Wardha, Maharashtra, India
[2,3]Department, Laxminarayan Institute of Technology, R.T.M. University, Nagpur, Maharashtra, India

ARTICLE INFO

Article History:

Received 19th February, 2016
Received in revised form 12th March, 2016
Accepted 26th April, 2016
Published online 28th May, 2016

Keywords:

Liquid Glucose, Hand Wash, Antimicrobial Activity.

ABSTRACT

With improvement in living standard in our country a Hand Wash is becoming a popular and important product. The special feature of Hand Wash has acidic pH 5-6 which match with our skin and Antimicrobial activity against several microorganisms. Liquid glucose also known as Corn Syrupis a fundamental ingredient in many food and industrial products it is a purified concentrated aqueous solution of nutritive saccharides obtained from starch. The quality of liquid glucose has a direct impact on the quality and performance of the finished product. In the present research work polymeric surfactant is prepared using liquid glucose and sorbitol. This polymeric surfactant is used in preparation of hand wash. The Antimicrobial Activity of our Hand Wash was tested against S. auerus and E. coli. The Minimum Inhibition Concentration is 0.125 mg for both type of micro-organism. The hand wash prepared from liquid glucose polymer appears to have excellent microbial activity.

INTRODUCTION

Liquid glucose[1] with molecular formula ($C_6H_{12}O_6$)also known as Corn Syrup[2]is a fundamental ingredient in many food and industrial products it is a purified concentrated aqueous solution of nutritive saccharides obtained from starch. The solids are composed of various carbohydrates such as dextrose; maltose and higher saccharides, the different carbohydrate profiles compiled with various available solids levels give liquid glucose its unique functionalities. The main source of preparation of Liquid Glucose is Starch[3].

Plants store starch in different organs such as fruit, seeds, rhizomes and tubers to prepare starch for the next growing season. Main crops with high starch content are potatoes, maize, sorghum, wheat, rye, triticale, barley, peas, rice and tapioca. In most of the country starch is extracted from Cassava Root.

The idea was to synthesis a polymer which can substitute conventional active material like Acid Slurry[4], Alpha Olefin Sulphonate[5] and Sodium Lauryl Ether Sulphonate. Various organic acids used in this polymer synthesis are Maleic Anhydride, Phthalic Anhydride, Oxalic Acid and Citric Acid. The polymers were prepared in Glass reactor of 2 liters capacity with heating and cooking ability. The cooking

*Corresponding author: **Gawande P D***
Department of Chemistry, Shri Shankar Prasad Agnihotri College of Engineering, Ramnagar, Wardha, Maharashtra, India

schedule was established to get desired properties of the polymer.

As a substitute of Acid Slurry, the polymer must give good foaming, surface tension reduction and cleaning properties. The samples were analyzed thoroughly for various physicochemical constants[6-7] like acid value, viscosity, surface tension and % solid. Some selected samples were also analyzed by spectroscopic techniques[8-9] like IR, NMR spectra. The IR and NMR studies indicate the presence of ester group, ether group, free OH group and free carboxylic acid group. All these groups contribute to surfactant properties.

Experimental

With improvement in living standard in our country a Hand Wash is becoming a popular and important product. The special feature of Hand Wash has acidic pH 5-6 which match with our skin and Antimicrobial activity against several microorganisms. For developing Hand Wash and Antimicrobial activity[10-11] specifically only those combinations were preferred in which about 15-20% organic acid have been used. Citric and oxalic acid in the recipes will certainly help in developing a good Hand Wash.

For this preparation we have specifically selected polymer which contain appreciable amount of Citric Acid. The composition of polymer is mentioned in Table No. 1 from which hand wash is manufactured. The composition of Hand Wash is given in Table No. 2.In all compositions 12% of selected polymer was incorporated. 2% Citric Acid was also used in the formulation to get the desired acidic pH. The other ingredients are common ingredients of Hand Wash.

Table No.1 Composition of Polymer Used For Preparation of Hand Wash

Ingredient % by weight -- Batch No.	Liquid Glucose 70 % solids	Glycerol 90% solids	Maleic Anhydride	Citric Acid	Oxalic Acid	Sodium Meta Bisulphite
B14	23.81	52.39	9.52	4.76	4.76	4.76
B17	19.05	57.15	9.52	4.76	4.76	4.76
B18	9.52	66.68	9.52	4.76	4.76	4.76
B23	40	45	-	5	5	5
B24	50	30	-	10	-	10

Table No.2 Formulation of Hand Wash (% by weight)

Name of Hand Wash Ingredients	Hand Wash No. 1	Hand Wash No. 2	Hand Wash No. 3	Hand Wash No. 4	Hand Wash No. 5
Polymer	B 14 = 12	B 17 = 12	B 18 = 12	B 23 = 12	B 24 = 12
SLES	12	12	12	12	12
Acid Slurry	6	6	6	6	6
SLS	1	1	1	1	1
Sodium Carbonate	3	3	3	3	3
Sodium Sulphate	2	2	2	2	2
Sorbitol	5	5	5	5	5
Urea	2	2	2	2	2
CMC	2	2	2	2	2
Citric Acid	2	2	2	2	2
Water	53	53	53	53	53

SLES = Sodium Lauryl Ether Sulphate (30% solid), SLS = Sodium Lauryl Sulphonate (100% solid), CMC = Carboxy Methyl Cellulose (20% solution)

All the prepared samples have reasonable viscosity, color, clarity and excellent foaming properties. There is significant reduction in surface tension. All these results are comparable to commercial samples available in market, see Table No.3.

Table No. 3 Physico-Chemical Properties of Hand Wash

Properties--- Hand Wash No.	Foam Height (in CC) (by Cylindrical method) (1% Solution)	Viscosity (in Second) (by Ford Cup No.4)	Density (gm/lit)	Surface Tension (in dyne/cm) (by Stalagnometer)	pH Value (by Digital pH Meter)	% Solid (%)
HW No. 1	1000	235	1.0084	32.67	4.78	32.40
HW No. 2	1000	275	1.0176	35.10	4.96	31.62
HW No. 3	1000	253	1.0084	30.60	5.03	26.89
HW No. 4	1000	205	1.0100	26.81	5.46	28.18
HW No. 5	1000	265	1.0108	29.14	5.38	27.27
Commercial Hand Wash	700	405	1.0044	29.18	4.32	16.07

Density of water = 0.99 gm/lit, Surface Tension of water = 72.8 dyne/cm

The Antimicrobial Activity of our Hand Wash was tested against S. auerus and E. coli. The Minimum Inhibition Concentration[12] is 0.125 mg for both type of micro-organism. These results are not only comparable but better than most popular brands of Hand Wash available in market. Our polymer appears to have excellent microbial activity. The Table no. 4 and 5given below shows the behavior of Hand Wash with microorganisms E. coli and S. aureus at different concentrations from 0.126 to 2 mg.

Table No. 4 Analysis of antimicrobial activity of hand wash based on liquid glucose polymers for staphylococcus aureus (s. Aureus)

Sample	0.125 mg	0.25 mg	0.5 mg	1.0 mg	2.0 mg	MIC mg
HW-1	6	8	12	14	19	0.125
HW-2	5	10	14	17	21	0.125
HW-3	3	9	14	16	18	0.125
HW-4	9	11	14	18	20	0.125
Commercial	4	8	9	11	11	0.125

Table No. 5 Analysis of Antimicrobial Activity of Hand Wash Based On Liquid Glucose Polymers for Escherichia Coli (E.Coli)

Sample	0.125 mg	0.25 mg	0.5 mg	1.0 mg	2.0 mg	MIC mg
HW-1	7	11	15	17	19	0.125
HW-2	8	10	19	20	21	0.125
HW-3	10	10	12	16	20	0.125
HW-4	9	11	12	16	23	0.125
Commercial	3	6	8	12	14	0.125

It is cleared that the samples of Hand Wash prepared from polymers containing Liquid Glucose are comparable rather shows excellent results than the commercial one. The minimum inhibition concentration[12] for all samples was 0.125 mg. Following are the images which show the inhibition zones at different concentrations of hand washes prepared from liquid glucose based polymers and commercial sample. In this both type of microorganisms i.e. E coli and S aureus are used for testing anti-bacterial activity. CHW is abbreviation for commercial hand wash, HW1, HW2, HW3 and HW4 are abbreviations for hand wash 1, 2, 3 and 4. Plate No. 1 and 6 shows inhibition zones for both type of microorganisms of commercial samples. Plate No. 2, 3, 4, 5, 7 to 10 shows inhibition zones for both types of microorganism for hand wash

no. 1 to 4. The hand wash synthesized from our novel polymer containing liquid glucose and glycerol with natural origin shows good results as compared to the commercial samples with petroleum or natural origin.

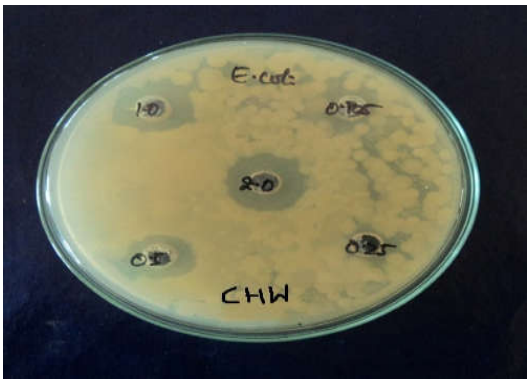

Plate No. 1 Inhibition Zone of Commercial Sample by E coli

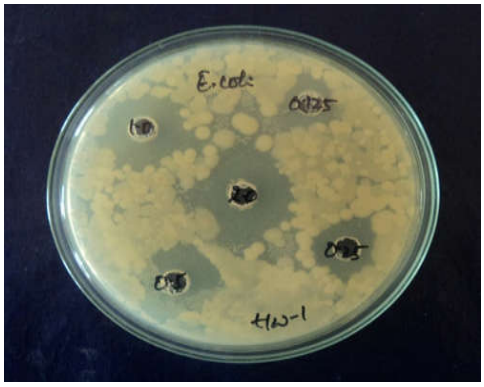

Plate No. 2 Inhibition Zones of HW 1 by E Coli

Plate No. 3 Inhibition Zones of HW 2 by E Coli

Plate No. 4 Inhibition Zones of HW 3 by E Coli

Plate No. 5 Inhibition Zones of HW 4 by E Coli

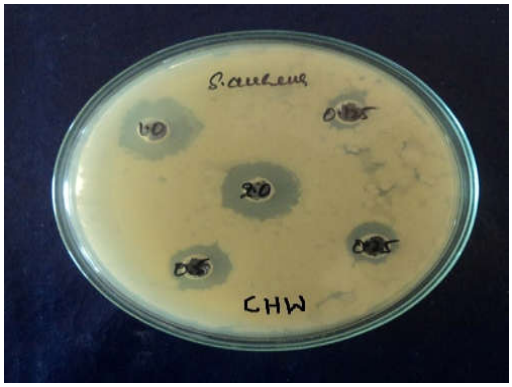

Plate No. 6 Inhibition Zones of Commercial Sample by S Aureus

Plate No. 7 Inhibition Zones of HW 1 by S Aureus

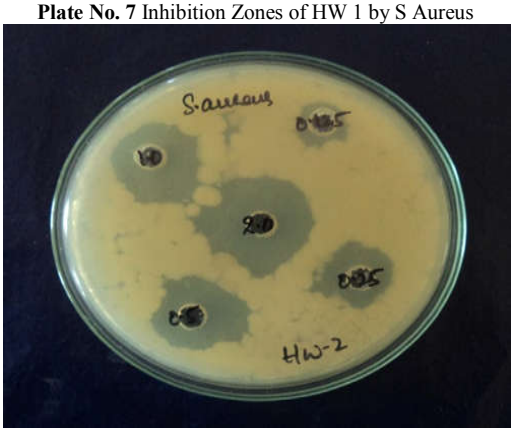

Plate No. 8 Inhibition Zones of HW 2 by S Aureus

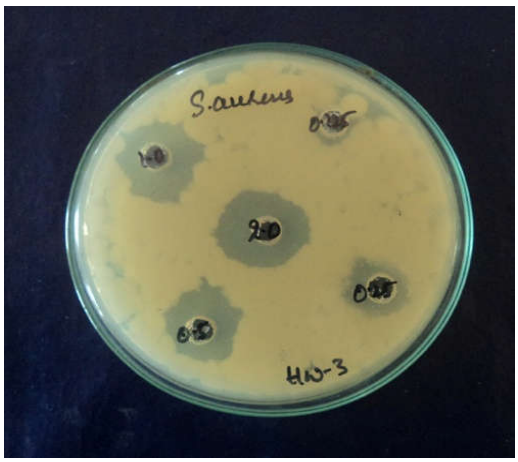

Plate No. 9 Inhibition Zones of HW 3 by S Aureus

Plate No. 10 Inhibition Zones of HW 4 by S Aureus

RESULT AND DISCUSSION

Table No.1 gives an idea about the selected polymer for preparation of Hand Wash. All the samples contain 4.76 to 10% of citric acid. The composition of Hand Wash prepared from these selected polymers is given in Table No. 2.

The physicochemical analysis of these Hand Wash shows that are comparable with commercial samples given in Table No. 3. This Hand Wash is tested for antimicrobial activity with commercial samples and it is seen that the behavior of our Hand Wash with both the microorganism is not even comparable but even better than commercial one. This conclusion is made from Table No. 4 and 5. From Plate No. 1 to Plate No. 10, it shows the inhibition zones of samples of Hand Washes.

CONCLUSION

1. Polymers can be synthesized based mainly on liquid glucose and sorbitol with small portion of organic acid. The mole ratio, time of heating and catalyst has been standardized witch will give optimum performance like commercial one.
2. Physicochemical and spectral analysis of polymers shows stability of polymers for commercial preparation.
3. These samples use minimum quantity of petroleum based products and free from Sodium Tri Polyphosphate (STPP) so green to use.
4. The polymeric surfactant formed from vegetable origin moves it towards eco-friendly environment.
5. Use of citric acid in preparation of Hand Washes is beneficial.
6. These samples of Hand Wash with high antimicrobial activity can be tried on pilot scale.

Acknowledgment

One of the authors P. D. Gawande, is thankful to BioGenics Research and Training Center in Biotechnology, Hubli, Karnataka for Antimicrobial Testing.

References

1. Ying Mei, Kumar Ajay, Wei Gao, Richard Gross, Scott B. Kennedy, Newell R. Washburn, Eric J., Amis John T., Elliott; Biomaterials, Vol 25(4),pp 4195-4201.
2. Kay Parker, Michelle Salas, Veronica C. Nwosu; Biotechnology and Molecular Biology Review, 2010, Vol 5(5), pp 71-78.
3. ParkS. H., BeanS. R., WilsonJ. D., SchoberT. J.; Cereal Chem., 2006, Vol 83(6), pp 611-616.
4. Mehlon, Bocher V. C., The Analysis of Fats and oils, Garrard Press Publisher, 1966, pp 299-308.
5. Mellor J. W.; *Journal of Compressive Treatise on Inorganic and Theoretical Chemistry*, pp 660-672.
6. John Wiley and Sons Inc. Drew Myers, Surfactant Science and Technology, 3rdEdition, 2005, CISA in Cardoba Argentina.
7. ASTM Standard Method 6.01, dl 639.70 (for acid value) of Organic Coating Material, Published by the American Society for Testing Material, Philadelphia, (1981).
8. BrarAjaib Singh, Goyal A. K., Hooda S.; Pure and Applied Chemistry, 2009, Vol 8(3), pp 389-413.
9. Molis S. E., Macknight W. J., Hsu S.L.; Applied Spectroscopy, Vol 38(4), pp 529-537.
10. Ikegbunam M. N., Metuh R. C., Anagu L. O., Awah N. S.; *International Research Journal of Pharmaceutical and Applied Sciences*; 2013, Vol 3(4), pp 133-135.
11. Ahmad NaeemSajed, Dr. Shagufta, Dr. SajidHaider, Dr. NosheenWasimYousaf, Dr. Imran Ahmed Shan, Dr. Sadaf Imran; IOSR *Journal of Pharmacy*; Feb 2014, Vol 4(2),pp 19-23.
12. Vidaver A. K.; *Journal of Anti microbiology and Agricultural Plant*, 2002, Vol 24, pp 107-110.

****

How to cite this article:

Gawande P D *et al*., A Good Hand Wash Using Liquid Glucose Based Polymeric Surfactant. *Int J Recent Sci Res.* 7(5), pp. 11274-11277.

TSSN 0976-3031