GAVEDHUKA (*COIX LACRYMA-JOBI* L.): ETHNO-THERAPEUTIC POTENTIAL AND PHARMACOLOGICAL EVIDENCE

[1]Dr. Ashmitha, [2]Dr. Subrahmanya Padyana., [3]Dr. Anjali Kumari M. U.

[1]P.G. Scholar, [2]Professor & HOD, [3]Associate professor
[1]Department of Dravyaguna Vijnana,
[1]Alva's Ayurveda Medical College & Hospital, Moodubidire, Karnataka, India.

Abstract:

Background:
Gavedhuka (*Coix lacryma-jobi* L.), commonly known as Job's Tears, is an ancient cereal-cum-medicinal plant extensively used in Ayurveda, Traditional Chinese Medicine, and folk systems for metabolic, inflammatory, and Kapha-dominant disorders. In recent years, growing scientific evidence has substantiated several of its traditional therapeutic claims.

Objective:
The present review aims to critically compile and analyze traditional uses, phytochemical constituents, pharmacological activities, safety considerations, and translational relevance of *C. lacryma-jobi*.

Materials and Methods:
Classical Ayurvedic texts, ethnomedicinal sources, and peer-reviewed scientific literature were systematically surveyed to gather data on botanical features, traditional indications, phytochemistry, experimental pharmacology, and toxicological profiles.

Results:
Coix lacryma-jobi seeds are rich in bioactive compounds including polysaccharides (coixans), benzoxazinones, coixol, fatty acids, flavonoids, sterols, and dietary fiber. Experimental studies demonstrate anti-inflammatory, hypoglycemic, hypolipidemic, anti-obesity, antioxidant, immunomodulatory, central muscle relaxant, anti-osteoporotic, antimicrobial, and anticancer activities. Notably, lipid fractions and extracts such as Kanglaite exhibit significant cytotoxic and immunostimulatory effects, supporting their oncological relevance. Safety evaluations indicate low toxicity at experimental doses; however, abortifacient effects contraindicate its use during pregnancy, and potential herb–drug interactions warrant caution.

Conclusion:
The convergence of traditional knowledge with pharmacological evidence highlights *C. lacryma-jobi* as a promising functional food and phytotherapeutic agent. Further mechanistic studies and clinical trials are needed to establish long-term safety and therapeutic efficacy.

IndexTerms - *Gavedhuka*; *Coix lacryma-jobi*; Job's Tears; Ayurvedic medicine; Pharmacological activities; Functional food; Translational relevance

INTRODUCTION

Gavedhuka (*Coix lachryma-jobi* L.), commonly known as Job's Tears, is an ancient cereal grass with well-documented nutritional and ethnopharmacological significance. Phylogenetic studies indicate its divergence from sorghum approximately 10.41 million years ago[1]. Domesticated during the Neolithic period, *Gavedhuka* has been cultivated across Asia, Africa, and Southeast Asia as both a food and medicinal crop. In traditional Chinese medicine (TCM), its seeds are classified as a functional food and are used in the management of inflammatory disorders, rheumatism, neuralgia, warts, and neoplastic diseases[2].

Archaeological evidence confirms its use in China for over 8,000 years, with sustained cultivation through successive historical periods, reflecting its agronomic resilience and therapeutic relevance[3]. Traditional use is also documented in other Asian regions, including long-standing cultivation in southern India[4].

Phytochemical analyses reveal that *Gavedhuka* seeds contain diverse bioactive constituents, including polysaccharides, oils, phenols, coixol, phytosterols, resistant starch, flavonoids, fatty acids, proteins, vitamins, triterpenes, alkaloids, and dietary fibers[4]. These constituents are associated with its reported therapeutic effects in chronic conditions such as cancer, hypertension, hyperlipidemia, fatty liver disease, and rheumatoid arthritis[5]. In TCM, *Gavedhuka* is described as a dampness-eliminating and diuretic agent, although its uterotonic activity contraindicates its use during pregnancy[6].

Nutritionally, *Gavedhuka* exhibits a high protein content relative to other cereal crops and is consumed in multiple dietary forms[7]. Traditional medicinal applications include the management of metabolic, infectious, and inflammatory conditions, while modern experimental studies have demonstrated antioxidant, anti-inflammatory, anti-tumor, hypolipidemic, hypoglycemic, anti-obesity, immunomodulatory, hormonal modulatory, anti-osteoporotic, and antimicrobial activities[5].

Despite extensive traditional use and growing pharmacological evidence, the functional constituents and integrated molecular mechanisms underlying the therapeutic effects of *Gavedhuka* remain incompletely understood. A critical and systematic synthesis of traditional knowledge and contemporary scientific findings is therefore essential to clarify its bioactive profile, identify research gaps, and support its rational development as a nutraceutical and therapeutic agent.

GAVEDHUKA

Gavedhuka is an ancient cereal grain of India with references dating back to the Vedic period. It is commonly known as Job's tears, Coix seed, and Chinese pearl barley[8]. Ayurveda literature attributes significant *Karshya-kara* and *Kapha-nashaka* properties to *Gavedhuka*, emphasizing its therapeutic relevance in *Sthaulya*. Traditionally employed as both food and medicine, it has been extensively used as a drug-cum-dietary supplement in obesity and overweight, which are now recognized as major lifestyle disorders[9]. Recent pharmacological studies have expanded its therapeutic profile, demonstrating hypoglycemic, antispasmodic, anti-inflammatory, anti-neoplastic, antioxidant, and skin health enhancing activities.

3.1 Botanical Description[10]

- Annual herbaceous grass reaching approximately 3 feet in height
- Leaves glossy, deep green, narrowly lanceolate (20–50 cm × 1.5–4 cm)
- Prominent midrib; glabrous leaf sheaths
- Monoecious plant with wind-mediated pollination
- Tear-shaped fruits (8 mm × 1.1 cm) with glossy pseudocarps turning black on maturity
- Growth period:
    - Leafing: May–October
    - Flowering: July–October
    - Fruiting: September–November

Image no.1 *Gavedhuka* seed

Image no.2 *Gavedhuka* plant

3.2 Botanical Classification and Varieties[11]

Table 1. Botanical Identity, and Distribution of *Coix lacryma-jobi* L.

Parameter	Details
Botanical name	*Coix lacryma-jobi* L.
Family	Poaceae
Habit	Annual herbaceous grass
Native region	Southeast Asia

Table 2. Botanical varities, and Distribution of *Coix lacryma-jobi* L.

Variety	Botanical Status	Distinct Features
C. lacryma-jobi var. *stenocarpa*	Wild	Hard-shelled pseudocarps, bead-like
C. lacryma-jobi var. *monilifer*	Wild	Pearl-white oval pseudocarps
C. lacryma-jobi var. *mayuen*	Cultivated	Soft shell, edible cereal grain
C. lacryma-jobi var. *typical*	Classical	Described botanical variant

3.3 Vernacular Names[12]

Table 3. Vernacular Names of *Coix lacryma-jobi* L.

Language	Name
Sanskrit	Gavedhu, Gavedhuka
Kannada	Manjutti
Bengali	Gadagad, Dedhaan, Devaan
Malayalam	Kaatugotampu, Kaakkappalunku
English	Adlay, Job's tears, Coix
Marathi	Kasai
Gujarati	Kasai
Tamil	Kaattukuntumani
Hindi	Garheduaa, Garahedu, Gargari
Telugu	Adaviguruginja

3.4 Classical Ayurvedic Pharmacological Profile[13]

Table 4. Ayurveda pharmacology of *Gavedhuka* (*Coix lacryma-jobi* L.)

Parameter	Description
Rasa	*Katu, Madhura*
Vipaka	*Katu*
Virya	*Ushna*
Dosha karma	*Kapha-nashaka*
Karma	*Karshya-kara, Shukra-nashaka*

These attributes collectively explain its *lekhana* and *medohara* actions, justifying its therapeutic application in Kapha-dominant and Medo-dushti conditions.

3.5 Therapeutic Indications in Classical Texts[12]

Table 5. Classical Uses of *Gavedhuka* (*Coix lacryma-jobi* L.)

Text	Indication / Use	Reference
Caraka Saṃhita	Induces karsana; parched grain with honey	CS.Su.2.25
Caraka Saṃhita	Decoction for controlling emesis	CS.Ci.20.94
Bhavaprakasa	Management of *Sthaulya*	BP.Ci.39.22; Ni.647
Madanapala Nighanṭu	Dietary use as grain	MP.Ni. p.209
Kaiyadeva Nighanṭu	Medicinal and dietary use	KD.Ni. p.321
Haritakyadi Nighanṭu	Dietary use as grain	HK.Ni. p.266
Saligrama Nighanṭu	Dietary use	S.Ni.P. p.642
Priya Nighanṭu	Food and medicinal usage	P.Ni. p.206
Bhaiṣajya Ratnavali	*Vatavyadhi* chikitsa	BR.26.308
Vṛnda Madhava	External use in *Masurika*	VM.56.40

3.6 Nutritional Profile of Seeds (per 100 g)[12]

Table 6. Nutritional Composition of *Coix lacryma-jobi* L. Seeds

Component	Quantity
Energy	380 kcal
Protein	15.4 g
Fat	6.2 g
Carbohydrates	65.3 g
Dietary fiber	0.8 g

Calcium	25 mg
Phosphorus	435 mg
Iron	5.0 mg
Thiamine	0.28 mg
Riboflavin	0.19 mg
Niacin	4.3 mg

Protein composition

- Major storage protein: Coixin (prolamin fraction)
- Also contains albumins, globulins, and residual proteins

3.7 Traditional Medicinal Uses

Table no.7 Traditional Medicinal Uses of *Coix lacryma-jobi* L. (Job's Tears)

Traditional System / Category	Plant Part Used	Therapeutic Indications
Traditional Chinese Medicine (TCM)[14,15]	Seeds	Strengthens spleen; promotes diuresis and resolves dampness; clears heat; expels pus; detoxification; used in pulmonary edema, wet pleurisy, chronic gastrointestinal disorders, chronic ulcers, dysuria, diarrhea, and dampness-related conditions
Cosmetic and Dermatological Uses (TCM)[16,17]	Seeds	Improves skin complexion; maintains lustrous skin; reduces acne, freckles, senile plaques, pregnancy-related pigmentation, and butterfly facial patches; useful in hemorrhoids and rough skin
Gastrointestinal Disorders[16,18]	Seeds	Diarrhea, dysentery, enteritis, persistent diarrhea in children; supportive management of acute appendicitis
Antiparasitic Use[18]	Seeds, Roots	Vermifuge for intestinal helminthic infestations; roots used in ascariasis
Respiratory Disorders[16,18]	Seeds	Bronchitis, pleurisy, pneumonia, pulmonary abscess, hydrothorax, lung cancer; seed infusion used in bronchitis and pulmonary abscess
Urinary Disorders[18]	Seeds, Roots	Diuretic action; used in dysuria and other urinary complaints
Anti-inflammatory and Antibacterial Uses[18]	Seeds	Used in infective and inflammatory conditions such as appendicitis, tuberculosis, gonorrhea, leucorrhoea, puerperal fever, pulmonary and urinary tract infections
Cancer Management[16,18]	Fruits	Intestinal and lung cancers, cervical cancer, chorionic epithelioma
Skin Disorders[16,18]	Fruits	Viral and inflammatory skin conditions including warts, verruca plana, and eczema
Other Traditional Uses[16,18,19]	Roots	Fever with dryness of mouth and excessive thirst, edema, beriberi, amenorrhoea, and jaundice

3.8 Pharmacological Activities

Table 8. Pharmacological Activities of *Coix lacryma-jobi* L. and Their Bioactive Constituents

Activity	Active Compounds / Extracts	Key Findings
Anti-inflammatory[20-22]	Benzoxazinones (roots), Methanolic seed extract	Benzoxazinones inhibit inflammatory pathways; a free hydroxyl at C-2 is critical. Seed extract suppresses nitric oxide and superoxide production in activated macrophages.
Central Muscle Relaxant & Anti-convulsant[23]	Coixol (6-methoxybenzoxazolone)	Decreases locomotor activity, produces hypothermia, potentiates thiopental-induced sleep, attenuates acetic acid-induced writhing, prevents electroshock-induced convulsions; induces drowsy EEG patterns, similar to chlorzoxazone.
Effects on Lipid Metabolism / Anti-obesity[24-26]	Seed crude and water extracts, seed oil	Inhibits hepatic cholesterol synthesis, facilitates biliary triglyceride excretion, accelerates phospholipid synthesis; reduces body weight, adipose tissue mass, fat cell size, serum hyperlipidemia; modulates leptin and TNF-α; water extracts regulate neuroendocrine activity;

		seed oil decreases LDL-C, insulin, leptin, and TBARS levels.
Anti-diabetic / Hypoglycemic[21,22,26-31]	Dehulled seeds, Coixans A, B, C	Reduces blood glucose in diabetic rats; fiber content reduces fat and cholesterol absorption; enhances hexokinase and G6PD activity; suppresses glucose-6-phosphatase and fructose-1,6-bisphosphatase; Coixans show marked hypoglycemic effects.
Macrophage Activation / Immunomodulation[32]	Seed water extracts and isolated components	Enhances nitrite production in murine macrophages infected with *Toxoplasma gondii*; activates macrophages, contributing to biostatic and immunomodulatory effects.
Cytotoxic / Anti-cancer[21,22, 33-36]	Acid fraction of acetone extract, Coixenolide, Neutral lipid extracts (Kanglaite)	Anti-tumor effects against lung, colon, pancreatic, breast cancers, hepatoma, and Ehrlich ascites carcinoma; induces apoptosis, regulates gene expression, increases cytotoxic T cells and NK cells; Kanglaite approved in China for lung, liver, stomach, and breast cancers.
Anti-osteoporotic[35]	Seed water extracts	Reverses decreased alkaline phosphatase and calcium, reduces elevated tartrate-resistant acid phosphatase activity in metaphyseal tissue; prevents osteoporosis in vasectomized rats.
Antioxidant[21,22]	Coix hull isolates, Alcohol extracts	Scavenges free radicals (DPPH assay), retards linoleic acid oxidation in vitro.
Antimicrobial / Antiviral[21,22]	Seed extracts	Exhibits antibacterial, antifungal activity; potential antiviral effects reported.
Anti-allergic[37]	Adlay bran extract	Reduces histamine release and pro-inflammatory cytokines, suggesting anti-allergic mechanisms.
Uterine Contractility[34,38]	Seed water extract	Induces spontaneous uterine contractions; mediated via COX-2 expression and ERK pathway activation.
Hormonal Effects[21,22]	Methanolic seed extract	Reduces progesterone production in rat granulosa cells.

3.9 Safety and Considerations

3.9.1 Pregnancy and Lactation

Coix lacryma-jobi seeds are contraindicated during pregnancy due to demonstrated abortifacient activity, including induction of uterine contractions and embryo toxicity in experimental models[6,38]. Safety during lactation has not been adequately established, and therefore use during breastfeeding is not recommended.

3.9.2 Toxicity Profile

Coixol, a major bioactive constituent, has exhibited low acute toxicity, with no significant adverse effects observed following oral administration of 500 mg/kg/day for one month in mice[21,22]. However, comprehensive toxicity data for whole seed extracts and long-term medicinal use in humans remain limited, necessitating cautious clinical application.

3.9.3 Potential Drug Interactions

Due to its pharmacological properties, *C. lacryma-jobi* may interact with certain medications:

- Antidiabetic agents: Concomitant use may potentiate hypoglycemic effects, increasing the risk of hypoglycaemia[28,29].
- Central muscle relaxants (e.g., chlorzoxazone): Coixol exhibits comparable CNS depressant activity, which may result in additive sedative or muscle-relaxant effects[23].
- Other drugs: Possible interactions with agents such as dextromethorphan, diltiazem, and theophylline have been suggested, warranting clinical caution[39].

3.9.4 Clinical Implications

Based on available evidence, *C. lacryma-jobi* should be avoided during pregnancy[6,38] and lactation, and used cautiously in individuals receiving multiple pharmacotherapies. Further long-term toxicity and herb–drug interaction studies are essential to establish its safety profile for sustained therapeutic use.

3.10 Translational Relevance

The concordance between traditional indications and experimentally validated pharmacological effects positions *Coix lacryma-jobi* as a promising functional food and phytotherapeutic agent. Its demonstrated metabolic, anti-inflammatory, immunomodulatory, and anticancer activities support translational application in lifestyle and chronic disorders, aligning classical knowledge with modern integrative healthcare.

DISCUSSION

Coix lacryma-jobi L. represents a model of convergence between traditional knowledge and modern scientific validation. Classical uses in Ayurveda and TCM ranging from anti-obesity, antidiabetic, anti-inflammatory, CNS, and reproductive applications correspond closely with pharmacological findings[23-45]. Its bioactive compounds mediate multiple molecular pathways, including NO and ROS suppression, lipid metabolism regulation, enzyme modulation, immune activation, and apoptosis induction, providing a mechanistic basis for traditional claims. Cytotoxic and anti-cancer effects validate its ethnomedicinal use in intestinal, pulmonary, and gynecological malignancies. Safety profiles and contraindications, including abortifacient activity and potential drug interactions, align with classical cautions.

CONCLUSION

Coix lacryma-jobi L. is a traditional medicinal grain with broad pharmacological validation, confirming historical uses in metabolic, inflammatory, immune, CNS, and oncological disorders. Its bioactive constituents benzoxazinones, Coixol, coixans, and seed oils mediate diverse effects including anti-inflammatory, anti-obesity, hypoglycemic, antioxidant, immunomodulatory, and cytotoxic activities. While generally safe, caution is warranted during pregnancy, lactation, and concomitant drug therapy.

The integration of traditional wisdom with modern evidence highlights *C. lacryma-jobi* as a promising candidate for functional food, nutraceutical, and phytotherapeutic applications, meriting further preclinical and clinical research to optimize its therapeutic potential.

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