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Review Article

SHOOLPRASHAMAN MAHAKASHAYA: AN INTEGRATIVE CLASSICAL AND PHARMACOLOGICAL REVIEW FOR PAIN MANAGEMENT

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ABSTRACT

Shoolprashaman Mahakashaya, mentioned in *Charaka Samhita (Sutra Sthana 4/45)*, is a classical Ayurvedic formulation traditionally used for the management of pain (*Shoola*). It comprises *Pipali, Pipalimula, Chavya, Chitraka, Sunthi, Jeeraka, Maricha, Ajmoda, Ajaji, Ajagandha,* and *Gandeer* (excluded here due to controversial identity). The formulation is predominantly characterized by *Katu* and *Tikta Rasa*, *Laghu-Teekshna* and *Ruksha-Snigdha Guna*, *Ushna Virya* and *Katu Vipaka*, which collectively act on all *Doshas* with a special role in *Vata* pacification. Pharmacological investigations of individual ingredients reveal their analgesic, anti-inflammatory, antispasmodic, antimicrobial, and antioxidant properties. Bioactive phytoconstituents such as piperine, zingerone, gingerols, plumbagin, quercetin, rutin, and cuminaldehyde contribute to pain alleviation by modulating inflammatory mediators, scavenging free radicals, and reducing spasmodic activity. These findings suggest that *Shoolprashaman Mahakashaya* has significant therapeutic potential in conditions such as *Amavata* (rheumatoid arthritis), osteoarthritis, inflammatory bowel disorders, and abdominal colic, thus validating its traditional claims through modern pharmacological evidence.

INTRODUCTION

Shoolprashaman Mahakashaya consisting of *Pipali, Pipalimula, Chavya, Chitark, Sunthi, Jeerak, Marich, Ajmoda, Ajaji, Ajgandha*, and *Gandeer* (*Charaka Samhita Shutra Sthana* 4/45). It is used in pain (i.e., all kinds of pain occurring in various diseases). Most of the ingredients are having *Agni-Deepka, Pachaka*, anti-inflammatory, and analgesic properties which are useful to reduce pain. It releases obstruction of *Vayu* (*Prana, Samana,* and *Apana*), inhibits aggravated *Kapha* and *Aama,* does *Vatanuloman* due to *Ushna, Ruksha,* and *Laghu Guna.* The ingredients of *Shoolprashaman Mahakashaya* are having *Katu* and *Tikta Rasa, Laghu Teekshana, Ruksha* and *Snigdha Guna, Ushna Virya, Katu Vipaka* in nature with obvious alleviating action on all *Dosa*. It also has *Agnideepaka, Pachaka*, analgesic, and anti- inflammatory properties, which are also useful in conditions such as *Amavata*, rheumatoid arthritis, osteoarthritis pain, etc.

Methodology: A narrative review was conducted using published research articles on *Shoolprashaman Mahakashaya* and its individual ingredients. Databases and sources included PubMed-indexed journals, Scopus-listed articles and classical Ayurvedic literature. Studies focusing on analgesic, anti-inflammatory, antispasmodic and antioxidant activities were included, while unrelated studies were excluded. Due to controversial botanical identity, *Gandeer* was omitted from analysis.

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Table 1: Ingredients of formulation

Content	Botanical name	Family	Synonyms	Part used
Pippali [1]	*Piper longum*	Piperaceae	*Magdhi, Krishna, Ushana, Kanna, Vidahe, Krishna, Chapla, Upkulya, Kola*	Fruit
Pippali mula[2]	*Piper longum*	Piperaceae	*Granthik, Ushna, Chatkashir*	Stem
Chavya (*Hegde. PL & Harini A.-g 2019*)	*Piper Retrofractum*	Piperaceae	*Chavya, Chavika, Ushan*	Stem
Chitrak[3]	*Plumbago zeylanica*	Plumbaginaceae	*Analnama, Pathi, Vyal, Ushna*	Root
Shunthi Bapalala G. Nighantu Adarsh- e)	*Zingiber officinale*	Zingiberaceae	*Vishva, Vishv, Nagar, Vishvabheshajya, Ushana, Katubhadra, Mahaushad*	Rhizome
Maricha[4]	*Piper nigrum*	Piperaceae	*Krishan, Ushan, Vellaj, Dharmpatan*	Fruit
Ajmoda (*Hegde.P.L & Harini A.-h 2019*)	*Apium graveolens*	Umbelliferae	*Ajmoda, Kharashva, Mayuro, Deepyak, Bhramkusha, Karvi, Lochmastka*	Fruit
Ajaji[5]	*Cuminum cyminum*	Umbelliferae	*Jeerak, Jaran, Kana, Dhergha Jeerak*	Fruit
Ajgandha (Lavekar G.S, Database)	*Cleome gynandra*	Capparidaceae	*Ajgandha, Tilparni, putigandha, Barbaraka*	Seeds

*Note- The 10th herb of the group i.e., Gandeer has been omitted in this review study due to having controversial identification at present.

Experimental Pharmacology

1. *Piper longum (Pippali)*

Description

It has a slender, aromatic, perennial climber, with woody roots and numerous wide, ovate, cordate leaves. The shoots are downy, and the leaves are 5-9 cm long, 5cm wide. The inflorescence is a cylindrical, pedunculate spike, the female flower is up to 1.5cm-2cm long, but the male flower is larger, slender, and is 2.5-7.5cm long. The fruits are small, ovoid berries, shiny blackish green, embedded in fleshy spikes.[6]

Pharmacological activities

Anti Inflammatory Activity

In vivo study on *Piper longum* fruit, decoction showed marked anti-inflammatory activity using carrageen induced paw rat edema (Placeholder1)[7]

In vivo study of essential oil of *Piper longum* reduced the edema induced by carrageenan by 65.95% on oral administration of 0.5 ml/kg and 72.34% on oral administration of 1 ml/kg, as compared to the untreated control group. [8]

The various extract of fruits of *P.longum* was tested for their efficacy against *Entamoeba histolytica* by in vitro against experimental cecal amebiasis. The ethanolic extract and isolated piperine alkaloid improved caecal amebiasis by 90% and 40%, respectively, in rats.[9]

Analgesic activity

An aqueous suspension of *P. longum* root powder is given orally to mice and rats in doses of 200, 400, and 800 mg/kg. The 400 and 800 mg/kg doses of *P. longum* show significant NSAID type of analgesia ($P<0.001$). Both Ibuprofen (40 mg/kg) and *P. longum* (800 mg/kg) show 50% protection against writhing.[10]

2. *Piper Nigrum (Maricha)*

Description

Piper nigrum plant is a flowering woody perennial climbing vine that belongs to the Piperaceae family. Pepper plants easily grow on supporting trees or poles up to a maximum height of 4 meters or 13 feet, and roots may come out from leaf nodes if the vine touch the ground. The perianth is absent, stamens 2-4, and stigmas are 2-5 in number. [11]

Pharmacological activities:

Anti Inflammatory Action

The *in vitro* anti-inflammatory activities were evaluated on interleukin 1β stimulated fibroblast-like synoviocytes obtained from rheumatoid arthritis, while anti-arthritic including analgesic activities were evaluated on carrageen and induced acute paw model of pain and arthritis in rats. The prostaglandin E2, interleukin 6, cyclooxygenase 2, and matrix metalloproteinase levels were evaluated by ELISA and RT-PCR methods of analysis. Piperine-treated groups were found to reduce the synthesis of prostaglandin E2

in dose-dependent comportment at the concentrations of 10-100 µg/Ml.[12]

Piperine at a dosage of 5mg/kg and ethanolic extract of P. nigrum at a dose of 15mg/kg after 120 min and hexane extract at a dose of 10 mg/kg after 60 min revealed significant (P<0.05) analgesic activity by tail immersion method, as compared to ethanolic extract at a dose of 10 mg/kg using analgesy-meter in rats. The hexane and ethanol extracts of *P nigrum* showed maximum analgesic effect by writhing method at all doses of 5, 10, and 15mg/kg.[13]

During *in vivo* experiment Black pepper hot water extract attenuated the ileal contractions induced by KCL (60 mm, n=10) or carbacol (CCh, 10µM, n=9) significantly and in a concentration-dependent manner.[14]

3. *Zingiber officinale (Shunthi)*

Description

The ginger plant has a perennial, tuberous root, or rhizome; the stems are erect, oblique, round, annual, and invested by the smooth sheaths of the leaves, 2 or 3 feet in height, yellow-green flowers, and thick tuberous rhizome. Laterally compressed rhizomes are 7-15 cm long and 1-1.5 cm broad. About 1-3 cm long branches arise and terminate in depress scars or in the undeveloped bud.[15]

Pharmacological activities

Anti-Spasmodic Effect

Ex vivo studies with the rat stomach fundus have shown that the hydro-methanolic extract of dried ginger was effective in reversing the spasmogenic effects.[16]

Anti-Inflammatory Effect

In an *in vitro* study, ginger and its compounds have been studied in detail for their anti-inflammatory effects by suppressing the synthesis of prostaglandin by inhibiting cyclooxygenase-1 (COX-1), cyclooxygenase-2 (COX-2), and the biosynthesis of leukotriene by inhibiting 5- LOX [17].

6-gingerol and four structurally related compounds of fresh ginger were separated and purified by chromatographic technique, and the resulting fractions for their effect on prostaglandin (PG) synthesis were assessed *in vivo*. Ginger suppresses prostaglandin synthesis.[18]

Altman and Marcussen using a ginger extract, conducted a 6-week, a double-blind placebo-controlled parallel-group study involving 247 patients with osteoarthritis, and it was found the percentage of responders experiencing a reduction in knee pain on standing was superior in the ginger extract group compared with the control group (63% versus 50%; P = 0.048). [19]

The phytochemicals 8-paradol and 8-shogaol are also reported to possess strong inhibitory effects on COX-2 enzyme activity *in vitro*.[20]

Antinociceptive Effect

The effect of ginger on morphine-induced analgesia was assessed *in vivo* in this experiment before a sub- effective dose of morphine (2.5 mg/kg i.p.) ginger extract (200, 400, and 600 mg/kg i.p.) was injected. The radiant heat tail-flick test was used to assess the nociceptive threshold before and at different times after drug administration results showed that ginger extract elicited a significant antinociceptive effect. [21]

Analgesic Effect

In vivo study on the ginger oil (dose 0.25, 0.5, and 1.0 g/kg) showed a significant decrease in the number of acetic acid-induced writhes in mice. [22]

In clinical research, 2 g of ginger supplementation was used for 11 days on 36 participants having myalgia. It was revealed that daily consumption of raw and heat-treated ginger resulted in in moderate-to-large reductions in muscle pain. [23]

4. *Piper longum (Pippali Mula)*

Description

Morphology of the root reveals that externally it is brownish grey in color, strong and characteristic odor, causing irritation in the nose while in raw form. The transverse section of the root show cork with tannin, fan-shaped arrangements of vascular bundle up to the center, which is the most important striking character of the *Pippalimula* without forming any pith[24].

Pharmacological activities

Analgesic Activity

An aqueous suspension of *P. longum* root powder was given orally to rats and mice. The study accomplished that *P. longum* root has weak opioid but potent NSAID type of analgesic activity.[25]

Antiamoebic activity

The ethanolic extract of roots was amoebicidal at 1000 µg/mL *in vitro* and cured 88% of caecal amoebiasis cases. [26]

5. *Piper retrofractum (Chavya)*

Description

It is a climbing vine with stems of about 3–4 mm in diameter. Its leaves have blades that are lanceolate, glabrous, with acuminate apex and asymmetric base, and are about 3–3.5 cm wide and 10–12 cm long. The vine is dioecious, with female spikes about 4 cm long and 0.5–1 cm wide and male spikes of about 5 cm long and, and part of the ovaries are attached on the axis.[27]

Pharmacological activities

Anti-bacterial property

The crude extracts of *P. retrofractum* fruits were tested against the various pathogens by the disk agar diffusion method. Methanol extract inhibited 9/10 of the tested pathogens with an inhibition zone in the range from 0.5 to 8 mm.[28]

6. *Plumbago zyelanica (Chitrak)*

Description

P.zeylanica is a herbaceous plant with glabrous stems that are climbing, prostrate, or erect. The plant grows up to a height of 3–4 ft. The leaves are petiolate or sessile and have ovate, lance-elliptic, or spatulate oblanceolate blades that measure 5-9 × 2.5–4 cm in length. Bases are attenuate, while apexes are acute, acuminate, or obtuse. Inflorescences are 6–30 cm in length and have glandular, viscid rachises. Bracts are lanceolate and 3-7 × 1–2 mm long. The heterostylous flowers have white corollas 17–33 mm in diameter and tubes 12.5–28 mm in length. Capsules are 7.5–8 mm long and contain are reddish-brown to dark brown seeds. [29]

Pharmacological activities

Anti Inflammatory activity

A study reported that hydro-alcoholic extract of P. zeylanica leaf showed anti-inflammatory activity. [30]

A study revealed the anti-inflammatory effect of P. zeylanica in carrageenin-induced raw paw edema in rats. In the investigation, four groups were taken where two groups were treated with 300mg/kg and 500mg/kg, which confirm the 31.03 and 60.30% acute inflammation inhibition.[31]

A clinical study was conducted on 30 patients who were taken from the OPD and IPD of National Institute of Ayurveda, Jaipur by Napalchyal et al., where 4mgs of *Chitraka churna* was given to 15 patients twice a day with lukewarm water for 15 days. And they found a significant improvement in the pain, swelling, tenderness, and dizziness caused due to inflammation of the body parts.[32]

Headache, antiperiodic, and sudorific activity

In Malay community, extract of the roots is used to treat hypertension. Paste of the roots applied behind the ear is helpful to relieve headaches. Another method of relieving headache is by applying the root paste to the palate. The tincture of the root bark is an antiperiodic and a sudorific. [33,34]

Anti-bacterial

Plumbagin, derived from the roots of *P. zeylanica* (*Chitrak mool*) was studied for its effect in developing antibiotic resistance using antibiotic sensitive strains of *E.coli* and Staphylococcus aureus. A delayed growth was seen when these organisms were inoculated into the antibiotic (streptomycin/ rifampicin) medium, due to development of resistance in some of the cells.

However, the growth was completely prevented when the bacteria were grown in the medium having plumbagin and antibiotic together, and this was attributed to the prevention of the development of antibiotic-resistant cells. [35]

Crude alcoholic extract of *P. zeylanica* showed anti-bacterial properties against the growth of multi-resistant strains of E. coli and Shigella. MIC value of 0.64-10.24mg/ml obtained when compared with other plant extracts[36].

7. *A.graveolens (Ajmoda)*

Description

It is a herbaceous plant with the root thickened at the neck. Stem furrowed, branched. Leaves are pinnate with wedged-shaped cut segments. Fruits round, contracted at the side, double. Half-fruits with 5 filiform equal ridges, of which the laterals form the border. Leaves are pinnate to bipinnate with rhombic leaflets 2–4 cm broad and 3–6 centimeters long. The flowers are creamy-white, 2–3 mm in diameter. The seeds are broad ovoid to globose, 1.5–2 mm long and wide. [37]

Pharmacological activities

Analgesic activity

The ethanolic extract of the seed of *A.graveolens* possessed significant analgesic activity when tested against the acetic acid-induced writhing and hot plate method.[38]

Anti-spasmolytic activity

Ethanolic extract of the *A. graveolens* showed significant anti-spasmolytic activity. It inhibited the ileum concentration in a dose-dependent manner [39].

8. *Cyminum Cuminum (Ajaji)*

Description

C.cuminum is an annual herbaceous plant with a glabrous, slender, branched stem that is 20–30 cm tall and has a diameter of 3–5 cm. Each branch has two to three sub-branches. The plant has a uniform canopy, as its branches attain the same height. The stem is colored grey or dark green. The leaves are 5–10 cm long, pinnate or bipinnate, with thread-like leaflets. The flowers are small, white or pink, and borne in umbels. Each umbel has five to seven umbellets. The fruit is a lateral fusiform or ovoid achene 4–5 mm long, containing two mericarps with a single seed. [40]

Pharmacological activities

Antimicrobial effect

Ethanolic extracts of *Cyminum cuminum* seed were tested for antimicrobial activity in vitro by the

microdilution method. It exhibited antimicrobial activity against biofilm Escherichia coli.[41]

Anti-inflammatory activity

According to studies, treatments supplemented with C. cyminum have a profound effect on several inflammatory biomarkers, such as adiponectin, high-sensitivity C-reactive protein (hsCRP), and TNF-α. [42]

Antispasmodic effect

The antispasmodic effect of an alcoholic extract of cumin seeds has shown an inhibitory effect on smooth muscle contraction induced by the spasmogens, acetylcholine, and histamine[43].

Gastrointestinal effect

Extract of cumin seeds produced dose-dependent antiulcerogenic effect against indomethacin-induced gastric ulcers, accompanied by decreased acid and leukotriene output and increased mucin secretion and prostaglandin E2 release. The histologically antiulcerogenic activity was also confirmed and was accredited to its flavonoid content and free radical scavenging properties [44].

9. *C. gynandra (Ajgandha)*

Description

C. gynandra is an erect, branching plant with 25 cm and 60 cm in height. Its leaves are each made up of 3–5 oval-shaped leaflets. The flowers are white, sometimes changing to rose-pink as they age. The seed is brown in color and 1.5 mm diameter sphere. The leaves and flowers are both edible (Alli, S. et al. 2007).

Pharmacological activities

Anti-bacterial property

In a study, antimicrobial property was compared of methanolic extract of *cleome chelidonii* and *cleome gynandra,* and it was found that the *C. gynandra* possesses maximum anti-bacterial activity against Staphylococcus aureus than *C.chelidonii*[45].

Anti-inflammatory effect

The increased levels of both protein-bound carbohydrates and lysosomal enzymes in arthritic rats were significantly suppressed near to normal level by administering C. gynandra extract. Further, the significantly elevated plasma levels of TNF-α found in arthritic rats were found to be significantly restored back to near-normal levels by the extract in experimental animals. C. gynandra extract may be through its stabilizing action on lysosomal membranes prevents the spread of inflammation [46].

DISCUSSION

Pain (*Shoola*) is one of the most common clinical manifestations explained in Ayurveda, largely resulting from aggravated *Vata Dosha*, often associated with obstruction by *Kapha* and *Aama*. *Shoolprashaman Mahakashaya*, through its *Ushna, Teekshna,* and *Laghu Guna*, helps in *Vatanulomana*, releases obstruction, and reduces inflammation and spasm. The review of pharmacological evidence supports these classical concepts, as the formulation's ingredients exhibit significant analgesic, anti-inflammatory, antioxidant, and antispasmodic properties. Piper species such as *Pippali, Maricha,* and *Chavya* contain piperine and chavicine, which are proven free radical scavengers with strong analgesic and anti-inflammatory activity. *Sunthi (Zingiber officinale)* provides bioactive compounds like 6-gingerol, shogaol, and zingerone that inhibit COX-2 and prostaglandin synthesis, thereby reducing pain and swelling. *Chitraka (Plumbago zeylanica)* contributes plumbagin with potent anti-inflammatory and antibacterial actions, while *Ajaji (Cuminum cyminum)* and *Ajmoda (Apium graveolens)* show antispasmodic and analgesic effects beneficial in gastrointestinal and musculoskeletal pain. *Ajagandha (Cleome gynandra)* adds further value with quercetin, rutin, and α-amyrin, which demonstrate antioxidant, anti-nociceptive, and anti-inflammatory effects. Together, these phytoconstituents act synergistically by suppressing inflammatory mediators like COX, LOX, and TNF-α, scavenging free radicals, stabilizing lysosomal membranes, and relaxing smooth muscles. This multi-targeted approach highlights the wide therapeutic scope of *Shoolprashaman Mahakashaya* in conditions such as *Amavata* (rheumatoid arthritis), osteoarthritis, abdominal colics, and inflammatory bowel disorders. Although the omission of *Gandeer* due to its controversial identity slightly limits the classical integrity of the formulation, the reviewed ingredients sufficiently validate its traditional claim as a potent pain-relieving remedy. Overall, the discussion establishes *Shoolprashaman Mahakashaya* as a scientifically supported Ayurvedic formulation with promising potential for further research and clinical application in pain management

CONCLUSION

Shoolprashaman Mahakashaya, described in *Charaka Samhita*, is a classical Ayurvedic formulation with strong potential in pain management. Its ingredients, rich in bioactive phytoconstituents such as piperine, gingerols, zingerone, plumbagin, quercetin, and rutin, exhibit proven analgesic, anti-inflammatory, antioxidant, and antispasmodic activities. These actions collectively help in *Vatanulomana*, removal of *Aama* and *Kapha* obstruction, and alleviation of *Shoola*. The review highlights its therapeutic applicability in musculoskeletal disorders like *Amavata* (rheumatoid arthritis) and osteoarthritis, as well as gastrointestinal conditions such as colic, gastritis, and inflammatory bowel disease. Although the exclusion of *Gandeer* due to its controversial identity slightly modifies the classical composition, the remaining herbs provide

substantial pharmacological evidence supporting its efficacy. Thus, *Shoolprashaman Mahakashaya* stands as a safe, multi-targeted, and scientifically validated Ayurvedic formulation that merits further clinical exploration for chronic pain and inflammatory conditions.

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