

Herbal cosmeceutical production in developing countries

Bringing herbal cosmeceuticals to global market as natural cosmetics is a challenging task, especially in developing countries where the manufacturers of herbal cosmeceuticals face many challenges to develop ecofriendly and user-friendly value added cosmeceutical products with medicinal values. In developing countries, new cosmeceuticals from indigenous medicine should be established by fostering Privat Public Partnerships (PPP) in collaboration with universities or research institutes and private industries in order to obtain standard quality products. However, it reveals that developing countries undergoes several difficulties when pursuing development of commercial herbal cosmeceutical products from indigenous medicine. Knowledge-sharing partnerships between research institutes and indigenous physicians, non-availability of trained personnel with entrepreneurial skills, low levels of PPP, lack of research capabilities and business responsibilities, regulatory barriers when transferring technology to produce value added products, unavailability of accurate methods for characterization/ authentication of raw materials, unsustainable collection practices of medicinal plants, quality control issues, insufficient manufacturing capacity of the cosmetic products and lack of financing are some of the highlighted challenges.

Global demand for herbal cosmeceuticals

Herbal cosmeceuticals are the modern trend in the field of beauty and fashion and there is a spectacular growth in the consumption of herbal cosmeceuticals due to increased recognition of their health benefits with both cosmetic and pharmaceutical values. With the growing scientific evidence of medicinal benefits of natural cosmetics, there is an opposing trend that rejects synthetic cosmetics in beauty products. It has been revealed that the medicinal benefits of herbal cosmeceuticals help to maintain the beauty of the human body through bioactive constituents in the plant materials. Also, these herbal products supply the nutrients and minerals required for beautification of the human body by enhancing health satisfaction with minimal side effects. Since, there is a global trend in the use of natural cosmeceuticals, use of synthetic ingredients such as parabens, phthalates, silicones, mineral oils, sodium lauryl sulfate etc. in the preparation of cosmeceuticals is avoided due to their toxic and side effects reported in the literature. Therefore, there is an increasing global demand for herbal cosmeceuticals as these are free of harmful synthetic chemicals when consider the toxicity related issues of some of the synthetic cosmetics flooded in the market. As the name suggests, herbal cosmeceuticals are natural and there has been an exponential increase in manufactures of eco-friendly, cost-effective, and relatively safe herbal

cosmeceuticals in developing and developed countries over the past two decades. The key cosmeceuticals available in the market have claimed biological functions such as hair growth, anti-wrinkles, anti-acne, anti-cellulite, tannings, skin whitenings, antioxidants, anti-ageing etc.

Herbal cosmeceutical production in developing countries

Most biodiversity hotspots are located in tropical developing countries and the biodiversity of developing countries is blessed with flowering plants, lichens, mosses, fungi, and algae as they contain a wide variety of bioactive compounds indicating high economic potential of the flora. These medicinal plants have shown valuable ethnobotanical and ethnopharmacological information that could navigate preparation of herbal cosmeceuticals. Although developing countries have great potential to utilize these resources sustainably to reach the needs of herbal cosmeceutical manufactures, only limited number of herbal cosmeceuticals produced can reach the global market mainly due to lack of systematic research published in peer review journals, inadequate knowledge of their mode of action, poor understanding on potential adverse reactions, and poor networking with PPP etc. (Siriwardhana *et al.*, 2015). Hence there is an urgent need to improve the standard and safety of the herbal cosmeceutical industry in developing countries.

Herbal cosmeceutical industry was first originated from indigenous medical systems, namely Ayurveda, Unani, Siddha and traditional medicine. This indigenous knowledge is incorporated when making herbal cosmeceuticals and plants, plant parts or plant extracts are mainly used to prepare cosmeceuticals such as moisturizing, whitening, tanning, color cosmetics, sunscreen, radical-scavenging, antioxidant, immune-stimulant, washings, preservatives, thickeners etc.

Nevertheless, the current trend is to produce herbal cosmeceuticals to the market as value-added products and to introduce them as ecofriendly and user-friendly herbal cosmeceuticals to obtain the customer attraction. Hence, it is essential to demonstrate that the therapeutic effects of those products remain same even after modification of the appearance using validated scientific research methodology. However, it was revealed that many of the herbal cosmeceutical products from the region remains scientifically untested and the efficacy of the products has not been evaluated. It becomes imperative that necessary actions be taken to ensure all the herbal cosmeceutical products release to the market are safe with suitable quality. The regulating authorities of herbal cosmeceuticals

in developing countries should take immediate action to address those issues and instructions should be given to prepare Standard Operating Procedures (SOPs) for evaluation of all the herbal products available in the market including value added herbal cosmeceuticals.

Promotion of sustainable production of medicinal plants in developing countries

Developing countries have glorious traditions on use of medicinal plants in indigenous medicine and these medicinal plants have been used to improve human beauty since time immemorial. Therefore, biodiversity of medicinal plants is an invaluable gift of nature in developing countries.

Herbal preparations have attracted considerable attention of the global market and exhibit good activity with comparatively lesser or no side effects when compared to synthetic cosmetics. Bioactivity of medicinal plants has been extensively studied and evaluation of antioxidant, anti-diabetic, antimicrobial, toxicity, and anti-inflammatory effects of these plants have been reported. Bioactive constituents of medicinal plants include terpenes, alkaloids, steroids, polyketides and phenolic compounds which serve as bioactive compounds in natural cosmetics. Although, the main use of medicinal plants is as indigenous medicine, currently medicinal plants are heavily used to produce herbal cosmeceutical products such as perfumery, face wash, shampoo, conditioner, soaps, nutraceuticals etc. Therefore, in herbal cosmeceutical industry, cosmetics are formulated using different synthetic ingredients to form the base where herbal components are added to obtain both cosmetic and medicinal values. Currently, it is recommended and encouraged by the WHO to use medicinal herbal preparations in natural health care programs as these formulations are freely available, inexpensive, and comparatively safe (Sharma *et al.*, 2018).

Quality control and standardization of herbal cosmeceuticals

When herbal cosmeceuticals are prepared using formulae stated in authentic texts or pharmacopeia of indigenous medical systems and the plant resources are used for the wellbeing of the mankind, there are no stringent regulations for the quality control of such herbal cosmeceuticals before being released to the market as they have been used for many decades with no report of toxicity or side effects. However, as there is a growing demand, most of the herbal cosmeceuticals produced are derived from indigenous medical system. However, if novel formulations are to be developed as user-friendly value-added products, these products are required to be standardized to assure safety, efficacy and potency using established validated experiential procedures. Therefore, guidelines and regulatory norms for such herbal cosmeceuticals should be established in order to assure that these products do not contain any hazardous effects on the health of the consumers. These guidelines help to manufacture quality products to the market and to avoid adulteration and substitution of products.

The quality of the herbal formulations is varied with phytochemical constituents present in herbal formulations.

Therefore, it is important to consider the factors that affect the phytochemical constituents of medicinal plants. Climatic changes, soil composition and maturity of plants are the major factors that affect the phytochemical constituents. Therefore, qualitative, and quantitative analysis of herbal extracts should be carried out using modern analytical techniques for global acceptance of herbal cosmeceuticals. Commonly used analytical equipment are TLC, HPLC, HPTLC, GCMS, LCMS to obtain the chemical profile of the plant extracts. Once the chemical profile is obtained, that can be saved and can be used to compare with the chemical profile of similar herbal product when repeating the production to confirm that it is free of adulteration. Nevertheless, the complete and accurate pharmacognostical assessment should be performed to prove both health effect and cosmetic effect of the products.

The international market of all herbal products is estimated to be US \$ 62 billion and it will increase to US\$ 5-7 trillion at a rate of 7% by 2050 (<https://www.fortunebusinessinsights.com>). The prevailing global herbal cosmeceutical market is valued to reach US\$ 22 billion by 2022 indicating high global demand for the herbal cosmeceuticals in the world (Liyanaarchchi *et al.*, 2018). One of the major constraints faced by cosmeceutical manufactures in developing countries is unavailability of adequate research publications on efficacy of novel herbal cosmeceuticals products released to the global market.

It reveals that there is enormous opportunity to expand the production of novel herbal cosmeceuticals using indigenous knowledge and biological resources in developing countries. Although tropical developing countries are blessed with the biodiversity and identified as the biodiversity hotspots in the world with enormous numbers of medicinal plants, the supply of herbal cosmeceutical products is still very limited. The highest number of herbs and plant parts can be made available for the wellbeing of the humans and to achieve Sustainable Development Goals (SDGs) introduced by the United Nations. Regrettably, developing countries have not been able to successfully utilize this natural wealth to improve the welfare of people. Therefore, it becomes indispensable to identify the difficulties / constraints encountered in development of herbal cosmeceuticals in developing countries. Several major problems such as inadequate availability of raw materials, poor quality and efficacy of plant materials, adulteration using non-effective plant materials, lack of proper cultivation and propagation system of the medicinal plants, have been recognized by manufactures of herbal cosmeceuticals.

Recommendation for development of herbal cosmeceutical industry in developing countries

Developing new herbal cosmeceuticals from indigenous medicinal knowledge using medicinal plants and other biological resources is a demanding area to improve public health. Further, there are many barriers to face when translating indigenous medical knowledge into commercially viable health products with cosmetic value. These constraints faced by the herbal cosmeceutical

industry should be addressed to develop this sector sustainably. The following recommendations can be considered by the regulatory authorities to overcome the major challenges of production of ecofriendly, value-added herbal cosmeceuticals.

- Chemical profiles of the cosmeceutical products should be reported using an appropriate analytical method such as HPLC, HPTLC, LCMS, GCMS etc. as this will help to maintain the reproducibility of the product.
- Carry out suitable *in vitro* and *in vivo* modern bioassays and compare the efficacy with suitable synthetic cosmetics.
- Conduct systematic research with appropriate clinical trials to prove the efficacy of the novel product and publish the results in peer review journals.
- Assess the production and utilization of commonly used medicinal plants to develop a strategy for promotion of sustainable use of medicinal plants in developing countries.
- Conduct awareness programs on sustainable use of medicinal plants in cosmeceutical production among the growers of medicinal plants with special reference to cultivation methods.
- Carry out research to identify efficacy of the plant / plant parts with high cosmetic potential.
- Strengthen networking of Private Public Partnership (PPP) with universities, research institutes and cosmeceutical industries to reduce the information gaps and to promote quality production of herbal cosmeceuticals.
- Share knowledge and technologies used for value addition of cosmeceuticals in developed countries and encourage development of value-added products in order to achieve user-friendly products that will be widely accepted by the global market.
- Develop strong communication systems to network potential stakeholders; plant cultivators, herbal cosmetic manufacturers, researchers etc. and educate all the parties on strategies to achieve the global market of cosmeceuticals.
- Establish relevant policy options for sustainable development of these natural resources with the aim of strengthening the capacity in their commercialization.
- Conduct awareness programs on intellectual property rights and patenting of the novel cosmeceutical products.
- Create a friendly supportive business environment for entrepreneurs in herbal cosmeceutical industry.

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