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REVIEW ARTICLE

Insight of *Kadali* (Musa paradisiaca Linn.): An Important Ayurvedic Medicinal Plant

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ABSTRACT

Introduction: *Kadali* scientifically known as *Musa paradisiaca* Lin, holds a significant position in the realm of Ayurveda due to its multifaceted therapeutic properties. This review aims to compile and summarize the diverse pharmacological activities, traditional uses, phytochemical constituents, and potential therapeutic applications of *Kadali* in Ayurveda.

Material and Method: Various ayurvedic literature and electronic search engine such as PubMed, Google Scholar, ScienceDirect, and Web of Science was conducted for the review of the plant.

Discussion: *Kadali* has a various bioactive compound like alkaloids, flavonoids, polyphenols, terpenoids, and sterols which contributes its different pharmacological activities such as anti-diarrheal, anti-diabetic, anti-ulcer, anti-hypertensive, anti-oxidant and wound healing activities.

Conclusion: This comprehensive review underscores the importance of *Kadali* as a valuable resource in Ayurvedic medicine and emphasizes the need for continued scientific exploration to fully exploit its therapeutic potential while ensuring its safe and effective utilization.

Key Words *Kadali, Musa paradisiaca*, Ayurveda

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INTRODUCTION

Kadali (Musa paradisiaca), commonly known as banana, has been a prominent constituent of traditional medicine systems, particularly Ayurveda, for centuries. Its therapeutic potential has been recognized and utilized extensively in various Ayurvedic formulations to treat a wide range of ailments. Traditional Ayurvedic texts describe *Kadali* as a potent herb with various therapeutic properties such as anti-inflammatory, anti-diarrheal, anti-ulcer, anti-oxidant, anti-hypertensive, anti-diabetic, and wound healing activities. In recent years, scientific interest in *Kadali* has surged, leading to an increased focus on exploring its pharmacological properties and potential health benefits. Scientific studies have corroborated many of the traditional uses of *Kadali* and provided insights into its potential mechanisms of action. Experimental evidence suggests that *Kadali* exhibits anti-inflammatory effects by inhibiting pro-inflammatory mediators, such as cytokines and prostaglandins. Additionally, its anti-diabetic properties have been ascribed to the presence of bioactive compounds that enhance insulin sensitivity and regulate glucose metabolism.

REVIEW ARTICLE

MATERIAL AND METHODS

Material of this chapter is collected from various text of Ayuveda, research portal of AYUSH and from different search engine including Google Scholar, PubMed, Scopus and Web of Science.

HISTORICAL REVIEW OF *KADALI* IN AYURVEDIC LITERATURE

The reference of *Kadali* is found in Karma pradeep (3/315) and Panini (pa.ga 4/2/80 and pa.ma. 1/12) the reference of *Kadali* is also found in Charaka Samhita- chikitsa sthan 3/257 as an ingredient of Chandanadi tail and Loghradi gana of Shushruta Samhita. In Nighantus, the description of ***Kadali*** is found in Karveeradi varga of Dhanwantari Nighantu, Ousadhi Varga of Kaiyadeva Nighantu, Amradi phala varga and ShakVarga of Bhava Prakash Nighantu and Amradi Varga of Raja Nighantu

Taxonomical Classification [1]

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Liliopsida

Subclass: Zingiberidae

Order: Zingiberales

Family: Musaceae

Genus: Musa

Species: Paradisiaca L.

Ayuvedic Classification

Shushruta Samhita: Loghradi gana

Astanga Hridya: Rodhradi Gana

Dhanwantari Nighantu: Karveeradi varga

Madanpal Nighantu: Phaladi Varga

Kaiyadeva Nighantu: Ousadhi Varga

Shodal Nighantu: Karveeradi varga

Bhava Prakash Nighantu: Amradi Phala Varga and ShakVarga

Raja Nighantu: Amradi Varga

Priya Nighantu: Haritkyadi Varga

Table 1 Sanskrit Synonyms with their etymological derivation [2,3]

Sanskrit Synonyms	Etymological derivation
Amshumatphala	On the pedicel or fruit stalked several fruits are arranged in rows.
Bruhatpushpa	Inflorescence is big in size
Deerghapatra	It has long leaves.
Gucchaphala	Fruits are appears in bunches.
Hastivishanika	Fruits are horn shaped and large in size.
Kadali	Kadali Plant has profuse water content. It attract many people with its good qualities.
Kashthila	Fruits are wood like with little seed.
Mocha	Its stem sheds off different covering layers.
Nihsara	It has pseudo-stem, no heart – wood.
Palashika	The Plant is full of leaves.
Rambha	It grows mostly in damp region. It attract many people with its beauty.
Swaduphala	Fruits are sweet in taste
Vaaranabusa	It is used as fodder for elephants.

Vernacular Names [4]

Assam. : Kal, Talha

Beng. : Kela, Kala, Kanch Kala, Kodali

Eng.: Banana

Guj. : Kela

Hindi. : Kela

Kan.: Bale Gadde

Mal.: Vazha

Mar.: Kela

Ori. : Kadali, Kadila

Punj. : Kela

REVIEW ARTICLE

Tam. : Vazhai

Tel.: Arati Gadda

Urdu. : Kela

Morphological Characteristics

Kadali (*Musa paradisiaca* L. Syn: *Musa sapientum* L.) is a tall herb about 2.5 to 9.5 m in height. Stem are pseudo and fleshy.

Leaves are very large, petiolate, oblong, erect and spirally arranged.

Flowers are unisexual in spikes, drooping, females at the bottom and males at the top.

Fruits oblong and fleshy.

Seeds sub-globose and embedded in pulp.

Flowering and Fruiting time: Throughout the year

Table 2 Chemical Constituents

S.N	Parts of Plant	Chemical Constituents
1.	**Pulp**	Catecholamines such as dopamine, norepinephrine, serotonin [5,6] Albuminoids, crystallisable and non-crystallisable sugars, vitamin B and C, fats, indole compounds, iron, mineral salts, nor-epinephrine, starch, serotonin, tannin, tryptophan[7].
2.	**Fruits**	Acyl steryl glycosides such as sitoindoside-I-IV and steryl glycosides such as gentiobioside, sitosterol sitosterol myo-inosityl, β-D-glucoside [8].
3.	**Fruit peel**	Cycloartane triterpenes such as 24- methylene epollinastanone, 3-epicycloeucalenol, 3-epicyclomusalenol, 24-oxo-29- norcycloartanone, 28-norcyclomusalenone [9].
4.	**Flower**	Hemiterpenoid glucoside, syringin, benzyl alcohol glucoside [10,11]

Table 3 Activity of different dose form of *Kadali* (*Musa paradisiaca* L. Syn: *Musa sapientum* L.)

Activity	Dose form	Observation
Analgesic activity	Aqueous extract	Showed analgesic activity in the rat in writhing method and hot-plate [12].
Anti-depressant Activity	Hydro-alcoholic extract of fruit	The level dopamine, norepinephrine, and serotonin were increased [13].
Anti-diarrhoeal Activity	Sap of *M. paradisiaca*	The sap M. paradisiaca prolonged the onset time of diarrhoea, decreased the number and water content of faeces in castor oil induced [14].
Anti-urothiatic Activity	Aqueous-ethanol extract of pseudo-stem	It show anti- urothiatic activity by inhibiting the rise in crystal deposition in urine [15].
Anti-ulcerative Activity	Methanolic extract in combination with catecholamines	It shows cytoprotective effect against indomethacin-induced peptic ulcer [16].
Anti-microbial Activity	Methanolic extract of fruit peels	It shows anti-microbial activity against *Bacillus subtilis, Candida albicans, Candida tropicalis, Escherichia coli, Pseudomonas aeruginosa Staphylococcus aureus* bacteria and *Aspergillus niger* fungi [17].
Anti-diabetic Activity	Ethanolic extracts of all parts and the hexane and chloroform fractions of leaves and fruit peels	It show hypoglycaemic activity in Streptozotocin induced diabetic rats [18].
Anti-lipidemic Activity	Oral administration of flavonoids extracted from unripe fruit	It reduced the concentrations of free fatty acids, cholesterol, phospholipids, and triglycerides in the serum, kidney, liver and brain of male rat [19].
Anti-hypertensive Activity	Ripe banana pulp	It show antihypertensive effect in deoxycorticosterone enantate induced hypertensive rats by increasing the level of serotonin [20].
Hepato-protective Activity	Alcoholic and aqueous stem extracts	It show hepatprotective activity against in CCl4 and paracetamol induced rats by reducing the elevated levels of the serum glutamic pyruvic transaminase, serum enzymes like serum glutamic-oxaloacetic

transaminase, alkaline phosphatase and bilirubin [21].

Table: 4 Therapeutic uses of *Kadali* (*Musa paradisiaca* L. Syn: *Musa sapientum* L.) in Ayurveda

Diseases	Therapeutic uses
Grahani Roga	Steamed unripe fruit of Kadali along with curd (Siddha Bhaisajyamanimala 4/179)
Bronchial asthama	A paste Flower of Kadali, kunda, shirish, pippali along with rice water (Bhavaprakash Chikitsa 14/37), Kadali fruit boiled in cow urine are effective in bronchial asthama (Vaidya manorama 3/17)
Meno-merorrhagia	Kadali fruit along with Ghrit effective in excessive discharge of menstrual blood (Raj martanda 31/3 and Gada Nigraha 6/1/50)
Somaroga	Ripe fruit of kadali alog with juice of aamalki, honey and sugar cures somaroga (Gada Nigraha 6/1/69)
Dysuria	Juice of Kadali along with Ela and honey used in Dysuria (Charak Samhita chikitsa sthan 26/55)
Udarroga	Paste made with kadali leaves kshara and flour cures udarroga (Gada Nigraha 2/32/40)
Wound	Kadali leaves removes pus wounds (vaidyamanorama 16/105)
Sidhma (Kustha)	Kadali kshara mixed with Haridra (Gada Nigraha 2/36/125)
Ear disease	Kadali juice is used in ear disease (Shusruta Samhita Uttar tantra 21/17)

DISCUSSION

The review revealed that *Kadali* exhibits a broad spectrum of pharmacological activities, including anti-inflammatory, anti-diarrheal, anti-ulcer, anti-diabetic, anti-oxidant, anti-hypertensive, and wound healing properties. These activities are attributed to the presence of bioactive compounds such as alkaloids, flavonoids, polyphenols, terpenoids, and sterols. These compounds exert their effects through various mechanisms, including antioxidant activity, enzyme modulation, and interaction with cellular receptors. Traditional Ayurvedic texts describe *Kadali* as a potent herb with various therapeutic uses. It has been traditionally employed for the management of gastrointestinal disorders, brachial asthma, menstrual disorder and skin conditions.

CONCLUSION

Kadali (Musa paradisiaca) represents a valuable Ayurvedic medicinal plant with diverse pharmacological activities and therapeutic potential. This review underscores the importance of integrating traditional knowledge with modern scientific research to harness the therapeutic benefits of natural remedies like *Kadali* for the promotion of human health and well-being.

REVIEW ARTICLE

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