Personal care products using All-Natural and Sustainable methods

Dr. Danie Kingsley J[1], Saleena Clarence[2], Anamika Singh[3]

[1]Assitant Professor Senior, School of Biosciences and Technology, Vellore Institute of Technology, Vellore – 632 014, Tamilnadu, India.
[2,3]School of Biosciences and Technology, Vellore Institute of Technology, Vellore – 632 014, Tamilnadu, India.

Abstract- *The conventional products available in the current market are overridden with harmful chemicals such as hydroquinone, parabens, phthalates, etc., which causes an immediate or delayed health- concern having long term impacts. Chemical ingredients in body care products such as skin care and cosmetics, are selected and designed to be readily absorbed by the skin and blood. Once absorbed they can cause damage to the nervous and endocrine systems and well as probable damage to reproductive and developmental health. About 10 kg day^{-1} of PPCPs which include personal care products are then passed into the environment through municipal sewage. This is capable of causing environmental degradation. Packaging plays a vital role in the manufacture of these products but over the years has caused growing environmental concern due to an increase in the amount of municipal solid waste. Our company aims to tackle these manifold problems by using ingredients which are made from all- natural ingredients, harvested and sourced locally, to minimize the adverse effect of personal care products on human health. The products are packaged using recycled paper and glass to induce a lower environmental impact of our products. Optimal packaging is also a key factor.*

Key Words: **Chemicals, health, skin, natural, environment, recycled**

1. INTRODUCTION

In 2018, Silent Spring Institute Massachusetts, conducted a study to measure the concentration of endocrine disrupting chemicals in numerous hair products. Each product contained on average 4 to 30 chemicals which included 45 endocrine disruptors. Such chemicals are associated with cancers, male genital birth defects, altered pregnancy outcomes, decreased sperm count amongst others. Chemicals present in personal care products are present effluents from wastewater treatment plants which fail to or inefficiently remove them from the effluent discharge. This water then enters either water bodies or used in irrigation. Biosolids in the form of sludge are also reported to enter farmlands through use as fertilizers. The effect of these chemicals at high concentrations on aquatic organisms is deadly toxic causing changes in the bacterial species present in the ecosystem. Unfortunately, in India the high surface presence of PPCPs has not spurred any action to be taken, resulting in aquatic organisms and humans being continually exposed to these pollutants.

The materials used to package these products both during shipping and as a container also cause environmental degradation. Studies have shown that in Europe, there is a rapid increase of municipal solid waste over the last few years. Discarded packaging accounts for 17% of this and 3% of total waste stream. Plastics used in packaging are made up of polymers, additives, adhesives and coatings which all impact human health and that of the environment. Chemicals associated with Plastic Packaging database (CPPdb) formulated by researchers shows that 63 substances act as human health hazards having carcinogenic, mutagenic and reproductive toxicity effects. Some contain heavy metals such as lead, cadmium, mercury, etc. Surfactants find wide application in plastic packaging when used as dispersion agents in biocides thus becoming an environmental hazard. Commodity plastics are often dumped in landfills where since not being biodegradable are resilient to attack by microorganisms. They thus remain in the soil for thousands of years defacing the environment.

Natural and organic ingredients when carefully and aptly selected provide numerous benefits when used in personal care products. Certain flowers, fruits, herbs etc. possess properties such as anit-microbial, anti-inflammatory, soothing, exfoliating amongst many others. These properties can be exploited to produce products which are free from harmful and unnecessary chemicals which are widely present in products available in the current market.

As awareness about environmental deterioration due to non-biodegradable materials is increasing, more eco-friendly and sustainable options are being explored in packaging. We have used recycled paper produced in our workshops for packaging dry materials such as soaps and recycled glass containers for other items. The use of these alternatives also prevents the leakage of chemicals from the packaging into the product.

2. MATERIALS AND METHODOLOGY

2.1 Materials

2.1.1 Formulation for soaps

Table -1: Soaps

Ingredients	Concentration	Function
NaOH(lye)	200g	Soap base
Distilled water	1L	For dilution
Oils		
Coconut oil	50ml	essence
Avocado oil	50ml	essence
Olive oil	50ml	essence
Aloe Vera gel	100g	soothing
shea	50g	moisturizer
Kokum butter	50g	moisturizer
Flowers		
Lavender petals	2-3 drops As per required	Essential oils from the plant is said to relieve anxiety, insomnia and restlessness Petals can also be used for aesthetic value
Rose petals	2-3 drops As per required	Essential oil from the flower is said to clear scars and acne Petals can also be used for aesthetic value
Herbs and spices		
rosemary	10g	anti-inflammatory
peppermint	15g	Freshness
chamomile	10g	Anti-inflammatory Antiseptic
Turmeric	15g	Antioxidant Anti-inflammatory Anti-bacterial
Cinnamon	8g	Antibacterial antioxidant
Ginger	10g	Radiance
		Refresh
Nutmeg	10g	Antiseptic

2.1.1.1 Equipment required for soap making

- Digital scale: for ingredients are measured by weight
- Measuring cylinder
- Thermometer: to monitor temperatures
- Immersion blender: for easier mixing
- Container for lye solution: stainless steel
- Container for mixing soap: stainless steel or heat proof glass
- Gloves & goggles: to protect hands and eyes
- Spatulas & spoons: silicone or heat proof plastic
- Soap mold: 2.5 lb. soap mold, empty milk carton, or silicone molds

2.1.2 Formulation for Cocoa butter Exfoliating body scrub

Table -2: Cocoa butter Exfoliating body scrub

Ingredients	Concentration (wt%)	Function
Water Phase		
Deionised water	50.0 -60.0	To dilute
Coco glucosidase	5.0-10.0	To ease washing
Rosemary extract	0.5 -1.0	Preservative
Tapioca starch	0.5-1.0	Thickener
Oil phase		
Cocoa butter	15.0-25.0	Emollient
Beeswax	4.0-5.0	Emulsifier
Sorbitol	6.0-7.0	Humectants
Part C		
Exfoliator (425 µm)	1.0-2.0	Exfoliation

Fragrance	2 drops (if extract)	Aromas

2.1.3 Formulation for Coffee body scrub

Table -3: Coffee body scrub

Ingredients	Concentration (wt%)	Function
Coffee	30%	Anti-oxidative Anti-aging
Sugar	40%	Humectant exfoliant
Ground cinnamon	10%	Antibacterial Antioxidant
Oils	20%	To bind the ingredients Moisturize

2.2 Methods

2.2.1 Soaps

The lye is prepared by dissolving 200g of NaOH flakes in distilled water to obtain a solution of 200g/L. The oil or fats used are prepared according to the type of soap desired, customised to different skin types. The NaOH solution is then added to a stainless steel pot which contains the fats/oils in a 1:1 ratio (v/v) and stirred frequently for about 15 minutes. After the saponification process is completed the necessary herbs, natural colouring and other additives are added.

The soap is then poured out into moulds and left to cure and air-dry for the necessary time period.

2.2.2 Exfoliating body scrubs

First the oil phase ingredients are heated to 75°C in a stainless steel pot. In a separate pot the thickener is added to the water until fully dissolved followed by the addition of the preservative. This is then heated to 75°C. The oil phase mixture is then added to the water phase mixture and homogenized for 15 minutes. This mixture was then cooled down to 40°C through continuous agitation. The exfoliating particles and any desired fragrances are then added. The amalgamation is then transferred to a third container where it's left to set at least overnight.

Another variation of the body scrub not involving cocoa butter cream is also prepared.

2.2.3 Packaging

Recycled handmade paper is made by reusing old and used paper. The paper is first cut into small sizes and then added to water in a blender. This is done to achieve a pulp of the mixture of a particular consistency. The pulp is then spread over a mesh sheet fitted in a frame to allow the water to drain out. This sheet is then covered with a cloth and pressed down to remove the excess moisture. At this stage the paper can be separated from the mesh sheet frame carefully. Any excess moisture is then removed by air-drying the paper.

By partnering with recycling warehouses we have come up with another alternative for packaging. The glass bottles and jars obtained from these recycling units are first properly sterilized before use to meet health and safety standards.

3. RESULTS AND DISCUSSION

Natural ingredients have been used for years together, having applications in traditional medicines and in healing traditions of many cultures around the world. The most recent patterns in excellence, wellbeing and prosperity have offered ascend to another domain of conceivable outcomes by intertwining with customary Indian medication. They are helpful for investigation of conceivable outcomes of growing new enemies of maturing cosmeceuticals with characteristic elements for effective applications.

In antiquated occasions the composed data on ayurveda like charaka samhitha and varnya kashaya has clarified the utilization of spices in getting sparkling composition. The spices utilized were sandal wood, nagkeshar, padmak, khus, yashtimadhu, manjistha, sariva, payasya, seta (sweta durva) and lata (shyama durva). These ayurvedic spices are utilized to clean blood and kill vitiated doshas like from the body as they are primarily liable for skin issues and different infections. These spices are successful in skin problems, including khedira, abhaya, amla, turmeric, bhallataka, saptaparna, karavira, vidanga and jati. The utilization of ayurvedic spices increases the value of the items. The ayurveda is notable for the perpetual solution for afflictions and it is likely obvious from the current market drifts that the natural restorative item will prevail with regards to catching the market.

The information about the structure and essential capacity of the skin and its limbs and information on common or home grown consideration or solutions for its issues will assist with augmenting the significance of natural cosmetics.

Green tea assists with treating skin inflammation injuries, while Manjishtha decontaminates the blood and in a roundabout way encourages skin. Aloe vera soothes the skin, sandalwood lights up the skin by being utilized as an astringent, while rosemary provides anti-

inflammatory properties. Apricot assists with battling the wrinkles. Papaya and cucumber have a significant part in the treatment of pigmentation. Witch hazel, white oak, carrot and gingko go about as astringents. Pumpkin and pecan are wealthy in sun-screen impacts. Turmeric is a very useful antiseptic.

Upheld by sound science and validated structure and capacity, they offer tremendous advantages to the cosmeceutical area. This paper may help corrective and individual consideration industry, advertisers and current researchers to comprehend various patterns of expected use to explore cosmeceutical ways to deal with the issues related with derma care.

The recycled glass containers and paper can be recycled or reused after use. The paper can also be composted.

4. CONCLUSION

Statistics show that in India, more than 70% of the population prefers herbal cosmetics for their health care. The current market scenario shows that there is a great requirement for herbal cosmetics in daily life. The chemical formulation of herbal products includes the addition of various natural additives, like waxes, oils, natural colours, natural fragrances and parts of plants like leaves. There is a need to do more research and development in the field of herbal cosmetics to prove effectiveness and include herbal cosmetics in safety profile. It is important to conduct adequate safety testing as per existing regulatory rules and present requirements. Quality control for safety and vitality of herbal cosmetic products is of utmost importance, although it is assumed to be safe in the longer run. There are various herbs present in nature which are rich in phytoconstituents, having natural goodness to fulfill the requirements of the skin by improving the condition of the skin and cleansing it gently.

REFERENCES

1) Kapoor VP., "Herbal Cosmetics for skin and hair care. Natural Product Radiance 306-14.

2) Sankholkar DS. Current Regulations and Suggested Way Forward. Pharm Times 2009; 41(8): 30-1.

3) Prashant L. Kole, Hemant R Jadhav, Prasad Thakurdesai and Anantha Naik Nagappa, "Cosmetics potential of herbal extracts." Indian J Nat Prod Resour 2005; 4(4): 315-21.

4) Cosmetics [online], Available from: http://en.wikipedia.org/ wiki/Cosmetics

5) Harry RG. Modern Cosmeticology 1962; 1.

6) Kadam VS, Chintale AG, Deshmukh KP, Nalwad DN., "Cosmeceuticals an emerging concept: A comprehensive" Review. Int J Res Pharm Chem 2013; 3: 308-16.

7) Ligade VS, Udupa N. "Pharmaceuticals, Cosmeceuticals and Nutraceuticals: An Overview of Regulations" 2010.

8) Helena M. Ribeiro, Margherita Allegro, Joana Marto, Bruno Pedras, Nuno G. Oliveira, Alexandre Paiva, Susana Barreiros, Lídia M. Gonçalves, and Pedro Simões, "Converting Spent Coffee Grounds into Bioactive Extracts with Potential Skin Anti Aging and Lightening Effects"

9) Barbara Kasprzyk, Hordern Richard, M.Dinsdale Alan J.Guwy, "The removal of pharmaceuticals, personal care products, endocrine disruptors and illicit drugs during wastewater treatment and its impact on the quality of receiving waters."

10) Guang-GuoYing, "Fate, behavior and effects of surfactants and their degradation products in the environment," May 2006 Environment International 32(3):417- DOI: 10.1016/j.envint.2005.07.004

11) Wenxin Liang, "Toxicity and Effect of Chemicals in Skin Care Products on Human Health" 2020 IOP Conf. Ser.: Earth Environ. Sci. 512 012081

12) Sujith Varma, "General review on herbal cosmetics."

13) Montse Meneses, Jorgelina Pasqualino and Francesc Castells,"The sustainable consumption of domestic products: the environmental effect of packaging"

14) Huang, C-C.; Ma, H-W. (2004). "A multidimensional environmental evaluation of packaging materials", Science of the Total Environment., 324, p. 161-172.

15) https://silentspring.org/news/hair-products-black-women-contain-mix-hazardous-ingredients

16) Diana Montes, Grajalesab Mary Fennix, Agudeloa Wendy Miranda, Castroa, "Occurrence of personal care products as emerging chemicals of concern in water resources: A review "

17) C.R. Ohoro, A.O. Adeniji, A.I. Okoh, and O.O. Okoh, "Distribution and Chemical Analysis of Pharmaceuticals and Personal Care Products (PPCPs) in the Environmental Systems: A Review"

18) Pravin K Mutiyar and Atul K Mitta, "Pharmaceuticals and Personal Care Products

(PPCPs) Residues in Water Environment of India: A Neglected but Sensitive Issue "

19) Ksenia J.Groha, ThomasBackhausb, BethanieCarney-Almroth. Birgit Geuekea, Pedro A. Inostrozab, Anna Lennquist, Heather A. Leslie, Maricel Maffinie, Daniel Slunge, Leonardo Trasande, A. Michael Warhursth, Jane Munckea, "Overview of known plastic packaging-associated chemicals and their hazards"

20) Warra, A. A. , "A report on soap making in Nigeria using indigenous technology and raw materials" Department of Biochemistry, Kebbi State University of Science and Technology, P.M.B. 1144, Aliero, Nigeria.

21) Azila, A.K.* and Nur Azilah A., "Stability study of cocoa butter body scrub formulated with ground cocoa pod husk "

22) Williams, D. F. *et al.* Chemistry & Technology of Cosmetics & Toiletries Industry. U.K: Blackie Academic & Professional. 1996.

23) https://www.researchgate.net/publication/45183418_Innovations_in_Natural_Ingredients_and_Their_Use_in_Skin_Care

24) https://www.greenpeace.org/usa/wp-content/uploads/legacy/Global/usa/report/2007/8/hazardous-chemicals-in-consume.pdf

25) http://www.safecosmetics.org/get-the-facts/chem-of-concern/

26) (https//iopscience.iop.org/article/10.1088/1755-1315/512/1/012081/pdf)

27) https://formulabotanica.com/natural-surfactants/

28) https://blog.publicgoods.com/what-are-natural-preservatives/

29) https://www.beautifulwithbrains.com/sugar-in-skincare-products-bad/