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Pippalimoola (Root of *Piper longum*. Linn)–An Overview of Classical Ayurvedic References and Advanced Pharmacological researches

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ABSTRACT

Pippalimoola - Piper longum Linn. (Root), is having enormous therapeutic properties and one of the essential ingredients in many formulations of Ayurvedic systems of medicines. The significance of the drug in Ayurveda can be revealed by the fact that Acharya Charak has included it in agryaushadhi (a list of 152 most important drugs) in chapter 25 of Charak samhita.. As per Ayurveda the drug possesses *Katu rasa* (pungent taste), *Laghu* (light)*-Ruksha* (ununctous) *guna*, *Ushna* (hot) *virya and Katu vipaka*. Classically it is indicated in *Krimirog*(Worms), *Shwasa* (breathing problem, or Asthma),*Kshaya* (Pulmonary tuberculosis), *Pliharoga* (Splenomegaly), *Vishamjvara (*Intermittent fever), *Arsha*(Piles*)*, *Urustambha* (stiffness of thigh*), Vatavyadhi*, *Anindra*(Insomnia)etc. Its main chemical constituents are piperine, piplartine, triacontane, dihydro-stigmasterol, sesamin; methyl 3,4,5, trimethoxycinnamate, two alkaloids piperlongumine and piperlonguminine etc. Its anticancer, antioxidant, hepatoprotective, anti-microbial, anti platlet, analgesic, anti-amoebic, anti-fertility, anti-diabetic, Melanin inhibiting activity are proven pharmacologically

KEYWORDS

Pippalimoola, *Piper longum*, *Ayurveda*

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INTRODUCTION

Pippalimoola consists of dried root of *Piper longum* L. (Piperaceae) which is a slender, aromatic, climber with perennial woody roots occurring in hotter parts of India from Central Himalayas in Assam, Khasi and Mikir hills, Lower hills of Bengal and ever green forest of Western Ghats, from Konkan to Travancore, it has been recorded from Car Nicobar Islands.[1].In Ayurveda, *Pippalimoola* (root of *Piper longum* Linn; Piperaceae) is attributed *Dipaniya*(Appetizer) – *Pachaniya* (digestive) action and considered as main drug to relieve *Anaha*(Flatulence)[2].The drug possesses *Katu rasa* (pungent taste*); Laghu*(Light), *Ruksha* (rough) and *Ushna* (hot) *guna* (properties); *Katu vipaka* (Specific digestion) and used in various disease conditions i.e. *Krimi* (Worm),*shwasa* (Breathing disorders like Asthama), *Kshaya* (Pulmonary tuberculosis), *Pliharoga* (Splenomegaly),*Vishamajvara* (Intermittent fever), *Arsha* (Piles), *Urustambha* (stiffness of thigh),*Vatavyadhi* (Nervous diseases), *Nidranasha*(Insomnia), etc.[3]

The aim of this article is to highlight classical references and recent advances in pharmacology of P. *longum* root.

MATERIALS AND METHODS

The literature regarding *Pippalimoola* from Ayurvedic classics, texts of modern Pharmacology, Pharmacognosy, other relevant books, journals was reviewed; data was collected, analyzed and presented here systematically.

RESULTS AND DISSCUSSION

Plant Description

Piper longum Linn. is a slender aromatic climber with perennial woody roots, stems creeping, jointed, young shoots downy, leaves 5-9 long,3-5cm,wide,ovate,cordate with broad rounded lobes at base ,sub acute, entire, glabrous. Spikes cylindrical pedunculate, male larger and slender, female 1.3-2.5cmlong and 4-5mm in diameter ,fruits ovoid, yellowish orange sunk in fleshy spike.[4]

Taxonomical classification.

According to Benthem& Hooker (1862-1883)

Kingdom : Plantae

Division : Spermatophyta

Subdivision : Angiospermae

Class : Dicotyledonae

Subclass : Apetalae

Series : Microembryae

Order : Piperales

Family :Piperaceae

Genus : Piper

Species : Piper longum L[5]

Ayurvedic classification

In Ayurveda texts it is described as under

Charaksamhita:Dipaniya mahakashay, Shulprashaman mahakashay[6]

Sushruta samhita: Pippalyadi varga[7],

Ashtang Hridaya: Vatsakadi gana[8],

Dhanvantari Nighantu : Shatpushpadi varga[9]

Bhavprakash Nighantu: Haritakyadi varga[10]

Shaligram Nighantu: Mishrak varga[11]

Kaiyadev Nighantu: Aushadhi varga[12]

Madanpal Nighantu: Shunthayadi varga,[13]

Raj Nighantu: Mishrakadi varga[14]

Sodhal Nighantu: Shatapushpadi varga,[15]

Priya Nighantu: Pippalyadi varga[16]

Vernacular names

Sanskrit: Pippalimula, Granthik, Kanamul, Usana, Chavikashira Katugranthi,Sarvagranthik,etc.

English: Piper root.

Hindi: Pippalamula, Pipramul,

Gujarati: Ganthoda

Marathi: Pimplimula

Bengali: Pipulmul

Sindhi: Tippali

Malyali : Pippalimulam,Modikaddi.

Punjabi: Pipalamul

Telagu: Modo,Pippaliveru

Tamil: Thippaliveru.

Kannada:

Hippaliver,Hippaliver,Pippaliyveru

Arabian: Filfil-draj, Filfileymoya.

Magadhi; Pippalamula

Persian:Filfilidray, Pipal, Filfil-i-muyah

Sindhi:Filfilidray.[17]

Ayurvedic properties

Rasa Katu

Guna: Laghu, Ruksa

Virya: Usna

Vipaka: Katu[18]

Ayurvedic actions

Dipana,Pacana,Krimighna,Anahprashaman, Shulprashaman,Vatanuloman,Gulmaghna,Ruchikar,Plihanut,Shwasahar,Kasahar,Kshayhar,Bhedan,Udarroghar[19]

Chemical constituents

Piperine Piperlongumine Piperlonguminine , Piplartin, Triacontane, Dihydro-stigmasterol, an unidentified steroid, reducing sugar, glycosides,[20] Cepharadione B, Cepharadione A, Cepharanone B, Aristolactam A ,Norcepharadione B, 2-hydroxy-1-methoxy-4H-dibenzo, quinoline-4, 5(6H)-dione, piperolactam A and B, Piperadione, [21]

Indications in ayurveda

Krimiroga (Worm infestation)),*Shwasa* (Breathing disorders like Asthama), *Kshaya* (Pulmonary TB*),Pliharoga* (Spleenomegaly), *Vishamjvara* (Intermittent

fever) *Anaha* (heaviness of abdomen),*Gulma* (flatulence) ,*Arsha* (Piles) ,*Anidra* (insomnia) etc.[22]

Therapeutic uses : In Ayurveda classics it is prescribed for many diseases as

In *krimi* (Worms): *Pippalimoola* Powder recommended with goat's urine[23]

In *Anidra* (Insomnia): *Pippalimoola* Powder is prescribed to be taken with jiggery followed by buffalo's milk[24]

In *Arsha* (Piles): Buttermilk kept in a vessel anointed internally with the paste of *Pippali, Pippalimoola, Chavya, Citraka, Vidang , Sunthi and Haritaki* is considered to be wholesome[25]

Vishamajvara (Intermittent Fever): *Pippalimoola* Powder given with ghee and honey followed by cow's boiled milk is claimed to cure *hridroga* and *visam jvara*[26]

In *hridroga* (Heart Disease): It is recommended with cow's milk[27]

In *Urustambha(Stiffness of Thigh):* Decoction of *Pippali,Pippalimoola* and *Bhallatak* is prescribed with honey[28]

As Galactogogue: Milk mixed with *Marich* and *Pippalimoola* Powder acts as galactogogue[29]

In *Arsha (Piles): Pippalimoola* Powder has been prescribed in gradually increasing dose with buttermilk to patient for one month with restriction of other food [39]

Pharmacological action

Anticancer activity

The effect of piperine on the inhibition of lung metastasis induced by B16F-10 melanoma cells was studied in C57BL/6 mice. Simultaneous administration of the compound with tumor induction produced a significant reduction (95.2%) in tumor nodule formation. Increased lung collagen hydroxyproline (22.37 microg/mg protein) in the metastasized lungs of the control animals compared to normal animals (0.95 microg/mg protein) was significantly reduced (2.59 microg/mg protein) in the piperine-treated animals. The high amount of uronic acid (355.83 microg/100 mg tissue) in the metastasized control animals was significantly reduced (65 microg/100 mg tissue) in the animals treated with piperine. Lung hexosamine content was also significantly reduced in the piperine-treated animals (0.98 mg/100 mg lyophilized tissue) compared to the untreated tumor-bearing animals (4.2 mg/100 mg lyophilized tissue). The elevated levels of serum sialic acid and serum gamma glutamyltranspeptidase activity in the untreated control animals was significantly reduced in the animals treated with piperine. The piperine-treated animals even survived the experiment (90 days) and results of the study demonstrated the

antimetastatic activity of piperine, an alkaloid present in plant*Piper longum*.[31]

Antioxidant activity

In a study, Petroleum ether extract of the root and piperine from roots of *P. longum* Linn was found to decrease lipid peroxidelevels and maintain glutathione content, demonstrating antioxidant activity[32].

Hepatoprotective activity

In an *in vitro* and *in vivo study*, piperine was found to protect against tertiary butyl hydroperoxide-induced and carbontetrachloride-induced hepatotoxicity by reducing lipid peroxidation. Thus Piperine showed a hepatoprotective potency[33]

Antimicrobial activity

Antimicrobialand antifungal screening were performed with petroleum ether, ethyl acetate, chloroform and methanol extracts of root of *Piper longum* against 13 pathogenic bacteria (5 gram-positive and 8 gramnegative) and 6 fungi by the standard disc diffusion method. Standard antibiotic discs of Kanamycin and Clotzimazolewere used for comparison in antibacterial and antifungal tests.Ethyl acetate extract exhibited activity against gram- negative *Klebsiella species* and also showed excellent activity against grampositive *Sarcinalutea* and gram-negative *Shigellasonnei* whereas methanol extract showed strong activity against gram-negative *Shigella* thus ethyl acetate extracts of *P. longum* root were found to exert antimicrobial effects against various microorganisms[34]

Antiplatelet activity

In another study the inhibitory effects of the four acid amidespiperine, pipernonaline, piperoctadecalidine, andpiperlongumine, isolated from the fruits and roots of *P.longum* L. were evaluated on washed rabbit platelet aggregation and all of the four tested acid amidesdose-dependently inhibited washed platelet aggregation induced by collagen, arachidonic acid, andplatelet-activating factor, but not that induced by thrombin[35]

Analgesic activity

The aqueous suspension of *P. longum* root powder(200, 400, and 800 mg/kg) was given orally to mice and rat to evaluate it analgesic effects. The delayin reaction time to thermal stimulus was assessed in rats, and the amount of writhing to chemical stimuluswas assessed in mice. The effects of the 400 and 800 mg/kg doses of *P. longum* were similar to that of non steroidal anti-inflammatory drugs ($p < 0.001$).Both ibuprofen (40 mg/kg) and *P. longum* (800 mg/kg)

demonstrated 50% protection against writhing. The delay in reaction time to thermal stimulus was < 6% for different doses of *P. longum* as compared with100% for pentazocine. Thus indicated that the plant root produces a weak opioid-type but potent non steroidal anti-inflammatory drug-type of analgesia[36]

Melanin-inhibiting activity

Piperlonguminine from *P. longum* inhibited melanin production in melanoma B16 cells stimulated with snocyte-stimulating hormone, 3-isobutyl-1-methylxanthine, or protoporphyrin IX, where the compound exhibited stronger depigmenting efficacy.This effect was attributed to the inhibitory action of piperlonguminine on alpha-melanocyte stimulating hormone signaling through cAMP to the cAMP-responsive element binding protein, which inturn regulates the expression of the microphthalmia associated transcription factor, a key activator of tyrosinase expression. Thus the enzyme inhibited internally, thereby suppressing the production of melanin[37]

Ant amoebic activity

The fruits were tested for their efficacy against *Entamoeba histolytica in vitro* and against experimental cecal amebiasis *in vivo*. The ethanol extract and isolated piperine improved cecal amebiasis by 90% and 40%, respectively, in rats.[38]

Bioavailability enhancer activity

Piperine has shown to enhance the bioavailabilityof structurally and therapeutically diverse drugs and also has been reported to enhance the oral bioavailability of phenytoin in humans[39-41]

Antifertility activity

P.longum and *E. ribes*s eeds administered on days 4 to 7 and 6 to 9 of pregnancy showed 100% antifertility activity in female albino rat.[42]

Anti-diabetec activity

In a study to assess the antidiabetic activity of phytoconstituents from root of *Piper longum* using model of alloxan induced diabetec mice, ethanol extract root powder was proved as a potential Ayurvedic anti-diabetic drug.[43]

Therapeutic Dose of *Pippalimoola*

Powder-0.5- 1.0 gm.[44]

Classical Ayurvedic Preparations

In various Ayurvedic classics many formulations of *Pippalimoola* are quoted. Bharat Bhaishjya Ratnakar[45] has reported about 465 formulations which contain *Pippalimoola*. Some important formulations are Abhayamodak, Agatsyaharitaki, Chandraprabha vati, Changeri ghrita, Dashmula kwath, Kalyanaka ghrita,

Kumaryasava, Panchkol churna, Punarnava mandura, Sudarshan churna, Talishadi churna,Yograj Guggulu etc.

CONCLUSION

Numerous references of *Pippalimoola i.e. P. longum* Linn(root) found in Ayurvedic literature right from the time of Charak up to the latest nighantus prove its utility in therapeutics especially in gastrointestinal and respiratory system diseases. Further Pharmacological researches have proved its anticancer, antioxidant, hepatoprotective, anti-microbial, antiplatelet, analgesic, anti-amoebic, anti-fertility, anti-diabetic, Melanin inhibiting activity and bioavailability enhancer action. The drug being easily available, inexpensive, backed by years of therapeutic use by indigenous system of medicine has immense potential for therapeutics as well as further researches.

REFERENCES

1. Anonymous.(2005).The wealth of India,vol-8.CSIR, 97
2. Bhagvandas and Ramkaran Sharma. (2005).Carakasamhita,(vol-1). Chowkhamba Sanskrit series,Varanasi, reprint edition, 426.
3. Krishnachandra Chunekar (2010).Bhavprakash Nighantu,. Chaukhamba Bharati Academy. revised and enlarged edition., 19.
4. Anonymous. (2005).The wealth of India, vol-8.CSIR, 96.
5. Sharma.P.C,Yellne.M.B&Jeniss(2007) The Database on medicinal plants used in Ayurveda And Siddha,vol-3.,Central Counsil for research in Ayurveda and Siddha New Delhis., 453.
6. Bhagvandas,.Ramkaran Sharma,(2005) Carakasamhita ,Chowkhamba Sanskrit series ,Varanasi,vol-1,reprint edition,89,99.
7. P.V.Sharma (2010).Susruta Samhita with Dalhan's commentary(vol-1,2,3).Chaukhambha Visvabharati Oriental Publishers &Distributors, ,reprint edition, 358.
8. Anna More kunte, Krishna shastri (2012).Astang Hridayam, Chowkhamba Sanskritsansthan,, reprint,238.
9. S.D.Kamat (2011),Dhanvantari Nighantu,Chaukhamba Sanskrit pratisthan,vol-1Reprinted, 161.
10. Krishnachandra Chunekar (2010). Bhavprakash Nighantu, Chaukhamba Bharati Academy, revised and enlarged edition,pg-19.
11. Shaligram vaishya(2002). ShaligramNighantu, Khemraj Krishnadas Prakashan, Mumbai,reprint edition,89-90.
12. P.V.Sharma (2009).Kaiyadev Nighantu, Chaukhambha Orientaliya, reprint Edition, 216.
13. Gyanendra Pandeya (2012).Madanpal Nighant.Chaukhambha Orientaliya,1st edition, 268
14. Vishvanath Drivedi (1983).Raj Nighantu, Krishnadas Academy,Varanasi,1st edition, , 661.
15. Gyanendra.Pandey (2009).Sodhal Nighantu, Chaukhamba Krishnadas academy. Varanasi, 1st edition, 242
16. .P.V.Sharma (1995).Priya Nighantu, Chaukhamba Surbharati Prakashan.Varanasi,2nd edition, 56.
17. Anonymous (2003). Wealth of India. Vol-7, CSIR, New Delhi, Reprint. 96
18. Anonymous. The Ayurvedic Pharmacopoeia of India, part-1, vol 2. Ministry of health and family welfare Government of India,1 41-142 .

19. Shaligram vaishya (2002). Shaligram Nighantu. Khemraj Krishnadas Prakashan. Mumbai,reprint edition, 89-90.

20. Anonymous(2003) Wealth of India.vol-7, CSIR, New Delhi,,New Delhi, Reprint.pg-96

21. Anonymous.(2003).The wealth of India,vol-8.CSIR.first supplement series, pg-318

22. Krishnachandra Chunekar (2010).Bhavprakash Nighantu,. Chaukhamba Bharati Academy. revised and enlarged edition., 19

23. P.V.Sharma (2010).Susruta Samhita with Dalhan's commentary (vol-1,2,3,) Chaukhambha Visvabharati Oriental Publishers &Distributors. Reprint edition,pg 543.

24. ,K.R.Krishnamurthy (1998). Bhavprakash of Bhavamishra (vol-1).Krishnadas Academy,1st edition, 113

25. P.V.Sharma (2010).Susruta Samhita with Dalhan's commentary (vol-1,2,3). Chaukhambha Visvabharati Oriental Publishers &Distributors, reprint edition, 332.

26. Sri Indradeva Tripathi (2005).Gadanigraha of Sri Vaidya sodhala with vidhyotinihindi commentary;part-2.Chaukhamba Sanskrit sansthan,Varanasi. reprint edition, 143

27. Sri Indradeva Tripathi(2005).Gadanigraha of Sri Vaidya sodhala with vidhyotinihindi commentary;part-2;Chaukhamba Sanskrit sansthan,Varanasi.reprint edition,pg-143

28. Sri Indradeva Tripathi (2005) Gadanigraha of Sri Vaidya sodhala with vidhyotini hindi commentary;part-2;Chaukhamba Sanskrit sansthan, Varanasi.reprint edition; 539-540.

29. Khemraj krishnadas (1993);Harita samhita Shri venkateshwar mudranalaya, Mumbai,1st edition, 457.

30. Vaidya Bhagvandas & Ramkaran Sharma (2005).Caraka samhita(vol-1,2m3).Chowkhamba Sanskrit series .

31. Pradeep CR &Kuttan G(2002). Effect of piperine on the inhibition of lung metastasis induced B16F/10 melanoma cells in mice. *Clin Exp Metastasis*;19,703−8.

32. Natarajan, KS, Narasimhan, M, Shanmugasundaram, KR & Shanmugasundaram, ER.(2006). Antioxidant activity of a salt/spice/herbal mixture against free radical induction. J Ethnopharmacol.105, 76–83.

33. Koul,IB & Kapil,A.(1993). Evaluation of the liver protective potential of piperine, an active principle of black and long peppers.Planta Med 5,413−7.

34. Ali, AM, Alam, NM, Yeasmin, MS, Khan, AM, & Sayeed, MA. (2007). Antimicrobial screening of different extracts of *Piper longum* Linn. Res J Agr Bio Sci. 3, 852–857.

35. Iwashita, M, Saito, M, Yamaguchi, Y, Takagaki, R,& Nakahata, N.(2007) Inhibitory effect of ethanol extract of *Piper longum* L. on rabbit platelet aggregation through antagonizing thromboxane A2 receptor. Phytomedicine.14,853–855.

36. Vedhanayaki, G, Shastri, GV, & Kuruvilla, A.(2003) Analgesic activity of *Piper longum* Linn. root. Indian J Exp Biol. 41, 649–651.

37. Kim, KS, Kim, JA, Eom, SY, Lee, SH, Min, KR, and Kim, Y.(2006) Inhibitory effect of piperlonguminine on melanin production in melanoma B16 cell line by downregulation of tyrosinase expression. Pigment Cell Res.19, 90–98.

38. Ghoshal, S and Lakshmi, V. Potential antiamoebic property of the roots of *Piper longum* Linn.Phytother Res. 2002; 16, 689–691

39. Pattanaik S, Hota D, Prabhakar S, Kharbanda P & Pandhi P.(2006).Effect of piperine on the steady-state pharmacokinetics of phenytoin in patients with epilepsy. Phytother Res.20, 683−6.

40. Singh M, Varshneya C, Telang RS & Srivastava AK.(2005) Alteration of pharmacokinetics of oxytetracycline following oral administration of *Piper longum* in hens. J Vet Sci.6,197−200.

41. Khajuria A, Thusu N & Zutshi U.(2002) Piperine modulates permeability characteristics of intestine by inducing alterations in membrane dynamics: influence on brush border membrane fluidity, ultrastructure and enzyme kinetics. Phytomedicine.9,224−31.

42. Garg, S.K. (1981), Antifertility effect of *Embelia ribes* and *Piper longum* in female rats, Fitoterapia, Vol. 52 (4),167-169.

43. Chaurasia Anand &Das Debashree.(2013). Evaluation of antihyperglycemic potential of *Piper longum* root on alloxan induced diabetic mice. Adv. Pharmacol. Toxicol. 14(1), 1-6.

44. Vaidhya,Bapalal,(1999).Nighantu Adarsa uttarardh, Gujratpustakalaya. s.s. mandal ,870-72

45. Nagindas,c,Shah.(1942).Bharat Bhaishjya Ratnakar,Unja Ayurvedic Pharmacy.