



FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

Introduction

Plants have been one of the important sources of medicines even since the dawn of human civilization. In spite of tremendous developments in the field of allopathy during the 20th century, plants still remain one of the major sources of drugs in modern as well as traditional system of medicine throughout the world. Approximately one-third of all pharmaceuticals are of plant origin, wherein fungi and bacteria are also included. Over 60% of all pharmaceuticals are plant-based.

Plants may have bioactive constituents like alkaloids, glycosides, steroids, phenols, tannin, antioxidants and other groups of compounds which may have marked pharmaceutical actions as anti-cancerous, anti-malarial, anti-helminthic or anti-dysentric, etc. Many of the essential oils, dyes, latex and even vegetable oils are also widely used as medicines. Many substances that go into making up medicines are frequently products of living cells, although seemingly 'waste' or intermediate, metabolic compounds and not an integral part of the protoplasm and may have no obvious utility to the plants.

Out of nearly 4, 50,000 species of higher plants available, only a small proportion have been investigated for medicinal properties and still a smaller number of plants yield well defined drugs. The same is the case with lower plants and with plants of the sea origin. Thus, the knowledge of plant constituents gained so far is still meager, considering the huge number of species available in the world. Approximately, only 10% of the

organic constituents of plants are reported to be known and the remaining 90% are yet to be explored.

A very small proportion of Indian medicinal plants are lower plants like lichens, ferns, algae, etc. The majority of medicinal plants are higher plants. The major families in which medicinal plants occur are Fabaceae, Euphorbiaceae, Asteraceae, Poaceae, Rubiaceae, Cucurbitaceae, Apiaceae, Convolvulaceae, Malvaceae and Solanaceae.

Drugs are derived from trees, shrubs, herbs and even from primitive kinds of plants which do not fall into the above categories. They are made from fruits (Senna, Solanum viarum, Datura, etc.), flowers (Butea monosperma, Bauhinia variegata), leaves (Senna, Datura, Periwinkle, Tylophora, etc.), stems (Liquorice, Ginger, Dioscorea, Costus, Garlic), roots (Rauwolfia, Periwinkle, Ginseng, etc.), seeds (Isabgol, Abrus, Nux vomica) and even bark (Cinchona).

History

- Plants have been associated with the health of mankind from time immemorial.
- In the past, sickness was viewed as a punishment by the gods and hence, was treated with prayers and rituals that included what may have been considered 'magic potions' prepared out of local herbs.
- Archaeological discoveries from 60000 year old Neanderthal burial grounds in Iraq point to the use of several plants like marsh mallow, yarrow and groundsel that still figure in folk medicine.
- Mexican Indians are reported to have used peyote cactus for its hallucinogenic and, also possibly its healing properties for thousands of years.
- This plant is now known to have antibiotic properties as well.

- Cuneiform writing on clay tablets by the Sumerians of the Tigris and Euphrates (present day Iraq) around 4000 BC, reported the use of opium, liquorice, thyme, mustard and the chemical element sulphur as medicine.
- The Babylonians who apparently followed the Sumerians in this field added senna, coriander, saffron, cinnamon and garlic among the other herbs in their formulations.

The importance of plants

Plants have been used by the mankind since prehistoric times for getting relief from sufferings and ailments. Primitive people, when injured in battle or when they had a fall or cut, instinctively resorted to materials available at the reach of hand for stopping the flow of blood or for relieving from pain and, by trial and error, they learnt that certain plants were more effective than others. Man has also gained such knowledge from his observation of birds and animals which use plants for curing their ailments. Even today, we find that the domestic dog and cat, when they suffer from indigestion or other ailments, run to the field, chew some grasses or herbs and vomit to get cured. The folk medicines of almost all the countries of the world abound in medicinal plants wealth, rely chiefly on herbal medicine, even today.

Today, chemical and pharmaceutical investigations have added a great deal of status to the use of medicinal plants by revealing the presence of the active principles and their actions on human and animal systems. Investigations in the field of pharmacognosy and pharmacology have provided valuable information on medicinal plants with regard to their availability, botanical properties, method of cultivation, collection, storage, commerce and therapeutic uses. All these have contributed towards their acceptance in modern medicine and their inclusion in the pharmacopeias of

civilized nations.

The practices of indigenous systems of medicine in India are based mainly on the use of plants. Charaka Samhita (1000 BC-100 AD) records the use of 2000 plants for remedies. Ancient medicine was not solely based on empiricism and this is evident from the fact that some medicinal plants which were used in ancient times still have their place in modern therapy. Thus for example, 'Ephedra' a plant used in China 4000 years ago is still mentioned in modern pharmacopoeias as the source of an important drug, ephedrine. The plant Sarpagandha (*Rauvolfia serpentina*) which was well known in India as a remedy for insanity is in existence today for curing mental ailments. Quinine, another important anti-malarial drug of modern medicine, was obtained from the cinchona tree.

The knowledge about the use of medicinal plants has been accrued through centuries and such plants are still valued even today, although synthetics, antibiotics, etc. have attained greater prominence in modern medicine. It is, however, a fact that these synthetics and antibiotics although they often show miraculous and often instantaneous results, prove harmful in the long run and that is why many synthetics and antibiotics have now gone out of use or have been specified to be prescribed strictly under medical supervision. In the case of most medicinal plants, however, no such cumulative derogatory effect has been recorded and that is why many of the medicines obtained from plants are still widely used today.

It is also true that lately, inspite of the rapid progress and spread of modern medicine, the popularity of herbal medicines is gaining momentum.

Besides the above, the following are some of the reasons that make the large scale cultivation of medicinal plants inevitable.

1. In nature, there remains a wide variation among the plants with regard to their active principles. As only the best among them are used for cultivation, it enables us to obtain raw material of homogenous quality with high potency.
2. It is easy to grow and fulfill the commitment of large scale demand through cultivated sources rather than from natural sources, which mainly depend on nature for their regeneration and availability.
3. The increasing pressure of population and the development of roads into remote areas have resulted in deforestation and the eventual loss of natural plant resources.
4. In many cases, the important plant parts used are roots or the entire plant, results in destructive collection/ extractive methods, which results in the extinction of many species and ecotypes.
5. Despite the fact that our forests are the major resource base for medicinal plants as many of them appear in wild, the importance of conservation has not been clearly spelt out. Any long-term strategy includes the conservation of biodiversity and support to the communities which are solely dependent on forests for their livelihood.
6. The unauthorized collection of minor forest produce by persons who are led by the burgeoning demand for raw medicinal plant parts has led to the deprivation of the rights and opportunities of the forest-dwelling communities.
7. Since government of India provides policy support for promoting Indian system of medicine, the pharma industries look for organized supply of quality raw materials in larger quantities.

Future prospects and constraints

1. India with its vast biodiversity and potential for commercial exploitation, could become a world leader in the supply of raw material for the phytopharmaceutical industry.

2. By drawing up a comprehensive strategy for the cultivation and conservation of medicinal plants in league with the forest departments, many threats outlined earlier could be turned into opportunities for successful commercial exploitation without tampering with the interest of the communities involved in the collection of medicinal plants.
3. The introduction of medicinal plants into the crop rotation especially in dry land and watershed areas could provide a strong thrust to the cultivation of medicinal plants.

Aromatic crops

- Out of the nearly 4,50,000 species known to mankind, about 2000 species, which come from about 60 botanical families, contain essential oils. The families-Pinaceae among the gymnosperms, Apiaceae, Myrtaceae, Rutaceae, Lauraceae, Lamiaceae, Asteraceae (dicots), Poaceae, Aracaceae, Zingiberaceae and Amaryllidaceae (monocots) among the angiosperms, account for a large number of plants bearing essential oils of commercial importance.
- The volatile oils occur in varied parts of the plant anatomy-in some cases being found all over the plant body, in others being restricted to one special portion of the plant. Thus, in the conifers, of which the pine is a type, volatile oil is found all over the various parts; whereas in the rose, the oil is confined to the petals; in cinnamon, to the bark and the leaves; in the orange family, chiefly to the flowers and the peel of the fruit; in aromatic grasses and mints, to the leaves, in ambrette, cumin, fennel, etc, in seeds and in vetiver in the roots. In plants, these essential oils are produced in

specialized glandular cells. In the case of the leaves and petals, the essential oils are contained in the innermost membrane of the cell-wall in parenchymatous tissue. In other plants, they accumulate as floating drops in the protoplasm (e.g.terpenes in orange peels) or in separate cell cavities.