











**Table:** Potential toxic effects associated with some common herbal medicines marketed for different indications

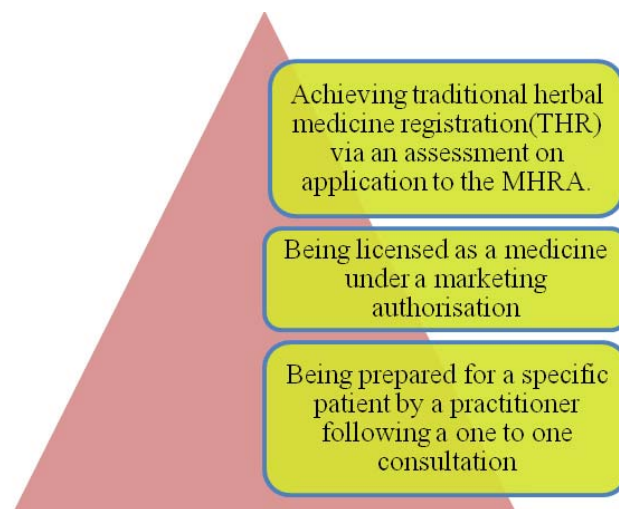
Common name	Plant source/parts used	Intended indications	Potential toxicity
Ginseng	<i>Panax ginseng</i> roots	Relieves stress, promotes mental and physical activity	Central nervous system stimulation, hypertension, skin eruptions
St. John's wort	<i>Hypericum perforatum</i> aerial parts	Antidepressant, mood stabilizer	Highly potent cytochrome P450 enzyme inducer which affects drug metabolism. Also causes hepatotoxicity and nephrotoxicity in pregnancy and lactation
Kava kava	<i>Piper methysticum</i> roots	Sedative, anxiolytic	Hepatotoxic, cytochrome P450 enzyme inhibitor
Ginkgo	<i>Ginkgo biloba</i> leaves	Impotence, vertigo, circulatory disorders, improves mental Alertness	Gastric irritability, spontaneous bleeding
Danshen	<i>Salvia miltiorrhiza</i> exterior taproot	Angina pectoris, antihyperlipidemic, ischemic stroke	Bleeding, anticoagulant effects
Hawthorn	<i>Crataegus oxycantha</i> Flowers, roots, berries	Mild to moderate congestive heart Failure	Cardiac arrhythmias, lowered blood pressure
Comfrey	<i>Symphytum officinale</i> Leaves	Anti inflammatory, antidiarrhoeal and treatment of thrombophlebitis	Hepatotoxicity, Carcinogenicity
Licorice	<i>Glycyrrhiza glabra</i> roots	Antiulcer, anti inflammatory, Antihypertensive	Hypokalemic myopathy, pseudoaldosteronism, thrombocytopenia
Chaparral, creosote bush	<i>Larrea tridentata</i> leaves and twigs	Blood thinner, weight loss, antioxidant, anticancer, anti arthritis	Carcinogenic, nephrotoxic, Hepatotoxic

#### 4. Addressing Opportunities in Globalization of Herbal Drugs

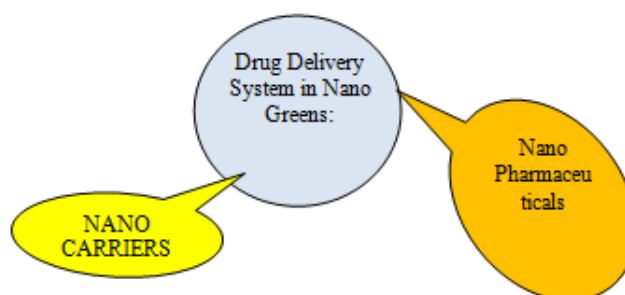
During the past decades, public interest in natural therapies has increased greatly in industrialized countries, with expanding use of medicinal plants and herbal medicines. The many and various forms of traditional medicinal products have evolved against widely different ethnological, cultural, climatic, geographical, and even philosophical backgrounds. The evaluation of these products and ensuring their safety and efficacy through registration and regulation present important challenges. The contributions from governments, institutions, and others would be greatly appreciated in formulating policies on traditional medicinal products and in introducing measures for their registration and regulation, and to facilitate information exchange on these subjects among Member States.

##### 4.1 Regulations of Herbal Medicines

The EU Directive on Traditional Herbal Medicinal Products replaces most existing member state regulations and creates a unified licensing system for traditional herbal medicine products (in use for at least 30 years, of which 15 must usually have been in the EU). The Directive came into full effect on 30 April 2011. The Directive has the potential to have a significant impact on some herbal medicinal products; there are three ways in which herbal medicinal products can continue to be sold in the UK:



##### 4.2 Credits of Nanotechnology



Nanotechnology plays a great role and the use of nanotechnology in medicine and more specifically drug delivery is set to spread rapidly. Nano herbal drug delivery systems have a potential future for enhancing the activity and overcoming the problems associated by medicinal plants. So the nanocarriers help to treat the dangerous diseases like cancer, Diabetes etc.

### 4.3 Nano Carriers

A nanocarrier is nanomaterial being used as a transport module for another substance, such as a drug. Commonly used nanocarriers include micelles, polymers, carbon-based materials, liposomes and other substances (Cajota et al., 2012). Nanocarriers are currently used in drug delivery and their unique characteristics demonstrate potential use in chemotherapy. Nanocarriers include polymer conjugates, polymeric nanoparticles, lipid-based carriers, dendrimers, carbon nanotubes, and gold nanoparticles. Lipid-based carriers include both liposomes and micelles. Examples of gold nanoparticles are gold nanoshells and nanocages. Different types of nanomaterial being used in nanocarriers allows for hydrophobic and hydrophilic drugs to be delivered throughout the body. Since the human body contains mostly water, the ability to deliver hydrophobic drugs effectively in humans is a major therapeutic benefit of nanocarriers (Yu et al., 2012). Micelles are able to contain either hydrophilic or hydrophobic drugs depending on the orientation of the phospholipids molecules. Some nanocarriers contain nanotube arrays allowing them to contain both hydrophobic and hydrophilic drugs.

### 4.4 Nano Pharmaceuticals

Nanopharmaceuticals offer the ability to detect diseases at much earlier stages and the diagnostic applications could build upon conventional procedures using nanoparticles. Nanopharmaceuticals represent an emerging field where the sizes of the drug particle or a therapeutic delivery system work at the nanoscale. In the pharmaceutical industry a long standing issue is the difficulty of delivering the appropriate dose of a particular active agent to specific disease site. Nanopharmaceuticals have enormous potential in addressing this failure of traditional therapeutics which offers site-specific targeting of active agents. Such precision targeting

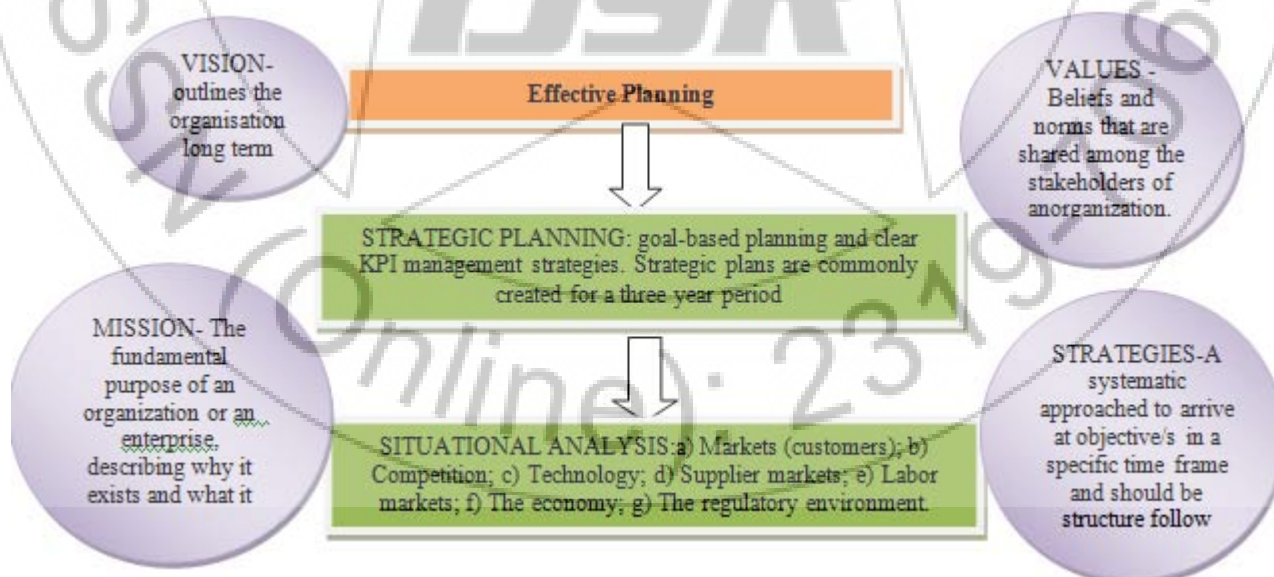
via nanopharmaceuticals reduces toxic systemic side effects, resulting in better patient compliance

### 4.5 Future Prospects of Nanomedicines

Herbal remedies and natural products research is more familiar throughout the world. The development of herbal remedies in the drug delivery system in a number of institutes is being carried out at basic and clinical trial levels. To improve the proper delivery systems at the sites or locations in the whole body in a particular dose will not compromise with the existing treatment. This would not only give relieve from side effects like toxicity and hypersensitive reactions but also will increase the patient's strength from inside is very much desirable. In the future, the concept of herbal nanoparticles for cancer drug delivery may also fascinate some potential research groups and potentially create attention grabbing results.

## 5. Pioneering Developmental Strategies

The importance of Strategic planning to business organizations either big or small has been emphasized in strategic management literature. Not many researches were conducted to study the applicability of strategic planning in the herbal industry. This chapter attempts to provide insight to the strategic planning in the herbal industry as well as identifying issues, prospect and future of the herbal industry. Herbal industry was classified in two major streams that are culinary herbs, medicinal herbs. The issues identified are such as regulatory issues, consumption of herbal products, product quality, research and development, side effect, imported herbal medicine, pricing, current market status, technology and human resources. An effective plan should include the vision, mission, objective, strategy and policy.



Standardization of drugs means confirmation of its identity and determination of its quality and purity. At present due to advancement in the chemical knowledge of crude drugs various methods like botanical, chemical, spectroscopic and biological methods are used for estimating active

constituents present in the crude drugs in addition to its physical constants. Plants have been known to relieve various diseases in Ayurveda. Therefore, the researchers today are emphasizing on evaluation and characterization of various plants and plant constituents against a number of

diseases based on their traditional claims of the plants given in Ayurveda and the authenticity, quality and purity of herbal drugs are established by reference given in pharmacopoeia. The pharmacopoeia prescribes (numerical value) like structural, analytical, physical standards for the drugs. The pharmacopoeial standards are mandatory to be adhered for all herbal drug organisation to avoid any side effect due to deviation in the authenticate information.

### 5.1 Standardization Parameter for Plant Drugs

The pharmacopoeial standards in Ayurvedic Pharmacopoeia of India are not adequate enough to ensure the quality of plant materials since the materials received in the manufacturing premises are not in a condition that effective microscopic examination can be done. Therefore chemical, methods, instrumental methods and then layer chromatographic analysis would determine the proper quality of plant material. Non standardized procedures of extraction may lead to the degradation of the phytochemical present in the plants and may lead to the variations thus leading to the lack of reproducibility. Efforts should be made to produce batches with quality as consistent as possible (within the narrowest possible range) and to develop and follow the best extraction processes.

### 6. Conclusion

The growth of the pharmaceutical industry and the unceasing development of new and more effective synthetic and biological medicinal products has not diminished the importance of medicinal plants in many societies. On the contrary, population growth in the developing world and increasing interest in the industrialized nations have greatly expanded the demand for medicinal plants themselves and the products derived from them. Regulations in countries for the assessment of the quality, safety and efficacy of medicinal plants, and the work of WHO in supporting the preparation of model guidelines in this field, have been helpful in strengthening recognition of their role in health care. It is hoped that assessment of these traditional remedies could become the basis for a future classification of herbal medicines, as well as for evaluative studies on their efficacy and safety, and their potential use in national health care systems in different parts of the world.

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