

PHARMACOLOGICAL EVALUATION OF PALASHBEEJADI YOGA AGAINST WORMS INFESTATION

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ABSTRACT

Palashbeejadi yoga is a compound formulation, which contains *krimighna* (antehelminthic) drugs: *Palasha* (*Butea monosperma*), *Vidanga* (*Embelia ribes*) and *Kutajabeeja* (*Holorhhaena antidysentrica*). Each drugs have specific action against various bacterial, protozoal and helmithic infection. The combination of above metioned drug has a broad coverage against intestinal infection and infestation. These drugs have better safety, palatability and compliance; therefore it can be used in intestinal ailments safely from pediatric to geriatric age group. Many photochemical substances are being isolated and their effects have been evaluated over various microbes and helminthes.

KEYWORDS: Anthelminthic, Antiprotozoal, krimighna, Palasha,

Vidanga, Kutajabeeja.

INTRODUCTION

As per *Ayurvedic* principles, treatment is governed by *Chikitsa Chatushpada*^[1] i.e. four basic pillars of treatment and their best qualities lead to the faster relieve of disease and recovery of the patient. Four basic pillars of treatment i.e. *Chikitsa Chatushpada* are the *bhishak* (clinician), the *Dravya* (drug), the *upasthata* (attendant) and the *rogi* (patient). Among these four basic factors of treatment, *Dravya* has been designated as *karan*^[2] (a major tool) and has occupied second place in hierarchy of *chatuspada* in treating the diseases.

The word Drug has been derived from a French word *Drogue* which means a dry herb. Drug is that chemical entity present in a medicine which is used in diagnosis, prevention, treatment or cure of a disease. In 1966 the WHO has given a more concise and self explanatory definition of Drug, i.e., any substance or product which is used or intended to be used to modify or explore physiological systems or pathological states for the benefit of the recipient is called drug.^[3] *Palashbeejadi Yoga* has been suggested to be used in children suffering from *Krimi* (helminthic infestation).^[4] Here is an effort to explore, chemical constituents, pharmacodynamic and pharmacokinetics of individual ingredients of above mentioned yoga. The compound, *Palashbeejadi Yoga*, have three ingredients viz. *Palasha* (*Butea monosperma*), *Vidanga* (*Embelia ribes*), *Kutajabeej* (*Holorhhaena antidysentrica*).

Details of individual drugs

Palasha (*Butea monosperma*)

Butea monosperma is a medium sized tree of height 12 to 15 meter having irregular branches and is commonly found throughout the country at about 915 meter altitude.^[5]

Taxonomic Rank^[6]

Kingdom: *Plantae*

Sub-kingdom: Embryophyta

Division: Tracheophyta

Sub-division: Pteropsida

Division: Angiospermae

Class: *Dicotyledoneae*

Sub-class: Polypetalae

Series: *Calyciflorae*

Family: Leguminosae

Sub-family: Papilionaceae

Genus: *Butea*

Species: *monosperma*

Vernacular Names of Palasha are Chichra, Desukajhad, Dhak, Kakria and Palasha (in Hindi), Palash, Polasi & Gachha (in Bengali), Khakara, Khakda, Khakhado & Khakhar (in Gujarati), Muttuga (in Kannada), Dhak & Palas (in Kumaon), Palashu (in Malayalam), Kakracha, Palas, Parash, Phalas & Phulas (in Marathi), Dhak, Palash, Tesoo, & Kesoo (in Punjabi), Purashu (in Tamil), Moduga mada (in Telugu) and Dhak & Tesu (in Urdu).^[7]

Sanskrit Synonyms

Bijasneha, Bramhapadapa, Brahamvriksha, Brahampaneta, Kamalāsana, Krimighna, Ksharashreshtha, Lakshataru, Palasha, Parna, Putadru, Raktapushpaka, Samidvara, Suparni, Tripatraka, Yajnika.^[8]

Botanical description of Seed^[9]**a) Macroscopic**

The seed of *palasha* is about 2.5 to 4 cm in length and 1 to 3 cm in width. It is kidney-shaped, flat, dark reddish-brown, thin, glossy with clear hilum situated near middle part of its concave edge. It has faint odour and slightly acrid and bitter in taste.

b) Microscopic

The seed of *palasha* in microscopic examination, shows a wide zone of testa and consists of palisade cells layer, a row of bearer cells and parenchymatous cells. Palisade cells are columnar in shape covered with thick cuticle, compactly arranged and is followed by a single row of bearer cells. The parenchymatous cells are filled with reddish-brown fluid, vascular bundles seen in a row, cotyledons are composed of square to oval cells and covered a single layer of epidermis. The mesophyll cells are oval to irregular in shape, centric hilum, compound grains having 2 to 4 components measuring 8 to 16 μ in diameter and have hyaline walls.

Pharmacological Properties of drug (Rasa Panchaka)

Guna of *Palashabeeja* is Snigdha^[10] & Ruksha,^[11] It has Katu and kashaya rasa and Katu vipaka and ushna virya with kaphanashak prabhav.^[12]

Acharya Sushruta has included it in *Rodhradi, mushkadi, ambasthadi* and *nyagrodhradi* gana.

The useful parts are seeds, bark, leaves, gum and flowers.

Chemical constituent and Pharmacology

The seeds of *palasha* has free Butein (0.37%), Butein (0.04%) and compound Butrin (1.5%).^[13] The flowers of the *B. monosperma* possess the seven flavonoid, out of which two are glycosides, butrin and isobutrin whereas three are glucosides coreopsin, isocoreopsin, sulphurien and two other new constituents are monospermicide and isomonospermicide. The bark and gum of *B. monnosperma* consists of tetramers of leucocynidine.^[14] Yellow coloured

oil obtained from the seeds of *B. praviflora*, contains glycerides of palmitic acids 20.89% stearic acids 15.89% lignoceric acids 5.55%, oleic acids 40.62% and linoleic acids 17.05%.^[15]

Palashaonin is the anthelmintic constituent present in the seeds (0.925-0.030 %). It also contains imide, a methyle ester, which on saponification, yeilds Palashaonin and beta phenylalanine. In human studies, the anthelmintic effect of Palashaonin is more pronounced than either piperazine and santonin against round worm (*Ascaris lumbricoids*). It has been also shown that, it potentiate the stimulant action on different smooth muscles. The seeds contain fatty oil known as Moodooga oil or Kino tree oil upto 20%. Palashonin, isolated from *B. frondosa* seeds and its piperazine salts exhibit good anthelmintic activity against ascariasis lumbricoids in vitro and against *Toxocara canis*, in vivo.^[16]

The anthelmintic activity of different species of butea has been reported against *Ascaridia galli*, *Ascaris lumbricoides*, *Toxocara canis*, *Oxyurids*, *Dipylidium caninum* and *Taenia*^[17] & methanol extract of *Butea monosperma* seeds showed significant anthelmintic activity in-vitro^[18] methanol extract of *Butea monosperma* seeds showed significant anthelmintic activity in- vitro.^[19] The seed oil of *Butea monosperma* shows significant bactericidal and fungicidal effect in in-vitro testing studied by the filter paper disk method against several human pathogenic bacteria and fungi.^[20] Pippali rasayana (PR), an Ayurvedic herbal medicine, prepared from *Piper longum* (Pippali) and *Butea monosperma* (Palash) in which ash of stem, root, flower and leaves of *Butea monosperma* is used, has significant activity against Giardiasis It produced up to 98% recovery from the infection. The rasayana had no killing effect on the parasite in vitro. It induced significant activation of macrophages as evidenced by increased macrophage migration index (MMI) and phagocytic activity. With higher doses of PR recovery increased up to 98% at 900 mg/kg.^[21]

Vidanga (*Embelia ribes*)

Vidanga consists of dried mature fruits of *Embelia ribes* of family Myrsinaceae. It is a large scandent shrub with long slender, flexible branches, distributed throughout hilly parts of India upto 1600 m.^[22]

Taxonomic Rank^[23]

Kingdom: *Plantae*

Sub-kingdom: Embryophyta

Division: Tracheophyta

Sub-division: Pteropsida

Division: Angiospermae

Class: *Dicotyledoneae*

Sub-class: Polypetalae

Series: *Disciflorae*

Family: Myrsinaceae

Genus: *Embelia*

Species: *ribes*

Vernacular Names

Silgilla (in Asami), Biranga, Bhaibirunga (in Bengali), Vayavidanga, Varadinga, Vavadinga (in Gujarati) Vaberunga, Waiwarunga, Bhabhirunga, Baihidunga, Baibhirunga, Bhabhirunga, Babirunga (in Hindi), Vayuviranga, Baibilaunga, Vaivalanga (in Kannada), Karkannie, Waiwaranga (in Marathi), Babading (in Kashmiri), Vizhalari, Vizalari (in Malayalam), Vavading & Vavding (in Marathi), Bidanga & Vidanga (in Oriya), Babrung, Vavaring (in Punjabi), Vayuvilangam & Vayuvidangam (in Tamil), Vayuvidangalu (in Telugu) and Baobarang & Babrang (in Urdu).^[24]

Sanskrit Synonyms

Amogha, Bhasmaka, Bidanga, Chitrabija, Chitratandula, Chitra, Gahara, Gardabha, Ghosha, Jantughna, Jantunashaka, Kairala, Kapali, Kevala, Krimighna, Krimiha, Krimikantaka, Krimiripu, Krimishatru, Mogha, Mrigagamini, Pavaka, Rasayana, Shudratandula, Suchitrabija, Tandula, Tanduliyaka, Vara, Vatari, Vella, Vidanga & Vrishnashana.^[25]

Botanical description of Seed^[26]

a) Macroscopic

The Fruit is brownish-black in colour, globular in shape & 2-4 mm in diameter. It has warty surface with a beak like projection at apex, often short, thin pedicel and persistent calyx with usually 3 or 5 sepals. Its pericarp is brittle enclosing a single seed covered by a thin membrane. The entire seed is reddish and covered with yellowish spots (*chitra tandula*) with a slightly aromatic odour & astringent in taste.

b) Microscopic

Transverse section of fruit shows epicarp which consists of a single row of tabular cells of epidermis. It is usually obliterated, in surface view the cells are surrounded with wrinkled cuticle. The mesocarp consists of a number of layers of reddish-brown coloured cells, numerous fibrovascular bundles and a few prismatic crystals of calcium oxalate. The inner part of mesocarp and endodermis are composed of stone cells. The endodermis consists of single layered, thick-walled, large, palisade-like stone cells, seed coat have 2-3 layers containing fixed oil and proteinous masses. The embryo is small when present otherwise most of the seeds are sterile.

Pharmacological Properties of drug (Rasa Panchaka)

The guna of vidanga is Laghu, Ruksha, Tikshna.^[27] It has Katu, Tikta rasa,^[28] Laghu,^[29] Katu vipaka^[30] and Ushna virya.^[31]

In *Charaka Samhita*, vidanga has been included under *Kusthaghna*, *Krimighna*, *Triptighna* and *Shirovirechana gana*. While Acharya Sushruta has placed it in *Shurshadi*, *Pipalayadi gana* where as it is one of the component of *Trimada* as per Bhavaprakasha.^[32] Its useful parts are Fruits and Seeds.

Chemical constituents and Pharmacology^[17]

The drug Vidanga contains (dry basis) Embelin (2:5-dihydroxy-3-lauryl-p-benzoquinone) 2.5 – 3.1 %, Quercitol 1.0 % and fatty ingredient 5.2%, an alkaloid Christembine, a resenoid and volatile oil.

Vidanga has a vermifuge property. It has shown positive anthelmintic activity against roundworm and tape worm infestation. and also have high efficacy against oxyuriasis. The embelin, present in fruit, is responsible for the anthelmintic property. The action of Embelin is a useful and safe remedy against tapeworms. It has shown in both *in vitro* and *in vivo* studies. Seeds of *Embelia ribes* has anthelmintic against tapeworms of poultry.^[32] *Embelia ribes* have shown activity against cestode, nematode and helminthic infestation.^[33]

Embelin has also shown significant antibacterial activity at higher concentration (100 mg). The inhibition was highly significant against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Shigella flexneri*, *S. sonnei* and *Pseudomonas aeruginosa*; moderate action against *Salmonella typhi*, *S. boydii* and *Proteus mirabilis*.^[34] Methanol and aqueous extract of *E.*

ribes showed moderate activity against multi-drug resistant *Salmonella typhi*.^[35] Wound healing activity of embelin is isolated from the ethanol extract of leaves of *Embelia ribes*.^[36]

Kutaj (*Holarrhena antidysenterica*)

Indrayava consists of dried seeds of *Holarrhena antidysenterica* of Family Apocynaceae. It is a small to medium sized tree, found throughout India.^[37]

Taxonomic Rank^[38]

Kingdom: *Plantae*

Sub-kingdom: Embryophyta

Division: Tracheophyta

Sub-division: Pteropsida

Division: Angiospermae

Class: *Dicotyledoneae*

Sub-class: Gamopetalae

Series: Bicarpellate

Order: Gentianales

Family: Apocynaceae

Genus: *Holarrhena*

Species: *antidysenterica*

Vernacular Names

Ester Tree, Kurchi, Conessi, Tellicherry bark (in English), Dhudi, Hat, Karchi, Kari, Kaura, Karvaindarjau, Kura, Kora (in Hindi), Lasanulassafirulmurr, Tivraja (in Arabic), Kari, Kaura, Kadvoindarjou, Kuda, Kado, Indrajwnunjad (in Gujarati), Kurchi, Titaindrajau (in Bengali), Dudcori (in Assame), Bedaki, Kodaga, Kuda, Kurra, Pandharakuda (in Marathi), Kotakappala, Pala, Panipalai, Venpala (in Malayalam), Erukkalaipalai, Indrabam, Kasappuveppalai, Veppalai (in Tamil), Amkudu, Chedukodise, Girimalika, Kodaga (inTelugu), Kewar, Kogar, Kiam, Koeva (in Punjabi) and Zabanekunjashketalkh, Indarjvetalkh, Tukhmeahharetalkh (in Persian).^[39]

Sanskrit synonyms

Girimallika, Indra, Indradu, Indrayava, Indrayavaphala, Kahi, Kalinga, Kutaja, Kshiri, Kahi, Mahagandha, Mallikapushpa, Pandura, Raktanashaka, Sanghrahi, Sukrashakshi, Tiktaka, Vrikshaka, Yavaphala, Kutajbeej, Yava, Indrayava, Lingka & Bhadrayava.^[40]

Botanical Description of Seed^[41]**a) Macroscopic**

The seeds of *Kutaja* are 1-2 cm long and 0.2-0.3 cm thick. Its surface is light yellowish-brown, is compressed, linear, oblong or elongated with margins curved inside. Its one side is convex where as other side is concave with a longitudinal striations. It has no distinct odour and is bitter in taste.

b) Microscopic

The seed of *Kutaja* has 2-3 layered integuments, which consists of single layered, rounded, oval or radially elongated, thick-walled, reddish-brown parenchymatous cells. Some of the parenchymatous cells are elongated outwards forming small papillose structure, covered by a few unicellular, and uniseriate, multicellular types of trichomes. Below this layer, 1 or 2 layers of small rounded or irregular cells, a few having single prismatic crystals of calcium oxalate, followed by a few layers of collapsed, brown coloured cells. The endosperm is 4-6 layered consisting of rounded, oval or polygonal, thin-walled, parenchymatous cells, containing aleurone grains. Most of the cells also contain oil globules and embryo have conical radicle and two foliaceous, convoluted cotyledons consisting of single layered tabular epidermal cells towards dorsal side and rectangular cells. Towards the ventral side and externally covered with cuticle, rest of the cotyledon cells are composed of rounded, oval or rectangular parenchymatous cells containing rosette crystals of calcium oxalate and oil globules.

Ayurvedic properties of drugs (Rasa-panchaka)

The guna of *Kutaja* is Snigdha,^[42] Laghu & Ruksha.^[43] It has Katu, Tikta, Kashaya rasa,^[44] and Ushna^[45] & Sheeta virya.^[46]

Acharya Charaka has placed it in Arsoghana, kandughana, stanyashodhan, aasthapanopaga, vaman gana, whereas in Aaragvadhadi, pippalydi, haridradi, lakshadi, urdhvabhaghar gana as per *Acharya Sushruta*.^[47]

The useful part of *Kutaja* are bark & seed. The seeds of *Kutaja* are known as Indrayava.

Chemical constituents and Pharmacology

Kutaja contains steroidal alkaloids, antidysentricine, kurchiphyllamine, crystalline glucoalkaloid and other alkaloids kurchiline, kurchiphylline, holarrhesiene, kurchessine,

holarrhidin, holonormine, holantosine E. and trimethyle conkirchine. Its bark has alkaloids kurchicine, conessine.^[48] Crude protein content of seed has aspartic acid (18.44%) and argine as major amino acids. The alkaloid Holarrhine & Holarosine is isolated from seeds.^[49] Concuressine (MP 86°C), 3-epiphetro-conessine (MP 146°C), kurcholessine (MP 219°C) are isolated after methylation of alkaloid mixture. O-free alkaloid (conessine, conimine, conkurchine group of alkaloids (including conissidine) and O-containing alkaloids (holarrhemine, holafrine, holarrhetin) are present in bark where as leaves contains alkaloids kurchiphyllamine and kurchiphylline.^[50]

It has antitubercular, hypotensive, antiprotozoal, hypoglycemic, antispasmodic, anti-amoebicidal action. The alkaloids from ethanolic extract of Holarrhena antidysenterica seeds were evaluated for their antibacterial activity against E. coli in vitro and their antidiarrhoeal activity on castor oil induced diarrhea in rats.^[51] Kurchicin is an active principle of Kutaja (Holarrhena antidysenterica) and highly effective against causative micro-organisms of diarrhea, dysentery i.e. especially amoebic type.^[52]

CONCLUSION

The above mentioned drug has anthelmintic and antiprotozoal action alongwith bactericidal and fungicidal effect. The individual content of the compound have additive and synergistic effect in the body against infection. The mechanism of action of above mentioned compound is may be because of its prabhava or rasa-guna-virya-vipaka. Many researches carried till date has established its safety and efficacy in pediatric and adult age group.

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