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An over view of medicinal uses of Ayurvedic drug *Pippali* (*piper longum*)

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ABSTRACT

Background: *Pippali*, *Piper longum* (*P.longum*) usually called *pippali* which is a member of the Piperaceae family, is frequently used medicinal herb in Ayurved, Unani & Siddha system of medicine. In traditional medicine world it is being used to treat most of the systemic disorders. This systematic review was conducted with an objective to search, explore & compile the phytochemical constituents & their efficacies both in modern and traditional part to understand as a potential therapeutic agent.

Material & method: Published details scientific literature on *P.Longum* by various research scholars, organizations & Pharmacopeias were reviewed. The review criterion was restricted to bio-efficacy and phyto-pharmacological activities of *P. longum*.

Results and Conclusions: This review shows various experimental studies conducted on Bio-active compounds

isolated from *P. longum* has prospective uses as anticancer, antilipidemic, antifungal and as a radioprotective.

KEY-WORDS-

Piper longum, *Pippali*, Phytoconstituents, Antioxidant, Antineoplastic, Safety profile

Introduction

Ancient system of medicine so called *Ayurved* is using herbal medicines from generation to generation at greater extent. Now a days herbal drugs are becoming popular due to use of their less side effects and less adverse reactions. The World Health Organization has reported that 80% of world population depend on drugs of traditional medicine for their health problems ¹. Most of the *Ayurvedic* drugs are under alternative medicine practice without any scientific validation. Therefore need of hour to check the scientific research going on herb *Piper* (*Piper longum*). The word pepper derived from Sanskrit word for long pepper

(*pippali*). Genus *Piper* are important medicinal plants used in various ailments.

Across the globe there is great interest for *long pepper* among researchers due to its medicinal properties like chronic bronchitis, asthma, constipation, gonorrhea, diarrhea, cholera, chronic malaria, viral hepatitis, respiratory infections, stomachache, bronchitis, diseases of the spleen, and tumors. *P.longum* is also used as *Rasayan* which can improve the immune system and increase the resistance for respiratory diseases specially like allergy and asthma. This plant is inexpensive, easily available and having a therapeutic use. The purpose of the review is to gather the information on phytochemical, pharmacological, and toxicological effects of the *P. longum*. It could be useful for scientific fraternity for to encourage for future research².

History

P.longum was first written about by Hippocrates, who described it as medicament rather than spice. Long pepper reached to Greece in the 5th or 6th century BCE³. *Long pepper* was an important and well known spice before discovery of European new world. In *Ayurved* *P.Longum* was first mentioned in *vedic* era specially in *Atharvaveda*. *Bruhatrayi* (*Charak samhita*, *Sushrut samhita* and *Vagbhat*) and *Bhavprakash nignatus* are also mentioned *P.longum* in different *ganas* as well as given therapeutic effects of *P.longum*.

Geographical distribution:

The plant grows in mostly southern part of India Tamilnadu, Andhra Pradesh, Kerala and western part like Assam.

The plant cultivated on large scale heavy rainfall areas and in heavy rainfall having high humidity⁴.

Plant Description

P.longum is a small shrub with large woody root and numerous creeping jointed stems that are thickened at nodes (Figure 1)

The leaves are alternate without stipules, with blades varying in size. The lowest leaves are 5-7 cm long whereas lower one are 2-3 cm long. Flowers are grown in solitary spikes. The fruits which grow in fleshy spikes 2.5-3.5 cm long and 5 mm thick are oblong, blunt and blackish green. The mature spikes are collected and commercial value form of *P.longum*.



Figure-1

Scientific classification

- Kingdom: Plantae
- Division : Magnoliophyta
- Class : Magnoliopsida
- Order : Piperales
- Family : Piperaceae
- Genus : *Piper*
- Species: *Longum*
- Botanical name: *Piper longum*

Synonyms

- Marathi Pimpali
- English Pepper
- Kannada Hippali
- Tamil Thippali
- Malayam Magadhi
- Telugu Pippalu

Principal constituents

- The *piper longum* fruit contains large number of alkaloids and its related compounds. The important one is piperine.
- Other ones are methy piperine, piperettine, asinine, pellitorine, Piperidine, piperderidine, longamide, tetrahydropiperine, Piperine, piperlongumine, piperalongumine, piperalonguminine, piperlongumamide, brachystamide – B, dysmethoxy piperidine, N-isobutyl decamid^(2,4).
- The main lignans present in fruits are sesamin, pulvitol^(2,4).
- The fruits contains esters tridecyl-dihydro-p-coumarate and Z-12 – octadecenoic glycerol mono ester^(2,4).
- Volatile oil are present in fruits are caryophyllene, pentadecane, and bisboline.
- Others include thujone, terpinolene, p-cymene and Vitamins A and E^(2,4).

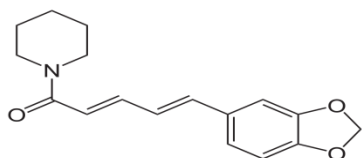


Figure-2-Piperine

Pharmacological action—

The Pharmacological aspects of *P. longum* are as follows

Melanin –Inhibiting activity

Piperlongumine from *P. longum* inhibits production in B16 cells stimulated with alpha melanocyte stimulating hormone.

3 isobutyl-1-methylxanthine or protophyllin IX exhibits stronger depigmenting activity. This effect was attributed by inhibitory action of piperlongumine on alpha melanocyte stimulating hormone through cAMP.

Which in turn regulates expression of *microphthalmia* associated transcription factor. By this way the enzyme inhibited internally and suppressed production of melanin⁵.

Antidepressant activity

Ethanol extraction of *piper longum* fruits yield known as a piperidine and piperine alkaloid as mono amino oxidase inhibitor. So *piper longum* act as an antidepressant⁶.

Analgesic activity

The aqueous suspension of *P. longum* root powder (200, 400, and 800 mg/kg) was given to mice and rats to evaluate its analgesic activity. The effects of 400 and 800 mg/kg doses of *piper longum* were similar to that of non-steroidal anti-inflammatory drugs. This indicates that plant root is potent non-steroidal and anti-inflammatory drug⁷.

Anti hyperlipidemic activity

The ethanol extract of *piper longum* fruit yields piperlongumine, piperine and piperonaline, which are working as the antihyperlipidemic agent. They exhibit useful antihyperlipidemic activity in vivo as compared to commercial antihyperlipidemic drug simvastatin⁸.

Anti platelet activity

The inhibitory effects of four amides piperine, piperonaline, piperocetadecalinine and piperlongumine from fruits of *P. longum* L. evaluated on washed platelet aggregation. All four amide acids work as a anti platelet activity agent⁹.

Anti cancer activity

The alcohol extract of *P. longum* (10mg/dose/animal) and piperine (1.14mg/dos/animal) inhibits solid tumor development in mice. Development in mice in mice induced Dalton's lymphoma ascites cell increases the life span of mice¹⁰.

Anti oxidant activity

P. longum exhibits promising potential against free radical induced oxidative damage. Petroleum ether extract of root and piperine from the roots of the *P. longum* decreases lipid peroxide level and act as antioxidant¹¹.

Hepatoprotective activity

The plant fruit extract was assessed in rodents for its hepatoprotective action against CCL4 (Carbon tetra chloride) induced acute, chronic reversible and irreversible damage using morphological, histo pathological parameters.

The extract stimulated regeneration by restricting fibrosis. Piperine was found to protect against carbon tetra chloride induced hepatotoxicity by reducing lipid peroxidation both vivo and vitro¹².

Immunomodulatory activity

The specific and nonspecific immunostimulatory actions of *P. longum* fruits have been evaluated by macrophage

migration index, phagocytic index in mice. A well known ayurvedic preparation containing *P. longum* was tested in mice infected with *Giardia lamblia* and found to activate macrophages as a result an increased macrophage index and phagocytic index indicating immunomodulatory activity¹³.

Radioprotective activity

The radioprotective property of an ethanol extract was evaluated in Swiss mice. The extract offer restored glutathione production and act as a radioprotective¹⁴.

Antiobesity activity

Pharmacological inhibition of acetyl co A diacylglycerol acetyl transferase has emerged as a potential target to act as a antiobesity function. Piperine is a potential acetyl co A diacylglycerol acetyl transferase inhibitor¹⁵.

Antifungal activity

Piper longum fruit derived extract as a fungicidal against phytopathogenic fungi like *Pyricularia oryzae*, *Rhizoctonia solani*, and *Phyphthora infestans*. So *P. longum* act as potential antifungal agent¹⁶.

As per Ayurved context *P. longum* is having following characteristics,

- *Rasa: Katu madhur*
- *Virya: Anushna shita*
- *Vipak: Madhur*
- *Guna: Laghu snigdha and tishna*

As per Ayurved following pharmacological function of *Piper longum* is explained in Table-1 as follows,

Table-1

Sr. No.	Ayurvedic texts	Pharmacological functions as per Ayurvedic texts
1	Kaiyadev Nighantu	Vrushya, Rasayani, shvasa kasaghna ¹⁷
2	Bhavaprakash Nighantu	Shvasa-kasa-jwaraghna, Pramehaghna, Kushtaghna ¹⁸
3	Chakradatta (Jwarachikitsa, 1-112)	Jwaraghna, Shvasa-kasaghna, Pliaghna, Hikkanashaka ¹⁹
4	Chakradatta (59-159)	Naktandha ²⁰
5	Raja Nighantu (Pippalyadivara 13)	Jwaraha, Vrushya, Kasa-Shvasa-shleshmaghna ²¹
6	Raja Nighantu (Pippalyadivara 18)	Jantughni, Koshtashodhani ²²
7	Charaka Samhita (Chikitsa, 8-96)	Kasa-shvasa-jwaraghna ²³
8	Bhavprakash (Yonogadhihara, 70-131)	Sutikakukshivruddhinashaka ²⁴
9	Bhavaprakash (Balrogadhikara, 71-175)	Balrogaghna ²⁵
10	Charaka Samhita (Chikitsa, 1-3/36-40)	PippaliVardhamanarasayana ²⁶
11	Susruta Samhita	Vatashonitaghna, Vishamjwaraghna, Pandu-pliha-Arshaghna ²⁷
12	Charaka Samhita (Chikitsa 14-48)	Arshoghna ²⁸
13	Gadanighraha (2-21-22,28)	Urusthambhaghna ²⁹

Safety profile of *Piper longum*

P. longum single dose in experimental animals (3g/kg body weight) and chronic toxicity studies for 90 days reveals no side effects. The acute toxicity studies do not show any mortality or morbidity when administered to animals. Hence *Piper longum* is safe drug³⁰.

Discussion and conclusion:

P. longum is very important medicinal plant in alternative medicine. The drug is useful in various ailments like depression, cough, obesity, fungal disorders and as good hepatoprotector. The value addition of *P. longum* is it's an antioxidant, anticancer and very much promising in radiation therapy. Furthermore the plant is nontoxic as per animal studies. The plant is readily and easily available and free from adverse effects. Thus data collected is showing ray of hope for utility of this plant at large scale for different health conditions of human beings.

The paper can raised the pharmacological interrelated research specially in between Ayurvedic fraternity, Pharmacologists, Biotechnologists, and Analytical experts.

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