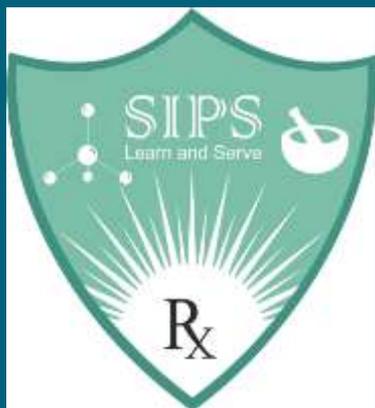


PLANT BASED INDUSTRIES AND INSTITUTIONS



Dr. Kaushik B. Kanada,
Associate Professor,
Dept of Pharmacognosy,
Saraswati Institute of Pharmaceutical Science

Facts and Figures:

- **Rs. 85,000 Crore – 2018** Confederation of Indian Industry (CII)
- **Rs. 30,000 crore - 2018**
- **Rs. 10450 crore (2006-2018)**
- **Rs. Rs 3,260 crore (2010-Reckitt Benckiser)**
- **Rs. 1651 crore (2009-2015)**
- **Rs 750 crore**
- **Global CAGR 5.56% till 2023 -USD1,29,689.3 m**
- **Indian CAGR 16% till 2025**

Introduction

- The demand for plant based medicines,
 - ▣ health medicines,
 - ▣ health products,
 - ▣ pharmaceuticals,
 - ▣ food supplements,
 - ▣ cosmetics, etc.,
- is increasing in both developing and developed countries,

- Due to the growing recognition that
 - ▣ The natural products are non-toxic,
 - ▣ Have less side effects,
 - ▣ Easily available at affordable prices and sometimes
 - ▣ The only source of health care available to the poor.
- Global estimation indicate that
 - ▣ over 80 % of the world population can't afford the products of the Western pharmaceutical industry and
 - ▣ they have to rely upon the use of traditional plant-based medicines.

- 
- To reduce the financial burden on the developing countries, which spend 40-50 % of their total budget on health.
 - WHO currently encourages, recommends and promotes the inclusion of herbal drugs in national health care programmes because such drugs are easily available at a price within the reach of a common man and safer than the modern synthetic drugs.

- 
- India has been identified as one of the top 12 mega-diversity rich flora of medicinal and aromatic plants occurring in diverse eco-systems.
 - India has a long history of more than 5000 years as a supplier of Medicinal and fragrant materials to the Western Civilizations in Greece, Rome and Egypt.

- 
- The Indian medicinal plant-based industry faces many problems and is affected by number of factors which include absence of well defined policies/guidelines and strategies for promotion of cultivation and post harvest technology, standardization and marketing.
 - The most alarming problem of the plant-based industry is the decreasing supply of plant materials from natural resources.

- 
- A national policy on medicinal plants with a view to preserve endangered species and promoting cultivation of plants which are being extensively used by industry, will help in solving the major problems of the industry.

- Special attention is required on medicinal plants on which significant research leads have been obtained.
- **E.g. *Acorus calamus* (Tranquilizer)**
- ***Albizia leback* (immunomodulator)**
- ***Andrographis paniculata* (Antihepatotoxic)**
- ***Boswellia serrata* (antiarthritic & antihepatotoxic)**
- ***Commiphora mukul* (antihypercholesteolaemic)**
- ***Coleus forskohlii* (cardiotonic)**
- ***Centella asiatica* (brain tonic)**
- ***Phyllanthus amarus* (antihepatotoxic)**
- ***Sida rhombifolia* (anabolic)**
- ***Valeriana wallichii* (Tranquillizer)**
- ***Withania somnifera* (Adaptogen)**

- 
- Indian industry is based on small family based units which are unable to compete at global level and need structural changes in production (size) and productivity (unit) through corporate entry in farming and utilization of technological innovation.
 - There is need to have separate marketing and development board for medicinal and aromatic plants and phytopharmaceuticals.
 - Such board could interact with the growers and users industry to bring stability in their production, demand, price, quality and also help in international trade.

- 
- Global Herbal Medicine Market, by category, is segmented into herbal pharmaceuticals, herbal dietary supplements, herbal functional foods, and herbal beauty products.
 - The herbal pharmaceutical segment is growing owing to the increasing research and development on various herbs to find their medicinal properties, growing demand for natural medicines having fewer side-effects, and rising prevalence of chronic diseases such as diabetes, arthritis, cancer, sleep disorders, and digestive problems.

CLASSIFICATION OF MEDICINAL PLANT BASED INDUSTRY

Six categories:

- ❑ i. Plant drugs for Indian system of Medicine (traditional system) covering- Ayurveda, Unani and Siddha.
- ❑ ii. OTC, non-prescription products consisting of plant parts, extracts and galenicals.
- ❑ iii. Essential oils industry
- ❑ iv. Phytopharmaceuticals
- ❑ v. Natural health products
- ❑ Health foods, Nutraceuticals, Recombinant proteins
- ❑ vi. Cosmeceutical industry

Based on indigenous systems

- Several traditional healthcare systems of medicine are being practiced in India subcontinents.
- The most commonly used one are Ayurvedic, Siddha, Unani and Tibbi system of medicine.
- All alternative systems introduced at different stages co-exist with its indigenous systems of medicine in the multiethnic states of India.
- There are many small manufacturing units using medicinal plants and thousands of Vaidyas preparing their own drugs from various plants.
- Herbal industry in India uses about 8000 medicinal plants;

- Frequently used plants in number of traditional herbal formulations.
- *T. chebula*, *T. belirica*, *E. officinalis* (219)
- *G. glabra* (141)
- *Piper longum* (135)
- *Adhatoda vasica* (110)
- *Withania somnifera* (109)
- *Cyperus rotundus* (102)
- *Tinospora cordifolia* (88)
- *Berberis aristata* (65)
- *Holarrhena antidysentrica* (59)
- *Boerhavia diffusa* (52)

SOME IMPORTANT MEDICINAL PLANTS USED BY INDIAN HERBAL INDUSTRY

Plant name	Consumption (tonnes)	Plant name	Consumption (tonnes)
Aloe leaf	200	Acorus rhizome	150
Kalmegh	250	Shatavari	500
Bacopa	700	Berberis	500
Cinnamon	200-300	Guggul	500
Kesar	5	Nagar motha	150
Bhringraj	500	Cardamom	60
Embelia	200	Glycyrrhiza	5000
Anantmool	200	Kurchi	150
Vasaka	500	Mucuna	200
Jaiphal	500	Jatamansi	200
Amla	10000	Kutki	200
Pipparimool	200	p. Nigrum	150

Plant name	Consumption (tonnes)	Plant name	Consumption (tonnes)
Chitrak	500	Vidarikand	200
Ashoka	1200	Senna	1000
Nux-vomicA	1000	Chirata	300
Clove	150	Cumin	300
Baheda	500	Harde	500
Galo	1000	Tagar-valerian	150
Ashwagandha	500	Ginger	500

- ❑ Several decade ago-medicine prepared by the practicing physician themselves
- ❑ Recent times-this practice replaced by the establishment of organized indigenous drug industry
- ❑ 25000 licensed pharmacies of Ind. Medicinal system
- ❑ 700000 registered practitioner
- ❑ 1000 single drugs, 3000 compound formulations
- ❑ Siddha-600-800 medicinal plants
- ❑ Unani 700-800
- ❑ Tibetan- 500-600
- ❑ Still exact quantification is not possible as no reliable data exists.

DEVELOPMENT OF HERBAL MEDICINE INDUSTRY

- Herbal medicines are the finished, labeled medicinal products that contain active ingredients from aerial or underground parts of plant or other plant materials, or combination thereof, whether in the crude state or as plant preparations.
- Herbal medicines may contain excipients in addition to active ingredients.
- Medicines containing plant material combined with chemically defined active substances, including chemically defined, isolated constituents of plants are not considered to be herbal medicines.

Non-prescribing (OTC)

- The direct utilization of plant material is a feature of traditional medicines not only in the developing countries but also in Europe and USA.
- Europe has a long history of research and processing of botanical extracts and has strict regulations, established quality control procedures and details of clinical data to support the products.
- Overall, the European market is as well regulated as the drug industry and many of the compounds sold in USA as dietary supplements are marketed as drugs in other countries.

- 
- The current trend is to procure standardized extracts of plants as raw material, for which, they are trying to establish their own R&D unit as per the guideline issued by WHO.
 - The objectives of these guidelines, therefore, is to define basic criteria for evaluation of quality, safety and efficacy of herbal medicines.
 - Herbal and related extracts will see the strongest growth based on expanding scientific evidence of health benefits and rising popularity of alternative medicines.

- 
- Govt. institutions involved in the standardization of raw material as well as formulations...
 - Pharmacopoeial committees for Ayurveda, Siddha, Unani and Homeopathy systems.
 - The Pharmacopoeial Laboratory for Indian Medicines (PLIM) and the Homeopathy Pharmacopoeial Laboratory (HPL) at Ghaziabad are providing technical backup to these committees.
 - 178 monographs are ready
 - Two volumes of Ayu. Formulary -635 formulations
 - Siddha pharmacopoeia committee- seven volumes containing standards of 910 drugs.

- The Unani Pharmacopoeial Committee has published one National Formulary of 441 formulations.
- 45 monographs of single unani drugs
- The homeopathic Pharmacopoeial Committee has brought out 7 volumes containing standards of 910 drugs.

Essential Oil Industry

- The essential oil industry was traditionally a cottage industry in India.
- During the last 65 years, a number of industrial companies have been established for a large scale production of essential oils, oleo-resins and perfumes.
- The essential oils from plants being produced in India are more than 500 tonnes accounts for 90% of the world production.
- E.g. Ajowain oil, Celery oil, Citronella oil, Cedarwood oil, Devana oil, Eucalyptus oil, Lemon grass oil, Mentha oil, Geranium oil, Lavender oil, Palmrosa oil, Rose oil, Orange oil, Jasmine oil, Vetiver oil, Coriander oil, Sandalwood oil etc..

- In India the production of turpentine oil and the resin from pines is well-established industry; having annual production about 35000-40000 tonnes annually.
- Another big established oil industry is of mentha oil, eucalyptus oil and lemon oil.
- Annual world production of limonene is about 75000 tonnes and Brazil is biggest producer in world market.
- It is the by product of citrus industry though turpentine oil and eucalyptus oil also yield limonene but the best economically cheap raw material is the discarded orange and lemon peel which is being used by Brazilian Phytochemical Industry.

phytopharmaceuticals

- Before independence, plant-based phyto pharmaceutical industry in India was confined only to Quinine from Cinchona in the three state-owned factories.
- The very first industry was established by British Government at Mungpoo in Darjeeling.
- During the past 55 years, bulk production of plant-based drug has become major part of Indian Pharmaceutical Industry.

- Major pharmaceuticals produced in India are:
- Morphine, Codeine, Papaverine, Thebain, Emetine, Reserpine, Quinine, Quinidine, Digoxin, Caffeine, Hyoscyamine, Berberine, Colchicine, Rutin, Vinblastine, Vincristine, Brucine, Strychnine, Ergot Alkaloids, Senna glycosides, Diosgenin, Podophyllotoxin resin and citral.
- Indian Institute of Chemical Technology (IICT), Hyderabad has developed methods for etoposide and teniposide production; and CIPLA is now producing it on commercial bases.

- 
- National chemical Laboratory, Pune developed the method for Vincristine (VCR) and Vinblastine (VLB) production and CIPLA has further improved the production technique and they are the third largest manufacturer of VCR and VLB in the world.

Natural Health Product Industry

- In these days the interest in herbal medicine is on rise, not only in the phytodrugs but also in natural health products, which include, health foods, nutraceuticals and personal care products.
- Health food: are the food products supplemented with herbal ingredients.
- Vitamines, minerals and nutrients or ingredients isolated from plants.
- They have physiological benefits and reduce the risk of chronic diseases.

□ **NUTRACEUTICALS**

- It is a latest term for health food, first innovated by Stephen Deffice, founder of the Foundation for Innovation in Medicine of New Jersey, USA.
- The word nutraceutical is an amalgamation of the term “Nutrition” and “Pharmaceutical” or it can be more correctly defined as parts of a food that have a medical or health benefit including the prevention and treatment of disease.
- The three main constituents, which make-up nutraceuticals are herbal and related extracts, vitamins, minerals and nutrients.

- Antioxidant and herbal teas also form an important part of the nutraceutical market.
- The leading antioxidant phytochemicals in demand are Vit. A, C and E; Carotenoids and flavonoids.
- Indian nutraceuticals market CAGR of 21 % and reach \$ 10 billion by 2022 from \$ 4 billion in 2017
- Globally, too, the nutraceutical market is expected to reach \$ 241 billion in 2019 from \$ 172 billion in 2014.
- CAGR 7.3% (2015-2021)
- Japan is the 3rd largest producer of nutraceuticals in the world and largest in the Asia pacific region. About half of the all patents for nutraceuticals have been developed in Japan.

- Nutraceuticals are the most progressing sector for health food and pharmaceutical industry based on plants.
- Many functional food/nutraceutical companies are part of larger food or pharmaceutical industries.
- A number of large food and pharmaceutical companies, such as Abbott laboratories, GSK, Ledrle, Dabur, Himalaya, Zandu, Allen lab, and Aimil pharmaceuticals are also manufacturing nutraceuticals.

Herbal cosmetics and personal care products

- Rs. 80370 crore (2018) CAGR 22% -2025
- Cosmetic and personal care products containing natural products have rapidly growing trend in the market.
- Beginning in the early 1990's, cosmetic manufacturers began to use the term cosmeceuticals to describe the OTC skin care products.
- Claiming therapeutics benefits, the cosmeceutical products contain phytoconstituents in the extracts form or in the purified form such as alpha-hydroxy acids, vitamins, antioxidants and emollient oils rich in Vit A and E, botanical extracts, plant acids/enzymes and essential oils.

- Botanical extracts:
- Canola (*Brassica napus*)
- Chamomile (*Matricaria chamomilla*) dry extracts
- Marigold (*Calendula officinalis*) dry extracts
- Echinacea (*echinacea spc..*)
- Pumpkin seed (*Cucurbita pepo*) lipophilic extracts
- Ivy (*Rhus toxicodendron*) soft extracts
- Peruvian bark (*Cinchona succirubra*) fluid extracts
- Ginkgo (*ginkgo biloba*)
- Centella asiatica leaf extractsetc..

PHARMACOGNOSY SECTION

- MICROSCOPE BINOCULAR
- DISSECTING MICROSCOPE
- MICROTOME
- PHYSICAL BALANCE
- ALLUMINIUM SLIDE TRAYS
- STAGE MICROMETER
- CAMERA LUCIDA (PRISM & MIRROR TYPES)
- CHEMICALS, GLASS WARES ETC.

Industries:

- 1.Dabur India Ltd
- 2.Hamdard Laboratories
- 3.Baidyanath Pharmaceuticals
- 4.Himalaya Herbals
- 5.Surya Herbals Limited
- 6.Charak Pharmaceuticals
- 7.Zandu Realty Limited
- 8.Zealous Herbals
- 9.Vicco Laboratories
- 10.Divya Pharmacy
- 11. Patanjali

Institutions:

- Council of Scientific and Industrial Research (CSIR)
- 38 national laboratories, 39 outreach Center, 3 innovation complexes and 5 units
- 4600 active scientists, 8000 scientific and technical personnel
- National botanical Research Institute
- Central Institute of Medicinal and Aromatic Plants (CIMAP)
- Central Drug Research Institute
- National Medicinal Plant Board
- Indian Council for Medical Research
- Indian Agriculture Research Institute

તમારી સફળતા કે
નિષ્ફળતાનો આધાર
તમે તમારો સમય
કેવી રીતે પસાર કરો છો
તેના પર છે.

