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RESEARCH ARTICLE

NATURAL PRODUCTS: USED AS TRADITIONAL MEDICINE

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Abstract

Plants have provided man with all his needs in terms of shelter, clothing, food, flavours and fragrances as not the least, medicines. Plants have formed the basis of sophisticated traditional medicine systems among which are Ayurvedic, Unani, Chinese amongst others. These systems of medicine have given rise to some important drugs still in use today. The search for new molecules, nowadays, has taken a slightly different route where the science of ethnobotany and ethnopharmacognosy are being used as guide to lead the chemist towards different sources and classes of compounds. It is in this context that the flora of the tropics by virtue of its diversity has a significant role to play in being able to provide new leads.

Introduction:-

Drugs derived from plant sources have been empirically used in the treatment of various human disorders for thousands of years in the form of the traditional Ayurvedic and Chinese medicine. A number of natural products, e.g. aspirin, morphine and quinine are still in use today.[1–3]

Today, natural products (and their derivatives and analogs) still represent over 50% of all drugs in clinical use, with higher plant-derived natural products representing approx 25% of the total.[4-5] The World Health Organization estimates that 80% of the people in developing countries of the world rely on traditional medicine for their primary health care, and about 85% of traditional medicine involves the use of plant extracts. This means that about 3.5 to 4 billion people in the world rely on plants as sources of drugs.[6]

Conservative estimates suggest that there are more than 250,000 species of higher plants existing on this planet, and only a very small percentage of plants have been exhaustively studied for their potential value as a source of drugs. Obviously natural products will continue to be extremely important as sources of medicinal agents. In addition to the natural products which have found direct medicinal application as drug entities, many others can serve as chemical models or templates for the design, synthesis, and semisynthesis of novel substances for treating humankind's diseases.

Ayurvedic medicine (Indian Traditional Medicine)

Ayurveda is perhaps, the most ancient of all medicinal traditions is probably older that the traditional Chinese medicine. It is considered to be the origin of systemized medicine. It is actually a practical and holistic set of guidelines to maintain balance and harmony in the system. Dioscorides (who influenced Hippocrates) is thought to have taken many of his ideas from India. Ancient Hindu writings on medicine contain no references to foreign medicines whereas Greek and Middle Eastern texts dorefer to ideas and drugs of Indian origin.

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Ayurveda is derived from the Indian words Ayar (Life) and veda (Knowledge or Science) and hence means the Science of Life. Following the system would help ensure a long life, which is considered to be the instrument for achieving righteousness (dharma), wealth (artha) and happiness (sukha). In India, knowledge and wisdom have been passed on from one generation to the next through songs and poems, which scholars and physicians had to learn by heart and recite. The principles of Ayurvedic medicine and the medicinal plants uses of herbs are contained in thousands of poetic hymns in the Rig Veda.

Ayurveda is similar to Galenical Medicine in that it is based on bodily humours (dosas) and the inner life force (prana) that is believed to maintain digestion and mental activity. The living and the non-living environment, including humans, is composed of the elements earth (prithvi), water (jada), fire (tejac), air (vaju) and space (akasa). For an understanding of these traditions, the concept of impurity and cleansing is also essential. Illness is the consequence of imbalance between the various elements and it is the goal of the treatment to restore his balance. Famous Ayurvedic medicinal plants include Azadirachta indica (Neem), Centella asiatica (Gotu Kola), Cinnamomum camphora (Camphor), Elettaria cardamomum (ela or cardamomum), Rauwolfia serpentina (Indian snake root), Santalum album (Sandalwood), Terminalia species (Myrobolan) and Withania somnifera (Aswargandha).

Chinese traditional medicine

The civilizations of China and India were flourishing when only modestly sophisticated cultures were developing in Europe. Expectedly writings on medicinal plants and the aesthetics of vegetation were numerous.

The Traditional Chinese medicine was systematized and written between 100 and 200 BC. The most complete reference to Chinese herbal prescription is the Modern Day Encyclopedia of Chinese materia medica published in 1977. It lists nearly 6000 drugs out of which 4800 are of plant origin. The five elements are earth, metal, water, wood and fire each of which is linked to the main organ systems of the body (respectively the spleen, lungs, kidney, liver and heart), the emotions (reflection, grief, fear, anger, joy), the climates (damp, dry, cold, windy, cold), the seasons (late summer, autumn, spring, summer) and tastes (sweet, pungent, salty, sour, bitter) and so on. Medicine is used to restore or maintain balance between these elements and to grant vital energy. Treatment is therefore based not only on symptoms but also on pattern of imbalances, often detected by taking the pulse or observing the patient's tongue.

Warming or hot herbs such as ginger, and cinnamon, are used to treat ailments associated with cold symptoms such as cold hands, abdominal pains and indigestion. In common with Western and African traditional medicines, Chinese herbs are usually given in fixed mixtures or formulas of up to 20 herbs, carefully prepared according to traditional recipes contained in ancient compendia. There are hundreds such recipes being used alongside with Western Medicines. As in other healing cultures, traditional recipes are used preferentially against chronic illnesses while acute or serious illnesses are cured by Western Medicines. The spread of traditional Chinese medicine to most continents has undoubtedly contributed to the current popularity of herbal medicines throughout the world. Examples of famous Chinese medicinal herbs are Angelica polymorpha var. sinensis (dang gui), Artemisia annua (qing hao), Ephedra sinica (ma huang), Paeonia lactiflora (bai shao yao), Panax ginseng (ren shen) and Rheum palmatum (da huang).

Hypoglycaemic and anti-diabetic herbs

Several plants have been tested for their anti-diabetic potential. For most of them, the findings have been based on the ethno-botanical claims.

Aegle marmelos (Rutaceae) (Bael fruit)

This plant originating from India is used against diabetes. In Mauritius, the bark decoction, is drunk by people suffering from diabetes. The tests effected on the aqueous extracts of the root bark, as used by people in India, (1 ml/100gm) showed hypoglycaemic effect which peaked (44%) at 3 h in normal fasted rats. The hypoglycaemic activity was reduced upon storage of the extract. Aqueous extracts of the leaves (1 mg/kg for 30 days) significantly controlled blood glucose, urea, body weight, liver glycogen and serum cholesterol or alloxanized (60 mg/kg IV) rats as compared to controls and this effect was similar to insulin treatment.[7-9]

Allium sativum (Liliaceae) (Garlic)

This perennial herb is cultivated almost throughout the world and is used as a food ingredient. Experiments have shown that an oral administration of 0.25gm/ kg of ethanol, petroleum ether, ethyl ether extract of Allium sativum cause 18.9, 17.9, 26.2% reduction of blood sugar in alloxan-diabetic rabbits (150 mg/kg). Oral administration of 0.25gm/kg allicin (isolated from Garlic) produced hypoglycaemia comparable to tolbutamide in mildly diabetic rabbits (glucose level ranging from 180–300 mg%) while it showed no effect on severely diabetic animals (>350 mg%).[10] It has been shown also that oral feeding or garlic extracts (100 mg/kg) increased cardiovascular functions in STZ rats, prevented abnormality in lipid profile and increased fibrinolytic activities with decreased platelet aggregation. Plasma insulin level increased with concomitant decrease in plasma glucose levels. Thus garlic may prevent diabetic cardiovascular complications.[11]

Aloe barbadensis (Asphodelaceae) (Aloe vera)

This plant is cultivated widely as an ornamental locally but in many countries, Aloe vera is cultivated on commercial scale for its gel and plant extracts. The latter are recommended in Ayurveda for managing painful conditions and it is also mentioned in other Pharmacopeias, namely the Arabic Pharmacopeia, as being useful in managing diabetes. Extracts of aloe gum effectively increased glucose tolerance in both normal and diabetic rats. Chronic but not single administration of the leaf exudates at a certain dose (500 mg/kg PO) showed significant hypoglycaemic effect in alloxan-diabetic mice. Nonetheless, single as well as chronic administration of the bitter principle (5 mg/ kg IP) showed significant hypoglycaemic effect in the same model. Hypoglycaemic effect of aloe and its bitter principle is mediated through the stimulation of synthesis and or/release of insulin from the b-cells of Langerhans.[12] It has been shown that the dried sap of the plant (half a teaspoonful daily) for 4– 14 weeks) has shown significant hypoglycaemic effect both clinically as well as experimentally.

Catharanthus roseus (Apocynaceae) (Rosy Periwinkle)

Originating from Madagascar but now or wide distribution throughout the tropics, this plant is commonly used in traditional medicine against diabetes. The oral administration of water-soluble fractions and ethanolic extracts of the leaves, have been tested and have been found to show significant dose-dependent reduction in the blood sugar at 4 h by 26.22, 31.39, 35.57 and 33.37% respectively in normal rats. In addition, oral administration or 500 mg/kg 3.5 h before OGTT (10 mg/kg) and 72 h after STZ administration (50 mg/kg IP) in rats showed significant anti-hyperglycaemic effects. No gross behavioural changes and toxic effects were observed up to 4 mg/kg IP.[13]

Momordica charantia (Cucurbitaceae) (Karela, Bitter gourd)

The Karela fruit is eaten as a vegetable. The leaf may be made into a tea called cerassie. The juice, extracted from the various plant parts (fruit pulp, seeds, leaves and whole plant), is very common folkore remedy for diabetes. When tested on laboratory animals, M. charantia has shown hypoglycaemic as well as anti-hyperglycaemic activity. Polypeptide-p isolated from fruit, seeds and tissue of M. charantia showed potent hypoglycaemic effects when administered subcutaneously to gerbils, langurs and humans. Another study carried out recently on M. charantia fruit extracts has shown that the latter had a direct impact on transport of fluid in vitro. Everted intestinal sacs from rats mounted in an organ bath containing Kreb solution were used. It was observed that M. charantia extract had a direct impact on water transport with increasing inorganic phosphate concentration with or without D-glucose in the buffer. In control experiment, fluid intake was greatly enhanced at high inorganic phosphate concentration (8–10 mM) in the presence of 5.5 mM D-glucose. The addition of 3.0 mg/ml M. charantia extract to the serosal side inhibits the uptake of fluid significantly. It has been hypothesized that an increase in inorganic phosphate enhances oxidative phosphorylation thereby increasing the fluid uptake across everted intestinal sacs of rats. This would point to the fact that M. charantia extracts reduced fluid absorption capacity and this may be because of interference with the carrier-mediated coupled entrance of glucose and Na^+ across the brush-border membrane.[14]

Murraya koenigii (Rutaceae) (Curry leaf, Carripoule)

The Curry leaf is an inevitable ingredient in Indian recipes. It is extensively used as a flavouring agent both in curries and chutney. It has been shown than an oral feeding of Murraya koenigii leaves diet (10% w/w) for 60 days to normal rats showed hypoglycaemic effect associated with increased hepatic glycogen content due to increased glycogenesis and decreased glycogenolysis and gluconeogenesis.[15] Dietary supplement with curry leaves has been shown to increase lecithin cholesterol acyl transferase activity.[16] Curry leaf powder supplementation (12 g providing 2.5 g fibre) for a period of 1 month in 30 NIDDM patients showed reduction in fasting and post-prandial blood sugar levels at 15-day period with no significant changes in serum glycosylated cholesterol fraction, serum lipids, lipoprotein cholesterol levels, uronic acid and total amino acids.[17]

Ocimum sanctum (Lamiaceae) (Tulsi, Holy Basil)

This herb, considered to be sacred by Hindus, is commonly planted next to temples generally. It is also an ornamental plant and is grown in gardens. The traditional pharmacopeia reports on the use of this plant against diabetes. In 1968, Dhar et al. reported hypoglycaemic effect of the ethanolic extracts of the leaf. The ethanol (70%) leaves extract or Ocimum sanctum has been shown to cause significant reduction of blood glucose level in normal, glucose fed hyperglycaemic and STZ (50 mg/kg IP) induced diabetic rats. This effect was 91.55 and 70.43% of that of Tolbutamide in normal and diabetic rats respectively. Diet containing leaf powder (1%) fed to normal and diabetic rats for 1 month significantly reduced fasting blood sugar, uronic acid, total amino acids, total cholesterol, triglycerides and total lipids. This plant has also demonstrated anti-oxidant and hypolipidemic effect.[18-20]

Syzygium cuminii (Syn. Eugenia jambolana) (Myrtaceae) (Jamblon, Java plum)

This herb, widely distributed throughout India and Africa, is commonly used against diabetes. The decoction of the dried leaves and bark as well as the seeds, have shown hypoglycaemic effect. Oral feeding of S. cuminii (170, 240, 510 mg/rat for 15 days) caused 50% reduction of blood glucose or normal fasted rats while chlopropamide showed 52% reduction. In addition, there was a 2.4, 6.8-fold and 9.2-fold increase in cathepsin B activity (proteolytic conversion or pro-insulin to insulin) by plant extract and chlorpropaide respectively. Oral administration of the fruit pulp extract to normoglycemic and STZ induced diabeticrats showed hypoglycaemic activity in 30 min possibly mediated by insulin secretion. In addition, the extract inhibited insulinase activity from the liver and kidney. Daily administration of lyophilized powder of E. jambolana (200 mg/kg) showed maximum reduction or 73.51, 55.62 and 48.81 as compared to their basal values in mild (plasma sugar > 180 mg/dl, duration 21 days), moderate (plasma sugar > 280 mg/dl, duration 120 days) and severe (plasma sugar > 400 mg/dl, duration 60 days) diabetic rats. In addition, the treatment also partially restored altered hepatic and skeletal muscle glycogen content and hepatic glucokinase, hexokinase, glucose-6-phosphate and phosphofructokinase levels.[13,21]

Plants used in cardiovascular ailments

Among the ills to which flesh is heir is cardiac insufficiency, a condition in which a weakened heart fails to pump enough blood through the body. Cardiovascular disorders are responsible for many deaths throughout the world and this has been attributed to a large extent to a consequence of lifestyle, diet and heredity. Progress has been made when there has been changes in diet, exercise along with treatment with conventional drugs or phytotherapy. Cardiology has benefited greatly with the introduction of many drugs, some of them semi-synthetic based on natural products. Among these compounds one notes the presence of anti-platelet agent (Aspirin), derived from the Salix sp., warfarin, an anticoagulant derived from dicoumarol. Other cardiovascular conditions are arrhythmias (Rauwolfia), dropsy or oedema, heart failures (Digitalis, Crataegus, Strophanthus), anti-platelets and anti-sclerotic drugs (Allium sp.).

Arrhythmias and heart failures

Heartbeat is irregular and fluid collects in the arms, legs and abdomen because the kidney cannot perform their normal function. The swelling is known as dropsy or more formally as oedema. This disease syndrome is not new. Ancient physicians knew of it but because they lacked knowledge of the circulation or blood (discovered by William Harvey in 1628) and information on the function or the kidneys, treatment was limited to usually unsuccessful attempts to reduce oedema with medicines, which increased urine production (diuretic agents). Rauwolfia serpentina (Apocynaceae) (Radix Rauwolfiae) Snake-root (Rawolfia serpentina, Apocynaceae) is a small shrub native to India, Sri Lanka and the East Indies that was used locally for mental illness and snakebite, long before it was discovered by Western medicine. More than a thousand years ago, the Indian Rig Veda mentioned snake-root in its verses that describe medicinal plants. In Hindi, it is known as chandra or moon, a reference to its use for moon disease or lunacy. It is also sold as pagal ke dawa the traditional herb for insanity.

Indian peasants and medicine men and women knew snake root, named because the twisted, woody roots suggest the form of a snake; this seems to be a coincidental example of the Doctrine of Signatures in which the plant is a true cure for the ailment. The Dutch physician and botanist G.E. Rumpf (1627–1702) had observed that mongoose or weasel, before attacking a snake, fortifies itself by eating the leaves of the Rauwolfia plant. This way, it can even resist the deadly bites of the Cobra hence an antidote to the poisonous bites of poisonous snakes. Snake-root had been cultivated for medicinal use in tropical India, and the roots are dried and ground into a powder that contains more than 60 alkaloids out of which Reserpine and Rescinnamine are among the principal hypotensive alkaloids.

Anti-platelet and anti-sclerotic drugs

Allium sativum (Liliaceae) Garlic

This perennial bulbous herb has been used since time immemorial as a culinary herb. It is particularly notorious because of its characteristic and persistent pungentsmell and acrid taste. This is due to the number of sulphur compounds and the main one being alliin. The latter undergoes enzymatic hydrolysis by alliinase to produce allicin when the garlic pod is crushed. Allicin forms a wide range or compounds such as allyl methyl trisulphide, diallyldisulphide, ajoene and many others, which are volatile.

Garlic has also been used in traditional medicine to treat asthma, bronchitis, as an expectorant, aphrodisiac, anthelmintic, anti-fungal and also to thin the blood. Experimental pharmacology has shown that the essential oil, water and ethanol extracts of the garlic bulb extract exhibits a wide range of anti-bacterial and anti-fungal activity against a wide range or pathogens. The antimicrobial and anthelminitic activities have been attributed to the presence of allicin. Ajoene and diallyl trisulphide also have anti-bacterial and anti-fungal activities.[22]

Plants used against problems of the CNS

During the history of Mankind, drugs affecting the Central Nervous System (CNS) have focused essentially on those that bring relief to psychiatric disorders. Recently, a lot of focus has been made on those likely to bring relief to those acting on Parkinsonism and epilepsy and more potent analgesics etc. Drugs of plant origin are important in all these areas although not usually for self-medication. Reserpine has been a classical example where this anti-psychotic drug has revolutionized the treatment of schizophrenia and has enabled patients to avoid hospitalization before the introduction of drugs such as chlorpromazine and olanzines and risperidone. Reserpine in the meantime has shown some side effects in depleting the neurotransmitter levels in the brain thus causing severe depression and has recently been involved in the development of breast cancer. For milder psychiatric conditions, phyto-therapy can still provide support when one takes into account the statistics whereby depression and anxiety still affects one in six persons and that 40% or the people having mental problems will also develop symptoms of anxiety and depression. The latter is more prevalent in women than in men with associated problems like sleep disturbances etc. It is in this context again that phytotherapy is called upon to re-establish a regular pattern of sleep. Migraines, dementia, Alzheimer disease are many of the problems associated with the CNS, which are being addressed by plant extracts.

Hypnotics and sedatives

It has been reported that the difference between a sedative and a hypnotic agent depends on the dose. Plant products used in this way are not as potent as synthetic drugs but they do not have as many disadvantages as their synthetic counter parts, which are often recommended for short-term use.

Valeriana officinalis (Valerianaceae) (Radix Valerianae).

This plant has a long history in traditional medicine as a digestive aid, and as adjuvant in spasmolytic states of smooth muscle and gastrointestinal pains of nervous origin. It has also been used to treat epilepsy, gum sores, headaches, nausea etc. This herbaceous plant is being cultivated in many European countries, in the US and also in Japan. The parts used pharmaceutically are the root, rhizome and stolons. Valerian has a characteristic smell, usually described as unpleasant and is attributed to the presence of iridoid valepotriate constituents and other volatile oils. The main components of the volatile oils are monoterpenes and sesquiterpenes including valeranone, valerianol, valerenol, valerenal and valerenic acid and derivatives.Among the valepotriate compounds are: valtrate, didrovaltrate and isovaltrate, which are highly unstable decomposing readily upon storage. The extracts of Valeriana officinalis also contain c-aminobutyric acid (GABA), glutamine and tyrosine. The pharmacological properties and clinical efficacy of extracts of V. officinalis are attributed to the valepotriates and valepotriate degradation products. The sedative effects are due to a mixture or compounds namely valerenal and valerenic acid which are both constituents of the volatile oils and also of valepotriate compounds.

Cancer drugs from plants

Cancer remains a major obstacle to overall public health and is responsible for one in every four deaths in the US alone. In 2003, the American Cancer Societyhad estimated that there would be some over one million new cases on invasive cancer diagnosed with over half a million deaths from basal and squamous cell skin cancers. Plants have a long history of use in the treatment of cancer,[23] though many or the claims for the efficacy or such treatments should be viewed with some skepticism because cancer, as a specific disease entity, is likely to be poorly defined in terms of folklore and traditional medicine.[24]

Podophyllum peltatum (Berberidaceae) (May Apple)

Podophyllum peltatum is commonly known as the Devils apple or May apple. This perennial plant is found growing in the woodland in Northern America. The rhizome, which is the most important part of the plant, is known to be toxic. The main components found therein are podophyllotoxin and a- and b-peltatin, all being toxic. The lignan, Podophyllotoxin is also found in other species of Podophyllum. These plants have a long history as a medicine, among native North American and Asian tribes.[25] They used to gather the rhizomes in the autumn, dry them and grind them to a powder. They would eat or drink a brew of the powder as a laxative or to get rid or intestinal worms. Currently, the extracts are applied on genital warts and some skin cancers. Nonetheless, the extracts and compounds present therein are too toxic to attempt self-medication.

Taxus brevifolia (Taxaceae) (Pacific Yew tree)

Another example of plant-derived anti-cancer drug is paclitaxel more commonly known by its trademark nameTaxol. Taxol, a complex terpene-based molecule is derived from the Pacific Yew (Taxus brevifolia) and is both a generic and a brandname. The Taxol story started in the 1960s, when a project was undertaken by the National Cancer Institute (NCI), which was involved in the collection of a number of plants to be assessed for their anti-tumour activity. One of them being the very slow-growing Pacific Yew, Taxus brevifolia. Extracts of the Pacific Yew were found to stop the growth of several mouse tumours, a case in which ethnobotany provided no clues. Nonetheless although, native Americans did not use the trees specifically for cancers or tumours, an early ethnobotany reference noted that the Bella Coola tribe of British Columbia used Pacific Yew for lung ailments. This reference may have overshadowed the present as paclitaxel is now being used to treat lung cancers that do not respond to other therapies.

Paclitaxel, along with several key precursors (the baccatins) occur in the leaves(albeit in very low yields: 0.004% from 12 kg of plant material) of various Taxus species, and the ready semi-synthetic conversions of the relatively abundant baccatins to paclitaxel and active paclitaxel analogs, such as docetaxel[26] has provided major, renewable natural source of this important class or drugs. Cancer exhibit un-controlled cell division and paclitaxel stops malignant tumours from growing, by interfering with the micro-tubules that are responsible for dividing the chromosomes during cell division. The microtubules do not disassemble after cell division is complete, and so many microtubules accumulate in the cytoplasm that cell division cease. Paclitaxel inhibits the separation of the tubulin molecules the protein subunits that compose the microtubules providing a unique method of interfering with cancerous growth. Clinical trials during the 1980s revealed that paclitaxel could help in 30% of the advanced cases of ovarian cancer and the drug shows promise for other malignancies as well namely melanoma cell lines.

Plants used against infectious diseases (Anti-malarial properties)

Throughout Mans troubled history, few diseases have played so tragic a role as malaria. It has killed or incapacitated more people than all plagues, wars and automobiles. More than 10% of the US overseas armies in 1943 had malaria. In 1596, the earl of Cumberland captured Spanish Puerto Rico but could not hold it because his forces were decimated because of malaria. Alexander the Great died of it in June 2323 B.P. Untreated malaria may kill about 1% of those infected. The survivors prone to relapse may suffer from anaemia, weakness, sexual impotence, chronic abortion and secondary infections, all of which lower the value of the individual to self, community, family.

Artemisia annua (Asteraceae)

Artemisia annua, also known in China as Qinghao, has a long history in Chinese medicine. A. annua or Sweet Wormwood has yielded the agent Artemisinin and derivatives which are potent classes of anti-malarial drugs. The Artemisinins are sesquiterpene lactones and are widely used to treat multidrug-resistant malaria and they act also on cerebral malaria-causing strains of Plasmodium falciparum. The clinical efficacy of these drugs is characterized by an almost immediate onset and rapid class reduction of parasitemia. Artemisinin is now used as an alternative to chloroquinine in areas of China with resistant strains of Plasmodium and has been investigated in the United States by the military, since malaria can quickly debilitate troops. In the meantime, in view of the fact that A. annua gives extremely low yields or Artemisinine (0.01–0.8%), the direct commercialization poses a problem. Therefore the enhanced cell culture of artemisinine either in cell/tissue culture is highly desirableand are being tried. First isolated in 1972, the sesquiterpene endoperoxide Artemisin has been the basis for several semi-synthetic drugs, namely Artemether and Arteether, which have greater solubility in vaccines and greater anti-malarial activity.[27-29]

Conclusion:-

This paper has given an overview of the importance of medicinal plants from antiquity to date. It cannot be denied that pharmacognosy has had a chequered history but has evolved over the years to become one or the pillars of areas like pharmacy, medicine and natural product chemistry amongst others. All these scientific disciplines now recognize the importance of plants as sources of medicines and have initiated active research programmes either to isolate new lead compounds or to produce standardized extracts. With the estimated 10–100 million species or organisms living on earth and higher plants forming a group of some 250,000 species out of which only 6% has been investigated for biological activities and 15% for their chemical constituents, it looks increasingly like we have only scratched the surface of this worlds wonderful

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