Study of Tridax Procumbens

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Published in IJIRMPS (E-ISSN: 2349-7300), Volume 6, Issue 3, (May-June 2018)

Abstract

Man uses plants in many ways to meet his basic needs as food, clothing and shelter. Plants are also known to relieve various diseases in Ayurveda. Wild Plants supply medicines (antibiotic, antispasmodics, emetics, anti-cancer, antimicrobials etc.), crafts and cosmetics to rural and urban communities. In addition, wild plants are the sources of income and employment to the rural areas. Important herbal products are spices, herbal teas, functional food ingredients, medicinal raw materials, aromatic plants, essential oils, flavoring, fragrant products and dietary supplements.

Introduction

Plants have also been used as medicines for thousands of years all over the world. WHO estimates indicate that 80% of the population, mostly in developing countries still relies on plant-based medicines for primary care WHO 1978. India is a country with a vast reserve of natural resources and a rich history of traditional medicine. The different systems of medicinal usage practiced in India, Ayurveda, Siddha, Unani, Amchi, Homoeopathy and local health traditions, utilize a large number of plants for treatment of human and animal diseases. Those plants used were called as medicinal plants. India officially recognizes over 3,000 plants for their medicinal value. It is generally estimated that over 6,000 plants in India are in use in traditional, folk and herbal medicine.

Medicinal plants contain numerous biologically active compounds which are helpful in improving the life and treatment of diseases. Natural products are the source of synthetic and traditional herbal medicine and are still the primary health care system. The presence of various life sustaining constituents in plants made scientists to investigate these plants for their uses in treating certain infective diseases and management of chronic wounds. Medicinal plants have been a major source of cure for human diseases since time immemorial. It is no wonder that the world's one-fourth population i.e. 1.42 billion people, are dependent on traditional medicines for the treatment of various ailments. Medicinal herbs are moving from fringe to main stream use with a greater number of people seeking remedies and health approaches free from side effects caused by synthetic chemicals. Recently considerable attention has been paid to utilize eco-friendly and bio-friendly plant based products for the prevention and cure of different human diseases. Considering the adverse effects of synthetic drugs, the Western population is looking for natural remedies, which are safe and effective. It is documented that most of the world's population has taken in traditional medicine, particularly plant drug for the primary health care.

Researchers have cast a sharper eye on natural products to get medicinally important compounds from plants.

Different plant parts like root, stem, flower, fruit, twigs exudates and modified plant of medicinal plants represent a rich source of antimicrobial agents. For medical application plants can be used directly or indirectly used for cure of particular disease. Indirectly, a medicinally active portion of plant tissues is extracted by using selective solvents through standard procedures. The products so obtained from plants are relatively complex mixtures of metabolites, in liquid or semisolid state or (after removing the solvent) in dry powder form, and are intended for oral or external use. Extraction methods used pharmaceutically involves the separation of medicinally active portions of plant tissues from the inactive/inert components by using selective solvents. During extraction, solvents diffuse into the solid plant material and solubilize compounds with similar polarity.

The purpose of standardized extraction procedures for crude drugs (medicinal plant parts) is to attain the therapeutically desired portions and to eliminate unwanted material by treatment with a selective solvent. The extract thus obtained, after standardization, may be used as medicinal agent as such in the form of tinctures or fluid extracts or further processed to be incorporated in any dosage form such as tablets and capsules. These products contain complex mixture of many medicinal plant metabolites, such as alkaloids, glycosides, terpenoids, flavonoids and lignans. The amount of product extracted depends upon time of extraction, temperature, nature of solvent, solvent concentration, polarity and quantity of plant material to be extracted.

Successful determination of biologically active compounds from plant material is largely dependent on the type of solvent used in the extraction procedure. Properties of a good solvent in plant extractions includes, low toxicity, ease of evaporation at low heat, promotion of rapid physiologic absorption of the extract, preservative action, inability to cause the extract to complex or dissociate.

Water is universal solvent, used to extract plant products with antimicrobial activity. Though traditional healers use primarily water but plant extracts from organic solvents have been found to give more consistent antimicrobial activity compared to water extract. Also water soluble flavonoids (mostly anthocyanins) have no antimicrobial significance and water soluble phenolics only important as antioxidant compound.

Acetone

Acetone dissolves many hydrophilic and lipophilic components from the two plants used, is miscible with water, is volatile and has a low toxicity to the bioassay used, it is a very useful extractant, especially for antimicrobial studies where more phenolic compounds are required to be extracted. A study reported that extraction of tannins and other phenolics was better in aqueous acetone than in aqueous methanol. Both acetone and methanol were found to extract saponins which have antimicrobial activity.

Alcohol

The higher activity of the ethanolic extracts as compared to the aqueous extract can be attributed to the presence of higher amounts of polyphenols as compared to aqueous extracts. It means that they are more efficient in cell walls and seeds degradation which have unpolar character and cause polyphenols to be released from cells. More useful explanation for the decrease in activity of aqueous extract can be ascribed to the enzyme polyphenol oxidase, which degrade polyphenols in water extracts, whereas in methanol and ethanol they are inactive. Moreover, water is a better medium for the occurrence of the micro-organisms compared to the aqueous extract can be attributed to the presence of higher amounts of

polyphenols as compared to aqueous extracts. It means that they are more efficient in cell walls and seeds degradation which have unpolar character and cause polyphenols to be released from cells. More useful explanation for the decrease in activity of aqueous extract can be ascribed to the enzyme polyphenol oxidase, which degrade polyphenols in water extracts, whereas in methanol and ethanol they are inactive. Moreover, water is a better medium for the occurrence of the micro-organisms as compared to ethanol.

The higher concentrations of more bioactive flavonoid compounds were detected with ethanol 70% due to its higher polarity than pure ethanol. By adding water to the pure ethanol up to 30% for preparing ethanol 70% the polarity of solvent was increased (Sunil et al., 2012). Additionally, ethanol was found easier to penetrate the cellular membrane to extract the intracellular ingredients from the plant material. Since nearly all of the identified components from plants active against microorganisms are aromatic or saturated organic compounds, they are most often obtained through initial ethanol or methanol extraction (Sunil et al., 2012; Tease & Evans W.C., 1989; Harborne, 1973). Methanol is more polar than ethanol but due to its cytotoxic nature, it is unsuitable for extraction in certain kind of studies as it may lead to incorrect results (Yoga et al., 2009; Surya & John, 2001; Paul et al., 1997).

Chloroform

Terpenoid lactones have been obtained by successive extractions of dried barks with hexane, chloroform and methanol with activity concentrating in chloroform fraction. Occasionally tannins and terpenoids will be found in the aqueous phase, but they are more often obtained by treatment with less polar solvents (Surya & John, 2001; Paul et al., 1997).

Ether

Ether is commonly used selectively for the extraction of coumarins and fatty acids (Sunil et al., 2012; Amal et al., 2009; Tease & Evans W.C., 1989; Harborne, 1973).

Dichloromethanol

It is another solvent used for carrying out the extraction procedures. It is specially used for the selective extraction of only terpenoids (Sunil et al., 2012; Paul et al., 1997; Tease & Evans W.C., 1989; Harborne, 1973).

Hexane

Hexane can be used to extract non polar components of plants (Paul et al., 1997; Tease & Evans W.C., 1989; Harborne, 1973).

Mishra et al. (2011) investigated antioxidant and antistaphylococcal activities of different solvent extracts of Bauhinia variegata, Tinospora cardifolia and Piper longum and found that phytochemicals play as potential antioxidants and antimicrobials. Further, acetone extract of bark and petroleum ether and ethanol extract of leaf of Cinnamomum zeylanicum exhibited complete inhibition of growth of two species of dematiaceous moulds, Alternaria solani and Curvularia lunata (Mishra et al., 2009). Sulphated polysaccharides have a broad range of important bioactivities comprising antioxidant, anticoagulant and antithrombotic activities. They are also known to increase the resistance to some virus and inhibit some tumour development (Toida et al., 2003). Sulphated polysaccharides are either extracted from marine

algae (McLellan et al., 1992) invertebrates (Cassaro et al., 1977) or obtained by chemical sulphation of natural polysaccharides.

Rai et al. (2010) has found that E. officinalis extract effected antioxidant enzymes and has the potential acted as an agent to boost the antioxidant system in the diabetic animal model. Freeze-dried rhizome powder of Curcuma longa dissolved in milk increased high-density lipoprotein and haemoglobin with significant decrease in the levels of blood glucose, lipid profile and hepatoprotective enzymes in diabetic rats and therefore can be used as antidiabetic dietary supplement (Rai et al., 2010). Flavonoids from aqueous extract of Cynodon dactylon with marked antioxidant efficacy on diabetes-induced diabetic rats. Furthermore, aqueous extract of C. dactylon showed protective role against carbofuran-induced oxidative stress thereby inhibiting level of acetylcholinesterase in the brain of model rats (Rai et al., 2011). Moreover, ethanolic extract of C. dactylon finds its application as antidiabetic agent of high potential in diabetic models against hepatic complications (Singh et al., 2008). Therefore, medicinal plants are gifts of nature to cure limitless number of diseases among human beings (Pathak et al., 2007).

Phytochemical examinations is carried out for all the extracts as per the standard methods for quinones, flavonoids, polyphenols, tannins, coumarins, terpenoids, essential oils, alkaloids, lectins, polypeptides, glycosides, saponins, steroids etc. The mechanism of their action is given in Table 1.

Table 1: Mechanism of Action of Various Phytochemicals

Phytochemicals	**Activity**	**Mechanism of Action**
Quinones	Antimicrobial	Binds to adhesins, complex with cell wall, inactivates enzymes
Flavonoids	Antimicrobial Antidiarrhoeal	• Complex with cell wall, binds to adhesins. • Inhibits release of autocoids and prostaglandins. • Inhibits contractions caused by spasmogens. • Stimulates normalization of the deranged water transport across the mucosal cells. • Inhibits GI release of acetylcholine.
Polyphenols and Tannins	Antimicrobial Antidiarrhoeal Anthelmintic	• Binds to adhesins, enzyme inhibition, substrate deprivation, complex with cell wall, membrane disruption, metal ion complexation. • Makes intestinal mucosa more resistant and reduces secretion, stimulates normalization of deranged water transport across the mucosal cells and reduction of the intestinal transit, blocks the binding of B subunit of heat-labile enterotoxin to GM1, resulting in the suppression of heat-labile enterotoxin-induced diarrhea, astringent action. • Increases supply of digestible proteins by animals by forming protein complexes in rumen, interferes with energy generation by uncoupling oxidative phosphorylation, causes a decrease in G.I. metabolism.
Coumarins	Antiviral	Interaction with eucaryotic DNA
Terpenoids and	Antimicrobial	Membrane disruption

Essential Oils	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
Alkaloids	Antimicrobial Antidiarrhoeal Anthelmintic	• Intercalates into cell wall and DNA of parasites. • Inhibits release of autocoids and prostaglandins. • Possess anti-oxidating effects, thus reduces nitrate generation which is useful for protein synthesis, suppresses transfer of sucrose from stomach to small intestine, diminishing the support of glucose to the helminthes, acts on CNS causing paralysis.
Lectins and Polypeptides	Antiviral	Blocks viral fusion or adsorption, forms disulfide bridges
Glycosides	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
Saponins	Antidiarrhoeal Anticancer Anthelmintic	• Inhibits histamine release in-vitro. • Possesses membrane permeabilizing properties. • Leads to vacuolization and disintegration of teguments.
Steroids	Antidiarrhoeal	Enhance intestinal absorption of Na+ and water

With the help of column chromatographic techniques these phytochemical can be separated to chemical constituets to identify their role to control particular disease.

Nowadays, weeds are not really “unwanted” especially in terms of traditional herbal medicines. These “naturally growing plants” are generally known as a group of very aggressive, noxious, competitive and troublesome plants. The weed, Tridax procumbens L. is known to posses remarkable medicinal properties. However, it is listed as a noxious weed in the United States and has pest status in nine states.

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