CURRENT SCENARIO OF HERBAL TECHNOLOGY WORLD WIDE: AN OVERVIEW

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ABSTRACT: This article addresses the basic concepts of herbal technology which is used worldwide. 21st century is the century of Biology mechanical and propelled by scientific knowledge and hi-tech expertise. Herbal technology, are going to be the most influential elements that are fundamental for success and welfare for the people of nations. Information on the herbal technology was collected via electronic search (using pub med, scifinder, Google Scholar and web of science) and library search for articles published in peer-reviewed journals. Furthermore, information also was obtained from some local books on ethnopharmacology. Nutraceutical are food or part of the food that grant medical or health benefits together with the prevention or cure of the disease. Cosmaceuticals are the largest accumulation to the health trade and are described as cosmetic products with drug; they are the fastest increased segment in the skin care market. Biopesticides are cost effective, safer, readily available, and ecological and therefore more environment-friendly and will offer substitute to conventional pesticides. Herbal drugs represent a major contribute to all the formally recognized systems of health in India. An upward trend has been experimental in the research on herbs. Export–Import reports reveal that the global trade of herbal technology and plant originated products is around US $250 billion. In the present article, an attempt has been made to present an overview of the herbal technology in the international market and intends to throw in the knowledge about Herbal drugs, Nutraceuticals, Cosmaceuticals, and Biopesticides which comes under herbal technology.

INTRODUCTION: Herbal technology circumscribes all the advancing technical frontiers (except genes) meant to tap myriads of modes of manipulating plants around us. A large number of technologies have been developed to harvest the bountiful products that the plants manufacture, including natural dyes, biofertilizers, biopesticides and biofuel. Herbal Technology was the first step in codifying principles and defining scientific methods of this new concept of profitably managing the plants around us 1. For over twenty years Herb Technology has been on the cutting edge of herbal therapy development.

Our team of Ayurvedic, Chinese and Western doctors has perfected the ancient art of herbal formulation. Incorporating modern scientific discoveries with traditional knowledge, Herb Technology professional formulas have set the standard for the clinical practice of herbal therapy 2. The herbal industry offers a unique and strategic investment opportunity that resulted in its rapid growth worldwide.
Thus, Institute of Bioproduct Development is offering Master of Science (Herbal Technology) programme, a taught course modular-based master level programme. This programme, that tackles the technological part of the development of herbal based products, is expected to meet the needs of skilled manpower in herbal industry. Being the only programme of its kind in the world, this programme is anticipated to contribute significantly to the development of relevant human capital that will spur the growth of herbal industry in Malaysia, and the world.

All technologies for the manufacture of value added plant products can be called as herbal technology are: Nutraceuticals, Cosmaceuticals, Biopesticides, Herbal drugs.

2. Nutraceuticals: About 2000 years ago, Hippocrates correctly emphasized “Let food be your medicine and medicine be your food”. Currently there is an increased global interest due to the recognition that “nutraceuticals” play a major role in health enhancement. The term “Nutraceutical” was coined by combining the terms "Nutrition" and "Pharmaceutical" in 1989 by Dr Stephen DeFelice, Chairman of the Foundation for Innovation in Medicine. “Nutraceutical” is a marketing term developed for nutritional supplement that is sold with the intent to treat or prevent disease and thus has no regulatory definition.

Hence a “nutraceutical” is any substance that may be considered a food or part of a food and provides medical or health benefits, encompassing, prevention and treatment of diseases.

Nutraceutical can be broadly classified into the following 2 groups:

1. Potential nutraceuticals.
2. Established nutraceuticals.

A potential nutraceutical could become an established one only after efficient clinical data of its health and medical benefits are obtained.

As mentioned earlier functional foods contain larger profit margins than conventional foods (30 to 500 percent higher). The global market size is estimated between 30 and 60 billion US$, with Japan, US, and Europe occupying the biggest share. By 2010, the nutraceutical demand is forecast to touch $197 billion.

### TABLE 1: COMMON HERBALS AS NUTRACEUTICALS:

<table>
<thead>
<tr>
<th>Herbal drugs</th>
<th>Biological name/Family</th>
<th>Chemical constituents</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garlic</td>
<td>Allium sativum/ Liliaceae</td>
<td>It contains S-allylcysteine, S-allyl mercaptocysteine, saponins, Nalpha-fructosyl arginin etc.</td>
<td>It has a characteristic pungent, spicy flavor that mellows and sweetens considerably with cooking.</td>
</tr>
<tr>
<td>Ginger</td>
<td>Zingiber officinale/ Zingiberaceae</td>
<td>It contains zingerone, shogaols gingerols, β-sesquiphellandrene, bisabolene, farnesene, β-phelladrene, cineol, citral etc.</td>
<td>It is used as spice, in recipes such as gingerbread, cookies, crackers, cakes, ginger ale, ginger beer, ginger tea.</td>
</tr>
<tr>
<td>Turmeric</td>
<td>Curcuma longa/ Zingiberaceae</td>
<td>It contains curcumin, demethoxycurcumin, bisdemethoxycurcumin, turmerone, turmerone, Curcuminoids etc.</td>
<td>It is used to color, and enhance the flavors of certain dishes, dairy products, orange juice, biscuits, popcorn color, sweets, cake etc.</td>
</tr>
<tr>
<td>Aloe</td>
<td>Aloe vera/ Liliaceae.</td>
<td>It contain Aloe-emodin, aloetic-acid, anthranol, barbaloin, isobarbaloin, emodin, Arachidonic acid, campestrol, etc.</td>
<td>It has been used as a food products, for the production of gel-containing health drinks and beverages.</td>
</tr>
<tr>
<td>Onion</td>
<td>Allium cepa/ Liliaceae</td>
<td>It contains thioallyl compound, alliens, quercetin, disulfides, trisulfides, cepaene, and vinyl dithiins.</td>
<td>It is used as an ingredient in various hearty warm dishes, or onion chutney, they can be baked, boiled, eaten raw in salads.</td>
</tr>
<tr>
<td>Liquorice</td>
<td>Glycyrrhiza glabra/ Leguminosae</td>
<td>It contain Glycyrrhizin, starch, glucose, asparagines, fat, resins, mannitol, gum</td>
<td>It is used worldwide as a natural sweetener, as well as a flavoring.</td>
</tr>
</tbody>
</table>
Global demand of nutraceuticals:

1. The nutraceutical industry lies under three main segments which include functional foods, dietary supplements, and herbal/natural products [39].

2. Global nutraceutical market is estimated as USD 117 billion (INR 5148 billion) [40].

3. In 2007, nutraceuticals sale is projected to reach $74.7 billion at an AAGR of 9.9%. This assumes a world economic recovery in 2003 and an end to price competition [41].

4. According to a recent report, the total market for nutraceuticals in India is growing at 21 percent per annum. It is currently valued at INR 44bn (€621 m), but could be worth more than INR 95bn in four years [42].

5. As a concept, “Nutraceuticals” is still in its stage of infancy in India. But it has been growing much faster than global rates at CAGR of 18% for the last 3 years driven by functional food and beverages categories [43].

6. The most rapidly growing segments of the industry were dietary supplements (19.5 percent per year) and natural/herbal products (11.6 percent per year) [44].
7. Globally the nutraceutical market was estimated to be US$ 140.1 billion in 2010. Of this USA and Europe formed the largest markets accounting to 36 percent and 25 percent respectively. Exhibit 1 portrays global nutraceutical market[45].

8. US: In 2010, the US nutraceutical market stood at US $ 50.4 Billion and was by far the largest nutraceutical market in the world. The dietary supplements segment was growing at roughly 3.1 percent while the functional food and beverages segment was growing at 5.6 percent [46].

9. Europe: The total European industry was valued at US $ 35 Billion in 2010. Companies in Europe believe that product and ingredient innovation is the way forward for the nutraceutical industry[47].

10. India: In 2010, the Indian nutra industry was estimated at US $ 2 Billion, roughly 1.5 percent of the global nutraceutical industry[48].

**Cosmaceuticals:** Cosmaceuticals are future generation of skin care. Cosmaceuticals refers to the combination of cosmetics and pharmaceuticals. Cosmaceuticals are cosmetic products with biologically active ingredients purporting to have medical or drug-like benefits.

Dermatological research suggests that the bioactive ingredients used in Cosmaceuticals have benefits beyond the traditional moisturizer. The "Cosmaceuticals" label applies only to products applied topically, such as creams, lotions and ointments. Products which are similar in perceived benefits but ingested orally are known as nutricosmetics [49].

Tracing the origin of cosmetics, the first recorded use of cosmetic is attributed to Egyptians, Cirea 4000 BC [50].

Some Cosmaceuticals are naturally derived while other are synthetic, but all contain functional ingredient with either therapeutic, disease fighting or healing properties [51]. However, according to the United States Food and Drug Administration (FDA), the Food, Drug, and Cosmetic Act "does not recognize any such category as "Cosmaceuticals." A product can be a drug, a cosmetic, or a combination of both, but the term "Cosmaceuticals" has no meaning under the law" [52].

<table>
<thead>
<tr>
<th>Herbal drugs</th>
<th>Biological source/Family</th>
<th>Chemical constituents</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areca palm</td>
<td>Areca catechu/Piperaceae</td>
<td>It contains Arecaidine, arecoline, arecatannins, quercetin, liquiritigenin, resveratrol, ferulic acid, vanillic acid, beta-sitosterol, cycloartenol</td>
<td>It is used for treatment of a mental disorder called schizophrenia, an eye disorder called glaucoma; as a mild stimulant, and as a digestive aid. It is a powerful antioxidant and provides effective protection from the sun. The health benefits come into the body by drinking hot tea or cold. It is used to make the skin fair, soft. In almost all the Indian wedding ceremonies, turmeric is applied to both, the groom and the bride, to make them look good with refreshed glowing skin.</td>
</tr>
<tr>
<td>Green tea</td>
<td>Camellia senensis/Theaceae</td>
<td>It contains epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate, kaempferol, quercetin, and myricetin. It contains oleoresin, curcuminoinds, curcumin, sesquiterpenes, demethoxycurcumin, bisdemethoxycurcumin, and α-turmerone.</td>
<td>It is used for skin depigmenting, skin lightening, antiaging, emollient, anti-anti and photoprotection.</td>
</tr>
<tr>
<td>Turmeric</td>
<td>Curcuma longa/Zingiberaceae</td>
<td>It contains Glycyrrhizin, starch, asparagines, fat, resins, mannitol, gum protein, a trace of tannin, bitter principles etc.</td>
<td>It is used for skin depigmenting, skin lightening, antiaging, emollient, anti-anti and photoprotection.</td>
</tr>
<tr>
<td>Liquorice</td>
<td>Glycyrrhiza glabra/ Leguminosae.</td>
<td>It contains Gentisic, gallic acids, lycopene, picrocrocin, safranal, crocin, zeaxanthin, α- and β-carotenes</td>
<td>It is used as a spice, adding its faint, delicate aroma, pleasing flavor, and magnificent yellow color to enhance palatability.</td>
</tr>
<tr>
<td>Saffron</td>
<td>Crocus sativus/Iridaceae</td>
<td>It contains Aloe-emodin, aloetic-acid, anthranol, triglicerides, triterpenoid</td>
<td>It is used in cosmetic and toiletry industry, production of creams,</td>
</tr>
</tbody>
</table>
**Global demand of Cosmaceuticals:**

1. According to our research report, "Global Cosmaceuticals Market Analysis", the global Cosmaceuticals market offers huge potential in the Asian countries, such as Japan, China, and India, which are also set to attract major players in future. Japan has already made a niche mark in the global cosmetics market and its position in the Cosmaceuticals (having quasi drug status) segment is effectively improving. Therefore, in the back of such a strong foothold among the Asian countries, the global Cosmaceuticals market is

| Rosemary | *Rosemarinus officinalis* /Lamiaceae | It contains α-pinene, camphor, 1,8-cineole, camphene, β-pinene, limonene, borneol, α-terpineol and cymene. Potassium sorbate, aldopentose etc. |
| Gingko | *Gingko biloba*/ Ginkgoaceae | It contains ginkgolides A, B and C. It is used in lotions, creams and ointments. |
| Amla | *Emblica officinalis*/ Phyllanthaceae | It contains gallic acid, elagic acid, phyllemblic acid, emblicol and vitamin ‘C’, phyllantine. It is used in Pro-oxidation, free cascading antioxidant, promotes skin lightening agent and reduces hyperpigmentation. |
| Lemon | *Citrus limonis*/ Rutaceae | It contains α-pinene, camphene, β-pinene, sabine, myrcene, α-terpine, linalool, nerol and neral. It is used in a cream or lotion to clear congested skin. The astringent properties are great for oily skin conditions. |
| Buckweed | *Fagopyrum esculentum*/ Polygonaceae | It contains potassium, phosphorous, calcium, iron, zinc, vitamins B, E and rutin. It is used for high quality edible oil, natural cosmetics, food addictive, and health-care food. |
| Centella | *Centella asiatica*/ Apiceae | It contains centellin, asiaticin, centelicin, brahminioside, centelloside, madasatic acid, centic acid, cenelic acid. It is used in skin care, collagen production, reduce fine lines and wrinkles, sun damage repair, scar care, anti-oxidant. |
| Psorolia seed | *Psorolia corylifolia*/ Fabaceae | It contains corylin, isosoralen, psoralen, sororacoumestan A, daidzin and uracil. It is used to Improve Skin Tone, Vegetarian Liquid Formula, to use for Dull Skin, and Aging. |
| Chamomile | *chamomilla*/ Asteraceae | It contains α-bisabolol, bisabolol oxides, chamazulene, and enyndicycloethers etc. It is used in skin cosmetics to serve as an emollient, and enhance the color of blonde hair. |
| Garlic | *Allium sativum*/ Alliaceae | It contains Resveratrol, viniferin, balanocarpol, B-glucopyranosyl 8-balanocarpol. It is used in cosmetic compositions for topical application for the beauty or the skin care, for the prevention of topical cellulite. |
| Grape Vine | *Vitis vinifera*/ Vitaceae | It is used in Pro intensive color cleansers and other products. It is used in in shooos, shaving products, skin care products, bath products, cleansing products, hair conditioners. |
| Carrots | *Daucus carota*/ Apiaceae | It contains Petroselenic, linoleic, palmitic, carotol, daucene, germacrene D, trans-a-bergamotene, selinene, daucol and copaenol. It is used tomoswheels wrinkles, gives skin more intensive color and freshness, protects it from harmful UV rays. |
| Tomato | *Lycopersicon esculantum*/ Solanaceae | It contains germacrene A, guaia-6,9-diene, germacrene B, beta-caryophyllene, alpha-humulene. It is used as anti-aging, treatment of acne, after-shaves and facial care products make use of the astringent properties. |
| Witch Hazel | *Hamamelis virginiana*/ Hamamelidaceae | It contains lupeol and its acetate, ceryl alcohol, friedelin, cadabicine, diacetate, betulinic acid and diosgenin. It is used in kidney and bladder stones (inhibit the formation of stones), fever, vomiting and Contraceptive. |
| Buch-Hum | *Crataeae murula*/ Capparidaceae | It contains lupeol and its acetate, ceryl alcohol, friedelin, cadabicine, diacetate, betulinic acid and diosgenin. It is used in kidney and bladder stones (inhibit the formation of stones), fever, vomiting and Contraceptive. |
anticipated to grow at a CAGR of over 9% during 2012-2014.

2. In 2011, the market was estimated to reach $30.5bn and looks likely to augment at a rapid pace in the coming years, growing at a CAGR of around 7.7 per cent during 2012-2016.

3. Among the global Cosmaceuticals industry, skin care is the most important segment and is expected to grow significantly in the years to come as increasing number of people entering the middle age of life will create more demand for Cosmaceuticals product.

4. US demand for Cosmaceuticals products is expected to increase 5.8% annually through 2015.

5. The global Cosmaceuticals market has been forecast to increase at a compound annual growth rate of 4.6% over the next five years, increasing from a valuation of $30.9 billion in 2011, to hit a market value of $42.4 billion by 2018.

6. Anti-aging and skin nourishing products totalled nearly $ 17.7 billion in worldwide retail sales in 2008, according to Euromonitor. The firm projects that this segment will go to $ 22.1 billion in worldwide retail sale in 2013. US based cosmetic firm Avon products leads the antiaging/skin nourishing segment with approximately $ 1.16 billion in 2008 worldwide retail sales, followed by UD peer Proctor & Gamble, with $ 1.1 billion for its Olay product line.

7. In 2009 the top five countries of origin for import of cosmetics and skin care products into Hong Kong were France (25 percent), Japan (17 percent), China (15 percent), United States of America (15 percent) and the United Kingdom (35 percent).

8. The expected market growth for 2007 to 2012 is established to be 6 percent. Western Europe and Australia which spend a combine $ 7.7 billion on wrinkle reducing facial creams in 2007, according to Euromonitor Internationals new 2008 cosmetic and toiletries database.

9. In the recent years, men have become more conscious about their image than ever before, resulting in sales on male grooming products to increase by 18 percent globally between 2006 and 2011.

Biopesticides: Biopesticides, a contraction of 'biological pesticides', include several types of pest management intervention: through predatory, parasitic, or chemical relationships. The term has been associated historically with biological control - and by implication - the manipulation of living organisms. Regulatory positions can be influenced by public perceptions.

a) In the EU, biopesticides have been defined as "a form of pesticide based on microorganisms or natural products".

b) The US EPA states that they "include naturally occurring substances that control pests (biochemical pesticides), microorganisms that control pests (microbial pesticides), and pesticidal substances produced by plants containing added genetic material (plant-incorporated protectants) or PIPs".

Biopesticides are typically microbial biological pest control agents that are applied in a manner similar to chemical pesticides. In order to implement these environmentally friendly pest control agents effectively, it can be important to pay attention to the way they are formulated and applied.

A major growth area for biopesticides is in the area of seed treatments and soil amendments.

**TABLE 3: COMMON HERBS AS BIOPESTICIDES:**

<table>
<thead>
<tr>
<th>Herbal drug</th>
<th>Biological source/family</th>
<th>Chemical constituents</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobbaco</td>
<td>Nicotiana rustica</td>
<td>It contains Anabasine, l-nornicotine, l-anabasine, l-nicotine and etc.</td>
<td>It is effective against aphids, whitefly, bollworms, thrips, green leafhopper, grups.</td>
</tr>
</tbody>
</table>
Global demand on biopesticides:

1. The global pesticide market was valued at approximately $40 billion in 2008. This figure increased to nearly $43 billion in 2009 and is expected to grow at a compound annual growth rate of 3.6% to reach $51 billion in 2014.\(^\text{120}\)

2. Biopesticides represent a strong growth area in the global pesticide market. This segment is expected to grow at a 15.6% compound annual growth rate from $1.6 billion in 2009 to $3.3 billion in 2014.\(^\text{120}\)

3. Synthetic pesticides represent the greatest market share, valued at $41 billion in 2009. This market will be worth an estimated $48 billion in 2014, a compound annual growth rate of 3%.\(^\text{120}\)

4. Projections for biopesticides use will be offered for geographical regions including the Americas (i.e., U.S., Canada, Central America [including Mexico], South America); Europe, Middle East, Russia, and Africa (EMRA); and Asia (Japan, China, India, Australia, New Zealand, other Oceanic countries).\(^\text{121}\)

5. The global market for biopesticide was valued at $1.3 billion in 2011 and is expected to reach $3.2 billion by 2017, growing at a CAGR of 15.8% from 2012 to 2017.\(^\text{122}\)

6. North America dominated the global biopesticide market, accounting for around 40% of the global biopesticide demand in 2011.\(^\text{122}\)

7. Europe is expected to be the fastest growing market in the near future owing to the stringent regulation for pesticides and increasing demand from organic products.\(^\text{122}\)

**Herbal drugs:** Herbal drugs constitute a major share of all the officially recognized systems of health in India viz. Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy, except Allopathy.\(^\text{123}\) Millions of Indians use herbal drugs regularly, as spices, home-remedies, health foods as well as over-the-counter (OTC) as self-medication or also as drugs prescribed in the non-allopathic systems.\(^\text{124}\) In the last few years there has been an exponential growth in the field of herbal drugs and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects.\(^\text{125}\)
Herbal drugs are the synthesis of therapeutic experiences of generations of practicing physicians of indigenous systems of medicine for over hundreds of years while nutraceuticals are nutritionally or medicinally enhanced foods with health benefits of recent origin and marketed in developed countries. In almost all Member States, herbal medicinal products are considered as medicinal products, and are, in principle, subject to the general regulations for medicines as laid down in the various national medicine laws.

**TABLE 4: COMMON HERBS AS HERBAL DRUGS:**

<table>
<thead>
<tr>
<th>Herbal drugs</th>
<th>Biological source/Family</th>
<th>Chemical constituents</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ginkgo</td>
<td>Ginkgo biloba/ Ginkgoaceae</td>
<td>It contains myricetin, quercetin, terpenoids, ginkgolides, bilobalides, and polyphenols</td>
<td>It is used in Alzheimer’s disease, improving thinking problems, Raynaud’s syndrome, Glaucoma.</td>
</tr>
<tr>
<td>Horse chestnut</td>
<td>Aesculus hippocastanum/ Hippocastanaceae.</td>
<td>It contains Aescin, prosapogenin, alpha- and beta-aescin, cryptoaescin, hippoaesculin</td>
<td>It is used as anti-oedema, antioxidant, anti-inflammatory, cancer, obesity.</td>
</tr>
<tr>
<td>Kava-kava</td>
<td>Piper methysticum/ Piperaceae</td>
<td>It contains arylethylene, pyrones, chalcones, ylangonin, methysticin, dihydroethylthcine, kavain, dihydrokavain</td>
<td>It is used as anxiolytic, psychosis, depression, migraines, chronic fatigue syndrome, tuberculosis and cancer prevention.</td>
</tr>
<tr>
<td>St. John’s wort</td>
<td>Hypericum perforatum/ Hypericaceae</td>
<td>It contains epigallocatechin, rutin, hyperoside, amentoflavone, astilbin, miquelianin</td>
<td>It is used in wounds, abrasions, burns, muscle pain, inflammatory skin diseases.</td>
</tr>
<tr>
<td>Myrtle</td>
<td>Myrtus communis/ Myrtaceae</td>
<td>It contains α-pinene, 1, 8-cineole, myrtenyl acetate, 1, 8-cineole</td>
<td>It is used as anti-cancer, anti-inflammatory, diabetics, Alzheimer disease.</td>
</tr>
<tr>
<td>Stinging nettle</td>
<td>Urtica dioica/ Urticaceae</td>
<td>It contains Histamine, acetylcholine, choline, serotonin, oleanol acid, sterols</td>
<td>It is used as arthritis, benign prostatic hyperplasia, rubefacient, galactagogue.</td>
</tr>
<tr>
<td>Saw palmetto</td>
<td>Serenoa repens/ Areceae</td>
<td>It contains caproic, caprylic, linoleic; anthrancic acid, sterols including β-sitosterol, β-sitosterol, campesterol, lupeol</td>
<td>It is used in prostate gland, benign prostatic hyperplasia, bladder disorders, hair loss, hormone imbalances, and cancer.</td>
</tr>
<tr>
<td>Milk thistle</td>
<td>Silybum marianum/ Compositae</td>
<td>It contains silybin (silibinin), silychristin (silichristin), sylvichristin B, sildianin, neosilyhermin</td>
<td>It is used in jaundice, chronic inflammatory liver disease, chronic hepatitis, heartburn complaints.</td>
</tr>
<tr>
<td>Soya beans</td>
<td>Glycine max/ Fabaceae</td>
<td>It contains phytic acid, alpha-linolenic acid, isoflavones, cellulose, hemicellulose, and pectin</td>
<td>It is used in sedative, anti-spasmodic, diaphoretic, anti-pyretic properties, fever, and restlessness.</td>
</tr>
<tr>
<td>Mistletoe</td>
<td>Viscum Album/ Loranthaceae</td>
<td>It contains quercit, chalcone, oleanic acid, beta-sitosterol, ursolic acid, lupeol</td>
<td>It is used in cancer, lower blood pressure, arthritic pain, Sleep/Insomnia, headache, hepatitis.</td>
</tr>
<tr>
<td>Chamomile</td>
<td>Matricaria chamomilla/ Asteraceae</td>
<td>It contains apigenin, apigetrin apigenin-7-O-glucoside, apin querocerin, rutin luteolin, patuletin, and quercimeritin</td>
<td>It is used in anti-inflammatory, antihyperglycemic, antigenotoxic.</td>
</tr>
<tr>
<td>Comfrey</td>
<td>Symphytum officinale/ Boraginaceae</td>
<td>It contains allantoin, caffeic acid, chlorogenic acid, lnhospheric acid, and silicic acid</td>
<td>It is used in cuts, bruises, pulled muscles and ligaments, fractures, sprains, and osteoarthritis.</td>
</tr>
<tr>
<td>Eucalyptol</td>
<td>Eucalyptus globulus/ Myrtaceae</td>
<td>It contains 1,8-Cineole, Sabinene and alpha-Terpinyl acetate, a-Pinene, alpha-Phellandrene and trans-/beta-osimen</td>
<td>It is used in mouthwash, cough suppressant, as well as an inactive ingredient in body powder, insecticide and insect repellent.</td>
</tr>
<tr>
<td>Black cohosh</td>
<td>Cimicifuga racemosa/ Ranunculaceae</td>
<td>It contains 26-deoxyactein, cimigoside, cimifugoside M, cimicaremosides</td>
<td>It is used in anxiety, and cough, menopause, premenstrual syndrome, and painful menstruation.</td>
</tr>
<tr>
<td>Bromelain</td>
<td>Ananas comusus/ Bromeliaceae</td>
<td>It contains bromelain, ananain, and comosain, glycoproteins, carbohydrates, peroxidases, phosphatases</td>
<td>It is used in inflammation, hay fever, swelling, ulcers, pulmonary edema, muscle contractions, preventing cancer.</td>
</tr>
</tbody>
</table>
Global demand on Herbal Drugs:

1. Total global herbal market is of size 62.0 billion dollars, in this India’s contribution is only one billion dollars. European Union is the biggest market with the share 45% of total herbal market. North America accounts for 11%, Japan 16%, ASEAN countries 19% and rest of European Union 4.1%.

2. Increasing demand for botanical remedies is both a national, and international, trend. In fact, the global herbal supplement and remedies market is expected to reach $93 billion by 2015, according to a new report by San Jose, CA-based Global Industry Analysts, Inc.

3. U.S.A: In the U.S., sales of herbal supplements increased more than 3% in 2010, reaching more than $5 billion, according to a new report published in HerbalGram, ABC’s quarterly journal.

4. It’s no surprise that botanicals addressing age-related health concerns topped the U.S. sales charts in 2010.

5. EUROPE: As of January 2011, the U.K. Medicines and Healthcare products Regulatory Agency (MHRA) recorded 187 traditional herbal applications, of which 84 have been granted.

6. ASIA: While Europe may represent one of the largest regional markets, “in terms of growth rate, the Asia-Pacific market, led largely by China and India, is set to pave the way with the highest CAGR (compound annual growth rate) of [nearly 11%] through 2015,” according Global Industry Analysts’ most recent report.

7. India's share in medicinal plant export in global trade is very low about 8.13% as against 28% of China.

8. The demand for medicinal plant-based raw materials is growing at the rate of 15 to 25% annually worldwide. Global market size for herbal and medicinal plants is estimated at US$ 60 billion and is projected to reach US$ 5 trillion by 2050 (source WHO 2003). About 75% to 80% of the total exports of crude drugs come from India.

9. The trend growth rate of India from the year 1991 to 2002 shows 4.95% growth of world export value of medicinal plants. Similarly the trend growth rate of China from 1991-2002 is 7.38%.

CONCLUSION: Several drugs have entered the international market through study of ethnopharmacology and traditional medicine. Cosmeceuticals are the products that forms interconnect between the drug and cosmetics. Cosmeceuticals are found to be a new rising market not only for males but also for females. Nutraceuticals have established health benefits and their utilization will keep diseases away and allow humans to sustain an overall good health. There is rich biodiversity of medicinal plants worldwide where many species of both medicinal and biopesticides plants are utilized. There is a necessary to educate and sensitize the younger age group on the potential and importance of conserving the local biodiversity, native knowledge and practices.

In India almost all generations use herbal drugs for their health benefits. These herbal drugs and Indian medicinal plants are also rich sources of beneficial compounds including antioxidant, anti-inflammatory, antiseptic and antimicrobial properties and other components that can be used in functional foods.

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