An overview 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 problems1. 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...
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 research.

**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 BCE. *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. Bruhtrayi (Charak samhita, Sushrut samhita and Vagbhat) and Bhavpraksh nignatus are also mentioned *P. longum* in different ganas as well as given therapeutic effects of *P. longum*.

**Geographical distribution:**

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

**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 grows in solitary spikes. The fruits which grows 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*.

**Scientific classification**

- Kindgom: 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, asrinine, pellitorine, Pipercide,piperderidine,longamide,tetracyclo piperine,Piperine,piperlongumine,piperlongumine,piperalonguminine,reterofractamide,brachystamide – B,dysmthoxypiplartine,N-isobutyl decamid(2,4).
- The main lignans present in fruits are sesamin, pulviatilol(2,4).
- The fruits contains esters tridecyl-dihydro-p-coumarate and Z-12 – octadecenoiglycerol mono ester (2,4).
- Volatile oil are present in fruits are caryophyllene,pentadecane,and bisboline.
- Others include thujone, terpinolne, p-cymene and and Vitamine A and E (2,4).

![Figure-2-Piperine](image)

Pharmacological action—

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

Melanin –Inhibiting activity

Piperlonguminine from *P.longum* inhibits production in B16 cells stimulated with alpha melanocyte stimulating harmone.

3 isobutyl-1-methylxanthine or protophyrin IX exhibits stronger de pigmenting activity. This effect was attributed by inhibitory action of piperlonguminine on alpha melanocyte stimulating harmone through cAMP.

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

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 a antidepressant.

Analgesic activity

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

Anti hyperlipidemic activity

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

The inhibitory effects of four amides piperine, pipernonaline, piperoctadecalidine and piperlongumine from fruits of *P. longum* L. evaluated on washed platelet aggregation. All four amide acids work as an anti platelet activity agent\(^9\).

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 mice\(^10\).

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 antioxidant\(^11\).

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 vitro\(^12\).

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 lambia and found to activate macrophages as a result an increased macrophage index and phagocytic index indicating immunomodulatory activity\(^13\).

Radioprotective activity

The radioprotective property of an ethanol extract was evaluated in Swiss mice. The extract offer restored glutathione production and act as a radioprotective\(^14\).

Antiobesity activity

Pharmacological inhibition of acetyl co A diacylglycerol acetyl transferase has emerged as a potential target to act as an antiobesity function. Piperine is a potential acetyl co A diacylglycerol acetyl transferase inhibitor\(^15\).

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 agent\(^16\).

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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Ayurvedic texts</th>
<th>Pharmacological functions as per Ayurvedic texts</th>
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<tbody>
<tr>
<td>1</td>
<td>Kaiyadev Nighantu</td>
<td>Vrushya, Rasayani, shvasa – kasaghna</td>
</tr>
<tr>
<td>2</td>
<td>Bhavaprakash Nighantu</td>
<td>Shvasa-kasa-jwaraghna, Pramehaghana, Kushtaghna</td>
</tr>
<tr>
<td>3</td>
<td>Chakradatta (Jwarachikits, 1-112)</td>
<td>Jwaraghna, Shvasa-kasaghna, Plihaghna, Hikkanashaka</td>
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<td>4</td>
<td>Chakradatta (59-159)</td>
<td>Naktandha</td>
</tr>
<tr>
<td>5</td>
<td>Raja Nighantu (Pippalyadivara 13)</td>
<td>Jwaraha, Vrushya, Kasa-Shvasa-shleshmaghna</td>
</tr>
<tr>
<td>6</td>
<td>Raja Nighantu (Pippalyadivara 18)</td>
<td>Jantughni, Koshtashodhani</td>
</tr>
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<td>7</td>
<td>Charaka Samhita (Chikitsa, 8-96)</td>
<td>Kasa-shvasa-Jwaraghna</td>
</tr>
<tr>
<td>8</td>
<td>Bhavprakasha (Yonorogadhikara, 70-131)</td>
<td>Sutikakshivruddhinashaka</td>
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<td>9</td>
<td>Bhavprakasha (Balrogadhika, 71-175)</td>
<td>Balrogaghna</td>
</tr>
<tr>
<td>10</td>
<td>Charaka Samhita (Chikitsa, 1-36-40)</td>
<td>PippaliVardhamanarasayana</td>
</tr>
<tr>
<td>11</td>
<td>Susruta Samhita</td>
<td>Vatashonitagghna, Vishamjwaraghna, Pandu-pliha-Arshagha</td>
</tr>
<tr>
<td>12</td>
<td>Charaka Samhita (Chikitsa 14-48)</td>
<td>Arshoghna</td>
</tr>
<tr>
<td>13</td>
<td>Gadanighraha (2-21-22,28)</td>
<td>Uruthambhagha</td>
</tr>
</tbody>
</table>

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 drug.

**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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Conflict of Interest: Non      Article Type: Review Article      Source of funding: Nil

Cite this article:

“An overview of medicinal uses of Ayurvedic drug Pippali (piper longum).”

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