DRUG REVIEW ON KADALI (MUSA PARADISIACA LINN.)

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ABSTRACT

Kadali (Musa paradisiaca L.) is one of the most important medicinal plant and forms an important drug of Ayurvedic system of Medicine. Musa paradisiaca L. is mainly grown in the tropical and subtropical countries and is widely used for its medicinal and nutritional values all over the world. The stem, fruit as well as the other parts of the plant like root, rhizome, leaves are used to treat different diseases in human as traditional medicine. It is prescribed for many diseases such as in diarrhoea, dysentery, intestinal lesions in ulcerative colitis, diabetes, sprue, uremia, nephritis, gout, hypertension and cardiac disease. In Ayurveda pharmaceutics, importance has been given to the stem and root juice due to their use in the purification procedures of metals like Vaikranta, Swarnamakshika and uses in the incinerating process of Abhraka (Mica). This paper presents a review on Musa paradisiaca L. with special emphasis on its ayurvedic properties and applications in the pharmaceutical area.

Keywords: Kadali, Musa paradisiaca, Useful Parts, Chemical Constituents,, Pharmacological activities, Uses in Rasashaadhi, Nutritional Properties

INTRODUCTION

Kadali is one among the drug which is available easily and economically. Kadali is considered as a religious drug and by this importance it is widely used in therapeutics. Kadali consists of fresh rhizome of Musa paradisiaca Linn. (Fam. Musaceae); plant found cultivated throughout India, up to 1200 m\textsuperscript{2}.

In ancient Indian literature, the plant is termed as Rambha, Ambusara, Mocha. Other common names and synonyms are Kadali, Hastivisha, Kasthila, Varana, Anshumatphala, Ambhusara, Dheergapatra, Balakapiya, Sukumari, Veera\textsuperscript{1}.

Ayurvedic Literature:

As per classical literature available in Ayurveda, it is evident that the drug Kadali is having much significant importance, being extensively used for its varied benefits. Almost all Acharyas of Ayurveda have referred this drug for its multiple benefits in therapeutics.

Historical Review of Kadali

In Vedas Kadali was not mentioned. God Hanuman is referred to have lived in Kadali Vana on the banks of Kuberapuskharani.

Taxonomic Position

Kadali (Musa paradisiaca L.) belongs to the family Musaceae. It is a tropical herb with fruit and flower kept in the same plant.

Classical Categorization of Kadali

<table>
<thead>
<tr>
<th>Samhita/Nighantu</th>
<th>Gana/ Varga</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astanga Hrudaya</td>
<td>Rodhradi gana</td>
</tr>
<tr>
<td>Susruta Samhita</td>
<td>Lodhradi gana</td>
</tr>
<tr>
<td>Bhavaprakasha Nighantu, Raja Nighantu</td>
<td>Amaradi Varga</td>
</tr>
<tr>
<td>Madanapala Nighantu</td>
<td>Phaladi Varga</td>
</tr>
<tr>
<td>Dhanwantri Nighantu, Shodala Nighantu</td>
<td>Karaviradi Varga</td>
</tr>
<tr>
<td>Bhavaprakasha Nighantu</td>
<td>Shaka Varga</td>
</tr>
<tr>
<td>Kaiyadeva Nighantu</td>
<td>Oshadi Varga</td>
</tr>
</tbody>
</table>

Botanical Description\textsuperscript{1}

A stout, stoloniferous, perennial herb, 2-8 m tall. Leaves oblong, 1-3\* 0.2-0.3m, suddenly truncate at both ends, acuminate or emarginate; petioles 0.5-1m on long sheaths forming pseudostems. Flowers unisexual, in a cymose inflorescence subtended by a large bract and all partial inflorescences arranged spirally on a long, drooping, stout axis. Bracts large, broadly ovate, 20-40*15-30 cm, brownish red, truncate at base; lower bracts subtending female and distal ones male flowers. Fruits oblong to fusiform, generally 15-25 cm long, fleshy\textsuperscript{1}.
A) **Rhizome**

a) **Macroscopic**

Drug available in 0.1-4 cm thick, transversely cut pieces, pinkish-brown to Greyish-brown, occasionally attached with a few roots.

**B) Flower**

a) **Macroscopic**

Inflorescence spike, drug occurs in cut and crumpled pieces, 2.5 to 4.0 cm long sessile, unisexual; calyx and corolla present; calyx 2.5 to 4 cm long crumpled, tubular spathaceous, dark brown having ridges and furrows; corolla 1.5 to 2.5 cm long, connate, crumpled, boat shaped creamish – yellow, membranous, toothed at apex; stamens 5+1 rudimentary, 0.8 to 1.2 cm long dark brown; filament erect, strongly filiform, anthers linear, bithecous; carpels 3, syncarpous, ovary inferior, trilocular, each with several ovules; axile placation; style 3.0 to 4.5 cm long light brown, filiform; stigma capitates or sub globose, 3 or 4 lobed, greyish – brown; taste arid odour not characteristic.

b) **Microscopic**

**Calyx** – Shows thin-walled, single layered, upper and lower epidermis, followed by thin walled, parenchymatous mesophyll, embedding vascular bundle, having usual elements surrounded by some large, thin walled, specialized cells containing oleo-resin ducts, tannin cells and a few oil globules.

**Corolla** - Shows thin-walled, striated single layered epidermis on either surface and oval to polygonal in surface view; mesophyll 2 or 3 layered consisting of thin-walled, parenchymatous cells; numerous prismatic crystals of calcium oxalate present in mesophyll.

**Androecium** – Filament shows single layered epidermis, followed by ground tissues consisting of oval to polygonal, thin walled, parenchymatous cells having crescent shaped vascular bundles and oleo-resin cells; another lobe shows 2 layered wall, 4 to 6 celled tapetum; pollen grains spherical measuring 26 to 47 µ in diameter, smooth, yellowish-brown, having clear, thick-walled, pigmented exine, thin-walled, colourless intine.

**Gynoecium** – Ovary shows single layered, cuticularised epidermis followed by ground tissue consisting of oval, polygonal, thin-walled, parenchymatous cells embedding a few thickened pitted cells; stigma consists of 6 chambers having single layered epidermis.

**Powder** – Brown, shows fragments of straight walled, thin walled epidermal cells, simple pitted cells, vessels with spiral thickening, anisocytic stomata, a few prismatic crystals of calcium oxalate, spherical, smooth, yellowish-brown pollen grains, having clear exine and intine and measuring 26 to 47 µ in diameter, a few oil globules, and oleoresin cells; a few simple, oval or irregular starch grains measuring upto 65 µ in length and 35 µ in width.

**Distribution:**

It is extensively cultivated throughout India.

**T.L.C.:**

T.L.C. of the alcoholic extract on Silica gel 'G' plate using Toluene: Ethylacetate (9: 1) shows under U.V. (366 nm) two fluorescent zones at Rf 0.25 (orange) and 0.33 (green). On exposure to Iodine vapour three spots appear at Rf. 0.11, 0.25 and 0.73 (all yellow).

**Parts Used:**

Fruit, Stem, Flower.
Table 2: Properties and Actions of Different Parts of Kadali

<table>
<thead>
<tr>
<th>Parts</th>
<th>Rasa</th>
<th>Guna</th>
<th>Virya</th>
<th>Vipaka</th>
<th>Karma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phala</td>
<td>Madhura, Kashaya</td>
<td>Mridu, Guru</td>
<td>Naati Sita</td>
<td>Madhura</td>
<td>Vrśya, Hridya, Ruchya, Rakta-Pittahara, Kaphakara, Guru</td>
</tr>
<tr>
<td>Kanda</td>
<td>Madhura, Kashaya</td>
<td>Guru, Ruksha</td>
<td>Sita</td>
<td>Madhura</td>
<td>Balya, Dipana, Kapha-Pittahara, Kshaya, Ruchya,</td>
</tr>
<tr>
<td>Pushpa</td>
<td>Madhura, Tuvara</td>
<td>Snigdha</td>
<td>Sita</td>
<td>Madhura</td>
<td>Vata-Pittahara, Rakta-Pittahara, Kshayahara</td>
</tr>
</tbody>
</table>

Rogagnnata – Vrana, Siddhama, Apasmara, Apatantraka, Karnashoola, Netraroga, Trishna, Daha, Grahani, Udararoga, Shwasa, Kasa, Kshata, Kshaya, Soma roga, Mootrakrichra, Raktapradara, Raktapitta, Madhumeha.

**Therapeutic Usage**

1. In *Sidhma* - Kadali kshara is given along with turmeric powder.
2. In *Raktapradara* – Kadali Phala is to be taken with ghee.
3. In *Somaroga* – Ripe fruit of kadali mixed with juice of amalaki, honey and sugar is given

**Chemical Constituents**

Fixed Oil and 4 α-O-Methyl Sterol Ketone, 9,19-Ocycloptriterpene ketone characterized as 4α, 14α-O-dimethyl-1O-9,19O-cyclocholestanO-20O-enO-3O-one, triterpenoidO-24(R)O-4αO-14α, 24O-trimethylO-5αO-cholestO-8,25(27)O-dieneO-3βO-ool,9,19O-cyclotriterpeneO-31OnorO-24βOmethylO-9O-12O-cyclolanostO-25O-enO-3βO-ool (flowers); hemiterpenoid glucosideO-1, 1O-dimethylallyl alcohol β-glucoside, benzyl alcohol glucoside, syringin and (6S,9R)-roseoside (flower buds); sterylac-yl glucosides-sitoidiosides 1 & 2, serotonin, norepinephrine, dopamine, catecholamine, tryptophan and indole compounds(fruit); cycloartane triterpenes-3-epicycloeucalenol, 3-epicyclomusalenol, 24-methylenepollinastanone, 28-norcycloartamulone, 24-oxo-29-norcycloartanone, two 3-oxo-28-norcycloartane-type triterpene, 4-epicycloeucalenone and 4-epicyclomusalenone and 3-oxo-28-norcycloartanes, cycloeucalenone and cyclosulamulene (fruit peel); 14α-methyl-9β,19-cyclo-5α-ergost-24(28)-en-3β-ol (plant).

**Pharmacological activities and Uses**

Table 3: Different parts of Musa Paradisiaca and their uses

<table>
<thead>
<tr>
<th>Part Used</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>Anthelmintic, Antiscorbutic, Antibilious, Alternative, Depurative and Tonic. Useful in venereal diseases, helminthiasis, scabies, leprosy, toothache, skin diseases, debility, anemia, cachexia and intrinsic hemorrhage</td>
</tr>
<tr>
<td>Tender leaves</td>
<td>Useful in Scabies, Inflammations, Eye diseases, Blisters and Burns</td>
</tr>
<tr>
<td>Fruits</td>
<td>Astringent, Emollient, Cooling, Anthelmintic, Aphrodisiac, Antiscorbutic, Laxative, Demulcent, and Nutrient. Useful in Dipsia, Haemoptysis, Diabetes, Gastritis, Dyspepsia with Flatulence and Acidity, Chronic Dysentery, Diarrhoea, Scurvy, Helminthiasis, Scabies, Pruritis, Bronchitis, Pharyngeal disorders, Nephropathy, Strangury, Menorrhagia, Metrorrhagia, and General debility</td>
</tr>
<tr>
<td>Ashes obtained by Burning Plant</td>
<td>Antiscorbutic, Anthelmintic, Stomachic, Useful in Hyper acidity, Heartburn, Colic and Verminosis</td>
</tr>
<tr>
<td>Flowers</td>
<td>Astringent and good for Dysentery, Bronchial asthma, Dysmenorrhoea, Menorrhagia, Diabetes, Ascites and Dropsy</td>
</tr>
<tr>
<td>Inflorescence Axis stem</td>
<td>Very specific for renal and vesical calculi</td>
</tr>
</tbody>
</table>

Uses in Rasaushadhi

Rasoushadhis (Medicines prepared out of minerals) should not be consumed in raw state, as they won’t get assimilated in the body. But by consuming it after proper samsakaras like Sodhana (Purification) & Marana (Incineration) with certain drugs it will give better efficacy and those properties will get incorporated in that. Here Parts like stem and root juices of Kadali are used for the purpose of processing.

In case of Swarna Makshika – Kadali kanda swarasa (Stem juice of Musa paradisiaca) is used as media for the purification process

In case of Vaikranta – Kadali kanda swarasa (Stem juice of Musa paradisiaca) is used as media for the purification process (Shodhana) – for 3 days.

In case of Abhraka – Rambhamoola (Kadali) Swarasa is used in the Maraka gana of Abhraka to relieve Visha.

Parpati Preparation - In the preparation of Parpati kadali patra is used. In Rasayoga Sagara prior importance has given to Kadali patra for the Parpati preparation. Therapeutically the Phytochemical constituents of the leaves may be absorbed into the drug and potentiate the preparation. Studies have also proven that the chlorophyll pigment present in the leaves may act as detoxifying and healing agent especially in gastro-intestinal disorders. Kadali Patra is used frequently in the preparation of Parpati, as it is easily available and broader than other leaves with greater, smooth, and even surface to spread the drug. It possesses Kashaya, Grahi and Pittahara properties which may increase the efficacy of Parpati.
As Pathya – Kadali Prasooona (Banana flowers) is considered as Pathya during Parpati sevana. As Apathya - Kadali comes under one among the Kakarashtra dravya. Here during Parada sevana time it has been mentioned to avoid these drugs when Parada is taken for the purpose of rasayana.

As Anupana (Adjuvant)
Any dravyas or drinks which are consumed along with or followed by the main drug or diet are called as Anupana. Anupana in general brings about refreshment, pleasure, energy, nourishment, satisfaction and helps in breaking down, softening, digesting, proper assimilation and instant diffusion of food and diet consumed. Anupana is decided based on Aahara, Aushadha, Roga, Rogi, Dosha etc factors. Significance of Anupana with respect to Aushadha is that, it helps drugs to spread faster in the body.

### Table 5: Siddha Properties

<table>
<thead>
<tr>
<th>Suvaai (Taste)</th>
<th>Veeriyaam (Potency)</th>
<th>Vipakam (Transformation)</th>
<th>Ceikai (Pharmacological Action)</th>
<th>Gunam (Uses)</th>
<th>Sidha Preparations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thuvarpu (Astringent)</td>
<td>Veppam (Hot)</td>
<td>Kaarppu (Pungent)</td>
<td>Siruneerperukki (diuretic), Malamilakki (Laxative) &amp; Udaluramakki (Nutritive)</td>
<td>Leucorrhoea, Hemorrhoid</td>
<td>Thangaparpam, Kantachenduram, Poornachandrothayam, Vallaraine</td>
</tr>
<tr>
<td>Siruneerperukki</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Medicinal and Nutritional Properties

**Beneficial effects**

The fruit has a mild laxative property. It is used as a remedy for constipation in children. It is believed to be helpful in curing diarrhea and dysentery. The fruit is used to heal the intestine lesions. It forms the part of diets of children suffering from malnutrition. The core of the stem is believed to be useful in stomach upset and diabetes. The extract of core of the stem is considered to be useful in dissolving the stones in the kidney and urinary bladder and reducing the weight. The inflorescence mixed with coconut oil and spices is used for flushing the urinary blocks. The fruit is believed to reduce the worm problems in the kids.

**Nutritional properties**

Hundred grams of ripe Banana provides approx. 116 K Cal energy that makes it a supplementary staple food. Banana has relatively less proteins compared to cereals, absence of other protein rich foods in the diet can cause protein deficiency in people depending mostly on Banana as staple food cooked or ripe Banana are easily digested. Banana is a fair source of Vitamin B and Calcium. Banana contains about 20% sugar.

**Research Activities**

a) **Hypoglycemic activity:** The green fruit of M. paradisiaca has been reported to have hypoglycemic effect due to stimulation of insulin production and glucose utilization. Musa paradisiaca’s high potassium (K) and sodium (Na) content has been correlated with the glycemic effect.

b) **Antihyperglycemic effect:** The hydromethanolic extract of M.paradisiaca root has been found significant.

c) **Antiurolithiatic property:** The influence of banana stem (Musa paradisiaca) extract on urinary risk factors for stones in normal and hyperoxaluric rats.

d) **Antioxidant Activity:** Reported the antioxidant activity of the extracted flavonoids from M. paradisiaca in rats.

Some of the yogas mentioned below where Kadali is given as Adjuvant.

### Table 4: Yogas Containing Kadali

<table>
<thead>
<tr>
<th>Akika Pishti</th>
<th>Kasturi Modaka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akika Bhasma</td>
<td>Kshara Taila</td>
</tr>
<tr>
<td>Hemanatha Rasa</td>
<td>Bhrat Dhatri Ghrita</td>
</tr>
<tr>
<td>Kadalyadi ghrita</td>
<td>Abhraka Bhasma( Shataputi)</td>
</tr>
</tbody>
</table>

Other than that Kadali is used in Siddha Science. In Siddha Kadali is named as Vazhai, Arambai, Kadhal, and Thayaikondravan.

**CONCLUSION**

Kadali (Musa Paradisiaca Linn.) is a large, herbaceous plant native to India and Southeast Asia. It is considered as a religious drug. Scattered references are found from the authoritative books of Ayurveda. The various parts of plant are useful in different ailments in different dosage forms like Swaras, Kshara, etc. In Ayurveda pharmaceuticals, importance has been given to the stem and root juice due to their use in the purification procedures of minerals like Vaikranta, Swarnamakshika and uses in the incinerating process of Abhraka (Mica). By these processes the properties of the drug can be incorporate in the medicine. Banana has great nutritional value. It has a rare combination of energy value, tissue-building elements, protein, vitamins and minerals. These are a good source of Vitamin C which helps to rebuild...
the immune system. Also it is good in different Pharmacological activities like, anthelmintic, antiscorbutic, anaemic, also useful in hyper- acidity and very specific for renal and vesical calculi. Various research activities show anti-urolithiatic property, hypoglycemic activity, antioxidant activity which assures their use in therapeutics. Also the starch obtained from plantain *Musa paradisiaca* acts as a binder and disintegrating agent for compressed tablets which shows its importance in Pharmaceutics.

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9. Ibid p. 88

10. Ibid p. 117


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