

Invitable clinical significance of Herbal Phytochemicals

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DOI 10.51129/ujpah-2024-37-2(11)

Received – November 18, 2024

Revised – November 21, 2024

Accepted – November 25, 2024

Published – December 07, 2024

Abstract- The most important and promising source of phytochemicals are traditional plants for herbal medicines preparation. Now a days the pharma industry has been forced by unwanted side effects, drug resistance and rise in population to speed up the development and processing of phytochemicals from plants used as herbal medicines to address current health scenario. Medicinal herbal plants not only serve as complements or substitutes for conventional treatments, which are often inadequately available but also enhance the health and security of indigenous population. Thus, these herbal plants play indispensable roles in daily life and are deeply connected to diverse socio-cultural, and economic events associated with life, aging, illness, and death. It has been evident from previous so many researches that the herbal plants have the potentiality of its medicinal value because

it is a rich sources of phytochemical ingredients. Present review is an attempt to explore the clinical vitality of phytoconstituent of traditional herbal plants and their potentiality in protecting against different types of diseases.

Keywords: Phytochemicals, Herbal medicines, Traditional herbal plants

Introduction

Phytochemicals are nutritional/non-nutritional bioactive compounds present in different parts of plants, fruits, vegetables and cereals. They may have health advantages in addition to basic nutrition, such as protecting/lowering the risk of major chronic diseases. The major phytochemicals present in plants are carotenoids, polyphenols, isoprenoids, phytosterols, saponins, dietary fibers, and polysaccharides etc. These phytochemicals shows strong antioxidant activities and

exhibit antimicrobial, antidiarrheal, antihelminthic, antiallergic, antispasmodic, and antiviral activities, help to regulate gene transcription, enhance gap junction communication, improve immunity, and provide protection against lung and prostate cancers^[1-6].

As per WHO, the primary health care of most population of developing countries depend on traditional medicines and mostly

natural plant products (Vines 2004). About 75–90% of the rural population in the world (excluding western countries) relies on traditional system of medicines as their only health care system and is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs in a way conventional medicine does not (Fassil Kibebe 2001).

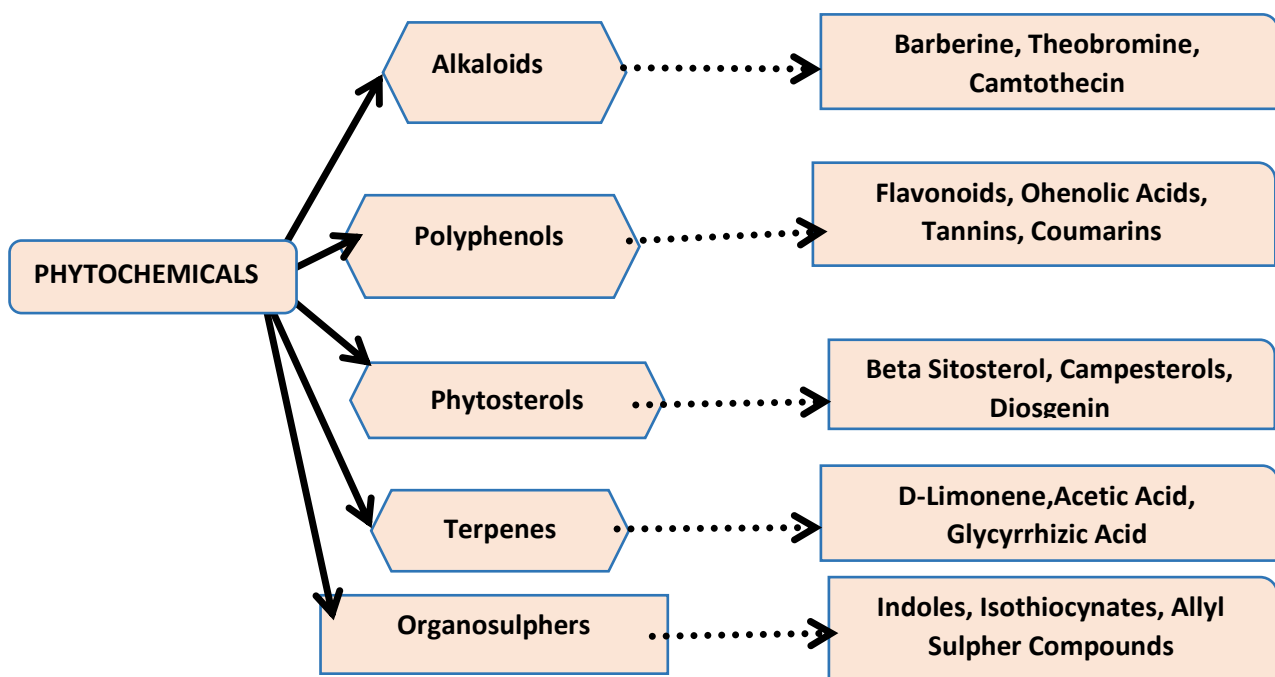


Figure- 1 Different Variants of Phytochemicals

Phytochemicals includes a variety of plant ingredients having different structures and are capable of health-promoting effects. These are natural substances but are not called nutrients in the traditional sense, since they are synthesized by plants neither in energy metabolism nor in anabolic or catabolic metabolism, but only in specific

cell types. They occur only in low concentrations and usually have a pharmacological effect. Since antiquity, these effects have been used in naturopathy in the form of medicinal herbs, spices, teas, and foods. With the development of highly sensitive analytical methods, a variety of these substances could be identified. These

phytochemicals may have health benefits or adverse health effects, depending on the dosage^[7].

Aims and Objectives

1. To explore the concepts of Phytochemicals
2. To explore the relationship between Phytochemicals and health related benefits
3. To explore the therapeutic utility/vitality of Phytochemicals

Material and Methods

The articles were searched for in research engines such as Google Scholar, Research Gate, Science Direct, and Pub Med. Synonyms and alternative words were identified and used to obtain the current literature. The major search terms and key words used were phytochemicals, traditional herbs, phytosterols, major bioactive compounds in plants, carotenoids, isoprenoids, saponins, anthocyanins, flavonoids, dietary fiber, polysaccharides in plants, health benefits of phytochemicals.

Why phytochemicals are important:

Phytochemicals are nothing but plant metabolites, biologically active compounds and are naturally present in plants. They provide health benefits for humans beyond those attributed to common nutrients. Their biological activities include antioxidant and antimicrobial activities, detoxification

enzyme modulation, and immune system stimulation, as well as hormone metabolism modulation. These are not vital nutrients, and are not needed by the human body to sustain life, but they do have important properties to prevent or combat some common diseases (Acidri et al., 2020; Saxena et al 2013). In view of that, phytochemicals play significant role in protecting against cardiovascular diseases, cancer and other chronic degenerative diseases such as cataracts, macular degeneration, neurodegenerative diseases and diabetes mellitus (Farah & Donangelo, 2006; Patay et al., 2016; Saxena et al., 2013). Phytochemicals are an important component of the human body, particularly in their role as antioxidants. They serve as a protective shield for cells, defending cells against the injury (Oxidative stress) caused by free radicals. The antioxidant properties of some phytochemicals, such as carotenoids and polyphenols, are especially strong, enabling them to neutralize free radicals and reduce oxidative stress^[8-10]. It has been shown in so many previous researches that higher levels of carotenoids- α -carotene, β -carotene, β -cryptoxanthin, lycopene, and lutein/zeaxanthin, and polyphenols in the diet or plasma are associated with to lower frailty and a reduced risk of cardiovascular disease . In addition, phytosterols, which can be found in nuts and unrefined pressed oils, have

been linked to cholesterol reduction^[11-15]. In recent times, phytochemical index (PI-Dietary index), has been developed to efficiently evaluate the health related effects of phytochemical-rich foods in large population-based epidemiological studies. PI serves as a convenient surrogate measure of phytochemical intake.

Therapeutic benefits of important phytochemicals

Phytochemicals are low-molecular-weight (LMW) secondary metabolites that play a

significant role in the normal cellular metabolic process and promote health and disease prevention^[16]. Primary metabolites comprises of glucose, starch, polysaccharide, protein, lipids and nucleic acid which are helpful for growth

and development of the human body. Plants produce secondary metabolites which include alkaloids, flavonoids, saponins, terpenoids, steroids, glycosides, tannins, volatile oils etc^[17-18].

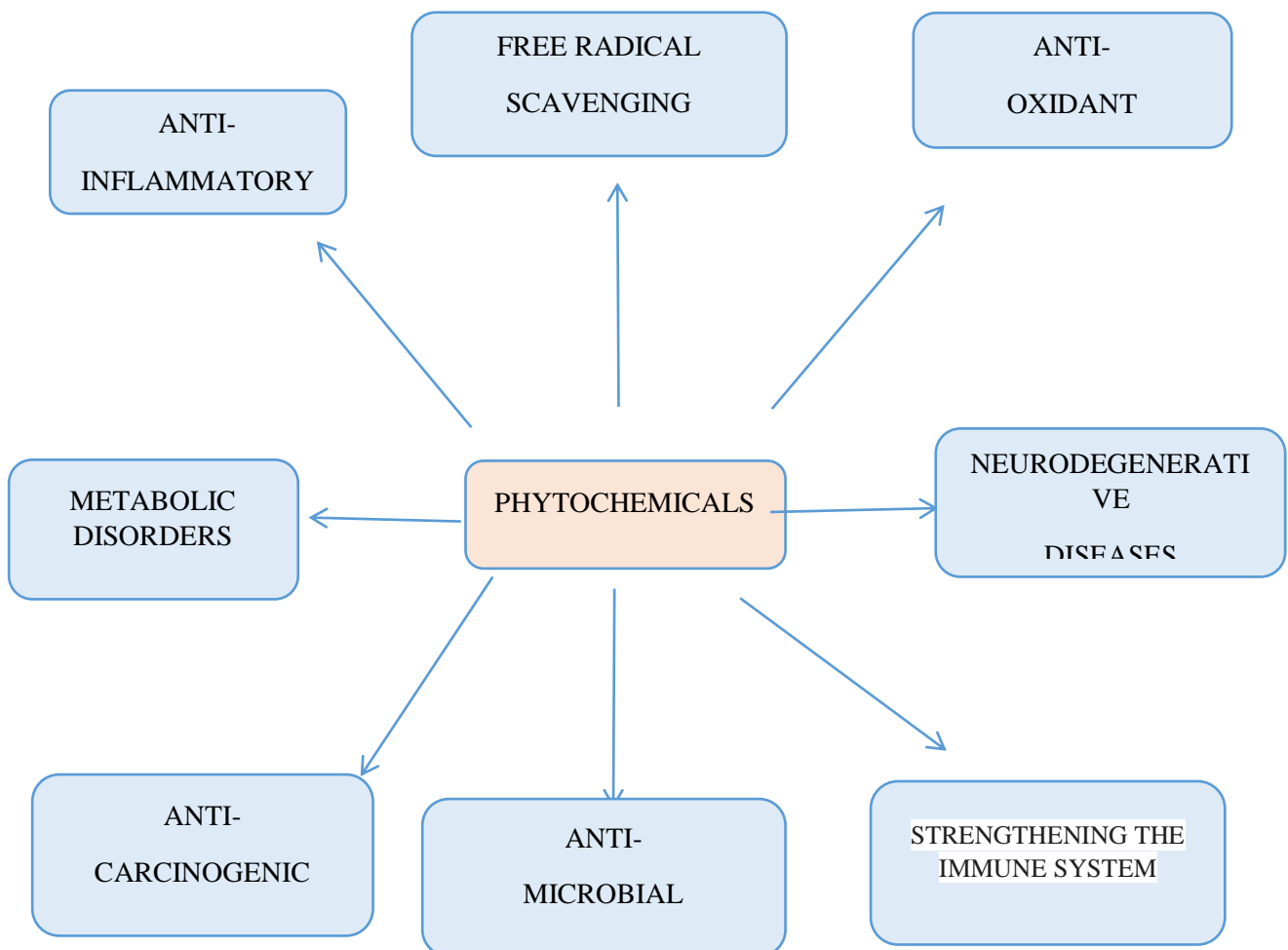


Figure- 2 Different functions of Phytochemicals

Alkaloids-having pharmacological importance like antihypertensive (many

indole alkaloids) and antiarrhythmic (quinidine, sparteine), antimalarial activity

(quinine) and anticancer actions (dimeric indoles, vincristine, vinblastine). Some alkaloids contain caffeine, nicotine, and morphine etc possessing the stimulant property and used as the analgesic and quinine as the anti-malarial drug^[19].

Carotenoids- are bright yellow, red, and orange-colored pigments found in plants, algae, and photosynthetic bacteria, abundantly found in carrots (*Daucus carota* L.), tomatoes (*Solanum lycopersicum* L.), parsley (*Petroselinum crispum* L.), orange (*Citrus sinensis* L.), cabbage (*Brassica oleracea* L.), spinach (*Spinacia oleracea* L.), fenugreek (*Trigonella foenum-graecum* L.), and green leafy vegetables, health benefits of carotenoids include gene transcription regulation by lutein, α -carotene, and β -carotene, enhancement of gap junction communication by β -carotene, improvement of immunity by β -carotene, lutein; protection against lung and prostate cancers by α -carotene, β -carotene, lycopene, and zeaxanthin^[20-23].

Polyphenols- has four major sub-classes, such as flavonoids, stilbenes, phenolic acids, and lignans. These are abundantly found in artichoke (*Cynara cardunculus* var. *scolymus* L.), spinach (*Spinacia oleracea* L.), broccoli (*Brassica oleracea* var. *italica* L.), chicory (*Cichorium intybus* L.), flax (*Linum usitatissimum* L.), onion (*Allium cepa* L.) etc. Health benefits of polyphenols include action against free

radicals; protective effects against cardiovascular diseases, cancers, and other age-related diseases; and prevention of inflammation and allergies. Flavonoids have been also found to be useful in angina, cervical lesions, chronic venous insufficiency, dermatopathy, diabetes, gastrointestinal disorders, lymphocytic leukemia, menopausal symptoms, rhinitis, traumatic cerebral infarction, etc.^[24-26].

Phytosterols- collective name of plant sterols and stanols, abundant in olive oil, oils of corn (*Zea mays* L.), sesame (*Sesamum indicum* L.), sunflower (*Helianthus annuus* L.), peanuts (*Arachis hypogaea* L.), beans (*Phaseolus vulgaris* L.), and almonds (*Prunus dulcis* L.), Health benefits in general, include support for prostate health, hair growth, reduction in LDL cholesterol, and high antioxidant activity^[27-28].

Saponins- abundant in the legumes viz. black gram (*Vigna mungo* L.), garden pea, (*Pisum sativum* L.), pigeon pea (*Cajanus cajan* L.), and common bean (*Phaseolus vulgaris* L.). The general impact on health includes- acute impact injuries, erectile dysfunction, venous edema in chronic deep vein incompetence, and SLE^[29].

Polysaccharides and Dietary Fibers- may be storehouses of energy such as starch and glycogen or non-digestible components such as cellulose, pectin, beta-glucan, hemicelluloses, resistant starch, lignin, etc.,

and are collectively known as dietary fiber. These components are not digested by human digestive system but are broken down by the gut microbiota in the large intestine, where they selectively support the growth of healthy microorganisms. All plant-based foods are rich sources of dietary fiber e.g. chicory, tamarind (*Tamarindus indica* L.), barley (*Hordeum vulgare* L.), corn, oats (*Avena sativa* L.),

wheat (*Triticum aestivum* L.), and green beans (*Phaseolus vulgaris* L.). The regular consumption of dietary fiber helps to prevent cancer, inflammation, hypertension, hyperlipidemia, hypercholesterolemia, obesity, and cardiovascular diseases, as well as improving insulin sensitivity and promoting healthy microbiota in the gut^[30-31].

Table-1 Some traditional herbs their phytochemicals and health related benefits:

HERBS	PHYTOCHEMICALS	BENEFITS
Aloe vera (Ghrit Kumari)	β -sitosterol, campesterol, emodin and aloin	Anti-diabetic,healing properties,antiseptic effects, anti-viral and anti tumor, Helps to nourish skin and hairs Mittal et.al 2014
Curcuma longa (Haldi)	Flavonoid	Anti-inflammatory, anticancer,hepato-protective Sharma et.al 2013
Azadirachta Indica (Nimb)	Di and Tri terpenoids, limonoids	Blood purifier,anti-diabetic, inhibit colon cancer, anti-allergic Gupta et.al 2014
Phyllanthus emblica (Amla)	Emblicanin B, punigluconin and pedunculagin	Good for skin, eyes and hairs, antiviral,anticancer, antidiabetic, and hepatoprotective Paarakh et.al 2010
Allium sativum (Lasun)	Allicin	Anti-inflammatory, cardioprotective Joshi et.al 2005
Tinospora cordifolia (Giloy)	Tinosporin, isoquinoline alkaloids	Cardioprotective,anti-diabetic, Immuno-modulator, chemo prevention Nisar et.al 2012
Withania somnifera (Ashwagandha)	Withanolides, steroidal lactones	In Alzheimer's and Parkinson's disorders helps to enhance memory Immuno-modulatory, anti-cancerous and chemo preventive Rathinamoorthy et.al 2014

Discussion and Conclusion

Today's lifestyle is a major issue related with human health. Conventional medicines often work effectively against the disease but may show extreme side effects in certain cases. Commonly manifested side are face swelling, rashes on the body, inflammation, and drug resistance etc. A safer alternative to treat diseases is indigenous herbs or plant derived medicines that have been used since the ancient period. The versatile and vast pharmacological effects of medicinal plants are completely dependent on their phytochemical constituents. The present review reveals secondary metabolites (terpenes, alkaloids, flavanoids, phenols etc) which shows a wide range of pharmacological activities like antihypertensive effects, antimalarial activity, anticancer actions, antioxidants, anti-inflammatory, antidiarrhoeal, cytotoxic, antibacterial activities etc. Based on many previous researches, indigenous medicinal plants of India would emerge to be a hopeful source of novel drugs and can be used as effectively of new pharmaceuticals.

Acknowledgement

We acknowledged the Himalayiya Ayurvedic (P.G) Medical College & Hospital (Dehradun), Uttarakhand, for providing library facility.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

No ethical approval is required as no animals or humans have been used in the study.

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