UNIT
1

Herbs as Raw Materials

Introduction

Medicinal and aromatic plans constitute a major part of the flora, which provides raw materials for use in the pharmaceuticals, cosmetics and drug industries. In one of the studies by WHO, it is estimated ha 80 percent of the population of developing countries relies on traditional plant-based medicines for their health requirements. India and China are the two major producing countries having 40 percent of the global biodiversity and availability of rare species. These are well known as the home of medicinal and aromatic crops that constitute a segment of the flora and provide raw materials to the pharmaceutical, cosmetics, fragrance, flavour etc. industries. From the trade data available, it is clear that the global market for medicinal plants has always been large and has been on increase in the recent past. The trade of medicinal plants from India is estimated Rs.550 crores.

Herb

Herb is defined as any plant with leaves, seeds, or flowers used for flavouring, food, medicine or perfume (or) herbs are crude plant material which may be entire, fragmented or powdered. Herbs include the entire aerial parts, leaves, flowers, fruits, roots, seeds, bark (stem/root) of trees, tubers, rhizomes or other plant parts.

An herb, also spelled as "herb," is a type of plant that is valued for its culinary, medicinal, aromatic, or ornamental properties. Herbs are typically grown for their leaves, stems, flowers, or seeds, which are used in various ways to enhance the flavour of food, provide therapeutic benefits, add fragrance, or beautify spaces.

Culinary herbs are commonly used to season and flavour dishes in cooking, adding unique tastes and aromas to recipes. Examples of culinary herbs include basil, thyme, rosemary, oregano, parsley, and mint. Medicinal herbs have been used for centuries in traditional medicine practices to treat various health issues. Some herbs are believed to possess healing properties, and their extracts or preparations are used to alleviate symptoms or promote well-being.

Aromatic herbs are known for their pleasant fragrances and are often used in perfumes, cosmetics, and aromatherapy. Lavender, chamomile, and eucalyptus are examples of aromatic herbs. Ornamental herbs are grown for their visual appeal in

gardens or landscapes. These herbs often have attractive flowers, foliage, or growth habits that add beauty to outdoor spaces. Herbs can be cultivated in gardens, pots, or even indoors, depending on the specific needs of each plant. They are used fresh, dried, or in various processed forms like oils, teas, and extracts.

Herbal medicine

Practice of using herbs and herbal preparations to maintain health and to prevent, alleviate or cure disease or a plant or plant part or an extract or mixture of these used in herbal medicine.

Herbal medicine, also known as herbalism or botanical medicine, refers to the practice of using plants and plant-derived substances for their medicinal properties to promote health, prevent illness, or treat various medical conditions. This approach to healing is one of the oldest forms of medicine, dating back thousands of years and spanning numerous cultures and traditions around the world.

Herbal medicine involves the use of various parts of plants, including leaves, stems, flowers, roots, and seeds, to create preparations such as teas, tinctures, extracts, poultices, and capsules. These preparations can be consumed orally, applied topically, or inhaled, depending on the intended therapeutic effect.

Herbal medicinal products

These are medicinal products where the active ingredient consists mainly of herbal substances.

Herbal medicinal products, often referred to as herbal remedies or herbal supplements, are products made from plants or plant extracts that are used for their therapeutic or medicinal properties. These products have been used for centuries in various cultures around the world as a form of traditional medicine. Herbal medicinal products can come in various forms, including teas, tinctures, capsules, tablets, creams, and more.

The active ingredients in herbal medicinal products are derived from different parts of plants, such as leaves, flowers, roots, stems and bark. These active compounds are believed to have specific beneficial effects on health and well-being. Some examples of commonly used herbal medicinal products include echinacea for immune support, Ginkgo biloba for cognitive enhancement, and St. John's wort for mood regulation.

It is important to note that while many people use herbal medicinal products for their potential health benefits, the scientific evidence supporting their effectiveness can vary widely. Some herbal remedies have been extensively studied and are supported by clinical research, while others might lack rigorous scientific validation. Additionally, just like any other form of medicine, herbal products can also have potential side effects, interactions with other medications, and varying degrees of safety.

Regulations regarding the production, marketing, and sale of herbal medicinal products can vary by country. In some places, these products are regulated as dietary supplements, while in others, they may be subject to stricter regulations similar to

pharmaceutical drugs. It's advisable for individuals considering the use of herbal medicinal products to consult with a healthcare professional before starting any new treatment regimen, especially if they have pre-existing medical conditions or are taking other medications.

Herbal drug preparations

They are prepared from herbal materials by different process, which is extraction with various solvents, purification, concentration and other processes. It includes such as powders, extracts and juices.

Herbal drug preparations are formulations made from plant materials or extracts that are used for medicinal purposes. These preparations can take various forms and are often derived from different parts of plants, including leaves, flowers, roots, stems, and bark. Herbal drug preparations have been used for centuries as a part of traditional medicine and continue to be utilized in modern healthcare systems as well.

Finished herbal products

Finished herbal products consist of one or more herbal preparations made from one or more herbs i.e., from different herbal preparations made of the same plant as well as herbal preparations from different plants. Products containing different plant materials are called "mixture herbal products". It includes various herbal formulations like tablets, syrups, capsules, semisolid dosage forms, etc. They may contain excipients in addition to active ingredients.

Source of herbs

Herbs or medicinal plants can be obtained from two sources viz:

a. Wild source & b. Cultivated source.

Wild source

The plants are obtained from the wild source such as forests, plains, river banks, etc, where they are found in their wild form. Collection from wild sources is suitable for plants which are abundant in nature and are easily available. Obtaining herbs from a wild source is easy, economical, less time consuming, and has a decreased cost of labour, however it also offers various disadvantages such as the quality of the plants cannot be predicted due to various environmental changes.

The plants will not be uniform in their growth and yielding characteristics. Modern scientific techniques cannot be applied to increase the yield as well as quality. If the plants are obtained continuously from wild sources for prolonged periods it may lead to depletion of raw materials from the wild.

Cultivated source

In recent times, medicinal plants have been systematically cultivated by applying modern scientific techniques. Obtaining herbs from cultivated sources offer various advantages which are as follows:

- Quality and purity are ensured.

- Better yield and more profit.
- Ensures regular supply of raw material.
- Application of modern scientific techniques is possible.

Steps involved in the selection, identification, and processing of herbal raw materials

Herbs are subjected to various stages starting from their selection, identification, cultivation, collection, storage and processing until the final product is formed.

Selection, identification and authentication of herbal drugs

Where applicable, the species or botanical variety selected for cultivation should be the same as that specified in the national pharmacopoeia or recommended by other authoritative national documents of the end-user's country. In the absence of such national documents, the selection of species or botanical varieties specified in the pharmacopoeia or other authoritative documents of other countries should be considered. In the case of newly introduced medicinal plants, the species or botanical variety selected for cultivation should be identified and documented as the source material used or described in traditional medicine of the original country.

Steps involved in processing of herbal drugs

The detailed steps involved in the processing of herbal drugs are discussed below:

1. Selection of herbs
2. Identification and authentication
3. Cultivation of herbs
4. Collection of herbs
5. Processing of herbal raw material

Identification tests should be specific for the herbal material and are usually a combination of three or more of the following:

- Macroscopic characters,
- Microscopic characters,
- Chromatographic procedures,
- Chemical reactions.

Authentication is especially useful in cases of drugs that are frequently substituted or adulterated with other varieties which are morphologically and chemically indistinguishable. Several herbal drugs in the market still cannot be identified or authenticated based on their morphological or histological characteristics. Use of wrong drugs may be ineffective or it may worsen the condition.

Processing of herbal materials

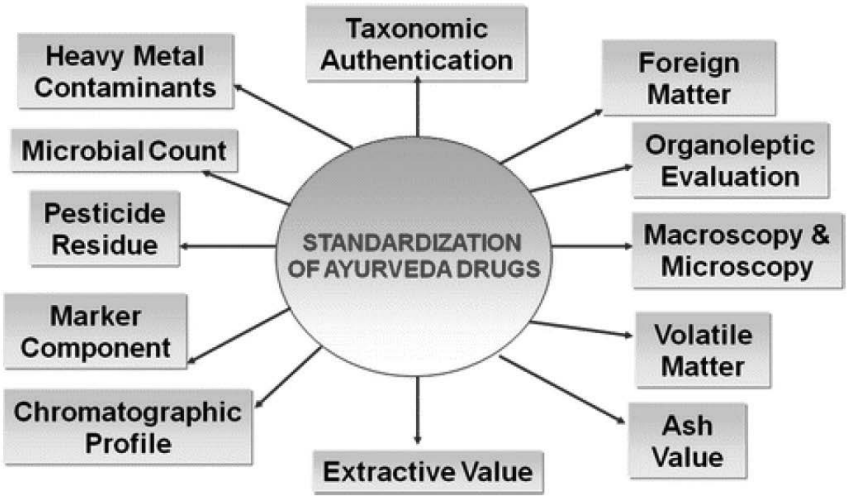
Depending on the intended use, herbal materials could be regarded as starting materials and herbal preparations could be regarded as intermediates in the process of producing finished herbal products, or as herbal dosage forms for therapeutic applications. In the latter case, simple herbal dosage forms may

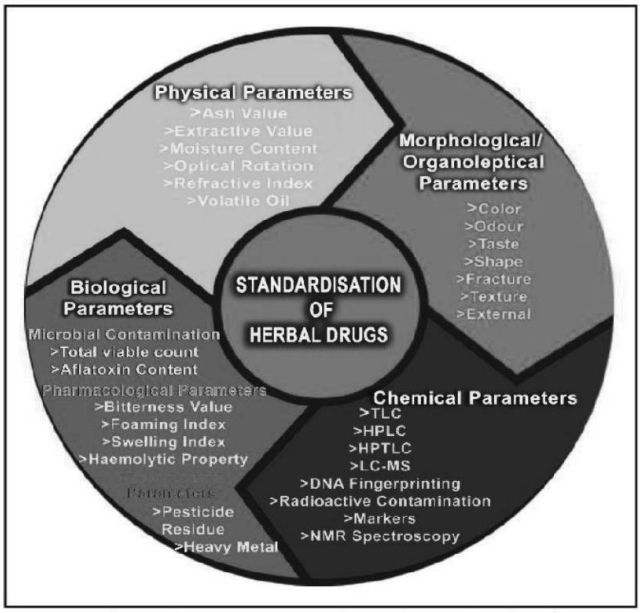
be prepared either from herbal materials (such as unprocessed seeds or plant exudates) or herbal preparations (such as ground powders and dried extracts) ready for administration to patients. These herbal dosage forms, produced under Good Manufacturing Practices (GMP) conditions, include decoctions, tea bags, granules, syrups, ointments or creams, inhalations, patches, capsules, tablets and pills, among others.

- Collection of drugs
- Time of collection
- Harvesting
- Primary processing
- Drying
- Specific processing
- Garbling
- Packing
- Storage

Safety management of toxic herbs

Among the herbal medicines (and their source medicinal plants) being used in traditional medicine contexts in different parts of the world, some are known to contain toxic substances that may lead to severe side-effects or even death. In general, these toxic herbal materials and their preparations or dosage forms have narrow therapeutic windows between elective dose and lethal dose. Examples of such toxic/effective therapeutic agents are cardio-active herbal preparations such as powdered digitalis and digitalis capsules which at the proper dosages, are excellent therapeutic cardiotonic agents, but are lethal when an overdose is taken.




STANDARDISATION OF HERBAL DRUGS
Physical Parameters
>Ash Value
>Extractive Value
>Moisture Content
>Optical Rotation
>Refractive Index
>Volatile Oil
Morphological/ Organoleptical Parameters
>Color
>Odour
>Taste
>Shape
>Fracture
>Texture
>External
Biological Parameters
Microbial Contamination
>Total viable count
>Aflatoxin Content
Pharmacological Parameters
>Bitterness Value
>Foaming Index
>Swelling Index
>Haemolytic Property
>Pesticide Residue
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>Radioactive Contamination
>Markers
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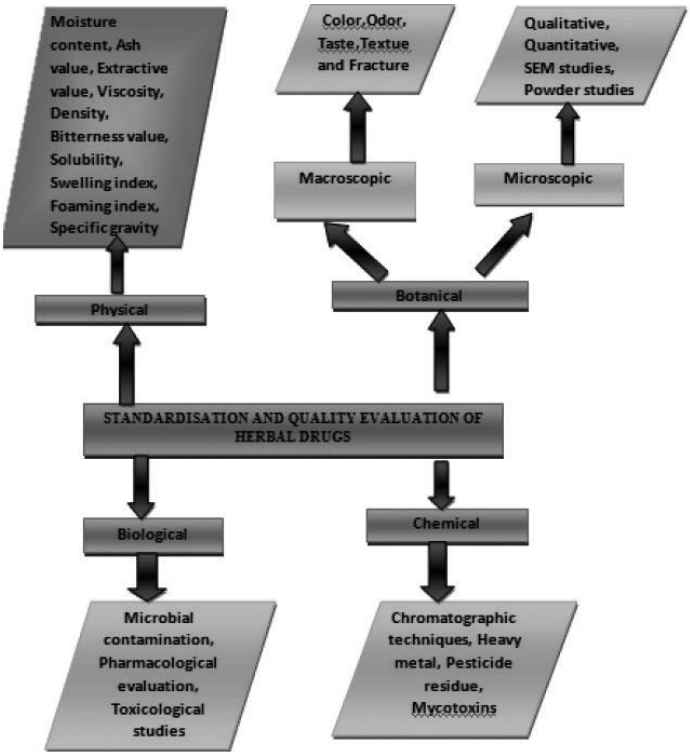

Moisture content, Ash value, Extractive value, Viscosity, Density, Bitterness value, Solubility, Swelling index, Foaming index, Specific gravity
Color,Odor, Taste,Textue and Fracture
Qualitative, Quantitative, SEM studies, Powder studies
Macroscopic
Microscopic
Physical
Botanical
STANDARDISATION AND QUALITY EVALUATION OF HERBAL DRUGS
Biological
Chemical
Microbial contamination, Pharmacological evaluation, Toxicological studies
Chromatographic techniques, Heavy metal, Pesticide residue, Mycotoxins

Biodynamic agriculture

Biodynamic agriculture was developed during the 1920s by Rudolf Steiner. Steiner argued that spirituality lays the foundation for the renewal of agriculture. In particular, he encouraged farmers to develop a personal relationship with plants, animals, soil, and even with manure in order to think more holistically about agriculture. Since then, biodynamic agriculture has been experimented with and implemented by farmers around the world.

Biodynamics has much in common with other organic approaches – it emphasizes the use of manures and composts and excludes the use of synthetic (artificial) fertilizers on soil and plants. Methods unique to the biodynamic approach include its treatment of animals, crops, and soil as a single system, an emphasis from its beginnings on local production and distribution systems, its use of traditional and development of new local breeds and varieties.

Biodynamic agriculture uses various herbal and mineral additives for compost additives and field sprays. WHO has developed a series of technical guidelines relating to the quality control of herbal medicines of which these WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants based.

In contrast, crop rotation and an assortment of animal life are an important part of sustainable agriculture. The practice of rotating crops from field to field and raising varied animal species, along with cover crops and green manures, encourages healthy soil, reduces parasites and controls weeds and pest.

Biodynamic farming treats animals, crops and soil as a single system and facilitates the use of traditional systems and development of new local breeds and varieties. It uses various herbal and mineral additives in the manufacture of composts and field sprays. Biodynamic farming also emphasizes on the use of astronomical sowing and moon planting calendar. Bio dynamic farming promotes composting, green manuring crop rotations, inter cropping, mixed cropping, etc, as well as employing predators, parasites, which are natural enemies of pests.

It is important to note that biodynamic practices can vary among farmers and regions. Some farmers might adopt all aspects of biodynamics, while others might incorporate certain principles based on their specific circumstances and beliefs. Biodynamic agriculture is recognized by various certification organizations, and products labeled as "biodynamic" have met the criteria of these organizations.

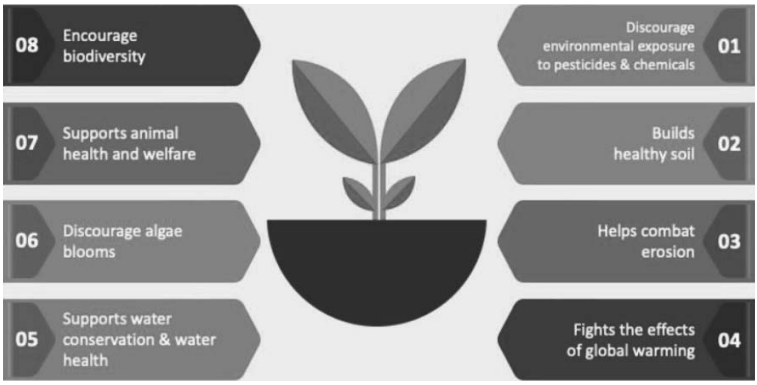
Good agricultural practices (GAP) in cultivation of medicinal plants

It describes general principles including quality control measures and provides technical details for cultivation of medicinal plants. The guidelines described for GAP are intended to streamline the cultivation of medicinal plants as per the well-regulated methods and follow a systematic way in the cultivation process as it is important for the production of good quality plant material.

The various stages of processing which are included in good agricultural practice (GAP) are described as follows:

- Seeds and propagation material

- Cultivation
- Soil and fertilization
- Irrigation
- Crop maintenance
- Harvesting
- Primary processing
- Packaging
- Storage and transport
- Staff requirements
- Documentation
- Quality assurance



Benefits of organic farming

Organic farming

An integrated farming system that strives for sustainability, the enhancement of soil fertility and biological diversity whilst, with rare exceptions, prohibiting synthetic pesticides, antibiotics, synthetic fertilizers, genetically modified organisms, and growth hormones. Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. Organic farming is primarily of two types, namely: Pure organic farming and integrated organic farming.

Pure organic farming involves avoiding all artificial chemicals. Every fertilizer and pesticide that is used are derived from completely natural sources such as blood meal or bone meal.

Integrated organic farming involves integrating techniques aimed at achieving ecological requirements and economic demands such as integrated pest management and nutrients management.

Nutrients management in organic farming: Organic farming follows a healthy way of farming for both crops as well as consumers. In this method, composted organic manure is used for nutrition of crops and thus, improves the organic content and fertility of the soil. Apart from manures, bacterial and fungal biofertilizers are also used for enhancing the soil nutrients.

Organic farming is an agricultural approach that prioritizes the use of natural and sustainable practices to cultivate crops and raise live stock. It aims to create a harmonious balance between farming practices and the environment, while also promoting the health and well-being of consumers, farmers, and the broader ecosystem. Organic farming emphasizes the avoidance of synthetic chemicals, genetically modified organisms (GMOs), and excessive use of non-renewable resources. Instead, it relies on traditional and innovative techniques that work in harmony with natural processes.

Key principles and practices of organic farming include:

- **Soil Health:** Organic farming focuses on maintaining and enhancing soil health through practices such as composting, cover cropping, and crop rotation. Healthy soil promotes nutrient availability, water retention, and microbial diversity, which in turn improves plant health and yields.
- **Avoidance of Synthetic Inputs:** Organic farming prohibits the use of synthetic pesticides, herbicides, and fertilizers. Instead, it relies on natural alternatives, such as beneficial insects, companion planting, and organic-approved pest management methods.
- **Biodiversity:** Organic farms often prioritize biodiversity by planting a variety of crops and utilizing diverse habitats to create a balanced ecosystem. This helps control pests naturally and improves overall resilience to environmental challenges.
- **Animal Welfare:** Organic livestock farming places a strong emphasis on the well-being of animals. It mandates access to outdoor spaces, proper nutrition, and humane treatment of animals.
- **Genetic Modification:** Organic farming avoids the use of genetically modified organisms (GMOs) in both plant and animal production. This is to maintain the integrity of natural genetic diversity and prevent potential environmental and health risks associated with GMOs.
- **Water Conservation:** Organic farming practices aim to reduce water consumption through techniques like mulching, efficient irrigation systems, and water management strategies that minimize runoff and water pollution.
- **Non-Chemical Weed Control:** Instead of relying on synthetic herbicides, organic farming employs methods like hand weeding, mulching, and cover cropping to manage weeds and maintain healthy crop growth.
- **Certification and Standards:** Many countries have established organic certification programs that set standards for organic farming practices. Farms must adhere to these standards to be officially recognized as organic producers and to label their products as organic.

Benefits of organic farming include:

- **Environmental Benefits:** Organic farming reduces the use of synthetic chemicals, leading to healthier soil and water systems. It also promotes biodiversity and helps mitigate climate change by sequestering carbon in the soil.
- **Health Benefits:** Organic foods are often perceived as healthier because they contain fewer pesticide residues and may have higher levels of certain nutrients.
- **Community and Local Economy:** Organic farming often supports local communities by creating jobs and promoting sustainable agriculture practices.
- **Long-term Sustainability:** By preserving soil health and biodiversity, organic farming helps ensure the long-term productivity of agricultural land.

However, it is important to note that organic farming also has challenges, such as potentially lower yields compared to conventional methods and higher labour requirements for certain practices. Additionally, achieving widespread adoption of organic farming practices can require a transition period and investment in education and resources. In recent years, organic farming has gained popularity as consumers become more interested in sustainable and healthy food choices. It is a dynamic field that continues to evolve with advancements in research and technology.

Applications of organic farming

Organic farming has a wide range of applications across various aspects of agriculture, food production, and environmental conservation. Here are some key applications of organic farming:

1. **Crop Production:**
   - **Fruits and Vegetables:** Organic farming methods are commonly used to cultivate a diverse range of fruits and vegetables, including tomatoes, lettuce, strawberries, and peppers.
   - **Grains:** Organic practices can be applied to crops like rice, wheat, oats, and barley.
   - **Herbs and Spices:** Many herbs and spices, such as basil, oregano, and turmeric, are cultivated using organic methods.
2. **Livestock Production:**
   - **Poultry:** Organic farming principles can be applied to raising organic chickens, turkeys, and other poultry, ensuring access to outdoor spaces, organic feed, and humane treatment.
   - **Cattle:** Organic beef and dairy production emphasize pasture grazing, organic feed, and ethical treatment of animals.
   - **Pigs:** Organic pig farming focuses on providing outdoor access, natural bedding, and organic feed.