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19. Ayurveda: Ancient Indian medicinal knowledge and emerging scope to sustainable global health in the modern era

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Abstract:

*Ayurveda is one of the ancient traditional medicine systems originated in the Indian subcontinent over 5000 year ago. Ayurvedic medicine knowledge system is a holistic concept of health remedy which based on principle of harmonizing connection between human health constitution (body, mind, and spirit) with nature. Ayurveda based on three fundamental body aspects "Trido*shas" *(*Vata, Pitta, *and* Kapha*); symbolizes body energies and their connections with environment (nature) for well being. Ayurveda has ability to maintain and balance overall health via using natural resources and life style management i.e., herbal therapy, natural detoxification techniques, dietary regulation, mental health practices (yoga and meditation) to achieve sustainable way of overall health and vitality.*

In the fast-paced modern era, unbalanced lifestyle, unhealthy diet, stresses, pollutions affect our physical, mental and social health badly which thrives people towards serious concern about their wellness. After Covid19 pandemic era, global interest has been increased toward traditional Ayurvedic medicine system in combating this pandemic era via improving stress management, respiratory functioning and immunity. Numerous Ayurvedic nutraceuticals and health products have originated in national and international market. Several recent scientific researches well validate that ayurveda not only proven its high efficacy in managing viral Covid19 pandemic, while it also have great significance in preventive cure/

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control of various chronic diseases; pulmonary problems (asthma), cardiac disease, diabetes, hypercholesterolemia, cancer, age-related degenerative diseases (arthritis, alzheimer's disease) which are difficult to cure in modern medicine practicing (Kumar et al., 2022; Chouhan et al., 2024). Least side effects, preventive approach in several chronic diseases, low cost herbal drugs, broad affectivity against microbial based pathogenecity are some reasons for renewed public interest in Ayurvedic medicine system. Ayurvedic knowledge system is a precious gift from our ancestors trailing to us. However, it still needs more exhaustive exploration to gain deeper perspicuity and to achieve new avenues in herbal drug discovery and naturopathy

Key words: Ayurveda, ancient medicine**,** chronic diseases, naturopathy, modern era

Introduction

In modern medical science, even after enormous scientific interventions, clinical researches, technology and synthetic derived medicines, quality healthcare is a major global challenge. The inefficacy of modern medicines in curing certain chronic and metabolic diseases, adverse side effects, high cost value urge the critical need to develop an effective and safe alternate healthcare system Indian traditional medicinal system (Ayurveda, Siddha and Unani) has a very ancient and rich history of their effectiveness; mentioned in Veda and other ancient scriptures (Thakar, 2010; Pandey et al., 2013; Shi et al., 2022). Ayurveda is India's traditional indigenous medical system having rich knowledge of nature derived medicine. It is the most ancient yet living medical practice which has been prevalent by common folk in around for over 5,000 years and from the vedic era. Even modern research also acknowledged the importance of this. The literal meaning of Ayurveda is the "study of life" derived from sanskrit word "Ayush" (life process) and "Veda" (knowledge). It based on principle of holistic approach of health, focus on preventive care, via rejuvenating the equilibrium between mind, soul and body in harmonized way for complete life well-being. Ayurveda's primary emphasis is maintaining health and well-being via strengthening the immunity system of the body and the prevention and treatment of diseases. Ayurvedic medicine relies greatly on the use of plant-based formulation as source of medicines to improve the quality and sustainability of life.. Along with herbal remedy, ayurvedic therapies also include nutritional/balanced diet regulation, yoga, meditation, herbal oil and massage therapy. Rural and remote area people around the world especially of India sub-continent zone India, Bangladesh, Sri Lanka, and Nepal commonly rely upon herbal medicine for primary health care because of its traditional practice and easy formulation by available herbal resources as Indian sub-continents are rich repository of herbal plant resources. Ayurvedic medicines contribution not limited to primary healthcare, also having significant contribution in lifestyle-led chronic diseases (CDs) like diabetes, cardiac diseases, asthma, Alzheimer's, Parkinson's disease, cancer, microbial infections (Sharma et al., 2015; Chouhan et al., 2023). Various evidences based scientific interventions and clinical studies on CDs patients. Many Ayurvedic research papers have been published during the recent Covid 19

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pandemic which thrive worldwide attention towards importance of Ayurveda for providing strong and resilient body immunity to fight against Covid19 virus and other related side effects (Goyal et al., 2020; Girija and Sivan 2022; Rastogi et al., 2022). Evidence-based researches prompted an increased focus of modern medical based scientists and doctors on developing clinical profiling of classical Ayurvedic literature.

Therapeutic potency of some common Ayurvedic plants

Based on the ancient literature reviews and information collected from ayurvedic practitioner some commonly used ayurvedic herbal plants are summarized in <Table 1>. The herbs mentioned in this table are commonly used herbs by local people, ayurvedic practitioners, Vaidyas, based on relevant experience, clinical studies and various literature exploration (Pandey et al., 2013; Kumar et al., 2017; Mann and Pathak 2018; Gautam et al., 2023). Based on scientific validation and tested results these plants are highly useful in treating many primary healthcare problems as well as severe chronic diseases (Shrivastava et al., 2020; Kumar et al., 2022). In the Table 1 herbs are explained in terms of its ayurvedic/ common name, scientific name, important medicinal active metabolites and referred therapeutic potency Based on method of extraction/ preparation. these herbs are named as i) *Svarasa* (fresh juice form) ii**)** *Kvatha* (decoction), iii) *Kalka* (crushed paste form) iv) *Hima* (in cold water) v) *Yhant* (in hot water) (Mann and Pathak, 2018).

Table 1 Some Traditional medicinal plants used in Ayurveda with description of their medicinal active metabolite and therapeutic potency

S. no.	Scientific name	Common / Ayurvedic name	Family	Medicinal active metabolites	Therapeutic potential
1.	*Achyranthes aspera*	Chirchita, Apamarga	Amaranthaceae	saponins, alkaloids, tannins, phenolic compounds, steroids	Hepatoprotective
2.	*Acorus calamus*	Bach	Acoraceae	α- and β-asarone,	Brain rejuvenator, boosting nervous system
3.	*Adhatoda vasica*	*V*asaka	Acanthaceae	Mimosine alkaloid, tannins, and turgorins	For cough, diarrhea piles, hyperglycemia
4.	*Alstonia scholaris*	Saptaparni	Apocynaceae	scholaricine, 19-epischolaricine, vallesamine, and picrinine,	to treat lung diseases (Fever, Malaria)
5.	*Alternanthera sessilis*	gudrisag	Amaranthaceae	alkaloids, terpenoids, , polyphenols, saponins, cardiac glycosides,	to treat wounds, nausea, vomiting, cough, bronchitis,

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				quinones, phytosterols	diarrhea, dysentery, diabetes, anti-hypertensive
6.	*Angrographis paniculata*	Kalmegh	Acanthaceae	Andrographic acid, andrographolide	anti-dote aginst snake-bite and poisonous insect stings, \anti-malarial, anti-diabetic, anti-inflammatory effect
7.	*Asparagus racemosus*	Satavar	Asparagaceae	Asparagamine A(alkaloid), asparanin A, shatavaroside A	For constipation, dyspepsia, stomach spasms, ulcers, tuberculosis, diabetes, cancer
8.	*Azadirachta indica*	Neem	Meliaceae	**Azadirachtin,** mevalonic acid, squalene, nimbin, nimbiol, polyphenolic	Skin problem, Intestinal , Fever, Diabetes
9.	Bacopa monnieri	Brahmi	Plantaginaceae	Bacosides	for mental retention
10.	*Berberis* genus	barberry	Berberidaceae	Berberine	For curing infections, inflammation, and cancer,
11.	*Boerhavia diffusa*	*Punarnava*	Nyctaginaceae	Rotenoids, Punarnavine	inflammation, Hepatoprotective, diuretic
12.	*Bryophyllum pinnatum*	Pattharchatta	Crassulaceae	bufadienolides, flavonoids, triterpenes	for diabetes, diuretic, dissolving kidney stones, respiratory tract infections
13.	*Calotropis gigantea*	Aak, Mudar	Apocynaceae	Cardenolides, pregnanones, triterpenoids	to treat asthma, colds, coughs, diarrhea, fever, leukoderma, rheumatism
14.	*Catharanthus roseus*	Sadabahar	Apocynaceae	Vinblastine, Vincristine Rubacine, catharanthine, serpentine, tabersonine, vindoline,	Anti-cancerous agent, anti-rheumatic, muscular pain relevant, against mental depression,

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				Ajmalicine, tryptamine, secologanine	insect bite, diabetes, stomach ache
15.	*Centella asiatica*	Gotu Kola	Apiaceae	triterpenes (asiatic acid, madecassic acid, asiaticoside, and madecassoside)	nervous disorders, epilepsy,premature aging, brain tonic
16.	*Chlorophytum borivillinum*	Safed musli	Asparagaceae	Saponin, β-Sitosterol and Taraxerone	For boosting general body immunity, high spermatogenic potency, well known to cure many physical illness and weaknesses
17.	*Commiphora mukul.*	Guggul plant		Guggulsterone	hypolipidemic agents,
18.	*Curculigo orchioides*	Kali musli	Hypoxidaceae	phenolic glucosides (curculigoside H and orcinoside I)	*rejuvenating tonic, diuretic,* jaundice, gonorrhoea
19.	Curcuma longa	Haldi/ Haridra	Zingiberaceae.	Curcumin	For curing infections, inflammation, and cancer,
20.	*Cyanthillium cinereum*	Sahadevi	Asteraceae	Phenolic acid (3-O-caffeoylquinic acid and luteolin-7-O-glucoside), Glycosides,Terpenoids, Sterols, Saponins,	To treat snae poison, conjunctivitis, arthritis, rheumatism
21.	*Cymopogon citrates/*	Bhustrina/ Lemongrass	Poaceae	Z-Citral	used as antiseptic and astringent, for treating digestive tract spasms, stomach pain and spasm, cough, vomiting, high blood pressure etc.
22.	*Cymbopogon winterianus*	Lemongrass	Poaceae	Citronellal, Geraniol	Anti-spasmodic, diuretic increase appetite, insect repellent, anti-

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					microbial and anti-fungal agent etc.
23.	*Eclipta prostata*	Bhringaraj	Asteraceae	Echinocystic acid and ecclalbasaponin II	Neuro-protective, hair and skin tonic, anti-cancerous
24.	*Ficus benghalensis*	Bargad	Moraceae	phenolics, flavonoids, carotenoids, coumarins, anthraquinones, tannins,	Diabetes, Arthritis, diarrhea, dysentery Constipation
25.	*Ficus religiosa*	Peepal	Moraceae	Kflavonoids (aempeferol, quercetin, myricetin), 1,2-benzenediol, caffeine stigmasterol	skin diseases, constipation, dysentery, impotency, asthma, snake bite
26.	*Gloriosa superba*	Kalihari	Colchicaceae	Colchine, colchicoside, Gloriosine	For snake and insects bites, dermal problems, infertility, arthritis, kidney problems, cholera, cancer, abdominal pains, infertility
27.	*Gymnema sylvestre*	Gurmohar	Apocynaceae	gymnemic acids (triterpenesaponins), gurmarin	ant-diabetic, for arthritis, anemia, osteoporosis, cardiac disorder, asthma, indigestion
28.	*Jatropha curcas*	Jatropha	Euphorbiaceae	tannins, alkaloids, phenols, flavonoids, glycosides and saponins etc.	anti-fungal, anti-bacterial, anthelmintic, for skin problems (eczema, ringworm), dysentery, diarrhea etc.
29.	*Mentha arvensis, Mentha spicata, Mentha piperita*	Pudina	Lamiaceae	Geraniol, linalool, carvone, piperitenone, menthofuran, menthone, menthol isomers	Used as carminative, antispasmodic gastrointestinal problems, indigestion, vomiting

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30.	*Mucuna pruriens*	Kevanch	Fabaceae	saponins, stigmasterol and hecogenin	for Parkinson's disease
31.	*Ocimum sanctum*	Tulsi	Lamiaceae	Eugenol, b-caryophyllene, b-elemene, ethyl linoleate, camphenol, humulene, selinene, cadinene etc.	antioxidant, anticancerous, anti-diabetic, anti-microbial, analgesic agent, hepatoprotective and cardioprotective effect
32.	*Phyllanthus amarus*	Bhui-amalaki	Phyllanthaceae	Phyllanthins	Anti-virals
33.	*Phyllanthus emblica*	Amla	Phyllanthaceae		Rejuvenating, anti-aging, Nerve detoxifying agent
34.	*Picrorhiza kurroa*	Kutki/ atuka	Plantaginaceae	Picrosides	hepatic protection, anti-carcinogenic potency
35.	*Piper longum*	Pippli	Piperaceae	piperine, isopiperlongumine and piplartine	Having antioxidative, analgesic, antipyretic, antithyroid, antiasthmatic and CNS depressant activities, remedy of tumor, respiratory, cardiac and mental disorders
36.	*Psoralea corylifolia*	Bakuchi	Leguminosae	Psoralen	For vitiligo, psoriasis
37.	*Rauvolfia serpentine*	Sarpgantha	Apocynaceae	Rauwolfinine, reserpine, thebaine (indole alkaloids),	for hypertension
38.	*Withania somnifera*	Ashwagandha (Indian ginseng)	Solanaceae	withanolides (lactones), alkaloids, glycosides, steroids, sterols etc.	antioxidant, anti-inflammatory, immune-boosting potency, for anxiety, arthritis, impotence, cancer, neurodegenerative

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	and cardiovascular diseases

Ayurveda treatment strategy and its integration in modern health practices

Ayurveda treatment based on holistic strategies of body, soul and mind wellness via balancing the Tri-doshas (vata, kapha, and pitta), alleviate disease symptoms, promote self-healing, optimized body health via improving natural detoxification and strengthening immunity power via using herbal medicines, maintaining healthy life style routine, Yoga, meditation, herbal massage and natural oil therapy (Singh et al. 2024). As Ayurveda has strong faith that nature and body itself has remedy against illness. Herbs rich in various medicinal active metabolites are believed to possess various specific medicinal properties that have high potency to cure various chronic disorders (Table 1). Different treatment modalities in Ayurveda are i) Healthy sattvic diet and balanced nutrition ii) Panchakarma iii) Yoga and meditation iv) Ayurvedic massage, herbal facial and body treatment (Verma et al., 2024). Ayurvedic principles and methods are increasingly being integrated into mainstream medical care, to provide a comprehensive approach to healthcare. In modern health practices, the amalgamation of Ayurveda integrating with modern drugs combining the strengths of both systems and is supposed to be the best way of treatments for various chronic diseases, stress management and mental health (Sharma and Prajapati, 2020) and the integration of Ayurvedic principles into modern medicine can provide a more comprehensive approach to patient care against severe chronic diseases. For example, rheumatoid arthritis (a chronic, immune-modulatory disease), diabetes (chronic metabolic disease), Alzheimer's disease are well treatable with complementary integration of Ayurvedic medicines in modern Western medicine (Chauhan et al., 2015; Sharma et al., 2019; Thomas et al., 2023). Ayurvedic therapies can reduce the conventional treatments' side effects and helps to promote a faster recovery (Kumar et al., 2022; Verma et al., 2024).

Global approach of Ayurveda in modern era:

World Health Organization (WHO) has paid high attention towards traditional medicine system for health care practices after its wide recognition and global acceptance in collaboration with modern medicine. during and after Covid19 pandemics. The WHO recently in year 2020 established the Global Centre for Traditional Medicine in in Jamnagar, Gujarat, India focusing on scientific innovations and technology, literature and data learning, data analysis to optimize contribution of traditional medicines to global health and sustainable developmental goals (SDG) (Nedungadi et al., 2023). To meet the global demand for value-added healthcare system, UN SDG agenda which is going to be attained by 2030 emphasizes on environmental and societal health concern and holistic approach of Good health and well-being. Ayurvedic and traditional knowledge system of India is expected to contribute significantly to SDG. This prompted an increased on Ayurveda pressure to generate scientific evidence of safety and efficacy.

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Challenges and Recommendations: However, the comprehensive basic knowledge of the Ayurveda is poorly acceptable in medicine practice due to lack of scientific evidence based clinical practice. There are many avenues still needs to be explored by the researchers and practitioner i.e., proper mode of action, pharmacology, pharmacovigilance and their physiological aspects of medication of phyto-components for contributing their vast scope in the future needs to fully explore. Other major barrier is lack of awareness and limitation of literature availability in different languages around the globe. Major recommendations for recognition and global acceptance of Ayurveda in worldwide plate form is i) increasing government funding and policy making for Ayurveda research ii) translate experience based finding into clinical validation iii) extensive exploration of phytometabolites and phytochemical formulation iv) sustainability approach

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