



Journal home page: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF INNOVATIVE AND APPLIED RESEARCH

RESEARCH ARTICLE

Article DOI: 10.58538/IJAR/2031

DOI URL: <http://dx.doi.org/10.58538/IJAR/2031>

EVALUATION OF BIOCOMPATIBILITY OF SELECTED SHAMPOO PRODUCTS THROUGH ANTI-MICROBIAL STUDY

Benecia Ravi¹ and Dr. V. Violet Dhayabaran²

1. UG. Scholar, Department of Chemistry, Bishop Heber College (Autonomous), Tiruchirappalli.
2. Associate Professor, Department of Chemistry, Bishop Heber College (Autonomous), Tiruchirappalli.

Manuscript Info

Manuscript History

Received: 04 May 2023
Final Accepted: 12 June 2023
Published: June 2023

Keywords:

Shampoo, in-Vitro, Antibacterial Activity, Well Diffusion Method

Abstract

The human scalp is susceptible to microbial build-up if not thoroughly and frequently washed with the appropriate cleansing agent such as shampoo. Shampoo is a fast-moving commodity for hair care that is used to get rid of contaminants such as dandruff, oils, grime, skin fragments, and other contaminants that slowly accumulate in the hair. The purpose of shampoo is to remove the undesirable buildup without extracting too much sebum to leave hair unmanageable. The chemicals in shampoo may harm the healthy microorganisms in our hair. In this study, the antibacterial efficacy of the most popular shampoo products is investigated. In order to evaluate the quality in terms of biocompatibility four different brands of shampoo for both regular shampoo and anti-dandruff shampoo were selected. The present study focussed on In-vitro antibacterial activity of commonly used shampoos. The samples selected were namely Himalaya, Meera, Dove, Pantene. They were examined for in-vitro antibacterial activity for biocompatibility. The compound were analyzed for five gram positive bacterias such as Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Cutibacterium, Candida albicans, gram negative bacteria Salmonella typhi and One fungi species named as Microsporum canis. The current study highlighted the anti-microbial assay of the commercially available shampoo products based on the well diffusion method. The biocompatibility of the products with seven different microbes were assessed. The experiment results have brought Interesting insights and helped to identify the safe products for dermatological relevance.

*Corresponding Author:- Benecia Ravi, Department of Chemistry, Bishop Heber College (Autonomous), Tiruchirappalli.

Introduction:-

Shampoo is the most important product for personal hygiene. To keep the hair healthy and clean it is necessary to choose the right product. Literature survey revealed the fact that more than 80% people are using shampoo products from the selected product. As it has different kinds of ingredients, the chemicals present in the shampoo can cause a lot of issues if it is not suitable for an individual hair & scalp. Hence selection of right kind of shampoo is essential to safe guard the scalp & hair health. To identify the right choice of shampoo it is necessary to find the efficacy of

the shampoo with microbes present in the scalp. So it is planned to explore the biocompatibility of the most commonly used shampoos.

Based on the existing health issues of hair health the following objectives are framed for the study.

Objectives:-

1. To recognize the potential benefits of bacterial.
2. To explore the usage of shampoos for various needs.
3. To examine the antimicrobial activity of selected shampoos and to identify its biocompatibility

Research Methodology:-

Study Design and Rational -This study was quantitative in nature. because it described its analysis data in form of quantity or numbers.

Materials and Methods:-

Collection of Shampoo Products

The shampoos were collected from shops. The collected samples were transported to the laboratory.

Micro Organisms and Culture Media

Bacterial cultures such as, Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Cutibacterium, Candida albican, Salmonella typhis and fungi culture Microsporum were obtained from Eumic analytical Lab and Research Institute, Tiruchirappalli. Bacterial strains were maintained on Nutrient agar slants (Hi media) at 4°C.

Inoculum Preparation

Bacterial cultures were subcultured in liquid medium (Nutrient broth) at 37°C for 8h and further used for the test (10^5 - 10^6 CFU /ml). These suspensions were prepared immediately before the test was carried out.

Preparation of Culture Media

Nutrient Agar Medium

Nutrient agar medium is one of the most commonly used medium for several routine bacteriological purposes:

Ingredients		Grams/Litre
Peptone	:	5gm
Beef extract	:	3gm
Agar	:	15gm
Sodium chloride	:	5gm
Yeast extract	:	1.5gm
pH	:	7.0

After adding all the ingredients into the distilled water it is boiled to dissolve the medium completely and sterilized by autoclaving at 15 lb psi pressure (121 °C) for 15 minutes.

Nutrient Broth

The nutrient broth was prepared by the same composition without agar. At the adding all the ingredients into the distilled water it is boiled to dissolve the medium completely and sterilized by autoclaving at 15 lb psi pressure (121 °C) for 15 minutes.

Solubility of shampoo

Collected shampoo products were dissolved in distilled water and used for microbial test.

Assay of Antimicrobial Activity Microbial inoculum preparation:

The nutrient broth were prepared, then identified bacterial colonies were inoculated into the broth culture were used for antimicrobial activity.

Kirby Bauer Agar Well Diffusion Assay

The nutrient agar medium was prepared and sterilized by autoclaving at 121°C 15 lbs pressure for 15 minutes then aseptically poured the medium into the sterile petriplates and allowed to solidify the Bacterial broth culture was swabbed on each petriplates using a sterile buds. Then wells were made by well cutter. The organic solvent extracts of leaves were added to each well aseptically.

This procedure was repeated for each Petri plates then the petriplates were incubated at 37°C for 24 hrs. After incubation the plates were observed for the zone of inhibition.

Result and Discussion:-

Antibacterial Activity

The in-vitro antibacterial activity of commercially available four different shampoo products was investigated through well-diffusion methods. In this study Normal and antidandruff shampoo products were examined.

Table 1:- Effect of microbes on selected samples used for normal hair growth.

SAMPLE	100 µl added and Zone of inhibition (mm/ml)				CONTROL (Gentamicin)
	A 1	B 1	C 1	D1	
Staphylococcus aureus	12	14	16	15	20
Staphylococcus epidermidis	16	16	16	16	20
Bacillus subtilis	20	22	25	18	25
Cutibacterium	22	24	22	23	28
Salmonella typhi	18	22	22	40	25
Candida albicans	20	22	26	24	25
Microsporum	14	18	18	22	20

Control: Gentamicin antibiotic disc A1- Himalaya Shampoo

B1- Meera Shampoo C1- Pantene

D1- Dove

The antimicrobial susceptibility of the selected samples were used to determine the degree of efficacy of the shampoo products against bacterial and fungal species at 100µl concentration. The shampoo products A1,B1,C1,D1 were examined against six selected species of bacteria such as (Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Cutibacterium, Candida albicans, Salmonella typhi) and one fungal species (Microsporum). The results reveal that the C1 shampoo products was effective against the Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Cutibacterium, Candida albicans and these are gram-positive bacteria through literature survey it is shown that these bacterial species are present in hair and helps in hair growth. A1,B1,D1 shows less activity against the above bacterial species. Salmonella typhi is a gram-negative bacteria which inhibits hair growth and D1 is active against this bacteria. Microsporum is a fungal species D1 is active against this species, shown in Fig 1. which is a desirable phenomenon since most scalp disorders like ringworm, dandruff and psoriasis and seborrheic dermatitis are caused by fungi.



Fig 1:- Antibacterial activity of A1,B1,C1 shampoo products.

Table 2:- Effect of microbes on selected samples used for antidandruff hair issue.

SAMPLE	100 µl added and Zone of inhibition (mm/ml)				CONTROL (Gentamicin)
	A 2	B 2	C 2	D2	
Staphylococcus aureus	14	16	20	18	20
Staphylococcus epidermis	16	14	20	16	20
Bacillus subtilis	20	22	24	22	25
Cutibacterium	22	24	28	26	28
Salmonella typhi	20	23	26	46	25
Candida albicans	22	25	28	28	25
Mirosporium	14	17	22	24	20

Control: Gentamicin antibiotic disc

A2- Himalaya (Anti-Dandruff Shampoo) B2- Meera (Anti-Dandruff Shampoo) C2- Pantene (Anti-Dandruff Shampoo) D2- Dove (Anti-Dandruff Shampoo)

Antidandruff shampoo products for four different brands were tested for antibacterial activity with bacterial and fungal species. Experimental results show that C2 shows high activity against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus subtilis*, *Cutibacterium*, *Candida albicans* and these are gram-positive bacteria. Dandruff is commonly caused by fungal and in this study *Mirosporium* is a fungi species that showed higher zone of inhibition for D2 compared to A2, B2, C2 shown in Fig 2 & Fig 3.



Fig 2:- Antibacterial activity of A2,B2,C2 shampoo products.

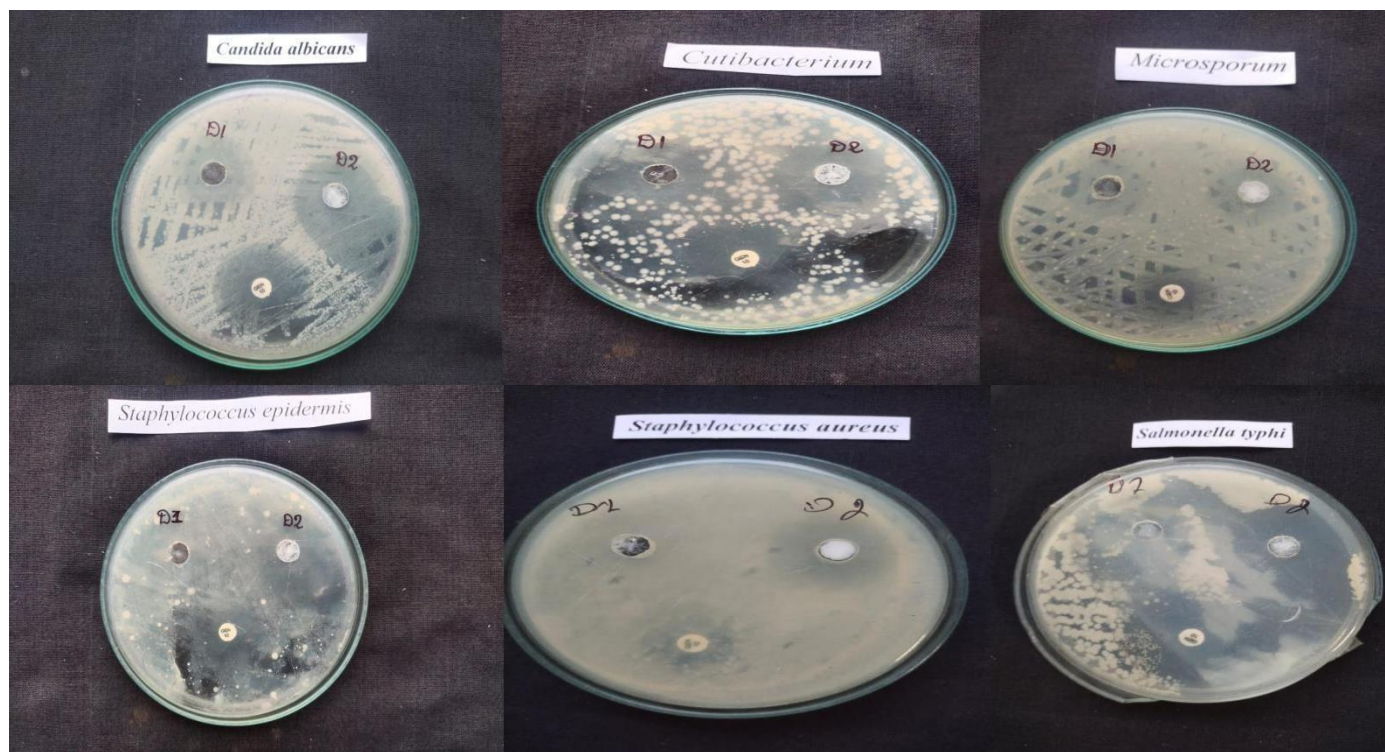


Fig 3:- Antibacterial activity of D1,D2 shampoo products.

Conclusion:-

Shampoo is the commonly used product by most of the people across the globe, to keep the hair clean and healthy. As the products available in the market are more attractive but fails to cater the needs of healthy hair, it has been planned to investigate the various kinds of shampoos namely A1 (Himalaya Shampoo),B1(Meera shampoo),C1(Pantene Shampoo),D1(Dove) used by majority of the people and to examine the effect of the products on gram positive bacteria such as Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Cutibacterium, Candida albican and one gram negative bacteria Salmonella typhi and Mirosporium is a fungi species present on the scalp.Among A1,B1,C1,D1 shampoo products C1(Pantene) shows high antibacterial activity in normal shampoo products. Among A2,B2,C2,D2 antidandruff shampoo products C3(Pantene antidandruff shampoo) shows high anti-bacterial activity. From the antimicrobial study through well diffusion method for the selected products on the specified bacteria revealed the results and interesting insights about the biocompatibility of the products.

References:-

- [1] Disha S.Nipurte, Mahendra B. Datir and Apekasha S.Fulsundar, (2022) A review on formulation and evaluation of herbal shampoo. World journal of pharmaceutical research / volume 11 / issue 3.
- [2] Ralph M. (2007)Trueb, Shampoos: Ingredients, efficacy and adverse effects. Clinic for Dermatology, university hospital of Zurich, Switzerland .
- [3] Mrs.K. Sravathi, N. Kavitha, K. Sowmya, S. Nazneen, U.Vaishnavi, CH. Anil., (2021)A review on formulation and evaluation of herbal anti-dandruff shampoo., International journal of pharmaceutical research and application., / volume 6 / issue 3.,
- [4] Marvin Rapaport,(2000) Cambridge medical publications limited. A randomized, controlled clinical trial of four anti-dandruff shampoos.,
- [5] G.A.Turner, J.R.Matherson, G.-Z. Li, X.-Q, D.Zhu & F.L.Baines. (2013), International journal of cosmetic science. Enhanced efficacy and sensory properties of an anti-dandruff shampoo containing zinc pyrithione and climbazole.
- [6] Swat kim kerk, Hui ying lai, Siu Kwan sze, Kee Woei Ng, Artur schmidtchen & Sunil S. Adav., (2018) Frontiers in microbiology. Bacteria display differential growth and adhesion characteristics on human hair shafts.
- [7] Káren Gercyane O Bezerra, Raquel D Rufino, Juliana M Luna, Leonie A(2018) Sarubbo Biotechnology progress. 34 (6), 1482-1493, Saponins and microbial biosurfactants: potential raw materials for the formulation of cosmetics.
- [8] Gaurav Pant, Nitesh Nayak, R Gyana Prasuna(2013) Enhancement of antidandruff activity of shampoo by biosynthesized silver nanoparticles from Solanum trilobatum plant leaf. Applied Nanoscience 3 (5), 431-439.
- [9] PA Cornwell (2018). A Review of shampoo surfactant technology: consumer benefits, raw materials and recent developments., International journal of cosmetic science 40 (1), 16-30.
- [10] Jennifer Gubitosa, Vito Rizzi, Paola Fini, (2019.) Pinalysa Cosma. Cosmetics 6 (1), 13. Hair care cosmetics: From traditional shampoo to solid clay and herbal shampoo, a review.
- [11]CD Igwebike-Ossi, IR Iroha and B Oke, (2017) Formulation and anti-microbial activity of tri closan-based medicated shampoo., Journal of chemical and pharmaceutical research,9(7):100- 104.
- [12] Adhithya Subramanian G. (2021) Anti-dandruff activity of polyherbal formulation against malassezia isolates from human scalp in-vitro., Jounal of advanced scientific research., 12(2) Suppl I: 290-295.
- [13] AR Mainkar, CI Jolly. (2001) International journal of cosmetic science Formulation of natural shampoos., 23 (1), 59-62.
- [14] K Patidar, M Soni, H Bhatt, V Saini, MD Kshirsagar. (2014)Herbal shampoo basic concept, formulation and market potential herbal shampoo: Basic concept, formulation and market potential. Advance Research in pharmaceuticals and Biological. 4, 673-4.
- [15] Chin-Hsien T. Chiu; Shu-Hung Huang; Hui-Min D Wang, (2015.)A review: hair health, concerns of shampoo ingredients and scalp nourishing treatments. Current Pharmaceutical Biotechnology, Volume 16, Number 12, pp. 1045-1052(8).
- [16] Nakamura Silva, Marcella Gabarra Almeida Leite, Gabriela Maria D'Angelo Costa, Patricia Maria Berardo Gonçalves Maia Campos. (2020) Influence of botanical extracts in the texture profile of shampoo formulations., Leticia International Journal of Phytocosmetics and Natural Ingredients 7 (1), 6-6.