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The wisdom of prevention: Holistic, preventive herb approach for healing of the globe

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Abstract

From ancient times, herbs as medicinal plants have been used in all cultures as a major source of medicine. Numerous herbal remedies are well described in ancient texts as in Vedas and the Bible, which are commonly obtained from traditional herbs and medicinal plants, have been traced to the occurrence of natural products with medicinal properties. Plants are source of numerous active plant agents such as alkaloids, bitters, cardiac glycosides, Cyanogenic Glycosides, Flavonoids, minerals, phenols, Polysaccharides, Proanthocyanins, Saponins, tannins and vitamins, volatile oils etc. that play major role in improving human health. Due to vastness, climatic and geographical conditions, India has major contribution having biodiversity of valuable plants. However, with over population, the insufficient supply of drugs, knock on effects of various allopathic medicine. Recent advanced technology has fueled the role of medicinal plants as re-emergent health aid. Worldwide, user friendly nature and intrinsic side effects of modern drugs has renewal of drug's traditional system. The article highlights the uses of traditional medicinal systems, properties of herbal plants, phytochemistry, dependency on local plants and threats and conservation values of medicinal herbs. Therefore, along with proper source of knowledge for the biodiversity conservation allow genuine management of floral biodiversity and its resources. The future availability of floral ingredients supports medications directory that totally dependent on conservation and sustainable use of plant species on the deep-rooted documentation.

Keywords: biodiversity, medicinal plants, bioactive compounds, conservation, sustainable use

Introduction

Medicinal plants, incomparable source of bioactive compounds that have been used for millennia by different ancient cultures like India, China, Greece, Rome etc. to treat the diverse health problems. Worldwide, the medicinal plants system is one of the centuries-old practice and long-serving companion to humankind are used an alternative medicine however the studies on these plants involve the pharmaceutical and toxicological (acute toxicity, sub-acute toxicity, sub chronic toxicity and chronic toxicity) evaluation are important for drug research and development. Medicinal plants always have a top position as major source drugs on a large proportion of the world however some medicinal plants are becoming endangered species due to ignorance of their presence in the surrounding environment (Jamshidi-kia *et al.* 2018) [29].

In Indian culture, the Rig Veda (4500-1600 BC) mentioned the use of medicinal plants (Kapoor 1990; Bahadur *et al.* 2007) [127, 128] and some other books like Sushruta Samhita and Charaka Samhita (till early 20th Century) gives remarkable description of many Indian medicinal plants i.e. *Materia medica*. Traditional medicinal plants (TMP) are culturally acceptable and due to readily availability, early humans collected the knowledge of utilization of these plants on therapeutic bases through billion years of vigilant observations, trial, error and experiences. The relation between science and botany has been showed close relation from the period when herbal treatment was the only answer to all kind of ailments however animals are also used as medicine from the ancient time.

Historical background

In fact, the introduction of modernization health system has cause vast ultimatum to native health practices due to their efficacy and rapid therapeutic effect which has led to the vanishing and shift of knowledge of traditional herbal medicines with time and undervalued by the humankind (Karunamoorthi *et al.* 2012) [55].

However, with over population, the insufficient supply of drugs, restrictive price of treatments, knock on effects of various allopathic medicine and evolution of resistance to recently used drugs for contagious ailments have led to raised significance on the utilization of plant matter as a source of drugs for a broad diversity of human disease (Joy *et al.* 2001) [46]. Worldwide, user friendly nature and intrinsic side effects of modern drugs has renewal of drug's traditional system (Karunamoorthi and Tsehaye 2012) [55]. The scientific community over the past three decades worldwide is extremely willed toward deep-rooted traditional medicinal systems to search the best opportunities to formulate new phyto-therapeutic factors, therefore, greater emphasis is being laid to revive all over the world nowadays and WHO has been given a call for its revival. The contribution of India with its vastness, climatic and geographical conditions has the vast biodiversity of plants containing about 2000 medicines can be used for curative purpose and only about 200 are of mineral and animal origin (WHO 2005) [98].

The Ayurvedic tradition believes that every part of plant-leaves, flowers, fruit, stem, bark, etc. have some medicinal value i.e. Bark of Arjuna tree makes an excellent heart tonic. More than 7500 medicinal plants listed as more as continue to be discovered. The PID section Of CSIR will provide the computerized report on medicinal and aromatic plants and research institution will do identification, biological screening and chemical investigation, uses of plants and their bibliographic work. The south Asian Association for Regional Cooperation (SAARC) countries emphasized the need for preparing an exhaustive inventory of all medicinal plants belonging to the forest species and the improvement of drug manufacturing techniques and capacities and linkages between allopathic medicinal practitioners and traditional medical systems.

A national committee set up with the main aim to exchange the information between the 13-member countries include, India, Nepal, China, Pakistan, Bangladesh, Sri Lanka, Taiwan, Thailand, South Korea, Vietnam, Malaysia, Papua New Guinea, Bangkok, and Australia to help in use of medicinal plants for cure of health issues globally.

Empower traditional medicinal system using conventional herbs

According to an article based on Worldwide Research Trends on Medicinal Plants analyzed the data from 1996 – 2019 period has revealed that more than 110,000 research studies linked to traditional medicinal flora have been documented worldwide and it also highlights that most of them have been supported in the pharmaceutical, pharmacology and toxicological studies with 27.1% of the total. Other categories with notable relative relevance have been Genetics and Molecular Biology (16.7%), Chemistry (8.7%), medicine (23.8%), Immunology and Microbiology (2.5%), Chemical Engineering (1.5%), Biochemistry, Environmental Science (2.1%) and Agriculture and Biological Sciences (11%). All other categories which carried out below 1% include Multidisciplinary, Nursing or engineering in around 159 countries. On the basis of Pharmaceutics, Pharmacology and Toxicology categories, Brazil has led of its own publication with around 35% followed by India (33%) while in terms of Medicine category China has led with 29% followed by Germany (27%). Biochemistry, Genetics and molecular Biology categories always hold position 2nd or 3rd in ranking with outstanding performance of Japan and South Korea

(23%) and France (22%). For many countries, the agriculture and biological science category represents the best position of Pakistan with 20% followed by Italy (16%). Japan (20%) and Iran (14%) occupy the best countries in chemistry category while Immunology and Microbiology, Multidisciplinary, Engineering, Chemical Engineering, Environmental Science categories are below 5% in all total countries (Salmeron-Manzano E *et al.* 2020) [126].

Implication practices to reduce the health issues using different TMP

The burden of health issue increase day by day globally and it not only related to mortality rate but also the causes suffering to people who live with them. According to WHO report 2017, there are about 56.9 million deaths worldwide occur that is more than half (54%) involving 15.2 million deaths by Ischemic heart disease and stroke; 3.0 million suffering from chronic disease; 1.7 deaths by lung cancer including trachea and bronchus cancers; 1.6 million deaths by diabetes; 3.0 million from Lower respiratory infections; 1.4 million deaths from diarrhoea; 1.3 million from TB; 1.5 million from HIV/AIDS. Deaths due to dementias more than doubled between 2000 and 2016, making it the 5th leading cause of global deaths in 2017 compared to 14th in 2000. So-called "Group I" conditions, which include communicable diseases, maternal cause's conditions arising during pregnancy and childbirth, and nutritional deficiencies related deaths are reported in more than half in low-income countries in 2017 while in comparison with high income countries <7% of deaths was occur due to these causes especially lower respiratory infections causes death more. 71% of death mainly caused by non-communicable diseases (NCDs) globally i.e., ranging from 37% (low-income countries) - 88% (high-income countries). Several UNESCO backed scientific projects are concerned with phyto-chemical studies of medicinal plants/herbs and to make rational use natural resources substituting home produced medicine for costly imported drugs and keep people away from the adverse effects of synthetic medicines in Europe, Latin America and Asia. Because of use of traditional plants all over the world has gained respectable position nowadays, they are growing rapidly in economic importantly especially in the developing countries where modernization in health services is restricted and represents only accessible treatment (Agra *et al.* 2007) [14].

The Indian forest are the predominant depository of huge number of remedial and aromatic plants which are chiefly gather as raw content for production of medicines and fragrance products. In India, approximately 8,000 herbal medicines have been codified in well-known AYUSH systems. AYUSH suggest a fuse of a substitute ordering of Medicine which was initial familiar as the India's System of remedies. AYUSH does comprise of Yoga, homeopathy, Ayurvedic, Unani, Naturopathy and Siddha, of these two famous Ayurveda and Unani remedial system are well developed and broadly practiced in Indian culture. The main target of AYUSH is to raise clinical multiracialism and to represent methods and techniques for mainstreaming the native frameworks of cures. The AYUSH practices are ease by the Division of AYUSH under the Health and Family Welfare's ministry, at the Union Government level, in India. Over the span of time, the extensive majority of this clinical exercise started in India and adjacent countries yet got supported in India. One of the central matters influence the expansion of India's AYUSH and an electoral medicine

advertisement is the common perspective of therapy as an additional source of medication. Globally, the AYUSH and Alternative Medicine industry has been split up on the basis of region, type and distribution channel in which the type segment is further categorized into ayurvedic medicine, homeopathy, acupuncture, herbal medicine, aromatherapy and other types. Additionally distance correspondence, e-sales and sales categories come under the Distribution Channel division. The vital contender operating in the Indian market are Patanjali, Himalaya Wellness, Sydlar India Pvt Ltd, Ganga Pharmaceuticals, Hootone Remedies, SBL Mathur, GR Herbals Dabur India, Hamdard and Baidyanath. The utmost operating competitor in the AYUSH and Alternative Medicine market are mainly focus on production of more progressive, good and cost-beneficial masks to lead to the development of profit in the manufacturing industry.

Medicinal flora is considered a secure remedy due to nil or least side effects and these treatments are in sync with Mother Nature which is the immense advantage. The favorable actuality of using herbal treatments is that it is independent of any age and the sexes groups. The former researchers believed that herbal plants are only solutions to heal numerous health problems and ailments. By conducted thoroughly experimental studies about the same, the scholars reach at precise conclusions about the potency of dissimilar herbs with medicinal value and thus many drugs are formulated without any side effects on human body which proves that traditional medicinal plant remedies are useful and growing in popularity globally. The herbs with effective medicinal value have quality provide logical quality to cure diverse internal diseases which are otherwise considered hard to heal.

Table 1:Involvement of various plant families in targeting health issues

Family	Properties	Targeted-tissues	Diseases	References
Apocynaceae, Scrophulariaceae, Asteraceae, Passifloraceae, Anacardiaceae, Cucurbitaceae, Graminae, Tiliaceae, Lauraceae, Liliaceae, Meliaceae, Palmae, Verbenaceae, Fabaceae, Malvaceae, Lamiaceae, Euphobiaceae, Apocynaceae,	Analgesic, anxiolytic, anticonvulsant, sedative, anti-Alzheimer's disease, motor coordination, antipsychotic, antidepressant, cognitive enhancement, and neuroprotective properties.	Brain	Alzheimer's Disease, Dementias, Brain Cancer, Epilepsy, Seizure Disorders, Mental Disorders, Parkinson's and Movement Disorder, Stroke and Transient Ischemic Attack.	Adegbola <i>et al.</i> 2017 ^[125] ; Michel <i>et al.</i> 2020 ^[106] .
Salicaceae, Ephedraceae, Cactaceae, Amaryllidaceae, Plantaginaceae, Melanthiaceae, Ginkgoaceae, Lamiaceae, Apocynaceae, Bursaceae, Taxaceae, Ranunculaceae, Asclepiadaceae, Brassicaceae, Asparagaceae, Rutaceae, Rosaceae, Sapindaceae, marinobufagenin.	calcium ion channel antagonist, β -adrenergic blocking agent with partial agonism, antineoplastic, circulatory stimulator, hypotensive, sedative property, Vasodilatory effect, antihypertensive effect, antioxidant, free radical-scavenging effects	Heart	Congestive heart failure, systolic hypertension, angina pectoris, atherosclerosis, cerebral insufficiency, venous insufficiency arrhythmia	Rastogi <i>et al.</i> 2016
Asteraceae, moraceae, Fabaceae, Amaranthaceae, Malvaceae, Lamiaceae, Violaceae, ranunculaceae, Poaceae, Acanthaceae Boraginaceae Asclepiadaceae, apiaceae, bras-sicaceae, liliaceae, Capparaceae, Labiateae, Mimosaceae, Papilionaceae, solanaceae, Myrtiacea, Euphorbiaceae, Rosaceae, polygonaceae,	Anti-allergic and anti-anaphylactic activity, anti-histamine action, Anti-asthmatic anti-inflammatory and protection against LPS induced airway hyper-reactivity, Bronchodilator vasodilator activities through dual blockade of muscarinic receptors and Ca ²⁺ channels, Antianaphylactic effect, anti-cholinergic effect, Demulscent, anti-tussive etc.	Lung disease	Bronchitis problems, flu, cold, cough, chest problems, asthma, pneumonia, whooping cough, lung cancer,	Alamgeer <i>et al.</i> 2018 ^[20] .
Nyctaginaceae, Iridaceae, Lythraceae, Combretaceae, Valerianaceae, Euphorbiaceae, Liliaceae, Asteraceae, compositae, Berberidaceae, Zingiberaceae, Scrophulariaceae, Gentianacea, Urticaceae,	Anti-inflammetory, anti-ulcer, anti-cancer, hepatoprotective activity, remedy for sore eyes, broken bones, wounds, gonorrhea, jaundice, anemia, nervousness, antibacterialproperty, anti-arrhythmic activity, enhanced protein synthesis, anti-fibrotic activity, regulators of fat metabolism,.	Liver disease	Hepatitis, jaundice, cirrhosis, liver cancer, etc.	Girish and Pradhan 2011 ^[124]
Poaceae, Rutaceae, Urticaceae, Santalaceae, Fabaceae, Malvaceae, Moraceae, Brassicaceae, Acanthaceae, Bignoniaceae, Zingiberaceae, Apiaceae, Asparagaceae, Oleaceae, Asteraceae, Lamiaceae, Cucurbitaceae, Menispermaceae, Euphorbiaceae, Amaranthaceae, Lauraceae, Adiantaceae, Costaceae, Convolvulaceae, Rhamnaceae. Apocynaceae, Nymphaeaceae, Melastomataceae,	Anti-inflammatory, antimicrobial activity, anti-infectant,	Kidney, bladder and urinary disease.	Chronic kidney disease (CKD),renal function and blood pressure in diabetes mellitus, kidney stone, urinary stone, urinary tract infection,	Choubey <i>et al.</i> 2010 ^[131] ; Arya <i>et al.</i> 2017 ^[130]
Fabaceae, Poaceae, Bignoniaceae, Liliaceae, Annonaceae, Scrophulariaceae, Solanaceae, Periplocaceae, Lythraceae.	antifungal activity and hypocholesterolemic efficacy, antifertility effect, for treatment of	Reproductive disease	Endometriosis, Uterine Fibroids, Gynecologic Cancer, HIV/AIDS. Interstitial Cystitis,	Devi Prasad <i>et al.</i> 2014 ^[122] .

Aristolochiaceae, Marantaceae, Verbenaceae, Asperagaceae, Bombacaceae, Rhyzophoraceae, Cucurbitaceae, Caricaceae, Menispermaceae, Meliaceae, Annonaceae, Cycadaceae, Asteraceae, Araceae, Musaceae, Ebenaceae	leucorrhoea, excess uterine bleeding, wet dream, vomiting at the time of pregnancy, gonorrhoea, easy delivery of baby, increase of breast milk, irregular menstruation, anti-bacterial, anti-fungal, anti-tumor, analgesic, anti-inflammatory, anti-spasmodic, anti-diabetic, anti-serotonergic, anti-migraine, antihelmintic agent,		Polycystic Ovary Syndrome (PCOS), Sexually Transmitted Disease, reproductive tract infection, reproductive cancer, reproductive functional abnormalities, infertility	
Solanaceae, Moraceae Fabaceae, Meliaceae, Verbenaceae, Liliaceae, Marsileaceae, Euphorbiaceae, Apiaceae, Cyperaceae, Verbenaceae, Caricaceae, Caesalpiniaceae, Apocyanaceae, Aristolochiaceae, Amaranthaceae, Papaveraceae,	Anti-inflammatory activity, to treat furunculosis, eczema, ulcers, emollient and demulcent properties, inhibitory effect on the lymphocytic reaction in the epidermis and the proliferation of local T cells etc	Skin disease	Eczema, psoriasis, rosacea, ichthyosis, vitiligo, hives, seborrheic dermatitis.	Joshi <i>et al.</i> 2016 [123]
Moraceae, Amaryllidaceae Cucurbitaceae, Fabaceae, Asclepiadaceae, Myrtaceae, Lamiaceae	Decreased blood glucose, management of obesity such as ephedra	Metabolic and Endocrine disorders	Diabetes, obesity, in hyperlipidemia, in hyperprolactinemia	Hasani-ranjbar and Larijan 2014 [105].

Dependency of world on complementary medicinal system: the new frontier

In 2019, the World Health Organization (WHO) report which is subjected as 'WHO Global Report on Traditional and Complementary Medicine (T&CM) 2019' give a fascinating detail as alternative medicine as misnomer, thus prescribes a new definition of the term by placing alternative and complementary medicine under one umbrella. In this report organization has explained the most important and yet often underrated health resource with numerous applications in the elimination and regulation of lifestyle linked and incurable ailments, in meeting the health demands of ageing community and calling for the entire combination of Traditional and alternative/ complementary medication into the conventional health maintenance system. Innumerable countries are be on the lookout for to stretch report of crucial health favors concurrently when consumer belief for protection and costs are increasing and most budgets are either static or being decreased. Specific distinctive fitness ultimatum of the current century, the interest in Traditional and alternative medicines is undergoing a renewal.

According to WHO, the terms complementary and alternative medicine are mention wide set of well-being protection exercises which are neither part of that country's own conventional or alternative remedies nor totally integrated into the presiding medical management system. They are used in some countries as interchangeably with conventional drugs. The another term as Herbal medicines is describe as herbs, their materials, preparations and final products which may contain active agent, any part of plants, other variety plant matters or mixture thereof. In many nations, herbal medicines may include organic or inorganic active agents that are not from the original plant, for instance, materials from animal and mineral. The Indigenous traditional medicine terms is refer the sum total of traditional knowledge and exercise whether it is reasonable or not used in identifying, preventing or eradicating mental, physical and social disorders. This practices and knowledge may completely base on past exposure and wisdom handed down in written or orally passes inheritably. These practices are indigenous to the nation in which they are skilled and majority of indigenous traditional medicines practices have been practiced at primary health care level globally.

Presently greater than 80% world's population totally depends in traditional herbal healing modalities as a primary health

care and wellness purposes (WHO 2003). Several developed countries practices the health care system especially on medicinal plants and take various important steps to preserve the popularity, ancient and cultural knowledge. 70% human population and 90% livestock of Ethiopia total depends on alternative medicinal remedies (Bekele 2011) [26]. In South Asia's more than 80% population have no access to current health care system and using native species instead of traditional medicines (Roberson 2010) [79]. Also observed that more than 70% of developing nation's population still show dependency on these traditional system of medications which include > 80% Africa's population, 71% Chile's populations and 40% Columbia's population (Shaikh and Hatcher 2005) [86]. This data clearly shows that the traditional healers play a powerful role in saving the lives of African human population and have the prospective serve as crucial constituent of a comprehensive health management strategy. Because of limited availability and affordability means poverty, ignorance of modern fitness facilities and pharmaceutical medicines have shown that the majority of the world's population, especially the rural world still rely on traditional medical remedies (IUCN 2011; Marinelli 2005) [40, 63]. Presence of approximately 250,000 higher floral species on planet, > 80,000 species codified as medicinal plants with having at least some medicinal value. All over the world, approximately 315 species of total 400 flowering plants' families are represented by India alone. WHO report has been analyzed about 60,000 species of plants are used for medicinal purposes of which 28000 are well documented and about 3000 species are internationally traded with 1/3rd of those well known to be in the traded cultivation (Jenkins *et al.* 2018). However, some of the medicinal properties ascribed to floras have been demonstrated to be inaccurate, the utilization of traditional medicinal plants for the curing of numerous ailments is familiar and registered since past times. Jiaxiang in his studies showed that about 4877 floral species related to distinct plant groups having potential medicinal value (Gurib-Fakim 2006; Joy *et al.* 2001; Jiaxiang 1997) [121, 44, 46].

The distribution of the flora in India includes about 600 species of pteridophyte (25% endemic), 8,000 species of angiosperm (40% endemic), 1737 species of bryophyte (33% endemic), 44 species of gymnosperm (16% endemic), 1,159 species of lichen (11% endemic) and 6,900 species of fungi (27% endemic) (Samant *et al.* 1998; Singh and Hajra 1996) [89]. Approximately 1748 medicinal floral species contain various

traditional and modern applications uses i.e., 118 medicinal plants species yielding essential oils, 155 sacred plants, 675 species of wild edible plants, 279 species of fodder, and 121 rare-endangered plants (Nayar and Sastry 1987, 1988, 1990; Samant and Dhar 1997; Samant and Pant 2003; Samant *et al.* 1998) [87, 89].

More than 50 angiosperm's families have been used for medicinal purpose and about 20 families are used for making herbal medicines. About 750 genera along with 19000 species belonging to family Fabaceae cover the third largest family (9.8%) of potent medicinal property. Acacia (950 species), Indigofera (700 species), Astragalus (2,400 species), Mimosa (500 species), Crotalaria (700 species) with 32 plant species under 23 genera of Fabaceae family are used for the treatment of different disease (Mahbubur and Parvin 2014; Christenhusz and Byng 2016) [61, 27]. 85 species of medicinal and aromatic plants of 54 genera were discovered in Uttarakhand region of India (Bisht and Bisht (2010) [23]. About eight species belonging to Asteraceae families were determined which have been used for therapeutic purposes. The plants determined in research area were; *Achillea alpina*, *Achillea biebersteinii*, *Chrysanthemum montanum*, *Gundelia tournefortii*, *Matricaria aurea*, *Anabasis syriaca*, *Onopordum carduchorum* and *Tripleurospermum parviflorum* (Arasan and Kaya (2015). Rubiaceae is the fourth largest family (6.2%) with respect to the number of medicinal plants. This is the fourth largest family of angiosperms with about 611 genera and 13,500 species. Many of these species are with antihypertension, anti-inflammatory, antimicrobial, antidiabetic, antimalarial, and antioxidant activities. Approximately 3000 plants of this family have been known to possess anticancer properties. Based on the some studies, it is analyzed that the some floral species like *Nauclea latifolia* and *Morinda lucida* showed excellent cytotoxic activities. Coffee and Cinchona are the most important medicinal and economical genera of Rubiaceae. 27 plant extracts were obtained from seven species: *Paederia foetida*, *Antirheaborbonica*, *Mussaenda arcuata*, *Danais fragrans*, *Chassalia coriacea*, and *Gaertnera psychotropics*. In a study, eleven of the 27 extracts showed antibacterial properties, five showed antifungal properties while two showed potent smooth muscle relaxation and contractile properties (Pederson *et al.*, 1999). Apiaceae (Umbelliferae) is a family of about 434 genera and 3700 species. It is the fourth largest medicinal family accounting for 5.7 percent. *Conium maculatum*, *Cicuta maculate* and

Aethusa cynapium are the poisonous plant species of this family with high medicinal values. *Dorema ammoniacum* and *Aegopodium podagraria*, *Trachymene coerulea* and *Eryngium maritimum* are also highly medicinal plants (Reddy 2008) [74].

Photochemistry of medicinal plants

The medicinal plants are rich source of various active bioactive agents which contain medicinal property and produce physiological activities on human being as well as comparative source of mosquito repellents and so on. The phyto-chemicals or secondary metabolites from plants origin have eminent pharmacological activities such as antibiotic, anti-carcinogenic, hypo-glycaemia, anti-oxidative and anti-allergic. These metabolites prevent the damage of cells caused by unstable molecules known as free radicals.

There is increasing interest in using wild antimicrobial compounds for the food's preservation. Therefore there is need for more searches on medicinal value on plants. The chemistry of natural components of medicinal plants has bright broad scope and bright future therefore there is clear need to systematic search on more medicinal plants on modern lines (WHO 2005) [98]. Approximately 4.5 million plant species are present in India in which only 25000-50000 species has been investigated on phytochemicals purposes. The bioactive agents or extracts use for treatment of various diseases and in pharmaceutical industries they would be use as new formulations for novel drugs discoveries i.e., Ashwagandha and Brahmi are used to enhance immunity, boost energy level, rise nutrients and restore body cells. Terpenoids, alkaloids, indole and anthraquinones are some bioactive compounds isolated from various plant species to cure different diseases. Traditional medicinal and aromatic floral species play important role in the enhancement of livelihood of rural people mainly women (Singh and Kumar 2017; Singh *et al.* 2017; Nishant 2016; Sharma *et al.* 2017) [4, 5, 6, 78]. Plants as a medicinal value also use their active ingredients for their own survival i.e., some chemical like salicylic acid produced by willows and other plants act as herbicides to inhibit the insects and herbivores.

There are numerous active plant agents that provide medicinal plants uses for humans such as alkaloids, biters, cardiac glycosides, Cyanogenic Glycosides, Flavonoids, minerals, phenols, Polysaccharides, Proanthocyanins, Saponins, tannins and vitamins, volatile oils etc.

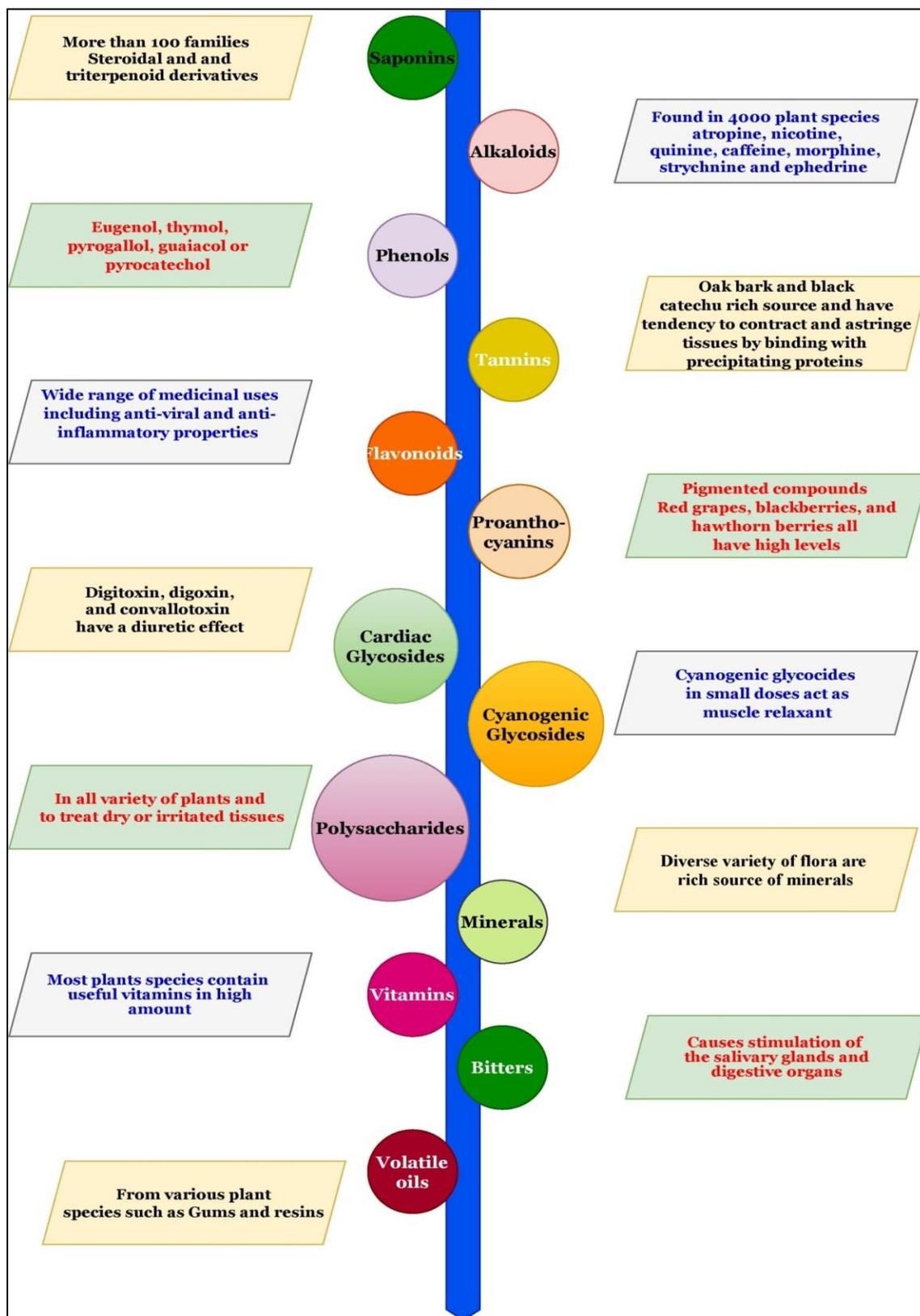


Fig 1: Phytochemical compounds used for ailment of various diseases.

Saponins: saponins are glucosides found in abundance in diverse plant species nearly about more than 100 families with foaming characteristics and have two major forms of saponins include steroidal (structure resemble with human hormones estrogen and cortisol) and triterpenoids (Szakiel *et al.* 2011; Vincken *et al.* 2007) ^[110, 111]. Triterpene saponins are present in parts of dicotyledonous plants i.e., leaves of Hedrae, roots and flowers of Primula, roots of Senegae, bark of Quillaja, leaves of Polygalae Amarae, seeds of Hippocastani,

seeds of Glycine max, roots of Saponariae, roots of Glycyrrhizae, roots of Ginseng, and leaves of Herniariae. Triterpenoid saponins are found in peas, beans and soybeans abundantly. Steroidal saponins are typically found in members of the Agavaceae, Alliaceae, Dioscoreaceae, Amaryllidaceae, Palmae, Asparagaceae, Bromeliaceae, Scrophulariaceae and Liliaceae families (Moses *et al.* 2014) ^[115].

Alkaloids: Alkaloids are nitrogen containing molecules found in different 4000 plant species for example, opium poppy (*Papaver somnifera*) and the ergot fungus (*Claviceps*), there are about 30 different alkaloid types. Alkaloids due to their bitter taste are used to repel herbivorous organisms and have a function to protect them from destructive activity of some insect species. Alkaloids have different physiological effects like anti-inflammatory, psychotropic, anti-mitotic, local anesthetic, analgesic, antibacterial, antitumor activity, hypnotic and many others. Major alkaloids such as atropine, nicotine, quinine, caffeine, morphine, strychnine and ephedrine (Chisholm 2015) [116]. Many plants used in pharmaceutical manufacturing units ie, vincristine, derived from the plant Madagascar periwinkle (*Catharanthus roseus*) is used to treat various kinds of cancer.

Phenols: Phenols are plant compounds that are thought to be produced to protect against infection and herbivory by insects. They are often anti-inflammatory and antiseptic and can have anti-viral properties. Phenols vary in structure and range from salicylic acid (similar to aspirin) to complex sugar-containing phenolic acids. Wintergreen and willow contain salicylates. Some like eugenol, thymol, pyrogallol, guaiacol or pyrocatechol are formed in natural way, but a vast majority of them are introduced as a consequence of industrial, agricultural and communal activities of humans.

Tannins: Most of the plants produced tannins which serve as a deterrent to Herbivory by insects and grazing animals due to bitter taste, useful in curing leather because of their tendency to contract and astringe tissues by binding with precipitating proteins ie, oak bark and black catechu are rich source of tannins.

Flavonoids: Flavonoids are widely found in plants with a wide range of medicinal uses and actions. They often act as pigments giving a yellow or white color to flowers and fruits. Some flavonoids have anti-viral and anti-inflammatory properties. Flavonoids found in many plants like lemon and buckwheat is known to strengthen capillaries and prevent leakage into tissues.

Proanthocyanins: These are pigmented compounds which give fruits and flowers red, purple, or blue hues and are closely related to tannins and flavonoids. These compounds have been documented to be valuable in protection of

circulation specifically in the heart, eyes, and feet. Red grapes, blackberries, and hawthorn berries all have high levels of proanthocyanins.

Cardiac Glycosides: Different compounds containing plants (Foxglove, Lily of the Valley) and have strong direct action on the heart. Cardiac glycosides such as digitoxin, digoxin, and convallotoxin support heart strength and rates of contraction when failing. These compounds also have a diuretic effect that stimulates urine production and aids in removal of fluid from tissues and the circulatory system.

Cyanogenic Glycosides: Cyanide, a very deadly poison, but in small doses, they can serve as a muscle relaxant. The bark of wild cherry and the leaves of elderberry (*Sambucus racemosa*) contain cyanogenic glycosides, which can be used to suppress and soothe dry coughs.

Polysaccharides: Polysaccharides are found almost in all variety of plants and for medicinal purposes, the “sticky” polysaccharides produce mucilage or gums that are commonly found in bark, roots, leaves, and seeds. These sticky polysaccharides are able to soak up large quantities of water and form jelly like masses ie, used to treat dry or irritated tissues such as skin and mucous membranes.

Minerals: Diverse variety of flora are rich source of minerals which is always the major factor in a effectiveness of plants as a medicine i.e., the high mineral content in *Equisetum* used for arthritis to supports the restore of connective tissue.

Vitamins: Most plants species contain useful vitamins in high amount ie., vegetables and fruits contain vitamin C and beta-carotene. *Nasturtium officinale*, *Rosa Ragusa* and *Hippophae rhamnoides* L. are rich in vitamins B, C, and E.

Bitters: The bitterness of this group causes stimulation of the salivary glands and digestive organs which is used to improve appetite and strengthen the digestive system ie., hops and wormwood.

Volatile oils: from various plant species, volatile oils are extracted. For example, tea tree oil as a strong antiseptic. Gums and resins are linked with essential oils but are not volatile.

Table 2: Bioactive compounds derived from various medicinal plants and their role in disease ailment.

Plants	Parts used	Bioactive compounds	Properties	Reference
<i>Ficus religiosa</i> (Peepal); Moraceae;	Bark, leave,	Tannins, saponins, polyphenolic compounds, flavonoids, and sterols. Sitosterol-d-glucoside, leucocyanidin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3-O-alpha-L rhamnoside.	antidiabetic effect, to treat skin diseases, respiratory disorders, central nervous system disorder, gastric problems etc.	Gautam <i>et al.</i> 2014 [114].
<i>Syzygium cumini</i> (L.) Skeels; Jamun Myrtaceae	Seeds, bark, leaves,	anthocyanins, glucoside, ellagic acid, isoquercetin, kaempferol, myricetin, and hydrolysable tannins (1-0-galloyl castalagin and casuarinin), alkaloid jambosine and glycoside jamboline	To treat diabetes, sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers.	Joshi and Pant 2012 [123]; Bachaya <i>et al.</i> 2009 [43, 21].
<i>Momordica charantia</i> (bitter gourd or karela); Cucurbitaceae.	Fruits, seeds,	vicine, charantin, and triterpenoids along with some antioxidants	Anti-diabetes, to treat cardiovascular diseases, antibacterial, antiviral, anticancer,	Joseph and Jini
<i>Ocimum sanctum</i> L. (holy basil or	Leaves, stem, seed	Eugenol, flavonoids, saponins, tannins, triterpenoids, rosmarinic acid, apigenin,	antidiabetic and cardioprotective effects, antifungal, antimicrobial,	Kumar <i>et al.</i> 2010 [47].

tulsi);Lamiaceae.	and leaves oil	isothymusin, isothymonin, cirsimaritin, orientin and vicenin.	analgesic, anthelmintic, antistress, antifertility, anti-inflammatory, antioxidant, gastroprotective, immunomodulatory, antithyroidic, anticancer, and radioprotective effects, protection for central nervous system and against sexually transmitted diseases.	
<i>Pterocarpus marsupium</i> (indiankino tree, bijasar); Fabaceae	Heart wood, leaves, flower, bark, and gum.	contains terpenoids and phenolic compounds: β -sitosterol, lupenol, aurone glycosides, epicatechins, and iso-flavonoids	Antidiabetic property, antiobesity, antihyperlipidemic, anti-inflammatory, anthelmintic, antioxidative, antitumorigenic and antiulcerative, hypoglycemic property but also β -cell protective and regenerative properties.	Tiwari <i>et al.</i> 2015 [85].
<i>Trigonellafoenum-graecum</i> (fenugreek, methi);	Seed, leaves	saponins, 4-hydroxyisoleucine, and trigonelline, an alkaloid and a high-fiber content	Anti-diabetic, antihyperglycemic effect, antifertility	Jhajhria and kumar 2016 [41].
<i>Gymnema sylvestre</i> (gurmar); Asclepiadaceae.	Roots	triterpene saponins, known as gymnemic acids and gymnemasaponins	Antidiabetic, effective against chronic inflammation, obesity, pancreatic β cell dysfunction, hypoglycemic effect, reduction in body weight, plasma proteins, total hemoglobin levels.	Saneja <i>et al.</i> 2009 [84].
<i>Allium sativum</i> (garlic) lahsun; Amaryllidaceae.	Leaves, bulb	allicin, allixin, ajoene, and other organosulphur compounds. exhibit numerous biological effects including lowering of cholesterol and glucose, cancer prevention, and antimicrobial properties, antioxidant and antihyperglycemic effects,	for the management of cardiac diseases, cancer, parasitic, fungal diseases, and diabetes	Alamet <i>et al.</i> 2016 [20]; Yin 2007; [18] Aggarwl and Shishodia 2004 [19]; Tsai <i>et al.</i> 2011[88]. Wang <i>et al.</i> 2010 [97].
<i>Phyllanthus emblica</i> L. (Amla); Phyllanthaceae	Fruits,	polyphenols, minerals and regarded as one of the richest source of Vit. C	energy refilling potential, aperient, antibacterial, antifungal, antiviral activities, along with gonorrhoea, analgesic and skin fairness and to stop nausea and vomiting, antitumour and hepatoprotectiv	Bhide and Nitave 2014; [22] Gaire and Subedi 2014; [37] Kumar and Rana 2012; Sharma <i>et al.</i> 2017 [78]
<i>Myrica esculenta</i> (Buch.-Ham. ex D. Don) I.M. Turner (Kafal, Kaphal); Myricaceae	Fruits, stone and bark	Tannins, Phenolic Acids, flavonoids, Terpenes, Triterpenoids, Proanthocyanidins, Diarylheptanoids, steroids.	Beneficial in cardiac debility, edema and hemoptysis; wax from fruit covering used for ulcer healing; along with anti-inflammatory activity and anti tumour activities.	Nitha <i>et al.</i> 2007 [65]; Dwivedi <i>et al.</i> 2019 [82].
<i>Mentha longifolia</i> (L.) L. (Pipermint); Lamiaceae	Leaf	Apigenin-7-O-glucoside, apigenin- 7-O-rutinoside, and apigenin-7-O-glucuronide, Menthol, Menthone, Pulegone	Use in common fever, coryza, rheumatism, dysentery, Dyspepsia; having cytotoxic, anti-oxidant, antinociceptive, antipyretic and antimicrobial activity,	Naghbi <i>et al.</i> 2005 [66]
<i>Hydrocotyle sibthorpioides</i> Lam. (Brahmni); (Araliaceae)	Leaf	Polyphenols and triterpenes, asiatic acid, madecassic acid (MA), asiaticoside, and madecassoside	Use in treatment of mental disorders, dysentery, diarrhoea, piles, rheumatism, digestive, diuretic, vermifuge, menstrual problem, Alzheimer Disease.	Das and Pathak 2013, Kai <i>et al.</i> 2008 [28]
Datura metel L.(Dhatura); (Solanaceae)	Flower, leaf, seeds, roots	Ropane alkaloids, Atropine, hyoscyamine and scopolamine, 1-oxo-21,24S-epoxy-(20S,22S-witha-2,5,25-trienolide, pyrrole derivative (2'-(3,4-dimethyl-2,5-dihydro-1Hpyrrol-2-yl)-1'-methylethyl pentanoate), Hyoscyamine, datura nolone and fastusic acid and many other tropane alkaloids, Hyoscyamine,3 α ,6 β -Ditigloyloxytropane,3 α ,6 β -ditigloyloxytropan-7 β -ol, tigloidine, apohyoscyine,hyoscyine,3 α -tigloyloxytropane, norhyoscyine, meteloidine, hyoscyamine, cuscohygrine and tropine, 12 β -hydroxy-1,10-seco-withametelinBand1,10-seco-withametelin B	antibiotics, antibacterial, antimicrobial, analgesic, antiasthmatic sedative, anti-spasmodic, anaesthetic, hallucinogenic, anti-asthmatic, anti-spasmodic, anti-tussive, narcotic, bronchodilator, anodyne, hypnotic, mydriatic effects, Anti-rheumatic Neuralgia, Anticancer, Antiproliferative along with insecticidal, herbicidal, Toxicities Cytotoxicity, Hypoglycemic Activity; useful in the treatment of painful Tumors, Scabies, Eczema, Allergyand glandular Inflammations, fever with catarrh, diarrhea, skin disease and cerebral complications treatment	Sakthi <i>et al.</i> 2011 [81]; Soni <i>et al.</i> 2012 [82]
<i>Aegle marmelos</i> (L.) Corrêa (Bel); (Rutaceae)	Fruit and root	coumarins, alkaloids, steroids, and essentialoils, scoparone, scopoletin, umbelliferone, marmesin and skimming. Fruitsin addition contain xanthotoxol, imperatorin and allo imperatorin and alkaloids like aegeline and marmelline, polysaccharides like galactose,arabinose,uronicacidandL-	Astringent, antidiarrheal, antidysentric, demulcent, antipyretic, laxative, cardio protective activity, antimicrobial and antifungal, radio protective activity, Antipyretic and Analgesic, treatment of cold and respiratory infection, antioxidant, hepatoprotective activity, wound healing activity, treatment of the jaundice and	Kesari <i>et al.</i> 2006 [52]; Kala 2006 CCRS. 1999

		rahaminose, Marmelosin, skimmianine and umbelliferone, ascorbic acid, sitosterol, crude fibers, tannins, α -amyrin, carotenoids, and crude proteins, skimmianine, aegelin, lupeol, cineole, citral, citronellal, cuminaldehyde, eugenol, marmesinin, marmelosine, luvangetin, aurapten, psoralen, marmelide, fagarine, marmin, and tannins.	leucorrhoea, conjunctivitis and defenses.	
<i>Trapa natans</i> var. <i>bispinosa</i> (Roxb.) Makino, Singhara; (Lythraceae)	Nut,	carbohydrates, phytosterols, saponins, fixed oils and fat in seed extracts and tannins, flavonoids and glycoside,	useful in diarrhea, dysentery, cardiac diseases, ulcer, blood pressure with having antimicrobial, cytotoxic activities, Analgesic activity, Anti-inflammatory Activity, Neuroprotective Effect, immunomodulator Activity.	Rahman <i>et al.</i> 2000 [72].
<i>Vachellia nilotica</i> (L.) P.J.H. Hurter & Mabb. Babul; Fabaceae	Leaves, roots, bark, gum, seeds, pods	Phytosterols, phenolic, flavanoids, saponins, alkaloids, glycosides, gallic acid, ellagic acid, isoquercetin, leucocyanadin, kaempferol-7-diglucoside, glucopyranoside, rutin, derivatives of (+)-catechin-5-gallate, apigenin-6,8-bis-C-glucopyranoside, m-catechol, kaempferol, condensed tannin and phlobatannin, protocatechuic acid pyrocatechol, (+)-catechin, (-)epigallocatechin-7-gallate, (-)epigallocatechin-5,7-digallate, umbelliferone.	chemopreventive, antimutagenic, antibacterial, anticancer, astringent, antimicrobial, anti-ulcers, anti-inflammatory activities. acrid cooling, styptic, emollient, anthelmintic, aphrodisiac, diuretic, skin diseases, biliousness, toothache, leucoderma, dysentery and seminal weakness.	Shukla <i>et al.</i> 2010 [79]; Agrawal <i>et al.</i> 2010 [20]; Ali <i>et al.</i> 2012.
<i>Ziziphus jujuba</i> Mill., Ber; (Ramanaceae)	Fruits	flavonoids, glycosides, saponins, lignins, sterols, phenols, 3-O-p-coumaroyl pteridic acids, triterpenic acid, betulinic acid,	To increase weight, stamina, improve muscular and liver strength along with diuretic; emollient and expectorant properties, anticancer, pectoral, refrigerant, sedative; to treat stomachache, palpitations, insomnia, nervous exhaustion, night sweats, excessive perspiration, fever, wound and ulcer, asthma and fever.	Sharma <i>et al.</i> 2017 [78]; Zhang <i>et al.</i> 2010.

Worldwide products of medicinal plants

Traditional medicines are popular globally i.e., South American nations, China and India where billions of dollars are spent on pharmacognosy research to identify and market natural drugs even to fight currently untreatable, life threatening disease such as Alzheimer's, HIV, Chronic Pain and malaria. In China, traditional herbal preparations account for 30–50% of the total medicinal consumption and now the annual global market for herbal medicine is over 60 billion USD. Also the demand of medicinal plants increases against pest i.e., antifertility drugs in agriculture field.

These are many medicinal plant ex., *Aloe*, *Tulsi*, *Neem*, *Turmeric* and *Ginger* considered as home remedies as well as important source of nutrition in many parts of the country. Many plant and their derivatives active ingredients as used in aspirin and toothpaste productions. They are also used in productions of pesticides, food, perfumes, tea and natural dye. In most of the countries, various types of medicinal flora are used as repellents for ants, flies, mice and flea. Recently, traditional medicinal plants are considered as major source of pharmaceutical industry.

Table 3: Uses of medicinal plants in different parts of world.

Plants	Uses	Places	Ref
<i>Ziziphus nummularia</i>	Churan (dried fruit powdered with spices)	Western India	Pareek 1983 [70]
<i>Z. mauritiana</i>	Eaten fresh, as dry powder used in baking and to prepare jam; As a traditional loaf Kachaso, a crude spirit; An alcoholic drink is also made in Malawi	Zimbabwe, Africa	Maposa and Chisuro 1998 [60]; Kadzere 1998 [48]; Arndt 2001 [16]; FACT.
<i>Z. jujube</i>	Fruits are used to make a liqueur called 'crema de ponsigue'	South America	Juju 1987 [99]
<i>Z. spina-christi</i>	As food red date	Sudan	Miller <i>et al.</i> 1988 [57]; Gebauer <i>et al.</i> 2007 [36].
<i>Z. jujube</i>	Used as flavoring products	China	Yao 2013 [99].
<i>Z. mauritiana</i>	Jujube tea	India	Meena <i>et al.</i> 2014 [58].
<i>Ficus religiosa</i> Linn	Ayurvedic formulations, such as Nalpamaraditailam, Chandanasavam, Nyagrodhadichurna and Saribadyasavam	India	Simha and Laxminarayana 2007 [83].
<i>Syzygium cumini</i> (L.)	Syzygium Cumini Powder; herbal tea, jamun seed extract, jamun fruit pulp or juice, jamunsarika	Unani, India	Chitnis <i>et al.</i> 2012 [53].
<i>Momordica charantia</i>	Karela powder, karelachuran, Momordica Charantia American Ginseng Extract Capsule S, Hofigal tablets, pure bitter guard, karela extract as anti-diabetic and other ailments.	China, India	Dinakaran <i>et al.</i> 2010 [31]
<i>Ocimum sanctum</i>	Basil tea, SBL Ocimum Sanctum (Dilution) medicine is prepared from fresh leaves., basil oil	India	Bhatt 2012 [25]

<i>Pterocarpus marsupium</i>	<i>vijatsar wood powder and vijsarchuran</i> as anti-diabetic	India, Nepal,	Badkahne <i>et al.</i> 2010.
<i>Trigonella foenum-graecum</i>	Seeds, leaves use a spices and food, antidiabetic, antifertility agents	Indian subcontinent, Eritrea, Ethiopia,	Kor and Zadeh 2013 ^[54]
<i>Aloe barbadensis miller.</i>	Gel and latex use in commercial products; skin conditions like burns, wounds, frostbite, rashes, cold sores, dry skin; for the relief of constipation; use as ingredients in yogurts, beverages, some deserts.	China, India, north Africa, Sudan, Madeira Island, Spain	Pathak and Sharma 2017 ^[68]
<i>Allium sativum</i>	Use as a seasoning or condiment; Antidiabetic; cosmetics products to treat skin acne, skin pigmentation.	All over the world	Gebreyohannes and Gebreyohannes 2013 ^[38] ; Parekh and Chanda 2007 ^[69] .
<i>Agathosma betulina</i>	Tonics, stomachics, aromatic bitters, diuretics and mild urinary antiseptics	South Africa	Van Wyk and Gericke, 2000.
<i>Aloe ferox</i>	Bitter tonics and stomachics; leaf parenchyma gel used to produce drinks, cosmetics and skin care products; also used as a pharmaceutical excipient in novel drug delivery systems from renewable sources.	India, Tibet	Fischer <i>et al.</i> 2000.
<i>Artemisia afra</i>	Bitter tonic and appetite as herbal medicine are used to treat respiratory ailments and stomach pain; also used in perfumes and as flavoring agent.	southern and eastern Africa,	Thring and Weitz, 2006, Neuwinger, 2000, Von Koenen, 2001; Bora and Sharma, 2011.
<i>Adenanthos linearis</i>	Herbal tea with health benefits including anti-spasmodic, anti-oxidant, anti-ageing and anti-eczema activities; milk substitute for infants suffering from colic and has become popular as a health drink because of the absence of caffeine or other stimulants	South coast of Western Australia	Van Wyk <i>et al.</i> 2009; Van Wyk and Gericke, 2000; Van Wyk and Wink, 2004; Joubert <i>et al.</i> 2008; Joubert and De Beer 2011.
<i>Bocconia frutescens</i> (L).	leaves use to stop bleeding and to treat burns, cracked lips, cuts, grazes, itches, mosquito bites, rashes, ringworm, sores, wounds and herpes; herbal tea to treat back pain, bladder and vaginal problems, cough, infertility and unspecified ailments; infusions of the roots to treat blood disorders, convulsions, diabetes, diarrhoea, nausea (vomiting), rheumatism, urinary complaints and venereal diseases.	Mexico, South Africa	Van Wyk <i>et al.</i> 2008; Van Wyk <i>et al.</i> 2009; Van Wyk and Gericke 2000; Rood, 2008
<i>Cyclopia genistoides</i>	Use as tea having health benefits i.e., antioxidant, antimutagenic, anticarcinogenic and oestrogenic activity.	South Africa	Mahomoodally 2013
<i>H. procumbens</i>	Use to treat painful joints, dyspepsia arthritis and loss of appetite.	Kalahari region of southern Africa	Wegener 2000; ESCOP, 2003; Van Wyk and Wink 2004
<i>H. gordonii</i>	Use as food and manufacture commercial products.	Khoi-San	Vermaak <i>et al.</i> 2011 ^[92] .
<i>H. hemerocallidea</i>	Harzol® for the treatment of benign prostate hypertrophy, immunostimulating effects, diversifying range of products used as antioxidants, anti-inflammatories, anti-diabetics and anti-convulsants	Germany, South Africa	Drewes <i>et al.</i> 2008; Owira and Ojewole 2009
<i>L. javanica</i>	Herbal teas to treat bronchitis, colds, coughs and fever	Southern Africa,	Van Wyk <i>et al.</i> 2009; Van Wyk and Gericke 2000 ^[90]

Medicinal plants with some important herbal property

- Many herbal plants are used as blood purifiers by eliminating the toxins from the body.
- Certain antipyretic herbs such as Chirayta (*Swertia*), black pepper (*Piper nigrum*), sandal wood (*Santalum album*) and safflower (*Carthamus tinctorius*) are recommended by Indian herbal medicine practitioners to lower the fever and the production of heat caused by the condition.
- Herbs like root and leaf of marshmallow (*Althaea*) are used to neutralize the acid in the stomach and also act as antacids.
- Indian sages were known to have remedies from plants which act against poisons from animals and snake bites.
- In cough syrup Ginger (*Zingiber officinale*) and cloves (*Syzygium aromaticum*) are used. They have expectorant property which promotes the thinning and ejection of mucus from the bronchi, lungs and trachea i.e., *Eucalyptus*, Cardamom (*Elettaria cardamomum*), and Wild cherry (*Prunus avium*).
- Herbs such as Chamomile (*Matricaria chamomilla*),

Calamus (*Acorus calamus*), Ajwain (*Trachyspermum ammi*), Basil (*Ocimum basilicum*), Cardamom (*Elettaria cardamomum*), *Chrysanthemum*, Coriander (*Coriandrum sativum*), Fennel (*Foeniculum vulgare*), Peppermint and Spearmint, Cinnamon (*Cinnamomum verum*), Ginger (*Zingiber officinale*) and Turmeric (*Curcuma longa*) are used as cardiac stimulants to enhance good blood circulation.

- Certain aromatic plants such as *Hydrastis canadensis* (Golden seal), *Aloe barbadensis* (Aloe), *Berberis vulgaris* (Barberry) and *Swertia* are used as mild tonics to reduce toxic compounds in blood as well as destroying infection.
- Cayenne compound obtained from some herbal plants such as *Capsicum frutescens*, *Commiphora myrrha*, *Cinnamomum camphora*, *Commiphora wightii* are used as stimulants to enhance the activity of organs.
- A broad variety of herbal plants like *Tinospora cordifolia* (Giloe), *Hydrastis canadensis* (Golden seal), *Aloe barbadensis* (Aloe) and *Berberis vulgaris* (Barberry) are used as tonics as well as nutritive.

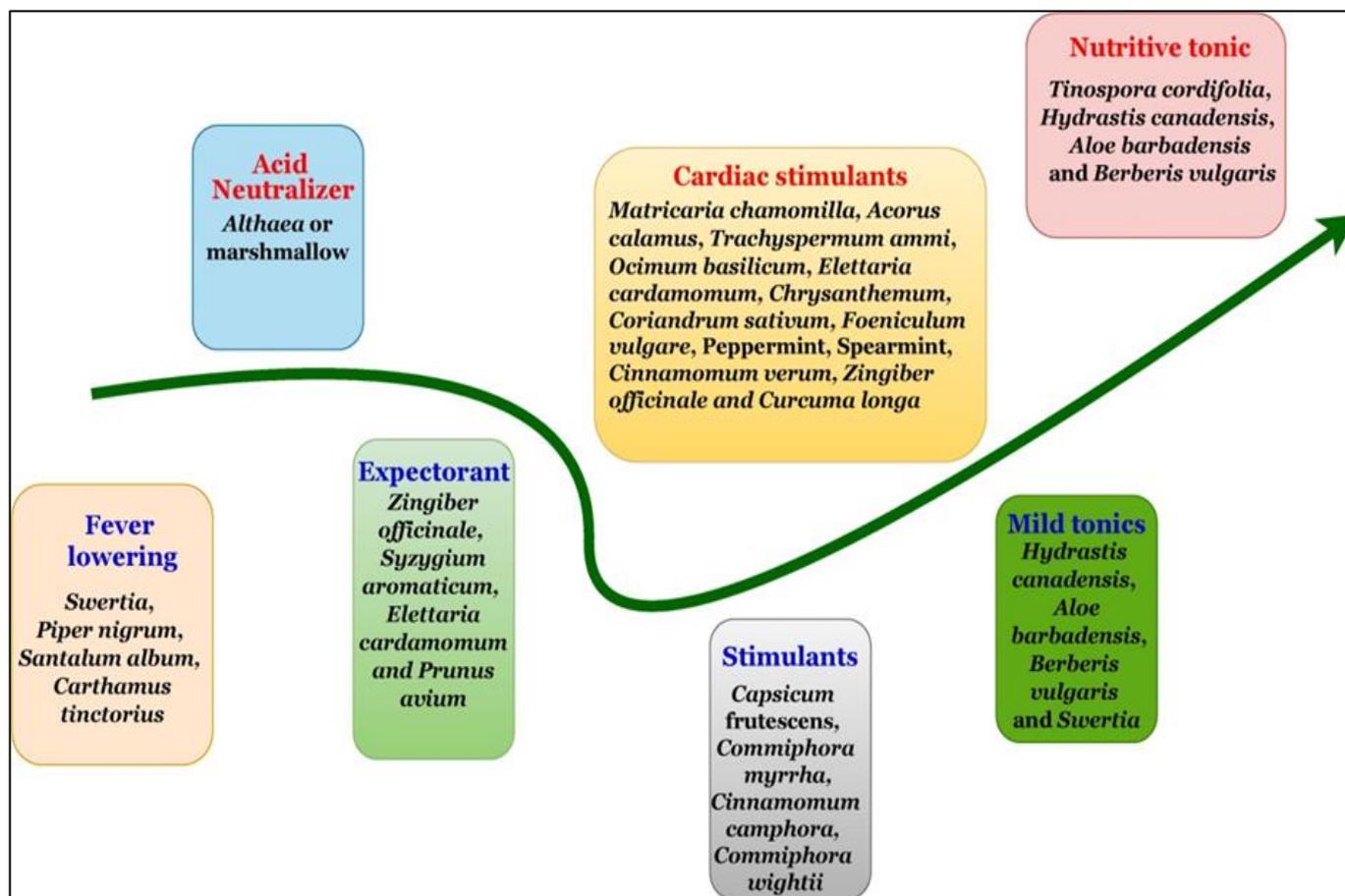


Fig 2: Role of different medicinal plants use in herbal formulation as remedies.

Covid 19 pandemic

The demand of medicinal plants increases during the phase of Covid 19 in 2020. The trade of organic herbal medicinal plants will grow at the rate of nearly 4.7 folds during the forecasted period (owing to high preference for organic products over conventional products). This shift has already been seen in East Asia (growing at 10% CAGR) and in March 2020, amid the global pandemic, main focus of many countries is on the traditional medicines which increase the opportunities for local and international brands supply medicinal plants. In Asia, traditional medicines are considered more reliable than other medicines while in South Asia the medicinal flora used as medicine (nearly 1/3rd of market demand). At the time of pandemic, Covid 19, in China's THM hospital has been used traditional drugs to prevent disease with data showed that the *Calendula* market accounts for approximately 50% of the world herbal medicinal demand which is mostly originated in India. Also this is in great demand from developed nations like Europe, US with top medicinal plants exporting countries like South Africa, Morocco, Bulgaria and Taiwan.

Wild flora importance in treatment and sustainability of their market matters: An official report on treatment version of pandemic "Covid 19" has been provided by the National Health Commission of the People's Republic of China showed a combine use of Traditional and Complementary Medicines (T&CM) and Western modern treatments accurately to treat patients. Root extract namely Liquorice is specifically recommended to prevent COVID-19 symptoms and a study has been screened total 125 traditional herbal medicines with the efficacy to inhibit corona virus (Zhang *et al.* 2020; Luo *et al.* 2020) [1, 10]. On 3rd march 2020, the 7th version of treatment

was issued in which about 13 proprietary traditional medicine formulations (injections, capsules and granules) and 10 T&CM prescribed formulations are officially recommended in China. Approximately 125 floral species's constituents used in various formulations for instance: root from root of *Glycyrrhiza* spp. i.e., Liquorice) used in 11 formulations. These plants are listed in Appendix II-list of CITES i.e., *Panax* spp and *Cibotium barometz*. Plant species are used to form in more than five formulations like *Forsythia suspensa*, *Scutellaria baicalensis*, *Armeniaca* spp, *Glycyrrhiza* spp, *Pogostemon cablin*, *Ephedra* spp, *Atractylodes macrocephala*, *Magnolia officinalis*. Two plant species including *Magnolia officinalis* and *Panax ginseng* are listed on China's grade- II protected species which require proper harvesting and marketing to take place with a grant from rural control and under their imprecision. A sub-set of these floral species is to be originate from the nature and come from China and international markets i.e., *Cibotium barometz*, American Ginseng *Panax quinquefolius* and liquorice root *Glycyrrhiza* spp ("Gan Cao" important TCM ingredient). Two major available trade species are *Glycyrrhiza uralensis* and *Glycyrrhiza labra* of liquor ice from Asia and Mediterranean region. The utilization procedure of traditional medicinal plants to treat covid is similar to treat severe acute respiratory syndrome (SARS) disease which has been studied since 2002-2003 outbreaks. Most frequently plants species used in treatment of SARS such as *Glycyrrhiza uralensis*, *Astragalus membranaceus*, *Schisandra chinensis*, *Atractylodes macrocephala*, *Angelica sinensis*, *Scutellaria baicalensis*, *Panax quinquefolius* and *Lonicera japonica* without any adverse effects (Liu *et al.* 2012). The data released by the National Health Commission of the People's Republic of

China in the response of COVID-during a news conference on 23rd March 2020 has suggest that at the national level about 74,187 infected patients used TCM (91.5%) and 61,449

infected patients used TCM (90.6%) in Hubei. On the basis of clinical analysis, the efficacy of treatment rate is more than 90%.

Table 4:Global market of medicinal plants

Global market	Countries	Compounds annual growth rate (CAGR) from 2014-2025
US pharmaceutical	US, Canada, Mexico, India	Over 45%
Biofuels market	Europe, Asia Pacific, North America, Latin America, Middle east and Africa.	4.5%
Organic skincare and hair products	US, China, Japan, India, Mexico	9.4%
Food industry	Europe, Asia pacific, Latin America, Middle East and Africa, North America.	12.9%
Herbal pesticides	North America, China, Japan India,	7.6%
Nutraceuticals industry	North America Europe, Asia pacific, South America and rest of the world.	7%

Threats and management to conserve traditional medicinal plants

The usage of medicinal plants in developing countries is a result of thousands of years of experience as well is relatively high in health care practices and these practices has been passed down from generation to generation through verbal and written means. This course of information transfer can result in fast depleting or loss of native knowledge and scarcity traditional medicinal plants because of globalization, modernization and the potency to change traditional lifestyles (Agra *et al.* 2008) ^[14]. Deleterious harvesting also brings about scarcity and disappearing traditional medicinal plants. The damaging habitat by export of medicinal flora collected from wild sources resulted to irreplaceable loss of genetic stock of many traditional plant species globally. In India, the ministry of environment and forests (2014), notifies about 29 different plant species which are banned for exports like *Katuki* (*Picrorhiza kurroa* Royle ex Benth.), *Vatsanabha* (*Aconitum* species), *Jatamansi* (*Nordostachys grandiflora* DC.), *Aguru* (*Aquilaria agallocha* Roxb.), *Trayamana* (*Gentiana kurroo* Royle), *Sarpagandha* (*Rauwolfia serpentina* [L.] Benth. ex Kurz), *Ativisha* (*Aconitum heterophyllum* Wall.), *Kiratatikta* (*Swertiachirata* [Roxb. ex Fleming] H. Karst.) and *Raktachandana* (*Pterocarpus santalinus* L.f.) etc. used for Ayurvedic drug formulations purposes. It is needed to conserve via *in situ* and *ex*

situ conservation, cultivate medicinal flora species for prevention of further depletion of herbal wealth and necessity to be tapped and documented properly. Because of natural and anthropogenic activities is resulted in the loss valuable indigenous knowledge of traditional medicinal plants. For example, in traditional ethno pharmacy the demand and renewed global interest increasing, coupled with the increasing preference for natural substances in the health care system which put the natural stock of traditional medicinal flora of Himachal Pradesh, India is under frightful pressure (Dhar *et al.* 2000; Samant *et al.* 2007) ^[89]. This link suggests that we need to conduct more ethno-botanical research, document the medicinal plants properly and to store this indigenous knowledge. These data are actually useful to identify and classify endangered herbal floral species and to take accurate conservation efforts in the coming days (Karunamoorthi *et al.* 2009a; Karunamoorthi *et al.* 2009b; Lulekal *et al.* 2008; Karunamoorthi and Tsehaye 2012) ^[49, 55, 112, 113]. Only 7% medicinal and aromatic plants (MAPs) information about the global threats to species survival is of approximately 20% of these species are threatened with extinction in the wild based according to IUCN Red List criteria. Globally MAPs traded has nearly threefold in the past 20 years i.e. from 1999 (USD1.1 billion) to 2015 (USD3 billion).

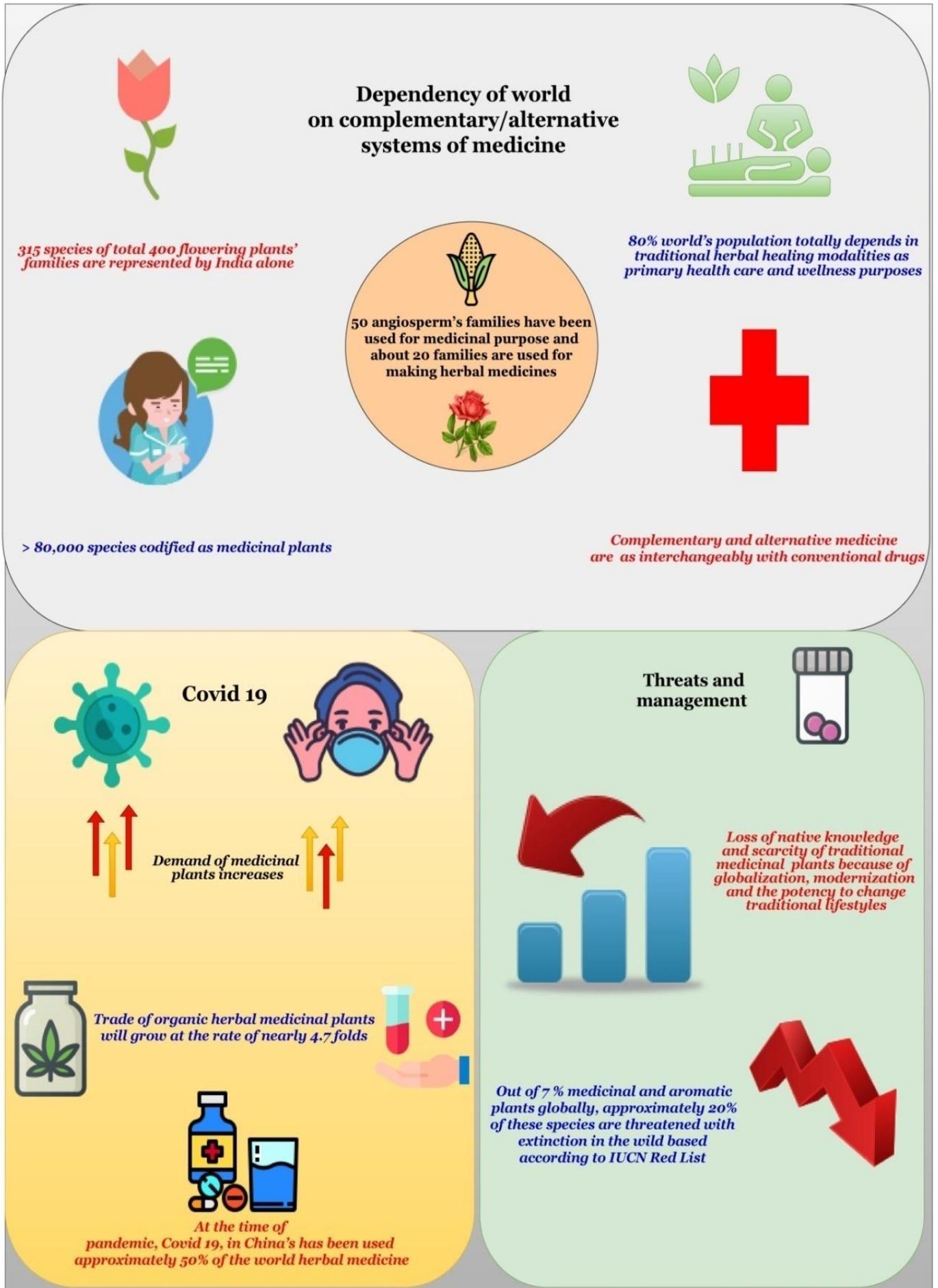


Fig 3: Overview of dependency on conventional medicinal systems in global level.

Conclusion

Traditional medicines or folk medicines are prolific sources of useful drugs and therefore, great emphasis has now been laid to revive the study of medicinal plants/traditional system of medicine/Indigenous drug. India grows 1500 to 2000 species of medicinal plants in forest and waste lands most of which have been identified, can be exploited for commercial purposes. Govt. has formulated diverse schemes to preserve Indian medicines to produce herbal drugs to open a central cell on medicinal and aromatic plants. Large scale production of medicinal plants is also mooted on Indian hills and plains following scientific extraction of chemicals from them. The respect for primitive wisdom is reflected in the form of phytotherapy and phyto-pharmaceutical. The consciousness of the significance of medicinal flora in health protection of human is principal as scientific assessment commitment their future utilize in the growth of novel medicines for emerging ailments. The knowledge on traditional medicinal flora, their dosages and the disease treated might be steadily eroded in the coming days as of the noticed poor data keeping and the rise utilization of modern medication. Therefore the proper directory can be used as a source of knowledge for the conservation organization to allow genuine management of floral biodiversity and its resources and the future availability of floral ingredients to support medications is totally dependent on highlighting the conservation and sustainable use of original plant species in the deep-rooted. On the part of governments, consumer and private sector to address the availability of plant species on long term bases, much greater action are required.

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