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Cosmetic potential of Southeast Asian herbs: an overview

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Abstract Herbs and spices have been used in retaining and boosting human beauty since time immemorial. Herbal cosmetic has growing demand in the worldwide market and is an invaluable gift of Mother Nature. In the present review, the focus is on the cosmetic herbs of Southeast Asian countries namely Malaysia, Cambodia, Laos, Myanmar [Burma], Thailand, Vietnam, Brunei, East Timor, Indonesia, Philippines and Singapore in highlighting both traditional and scientific knowledge or background of the selected potential herbs. The available literature was searched in the following scientific database such as PubMed, Google Scholar, Science Direct and Springer for publications and patents. In view of traditional uses, herbs like *Allium sativum*, *Aloe vera*, *Centella asiatica*, *Curcuma longa*, *Hibiscus rosa-sinensis*, *Lawsonia inermis* and *Tamarindus indica* L. were classified as need of special mention. Many herbs have been scientifically evaluated for their cosmetic potentials such as anti-aging, anti-acne, melanogenic and anti-tyrosinase activities. The great void remains for a systematic study, thorough review of scientific report that provides a basis for the use of specific herbs due to their efficacy as cosmetics. In addition, two of the Malay herbs; *Labisia pumila* (Kacip Fatimah) and *Ficus deltoidea* (Mas cotek), are proposed to be clinically studied for their safety in cosmetic application aspects wherein the need for safety evaluation and fruitful application of herbal cosmetics were emphasized.

Keywords Malaysian herbs · Traditionally use · Herbal cosmetics · Topical applications

Introduction

Herbs and spices have been used in retaining and boosting human beauty since indefinitely old-age (Gediya et al. 2011). For instance, about 5000 years ago the ancient Egyptian colored their hair with a mixture of henna and indigo, and scented with marjoram. Similarly Oriental people used numerous kinds of herbs to beautify their bodies from head to toe (Chomchalow 2002). The trend for the majority, nowadays, is going back to the usage of herbal products in adopting a more natural way of leading life (Kapoor 2005). However, in the present, herbal cosmetics must meet both of the technical safety and application standards (norms) required by the society. The herbal cosmetics are not only essential for the physical appearance, but also to safeguarding the physical well-being based on the regulated instructions of responsible

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authorities world-wide. The beauty of skin and hair basically depends on an individual's health, diet, nature of job and climatic conditions (Morganti 2010). As an example, the climatic condition during summer in tropical countries causes the people to be exposed in excessive sunlight and heat, which in turn dehydrates the skin and increases the melanin content. It also resulted in freckles, wrinkles, blemishes, sunburns and pigmentation. Similarly, extreme cold in winter causes discomfort to the skin such as cuts, cracks, maceration and even infections. Climate condition also has effects on hair, such as hair fall or loss and pre-mature graying which becomes very common in recent years among the younger generation (Kapoor 2005). Therefore, there are immense growing opportunities to explore and use herbal ingredients (phytochemicals) in cosmetics for skin and hair care.

In a selected Southeast Asian countries the trend in using herbal products are increasing. In Malaysia, the local herbs are primarily used in foods and beverages, traditional medicines, health enhancing products, dietary supplements, flavors and fragrances, cosmetics, and toiletries (Adnan and Othman 2012). The cosmetics for both local and international products are regulated under the Sale of Drugs Act 1952 (Revised 1989) and the Control of Drugs and Cosmetics Regulations 1984 (amended 2009). The Malaysian herbal market turnover is estimated to be around USD 2.5 Billion (2007) of which personal care sector holds 35 % share. Recently, Government of Malaysia identified eleven herbs of national importance which are *Eurycoma longifolia* (Tongkat Ali), *L. pumila* (Kacip Fatimah), *Orthosiphon stamineus* (Misai Kucing), *Phyllanthus niruri* (Dukung Anak), *Andrographis paniculata* (Hempedu Bumi), *C. asiatica* (Pegaga), *Zingiber officinale* (Halia), *Morinda citrifolia* (Mengkudu), *Hibiscus sabdariffa* (Bunga Raya), *F. deltoidea* (Mas Cotek) and *Clinacanthus nutans* (Belalai Gajah) (Supplementary Figure 1). These eleven herbs serve as one of the National Key Economic Areas (NKEAs) proprietary list. NKEA Agriculture-herbs sub-sector has approved a fund of MYR 9.8 million to conduct clinical trials for phyto-cosmetic products particularly on anti-aging serum from *L. pumila* (Kacip Fatimah) and whitening serum from *F. deltoidea* (Mas Cotek) (Aziz et al. 2010). Among the eleven chosen plants (Supplementary Figure 1), five of them namely *L. pumila, C. asiatica, Z. officinale*, *H. sabdariffa* and *F. deltoidea* are well known for their cosmetic applications.

Therefore in this review, the main focus is on cosmetic herbs of the selected Southeast Asian countries of Malaysia, Cambodia, Laos, Myanmar [Burma], Thailand, Vietnam, Brunei, East Timor, Indonesia, Philippines and Singapore, in highlighting both traditional and scientific findings of those potential herbs. This review provides researchers with useful knowledge and guidance for the experimental work on herbal cosmetics. The available literature was searched using keywords of "Southeast Asian countries herbs and their cosmetic uses" for each country in the following database of PubMed, Google Scholar, Science Direct and Springer Link for traditional claims and scientific publications and patents.

Traditional cosmetic uses of Southeast Asia herbs

In Southeast Asia, it was estimated that there are 65,000–70,000 plant species of which 6500 species are herbs. Of these, Malaysia owes more than 20,000 plant species, while the rest of plant species were brought in from neighboring countries by the immigrants who settled in Malaysia centuries ago. The neighboring countries such as Indonesia is also a country of mega biodiversity contributing 10 % of the world's plant species in which about thirty-four herbs were known for traditionally cosmetic uses. The usage of traditional medicine by different ethnic groups varies mainly due to the cultural differences. The presence of various traditional medicinal shops such as 'kedai sinseh' of traditional Chinese medicine or 'jamu' of Malay-Indonesia origin in Malaysia are the examples of the ethnicity related traditional medicines. The usage of most of the herbs in cosmetic is not only limited to Malaysia wherein many of the herbs are also used in various ways in other Southeast Asian countries and elsewhere. Therefore, it is interesting to review the herbal cosmetics of Southeast Asia, particularly based on their traditional claims.

Documentation on traditional knowledge of medicinal plants is still on-going throughout the world (Ong et al. 2011b). This knowledge, if wisely utilized, could draw out promising herbal leads of the future (Harsha et al. 2002). However, in recent years deforestation and urbanization are the two major factors, which result in huge loss of traditional knowledge and culture. Hence, there is a need of hour to preserve and conserve these treasures which include traditional herbal cosmetic.

Nowadays herbal cosmetic products are growing rapidly and are manufactured using better and more convenient modern technology. This technology allows the blending together of several plants species that are known for their medicinal attributes which for instance the skin lightening property. The herbal cosmetics are commonly grouped into two major categories of skin and hair care which then divided into five subcategories based on their uses for face, overall beauty, body, hair care and medicated cosmetics.

Supplementary Table 1 represents 89 Malaysian herbs which have been documented for their traditional cosmetic uses. Herbal parts that are used ranged from leaves, roots, fruits, flowers, stems, barks and seeds whereby most of the herbs are used alone and only a few being used in mixture recipes. Surprisingly more than half of those herbs are used for managing hair or as hair care regimes. Thirteen of these herbs are traditionally used in perfumery and aromatherapy preparations (Supplementary Table 1). Another nine herbs namely *Acalypha wilkesiana* (Euphorbiaceae), *Aloe barbadensis* (Liliaceae), *Alternanthera sessilis* (Amaranthaceae), *Averrhoa bilimbi* (Oxalidaceae), *Carica papaya* (Caricaceae), *C. longa* (Zingiberaceae), *Dioscorea daemona* (Dioscoreaceae), *Jasmium sambac* (Oleaceae) and *Peperomia pellucida* (Piperaceae) are traditionally used for treating pimples.These plants are mostly having a specific traditional use as treatment regimes with a few have more than a single medicinal use. *A. barbadensis* (Liliaceae), *C. odorata* (Annonaceae), *Citrus aurantifolia* (Rutaceae), *Citrus hystrix* (Rutaceae), *Michelia champaca* (Magnoliaceae), *Pandanus amaryllifolius* (Pandanaceae), *Polygonum minus* (Polygonaceae) are used for dandruff treatment. Herbs which are known for having used in acne treatment are *Agelaea macrophylla* (Connaraceae), *A. sessilis* (Amaranthaceae), *C. odorata* (Annonaceae), *Citrus microcarpa* (Rutaceae) and *Plumeria acuminata* (Apocynaceae). To improve skin complexion, *Adenostemma lavenina* (Asteraceae), *Piper sarmentosum* (Piperaceae) and *Wedelia biflora* (Asteraceae) are traditionally being used. *Ardisia elliptica* (Myrsinaceae), *C. odorata* (Annonaceae), *C. hystrix* (Rutaceae) and *C. longa* (Zingiberaceae) are four cosmetic herbs traditionally used for managing dry or rough skin. In relieving skin rashes and/or irritation, *A. paniculata* (Acanthaceae), *Archidendron jiringa* (Fabaceae), *Entada phaseoloides* (Fabaceae), *Heliotropium indicum* (Boraginaceae) and *Impatiens balsamina* (Balsaminaceae) are utilized. Herbs namely *C. asiatica* (Apiaceae), *Cosmos caudatus* (Asteraceae), *Curcuma xanthorrhiza* (Zingiberaceae) and *F. deltoidea* (Moraceae) are traditionally known to preserve youthful complexion (anti-aging) in women which locally referred in Malay as 'awet muda'. The majority of herbs as shown in supplementary Figure 2 and 3 are traditionally used for hair care & skin care respectively. Decoction of *Catharanthus roseus* whole plant is widely used as hair wash agent by Southeast Asians (Samy et al. 2005). *Punica granatum* (Punicaceae) and *Ruta angustifolia* (Rutaceae) are traditionally used for treating dandruff. *Amaranthus spinosus* (Amaranthaceae), *Anacardium occidentale* (Anacardiaceae), *Plantago major* (Plantaginaceae) and *Strychnos nux-vornica* (Loganiaceae) are traditionally known for pimple treatment. Another three herbs, B*aeckea frutescens* (Myrtaceae), *M. champaca* (Magnoliaceae) and *P. amaryllifolius* (Panadanceae) are traditionally used in perfumes as fragrance agent. Herb such as *Annona squamosa* (Annonaceae) was traditionally used to eliminate lice and *P. granatum* (Punicaceae) was used to prevent pre-mature aging symptoms.

In Southeast Asia, Thailand was greatly influenced by the culture and religions of India in which six herbs such as *A. sativum* (Alliaceae), *A. vera* (Liliaceae), *Cymbopogon citratus* (Poaceae), *Dianella ensifolia* (Xanthorrhoeaceae), *Lagerstroemia macrocarpa* (Lythraceae) and *Lophopetalum wallichii* (Celastraceae) are well known for their traditional cosmetic uses. Among these six, *A. sativum*, *A. vera*, *L. macrocarpa* and *L. wallichii* are traditionally used for baldness treatment. Other two herbs which are *A. vera* and *C. citratus* are traditionally known for skin nourishment. Interestingly *D. ensifolia* is used as fragrant agent in cosmetic and perfume.

Myanmar is one among the home lands of early civilization of Southeast Asia including Pyu and Mon. In Myanmar, seven herbs are known for their traditional cosmetic uses which are *A. vera* (Liliaceae), *Ananas sativus* (Bromeliaceae), *Cassia fistula* (Fabaceae), *Crataeva religiosa* (Capparidaceae), *Kaempferia galanga* (Zingiberaceae), *Nelumbo nucifera* (Nelumbonaceae) and *Nyctanthes arbor-tristis* (Oleaceae). Five of those herbs namely *C. fistula*, *C. religiosa*, *K. galanga*, *N. nucifera* and *N. arbor-tristis* are traditionally known to prevent pre-mature aging symptoms. *A. vera* and *A. sativus* are traditionally used in skin cream and deodorant herbal cosmetic products respectively.

One of the mega diverse countries of Southeast Asia is Philippines which makes a significant contribution to

the biological diversity. In the Philippines, four herbs were well known for traditional cosmetic uses of which three herbs, *A. vera* (Liliaceae), *Xylocarpus granatum* (Meliaceae) and *Z. officinale* (Zingiberaceae) are traditionally used to prevent hair loss. For skin itching relief, *Kalanchoe pinnata* (Crassulaceae) is utilized. Vietnam also owns a wide diversity of biological resources whereby many are plant species endemic to Southeast Asia. In Vietnam, three herbs which are *Ageratum conyzoides* (Asteraceae) *Embelia ribes* (Myrsinaceae) and *Sapium sebiferum* (Euphorbiaceae) are traditionally known for their cosmetic uses. Of them, *A. conyzoides* is traditionally known in dandruff treatment while *E. ribes* and *S. sebiferum* are traditionally used to heal pimple and hair as well as skin care, respectively.

In recent years, many of the Southeast Asia herbs not only limited to their traditionally uses, despite they were further validated scientifically for various biological activities such as anti-aging, anti-acne, anti-tyrosinase, melanogenic, anti-sebum and hair growth promoter. In this review, emphasis and elaboration are on those Southeast Asia herbs which owned for the above said biological activities.

Herbs reported for anti-aging activity

Skin aging is a biological complex process which originated due to the involvement of various intrinsic and extrinsic factors include genetic, hormonal, metabolic changes and exposure to environmental stresses particular Ultraviolet (UV) rays from the sun. Moreover, these various factors lead to a deterioration of the skin structure, appearance and function (Dalziel 1991). Indeed, the scientific understanding of the aging process enabled new test procedures to be developed and applied to medicinal plant research. As a results, nowadays anti-aging activities of plant extracts can be assessed by inhibition of specific (key) enzymes or biomarkers such as elastase, hyaluronidase and matrix metalloproteinases (MMP's) which involved in the aging processes. *Camellia japonica* (Theaceae), *Coffea arabica* (Rubiaceae), *C. longa* (Zingiberaceae), *C. xanthorrhiza* (Zingiberaceae), *Emblica officinalis* (Euphorbiaceae), *Ixora parviflora* (Rubiaceae) and *Polypodium leucotomos* (Polypodiaceae) are the seven herbs reported to be used for the protective effect against aging via inhibition of matrix metalloproteinase (MMP) activity (Supplementary Table 2). As for *Areca catechu* (Arecaceae), *Cordia dichotoma* (Boraginaceae), *M. citrifolia* (Rubiaceae), *Myristica fragrans* (Myristicaceae), *Pisidium guajava* (Myrtaceae), *Uncaria gambir* (Rubiaceae) and *Z. officinale* (Zingiberaceae), their mechanism of action is through inhibition of elastase activity. Inhibition of all important aging enzymes of matrix metalloproteinase (MMP), elastase and hyaluronidase are exhibited by *Cucumis sativus* (Cucurbitaceae), *Eclipta alba* (Asteraceae) and *Terminalia chebula* (Combretaceae). *Cassia alata* (Fabaceae) is a plant reported to protect against aging via the inhibition of both matrix metalloproteinase (MMP) and elastase activities. Differently, eleven herbs namely *Arctium lappa* (Asteraceae), *C. japonica* (Theaceae), *C. asiatica* (Apiaceae), *Cinnamomum* Species (Lauraceae), *C. arabica* (Rubiaceae), *C. xanthorrhiza* (Zingiberaceae), *E. officinalis* (Euphorbiaceae), *F. deltoidea* (Moraceae), *L. pumila* (Myrsinaceae), *I. parviflora* (Rubiaceae) and *Panax ginseng* (Araliaceae) showed effect against aging by the stimulation of collagen biosynthesis as shown in supplementary Table 2. The bioactive constituents such as asiaticoside (*C. asiatica*), catechin (*P. granatum*), cinnamaldehyde (*Cinnamomum* species), 3,3′-bisdemethyl pinoresinol (*M. citrifolia*) and xanthorrhizol (*C. xanthorrhiza*) isolated from the plants reported for having antiaging properties are as shown in supplementary Table 3.

Herbs with anti-acne activity

Acne is a skin disorder that suppresses an individual's self-esteem with regard to physical appearance and has a clinical onset during puberty and adolescence. A high incidence of acne is found in teen aged boys (aged 16–19) and in girls (aged 14–17). The pathogenesis of acne is regulated by sebum hyper-secretion in deformed follicles which leads to microcomedones and the follicular hyperproliferation of microcomedones, finally leads to inflammation (Cunliffe et al. 2004). The resulting skin condition with sebum enrichment is prone to the anaerobic growth of *Propionibacterium acnes*, which is the main causative microorganism in acne. *Staphylococcus epidermidis* and *Pitryosporum ovale* are other bacteria which could co-present in acne lesion. The proliferation of these microorganisms, mainly *Propionibacterium acnes* will lead to inflammatory lesion which could turn into severe acne. In this review, several herbs such as *Casuarina equisetifolia* (Casuarinaceae), *C. hystrix* (Rutaceae), *C. longa* (Zingiberaceae), *C. citratus*

(Poaceae), *I. balsamina* (Balsaminaceae), *Michelia alba* (Magnoliaceae) and *Syzygium aromaticum* (Myrtaceae) have been reported of having protective effect against *Propionibacterium acnes* (Supplementary Table 2). *Coriandrum sativum* (Apiaceae), *Garcinia mangostana* (Clusiaceae) and *Melaleuca alternifolia* (Myrtaceae) are another three herbs reported for the protective effect against both *Propionibacterium acnes* and *Staphylococcus epidermidis*.

Herbs having melanogenic activity

Melanogenesis has been defined as the biochemical process leading to the formation of macromolecular pigments such as melanin. It is initiated with the first step of tyrosine oxidation to dopaquinone catalyzed by tyrosinase which is the key enzyme. Melanin is formed by a combination of a few enzymatically catalyzed chemical reactions. This pigment plays a vital role in protecting human skin from the harmful effects of UV radiation from the sun wherein determines our phenotypic appearance (Radhakrishnan et al. 2007). Among the popular herbs, *G. mangostana* (Clusiaceae), *Piper nigrum* (Piperaceae) and *Zanthoxylum piperitum* (Rutaceae) are those reported for melanogenic activity. The phytochemicals from these plants which have been identified to be responsible for the melanogenic activity are (-)-cubebin and (-)-3, 4-dimethoxy-3, 4-desmethylenedioxy-cubebin from *P. nigrum*, and xanthoxylin of Z. *piperitum* as depicted in supplementary Table 3.

Herbs with anti-tyrosinase activity

Tyrosinase is a copper containing enzyme that is localized in human eyes, skin and hair. However, it is widespread in virtually all living organisms from bacteria to higher eukaryotes. This enzyme participates in cuticle formation in insects and also the rate limiting enzyme in melanogenesis process particularly in the first two steps of the tyrosine hydroxylation to 3,4-dihydroxyphenylalanine (DOPA) and the oxidation of DOPA to dopaquinone. Therefore agents from natural sources have been targeted as a way to inhibit or block tyrosinase activity for pharmaceutical and cosmeceutical purposes, darkening problems in agricultural products (Radhakrishnan et al. 2013). Four herbs namely *Alpinia galanga* (Zingiberaceae), *A. vera* (Liliaceae), *C. aromatic* (Zingiberaceae) and *Morus alba* (Moraceae) were reported of having the protective effect against ultraviolet (UV) induced pigmentation. Thirteen herbs which are *C. longa* (Zingiberaceae), *Dioscorea villosa* (Dioscoreaceae), *Eupatorium triplinerve* (Asteraceae), *F. deltoidea* (Moraceae), *K. galanga* (Zingiberaceae), *M. citrifolia* (Rubiaceae), *Origanum vulgare* (Lamiaceae), *Rehmannia glutinosa* (Scrophulariaceae), *Rosa canina* (Rosaceae), *S. aromaticum* (Myrtaceae), *T. indica* L. (Fabaceae) and *Z. officinale* (Zingiberaceae) are the reported melanogenesis inhibitors in melanoma cells. The responsible phytochemicals from these plants with anti-tyrosinase activity are aloesin (*A. vera*), anacardic acid, 2-methylcardols and cardols (*A. occidentale*), americanin and 3,3′-bisdemethyl pinoresinol (*M. citrifolia*), artocarpanone and artoindonesianin F (*Artocarpus heterophyllus*), artocarpanone (*Artocarpus integer*), chrysontemin (*Diospyros kaki*s L.), curcumin (C. *longa*) and diosgenin (*D. villosa*). Other reported constituents under this category are ethyl *p*-methoxycinnamate (*K. galanga*), geranic acid (C. *citratus*), 6-gingerol (*Z. officinale*), (+)-2,3-*trans*-dihydrokaempferol and (+)-2,3-*trans*-dihydroquercetin (*Peltophorum dasyrachis*), linderanolide B and subamolide A (*Cinnamomum subavenium*), (+)-lyoniresinol-3α-*O*-*β*-D-glucoside (*Vitex negundo*), 7-methoxy coumarin (*E. triplinerve*), mulberroside A (*M. alba*), origanol A and origanoside (*O. vulgare*). Supplementary Table 3 listed panduratin A (*Kaempferia panduarata*), pentagalloyl glucopyranose (*Mangifera indica*), proanthocyanidins (*R. canina*), protocatechuic acid (*O. vulgare*), pyranocycloartobiloxanthone A (*Artocarpus obtusus*), (*S*)-2-amino-5-((*R*)-1-carboxy-2-(*E*)-3-(4-hydroxy-3-methoxyphenyl)allylthio)ethyl-amino)-5-oxopentanoic acid, *N*-L-γ-glutamyl-*S*-sinapyl-L-cysteine, *S*-sinapylglutathione and *S*-sinapyl-L-cysteine (*Ananas comosus*), quercetin (*R. canina* & *Tibouchinasemi decandra*), quercetin-4-*O*-*β*-D-glucopyranoside (*Allium cepa*), zingerone and dehydrozingerone (*Z. officinale*) are a few more bioactive constituents with anti-tyrosinase activity. Some of these active compounds' structures are presented in supplementary Figure 4a to 4e.

Herbs active against sebum related skin imperfection

Oily skin is a common condition which is difficult to manage. The oily appearance of the skin resulted from

an extensive production of sebum responsible particularly by 5-alpha reductase (Type-I enzyme). Thus, by inhibiting this enzyme one can manage the oily skin problem (Chen et al. 1996). *Moringa oleifera* (Moringaceae) and *O. stamineus* (Lamiaceae) were reported of possessing the protective effect against sebum related skin imperfection (Supplementary Table 2).

Herbs with effect against skin dehydration/ irritation

Dry and chapped skin is a very common problem in both healthy individuals and those with skin diseases. Dry skin might be due to some inherited disorders related to the structure and function of the epidermis (e.g. ichthyosis and atopic dermatitis) and may also be secondary to other diseases such as diabetes or renal failure. The condition can occur in response to an environment with low humidity and/or low temperature. Exposure to chemicals such those in solvents, surfactants, acids and alkalis may also produce dryness. Products used for treatment or prevention of dry skin are called emollients or moisturizers which serve to return the water content (hydration) to the skin with the humectants attracting water from the lower layers of the epidermis into the stratum corneum and occlusive ingredients preventing trans-epidermal water loss (TEWL). Moisturizers help heal a damaged epidermal barrier and restore epidermal lipids, which play a key role in maintaining the permeability barrier of the skin as well as increasing its plasticity (Jemec and Na 2002). Two herbs which are *Ceratonia siliqua* (Fabaceae) and *Sapindus rarak* (Sapindaceae) have been reported for the protective effect against skin dehydration. Type-3 aquaporin from *C. siliqua* was reported as the bioactive constituent for the skin hydrator (Supplementary Table 3).

Herbs used against hair loss/damage

Hair loss, irrespective of gender, affects a large part of population. It is usually categorized into four pathogenetic mechanisms: hair shaft defect, telogen effluvium, anagen arrest, destruction of hair follicle or miniaturization of the follicle. However, hair loss often occurs due to various causes such as internal diseases, hormonal and nutritional conditions, intoxications and genetic traits. One major factor contributing to male pattern hair loss is 5-alpha reductase enzyme (Type-II enzyme) in the hair follicle. By inhibiting this enzyme is possible to manage the hair loss (Kumar et al. 2012) and three herbs namely *E. alba* (Asteraceae), *H. rosa-sinensis* (Malvaceae) and *Tridax procumbens* (Asteraceae) were reported for having the protective effect against hair loss (Supplementary Table 2).

Miscellaneous

Apart from these scientific reports, the herbs present in herbal cosmetic products of Malaysia are also highlighted. *A. vera* is one of the herbs present in most of the Malaysian cosmetic products as given in supplementary Table 4. A product development team of Universiti Putra Malaysia (UPM) has also commercialized herbal soaps named 'Putra AromatiQ' consist of 15 body soaps and 5 facial soaps with essential oils extracted from 12 different herbs which are *Alpinia conchigera* (Zingiberaceae), *C. odorata* (Annonaceae), *C. caudatus* (Asteraceae), *Cymbopogon nardus* (Poaceae), *Melaleuca leucadendron* (Myrtaceae), *Ocimum basilicum* (Lamiaceae), *Ocimum gratissimum* (Lamiaceae), *Persicaria hydropiper* (Polygonaceae) *Piper betle* (Piperaceae), *P. sarmentosum* (Piperacea), *Pogostemon cablin* (Lamiaceae) and *Zingiber zerumbet* (Zingiberaceae).

Conclusion

During the past few decades, numbers of herbal extracts have been reported to possess cosmetic potentials and the use of some of the medicinal plants in cosmetic preparations is increasing. Thus, this review provides a summary of the plants with claimed and/or proven potential for cosmeceutical applications. However, their efficacy validation and clinical studies with the emphasis on the ingredient standardization on concentrations (usage dose), the formulation stability or shelf life, safety and efficacy are crucial to be established.

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