

Review Article

History of plants and animal products in the treatment of human disease- A review

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Abstract

Advances in nutrition research during the past few decades have changed scientist's understanding of the contribution of vegetarian diets and non-vegetarian diets to human health and disease. Diets largely based on plant foods, such as well-balanced vegetarian diets, could best prevent nutrient deficiencies as well as diet-related chronic diseases. However, restrictive or unbalanced vegetarian diets may lead to nutritional deficiencies, particularly in situations of high metabolic demand. Recent scientific advances seem to have resulted in a paradigm shift: diets largely based on plant foods, such as well-balanced vegetarian diets, are viewed more as improving health than as causing disease, in contrast with meat-based diets.

1. Introduction

Plant and animal products have been the basis of treatment of human diseases since time immemorial. Every country in the world has lists of herbal remedies for the treatment of diseases and different other unwanted conditions in humans. India has a very long, safe and continuous usage of many herbal drugs in the officially recognized alternative systems of health viz. Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy [2].

India is one out of the 12 mega biodiversity centers of globe having 45, 000 plant species, with concentrated hotspots in the region of Eastern Himalayas, Western Ghats and Andaman & Nicobar Island. The country has a rich floral diversity (Table No.1).

Across the country, the forests of India are estimated to harbor 90% of India's medicinal plants diversity in the wide range of forest types that occur. Only about 10% of the known medicinal plants of India are restricted to non-forest habitats. The estimated numbers of plant species and those used for medicinal purpose vary. One fifth of all the plants found in India are used for medicinal purpose. The world average stands at 12.5% while India has 20% plant species of medicinal value and which are in use.

The officially documented plants with medicinal potential are 3000 but traditional practitioners use more than 6000. India is the largest producer of medicinal herbs and is appropriately called the botanical garden of the world. In rural India, 70% of the population is dependent on the traditional system of medicine, i.e. Ayurveda.

Table No. 1: Floral Diversity in India [3]

Numbers	Species
15, 000 - 18, 000	Flowering plants
23, 000	Fungi
25, 000	Algae
1,600	Lichens
1,800	Bryophytes
30 million	Microorganisms

1.1 History

Over the centuries the healing properties of plants and herbs has not changed [5]. Peoples around the globe used hundreds to thousands of indigenous plants for treatment of ailments since prehistoric times. The first generally accepted use of plants as healing

agents was depicted in the cave paintings discovered in the Lascaux caves in France, which have been radiocarbon-dated in between 13,000-25,000 BC. Medicinal herbs were found in the personal effects of an Ice man, whose body was frozen in the Swiss Alps for more than 5,300 years, which appear to have been used to treat the parasites found in his intestines.

Rigveda, the oldest document of human knowledge, had written between 4500 and 1600 BC mentions the use of medicinal plants in the treatment of human and animals. Ayurveda is an ancient holistic Indian traditional system of medicine originated around 5000 years ago. Ayurveda, means "the Science of life", which offers rich and comprehensive outlook to a healthy life. Ayurveda gives the account of actual beginning of the ancient medical science of India, which according to Western scholars was written in between 2500 to 600 BC. It has eight divisions dealing with different aspects of science of life and the art of healing. Susruta and Charaka were written around 1000 BC. Susruta deals with surgery in details along with therapeutics, while Charaka concentrates more on medicine.

The countries of the civilized world of that period, including Egypt, Greece, Rome and Arabia used to seek information about the science of medicine from India. There is definite evidence of the influence of Indian medicine on the Roman and Grecian medicine. The Indian System of medicine today uses across the various systems i.e. folk and codified around 8,000 species of plants. The maximum numbers of medicinal plants are utilized by the folk traditions, followed by Ayurveda, Siddha, Unani, Homeopathy, Tibetan and Modern respectively.

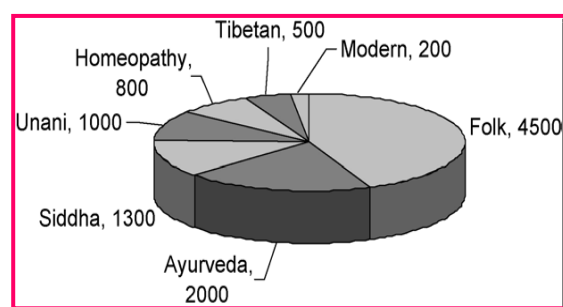


Fig. 1: Usage of Medicinal plant species across various medicinal systems

Herbal medicines are being used by about 80% of the world population primarily in the developing countries for primary health care. They have stood the test of time for their safety, efficacy, cultural acceptability and lesser side effects. The chemical constituents present in them are a part of the physiological functions of living flora and hence they are believed to have better compatibility with the human body. Ancient literature also mentions uses of herbal medicines for age-related diseases namely memory loss, osteoporosis, diabetic wounds, immune and liver disorders, etc. for which no modern medicine or only palliative therapy is available. These drugs are made from renewable resources of raw materials by ecofriendly processes and will bring economic prosperity to the masses growing these raw materials.

However, the last few years have seen a major increase in the use of herbal medicine in the developed world. In Germany and France, many herbs and herbal extracts are used as prescription drugs and their sales in the countries of European Union were around \$ 6 billion in 1991 and may be over \$ 20 billion now. In USA, herbal drugs are currently sold in health food stores with a turnover of about \$ 4 billion in 1996 which is anticipated to double by the turn of the century.

1. In India, the herbal drug market is about \$ one billion and the export of plant-based crude drugs is around \$ 80 million.
2. Herbal medicines also find market as Nutraceuticals (health foods) whose current market is estimated at about \$ 80–250 billion in USA and also in Europe.
3. India is sitting on a gold mine of well-recorded and well practiced knowledge of traditional herbal medicine.

But, unlike China, India has not been able to capitalize on this herbal wealth by promoting its use in the developed world despite their renewed interest in herbal medicines. This can be achieved by judicious product identification based on diseases found in the developed world for which no medicine or only palliative therapy is available; such herbal medicines will find speedy access into those countries. Backward integration from market demands will pay rich dividends. Strategically, India should enter through those plant-based medicines which are already well accepted in Europe, USA and Japan. Simultaneously, it should identify those herbs (medicinal plants) which are time-tested and dispensed all over in India. The basic requirements for gaining entry into developed countries include:

- well-documented traditional use,
- single plant medicines,
- medicinal plants free from pesticides, heavy metals, etc.,
- standardization based on chemical and activity profile, and
- Safety and stability.

However, mode of action studies in animals and efficacy in human will also be supportive. Such scientifically generated data will project herbal medicine in a proper perspective and help in sustained global market.

The World Health Organization (WHO) has recently defined traditional medicine (including herbal drugs) as comprising therapeutic practices that have been in existence, often for hundreds of years, before the development and spread of modern medicine and are still in use today. or say, traditional medicine is the synthesis of therapeutic experience of generations of practicing physicians of indigenous systems of medicine. The traditional preparations comprise medicinal plants, minerals, organic matter, etc. Herbal drugs constitute only those traditional medicines which primarily use medicinal plant preparations for therapy. The earliest recorded evidence of their use in Indian, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5000 years. The classical Indian texts include *Rigveda*, *Atharveda*, *Charak Samhita* and *Sushruta Samhita*. The herbal medicines/traditional medicaments have, therefore, been derived from rich traditions of ancient civilizations and scientific heritage [2].

1.2 Role of WHO in herbal medicine

Two decades ago, WHO referred to traditional health systems (including herbal medicine) as 'holistic' – 'that of viewing man in his totality within a wide ecological spectrum, and of emphasizing the view that ill health or disease is brought about by an imbalance or disequilibrium of man in his total ecological system and not only by the causative agent and pathogenic evolution' (WHO), probably implying that the indigenous system drugs including herbal medicine restore the imbalance or disequilibrium leading to the cure of ill health or disease. Such an attitude sent signals that WHO as an organization has failed to provide leadership to establish traditional systems of medicine which provide health care to about 80% of the world population. However, it helped the inclusion of proven traditional remedies in national drug policies and regulatory approvals by developing countries. The World Health Assembly continued the debate and adopted a resolution in 1989 that herbal medicine is of great importance to the health of individuals and communities. The redefined definition of traditional medicine thus issued in the early nineties. Consequently, in 1991 WHO developed guidelines for the assessment of herbal medicine, and the same were ratified by the 6th International Conference of Drug Regulatory Authorities held at Ottawa in the same year. The salient features of WHO guidelines are:

- **Quality assessment:** Crude plant material; Plant preparation; finished product.
- **Stability:** Shelf life.
- **Safety assessment:** Documentation of safety based on experience or/and; Toxicology studies.
- **Assessment of efficacy:** Documented evidence of traditional use or/and; Activity determination (animals, human). To the best of my knowledge, WHO has not systematically evaluated any traditional medicine.

1.3 Herbal medicine standardization

In indigenous/traditional systems of medicine, the drugs are primarily dispensed as water decoction or ethanolic extract. Fresh plant parts, juice or crude powder are a rarity rather than a rule. Thus medicinal plant parts should be authentic and free from harmful materials like pesticides, heavy metals, microbial or radioactive contamination, etc. The medicinal plant is subjected to a single solvent extraction once or repeatedly, or water decoction or as described in ancient texts. The extract should then be checked for indicated biological activity in an experimental animal model. The bioactive extract should be standardized on the basis of active principle or major compound along with fingerprints. The next important step is stabilization of the bioactive extract with a minimum shelf-life of over a year. The stabilized bioactive extract should undergo regulatory or limited safety studies in animals. Determination of the probable mode of action will explain the therapeutic profile. The safe and stable herbal extract may be marketed if its therapeutic use is well documented in indigenous systems of medicine, as also viewed by W.H.O. A limited clinical trial to establish its therapeutic potential would promote clinical use. The herbal medicines developed in this mode should be dispensed as prescription drugs or even OTC products depending upon disease consideration and under no circumstances as health foods or nutraceuticals.[2-5]

1.4 Herbal medicine market

As per available records, the herbal medicine market in 1991 in the countries of the European Union was about \$ 6 billion (may be over \$ 20 billion now), with Germany accounting for \$ 3 billion, France \$ 1.6 billion and Italy \$ 0.6 billion. Incidentally in Germany and France, herbal extracts are sold as prescription drugs and are covered by national health insurance. In 1996, the US herbal medicine market was about \$ 4 billion and with the current growth rate may be more than double by the turn of century. Thus a reasonable guesstimate for current herbal medicine market worldwide may be around \$ 30–60 billion. The Indian herbal drug

market is about \$ one billion and the export of herbal crude extracts is about \$ 80 million.

The sales of these drugs account for almost 50% of the herbal medicine market. These drugs have been well standardized and some of them namely Echinacea, garlic, ginkgo, ginseng and saw palmeto are supported with mode of action and clinical studies. Amongst the developed countries Germany holds the lead and has published individual monographs on therapeutic benefits of more than 300 herbs. In developing countries, China has compiled/generated data on over 800 medicinal plants and exports large amounts of herbal drugs. India has prepared only a few monographs and its exports are dismal.

1.5 Herbal medicine scenario in India

The turnover of herbal medicines in India as over-the-counter products, ethical and classical formulations and home remedies of Ayurveda, Unani and Siddha systems of medicine is about \$ 1 billion with a meagre export of about \$ 80 million. Psyllium seeds and husk, castor oil and opium extract alone account for 60% of the exports. 80% of the exports to developed countries are of crude drugs and not finished formulations leading to low revenue for the country. Thus the export of herbal medicines from India is negligible despite the fact that the country has a rich traditional knowledge and heritage of herbal medicine. Considering the huge herbal medicine and nutraceutical market in developed countries, India should reconsider exporting crude herbal drugs. Three of the 10 most widely selling herbal medicines in developed countries, namely preparation of *Allium sativum*, *Aloe barbadensis* and *Panax* species are available in India. India is the largest grower of Psyllium (*Plantago ovata*) and Senna (*Cassia senna*) plants and one of the largest growers of Castor (*Ricinus communis*) plant. These are also exported in large amounts and yet our market share is dismal because of export of crude extracts/drugs.

Twenty other plants are commonly exported as crude drugs worth \$ 8 million. Five of these, namely *Glycyrrhiza glabra*, *Commiphora mukul*, *Plantago ovata*, *Aloe barbadensis* and *Azadirachta indica* are even used in modern medicine. The plants *Glycyrrhiza glabra*, *Piper longum*, *Adhatoda vasica*, *Withania somnifera*, *Cyperus rotundus*, *Tinospora cordifolia*, *Berberis aristata*, *Tribulus terrestris*, *Holarrhena anti dysenterica* and *Boerhavia diffusa* have been used in 52 to 141 herbal formulations and triphala (*Terminalia chebula*, *Terminalia bellerica* and *Embelica officinalis*) alone have been used in 219 formulations. In spite of this, efforts have not been made to preserve their germ-plasm from different localities, identification of active plants vis-à-vis climatic zone and development of agro technologies for their organized farming and use as authentic materials in herbal medicines for better economic gains.

India is one of the 12 mega biodiversity centers having over 45,000 plant species. Its diversity is unmatched due to the presence of 16 different agro climatic zones, 10 vegetative zones and 15 biotic provinces. The country has 15,000–18,000 flowering plants, 23,000 fungi, 2500 algae, 1600 lichens, 1800 bryophytes and 30 million micro-organisms. India also has equivalent to 3/4 of its land exclusive economic zone in the ocean harboring a large variety of flora and fauna, many of them with therapeutic properties. About 1500 plants with medicinal uses are mentioned in ancient texts and around 800 plants have been used in traditional medicine. The major traditional sector pharma, namely Himalaya, Zandu, Dabur, Hamdard, Maharishi, etc. and modern sector pharmas, namely Ranbaxy, Lupin, Allembic, etc. are standardizing their herbal formulations by chromatography techniques like TLC/HPLC finger printing, etc. There are about 7000 firms in the small-scale sector manufacturing traditional medicines with or without standardization. However, none of the pharma has standardized herbal medicines using active compounds as markers linked with confirmation of bioactivity of herbal drugs in experimental animal models [3].

2. Conclusion

In the ancient time only Ayurveda and herbal natural products were used for the treatment of different type of disease and disorders. The people had good knowledge about the plant and parts of plants as well as the processes to apply, and the amount of formulation how to prepare. Churna, Quatha, lepa, bhasma were used commonly at that time. Oral and topical applications were common. Amla, satavari, mulethi, curcumin, neem, babool, ashwagandha, baheda, cinchona, isabgol, ginger, garlic, kattha, black pepper, tulsi etc were commonly used for the treatment of many diseases.

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