

## REVIEW OF PLANTS USED AS KSHAR OF FAMILY PIPERACEAE

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### Abstract

Many herbal remedies individually or in combination have been recommended in various medical treatises for the cure of different diseases. **Kshara** is a kind of medication described in Ayurveda Texts for the management of various disorders. The genus *Piper* L. is estimated to contain over 1000 species which are distributed mainly in tropical regions of the world. This review mainly focuses on the plants of family Piperaceae that are used in Kshar so that more research work is carried out in the direction of standardization, therapeutic level determination of Kshar plants.

**Keywords:** Kshar, Piper, Piperaceae, Herbal remedies

### INTRODUCTION

The word *Kshara* is derived from the root *Kshar*, means to melt away or to perish. Acharya Sushruta defines as the material which destroys or cleans the excessive/the morbid doshas (*Kshyaranat Kshyananat va Kshara*). According to the preparation we can consider it to be caustic materials, obtained from the ashes after distillation and are mostly alkaline in nature.

According to the administration it is of two types

1. *Paniya Kshara* (for internal Medication)
2. *Pratisaraniya Kshara* (external application)

The *Paniya Kshara* is mostly used for the treatment of diseases like artificial poison, abdominal lump, indigestion, calculus etc. The *Pratisaraniya Ksara* is used to apply on tumors, piles, fistula in ano, skin diseases etc (Shukla et al. 1994, Sharma et al. 1995)

### Drug Used

Many drugs have been advised by Sushruta and other Ayurvedic texts for the preparation of Kshara (Ghanekar 1998, Sharma et al. 1995)

### Method of Preparation

According to the three types of Ksharas are prepared on the basis of their strength. Mild - *Mridu*, Moderate - *Madhyama*, Strong - *Tikshna*

The general procedure can be narrated as - '**Mridu**' Bhaṣṁikaraṇa (conversion to ash) Adding to water (1:6 ratio) Filtration (21 times) Distillation (boiling the ksharajala still all water evaporates) collection (process called lixiviation) '**Madhyama**' Here the procedure is same some extra powders of Katasarkara Bhasma sarkara Ksheerapaka, Samkhanabhi( gravels of lime and ash, oyster-shell & core of conch-shell) are added to the boiling ksharajala before distilling it. '**Tikshna**' Similar to madhyama kshara here added is the powders of drugs like Chitraka, danti, vacha etc. in place of the lime stones (Ghanekar 1998, Shukla et al. 1994, Sharma et al. 1995).

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## Family- Piperaceae

The genus *Piper* L. is estimated to contain over 1000 species which are distributed mainly in tropical regions of the world. Several species have great economic and cultural importance and are used as foods, medicines, stimulants, antiseptics and antioxidants (Arunrat et al. 2006). There are three important plants used in Kshar Sutra from family piperaceae are *P. nigrum* Linn., *Piper cubeba* Linn., *Piper longum* Linn. (Kirtikar and Basu, 1935; Warriar et al. 2006; Yoganarasimhan and Chelladuri 2000)

### 1. *P. nigrum* Linn.

*P. nigrum* is the most important cultivated species due to its economic value (Bhat et al., 1995). Geographically, it is confined to Western-Ghats of South India (Nair et al., 2003). However, some reports of cultivation from Malaysia, Indonesia, Brazil, Sri-Lanka and West Indies are also available (Backer et al., 1963). *P. nigrum* had been found in vast altitudinal regions and showed great adaptability to a wide range of environmental conditions which led to inter-species diversity (Howard, 1973). "Black-pepper" as its generalized name is due to the colour of the peppercorn. It is considered as the "king of spices" due to its trade in the international market (Srinivasan, 2007; Mathew et al., 2001). Black-pepper is widely used in cooking and processing of food and perfumery (Philip et al., 1992; Bhat et al., 1995). Its quality is judged by its odour and pungency (Kay, 1970). Piperine is an active component in *P. nigrum* and contributes to its pungency (Tripathi et al. 1996). *P. nigrum* is reputed in the local system of medicine of India, Latin America and West-Indies for its multidimensional medicinal properties (Scott et al., 2008). Secondary metabolites from *P. nigrum* play defensive role against infections by microbes, insects and animals (Lupina and Cripps, 1987). Efforts have been made in screening these

chemicals against different pathogenic species of microorganisms (Umit et al., 2009). Piperamides extracted from *P. nigrum* had shown insecticidal activities (Scott et al., 2005; Boff et al., 2006).  $\beta$ -caryophyllene extracted from *P. nigrum* showed anesthetic activity (Santra et al., 2005). Nerolidol is a very famous secondary metabolite of *P. nigrum*, used to control mites. Another important component of pepper volatile oil is pipene, which is a famous odorants (Jayalekshmy et al., 2003). Black-pepper is anti-microbial (Dorman and Deans, 2000), anti-mutagenic (EI-Hamas et al., 2003), a free-radical scavenger (Gulcin, 2005; Saxena et al., 2007), immuno-modulator, anti-tumor (Sunila and Kuttan, 2004), anti-depressant (Lee et al., 2005), anti-apoptotic (Pathak and Khandelwal, 2007), anti-metastatic (Pradeep and Kuttan, 2002), anti-thyroid (Panda and Kar, 2003), hepatoprotective (Koul and Kapil, 1993), immunostimulator (Pathak and Khandelwal, 2009), anti-diarrheal and anti-spasmodic (Bajad et al., 2001). Black-pepper was reported to treat pulmonary diseases (Ravindran, 2000), fever, cold, colic disorder and gastric conditions (Parmar et al., 1997; Kumar et al., 2007). Recently, anti-spermatogenic and infertility effect in mice were reported by Mishra and Singh (2009). The following biologically important phytochemicals have been extracted from *P. nigrum* plants: alkaloids, amides, propenylphenols, lignans, neolignans, terpenes, steroid, kawapyrones, piperolides, chalcones, dihydrochalcones, brachyamide (Kiuchi et al., 1988), dihydropipericide (Miyakado et al., 1980), 3,4-dihydroxy-6(N-ethylamine), benzamide (Bandyopadhyay et al., 1990), (2E, 4E)-Neicosadienoyl piperidine (Kiuchi et al., 1988), N-transferuloyltryamine, N-formylpiperidine (Stohr et al., 2001), guineensine (Kiuchi et al., 1988), (2E, 4E)-N-5[(4-Hydroxyphenyl)-pentadienoyl] piperidine, (2E,4E)-Nisobutyldecadienamide, (2E,4E)-N-isobutyleicosadienamide (Bano et al.,

1991), (2E,4E,8Z)-Nisobutyl-icosatrienamamide, (2E,4E)-Nisobutyloctadienamamide (Nakatani et al., 1980), piperamide, piperamine (Kiuchi et al., 1988), piperettine (Orjala et al., 2003), pipericide (Miyakado et al., 1980), piperine, piperolein, trichostachine, sarmentine, sarmentosine, tricholein, retrofractamide (Kiuchi et al., 1988). Concentration of alkaloids in fruits of *P. nigrum* ranges from 4 to 5% (Dev and Koul, 1997). Pino et al., 2003 observed that the major components of the essential oil obtained from the aerial parts of *P. nigrum* were gluulol,  $\alpha$ -pinene,  $\beta$ -caryophyllene and  $\beta$ -terpinene. Piperine was the first amide to be isolated from piper species. Piperine the major active principle of black pepper, is closely related in structure to the known natural carcinogens-safrole, estragole and methylenegenol which are also widely distributed in spices and plant oils (Ames, 1983).

## 2. *Piper cubeba* Linn.

*Piper cubeba* (in Indonesia known as *kemukus*), is a plant, native to Java and Borneo that produces spicy berries (cubeb berries). It is now also cultivated in several other tropical areas, including East Africa. In Indonesia *P. cubeba* is valued as a medicinal plant (Eisei 1995, Sastroamidjojo, 2001). Only three groups of secondary metabolites have been reported from the berries of *P. cubeba*, i.e. alkaloids, lignans and terpenoids (essential oil). The lignans and the essential oil have been more intensively investigated, since *P. cubeba* accumulates both groups of compounds in relatively high amounts. Economically, *P. cubeba* is important as a source of pepper (the dried berries) for the worldwide spice market (Usia et al., 2005 a, b). Piperine is an abundant alkaloid in the berries of this species (Parmar et al., 1997). Twenty four lignans have so far been reported from *P. cubeba* (Prabhu and Mulchandani, 1985, Badheka et al., 1986, 1987, Koul et al., 1996, Parmar et al., 1997, Usia et al., 2005). Lignans are an

important group of secondary metabolites that are also assumed to contribute to the biological activity. Some of these lignans showed inhibitory activity against cytochrome P450 enzymes that are involved in the metabolism of all currently used drugs (Usia et al., 2005a, 2005b). Yatein, hinokinin, cubebin, dihydrocubebin have been reported to have antifeedant activity against a number of stored product insects. This activity is comparable to podophyllotoxin (Harmatha and Nawrot, 2002). Hinokinin has been reported to have anti-inflammatory and analgesic effect. Because of the structural relationship, hinokinin can be synthesized using cubebin as precursor (Da Silva et al. 2005). Cubebin has been shown to possess anti-inflammatory, analgesic and trypanocidal activities (Borsato et al., 2000, Bastos et al., 2001, De Souza et al., 2005). Yatein is also an interesting lignan due to its biological activity and its function as a biosynthetic precursor of deoxypodophyllotoxin and podophyllotoxin that are well known for their anticancer properties. Methanol and water extract of *P. cubeba* berries have been shown to display an inhibitory effect against the hepatitis C virus (Hussein et al., 2000). Anti-inflammatory, antioxidant, anti-allergic and analgesic activities of *P. cubeba* have been studied using chemically-induced edema and arthritis *in vivo* (Choi and Hwang, 2003 and 2005).

## 3. *Piper longum* Linn.

*Piper longum* Linn. is the accepted source of the drugs Pippali and Pippalimulam throughout the country. Pippali is the dried ripe fruits; Pippalimulam is the roots of this plant (Sivarajan & Balachandran, 1994). The plant is a dioecious slender aromatic climber with perennial woody roots, or a perennial creeping under shrub. Branchlets erect, glabrous with swollen nodes; roots clasping at nodes, which help to get attached to the host trees; leaves alternate, ovate, cordate, apex acute to acuminate, margin entire, glabrous. The male and

female plants are morphologically very similar till the formation of spikes. Mature female spikes, known as long pepper are shorter and thicker than the male spikes. Fruit spikes cylindrical, oblong, berries red or black when ripe, globose with aromatic odour and pungent taste (Sumy et al, 2000; Banerjee et al, 1999; Viswanathan, 1995, Sumy et al, 2000; Sivarajan & Balachandran, 1994). The fruits contain 1% volatile oil, resin, alkaloids piperine and piperlonguminine, a waxy alkaloid N- isobutyldeca-trans-2-trans-4-dienamide and a terpenoid substance. The pungency of the fruits is mainly due to the piperidine alkaloid piperine. The fruits also contain calcium, 1230; phosphorous, 190; and iron, 62.1mg/100g. Roots contain piperine, piperlongumine or pipartine and dihydrostigmasterol (Neelam & Krishnaswamy, 2001). This plant shows different pharmacological activity like antibacterial activity (Reddy et al, 2001), Antiallergic activity (Chatterjee, 1999; Dahanukar et al, 1984 ; Amit et al, 2003), Antitumour activity (Bai & Xu, 2000; Sunila & Kuttan, 2004), antitubercular activity (Kurup et al, 1979), Antifertility activity (Kholkute et al, 1979), vasodilating activity (Shoji et al, 1986), anti-giardial and immuno-stimulatory activity (Tripathi et al, 1999). This plant is also used in treatment of intestinal disorders (Ghoshal et al, 1996), hepatoprotective effect (Koul & Kapil, 1993), chronic bronchitis, cough and cold (Sumy et al, 2000) and bronchial asthma in children (Dahanukar et al, 1984; Anshuman et al, 1984).

### CONCLUSION

Major thrust by whole of the pharmaceutical industry is focused towards design and development of new innovative/indigenous plant based drugs through investigation of leads from traditional system of medicine. In recent years, ethno-botanical and traditional uses of natural compounds, especially of plant origin received much attention as they are

well tested for their efficacy and generally believed to be safe for human use. It is best classical approach in the search of new molecules for management of various diseases. Thorough screening of literature available on different species of family piperaceae depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment of ailments. Researchers are exploring the therapeutic potential of these plants as it has more therapeutic properties which are not known.

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