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Translational Therapeutics of *Coix lacryma-jobi* L. From Traditional Medicine to Kanglaite in Cancer Management

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Abstract

Coix Lacryma-jobi L. (Job's tears) is a cereal crop that is high in nutrients and has important therapeutic uses, especially in cancer treatment. The current review seeks to assess its anticancer potential across various cancer types and provide an overview of its phytochemical composition. The plant's pharmacological actions are influenced by bioactive substances like fatty acids, polysaccharides, coixenolide, and coixol. Through methods like apoptosis induction, tumor proliferation inhibition, metastasis suppression, and regulation of signaling pathways, these drugs demonstrate anticancer benefits. Its therapeutic promise is supported by evidence from in vitro, in vivo, and limited clinical research, including the use of Kanglaite injection. From nature(plant) to healing pains, the folk medicine to translational medicine, the development of research has proven its potential. To increase its effectiveness, however, more clinical validation and sophisticated drug delivery techniques are needed.

Keywords: *Coix lacryma-jobi* L.; Kanglaite; Translational Therapeutics; Traditional Medicine; Cancer Management; Anticancer Activity; Herbal Medicine; Phytochemicals; Integrative Oncology; Drug Development; Tumor Therapy; Ethnomedicine.

Introduction

Medicinal plants have been widely explored for their anticancer potential due to the presence of diverse bioactive compounds. Among these, *Coix lacryma-jobi* L., belonging to the family Poaceae, has gained attention for its dual role as a nutritional cereal and medicinal plant. Gavedhuka, is its Sanskrit name and seen in ayurveda, as an ancient cereal-cum-medicinal plant. Gavedhuka is an ancient cereal grain of India with references dating back to the Vedic period (Ashmitha et al., 2026). The seeds are rich in proteins, lipids, and phytochemicals such as coixenolide and coixol, which are associated with therapeutic effects. Recent studies have demonstrated that extracts of *Coix lacryma-jobi* exhibit significant anticancer properties through multiple mechanisms. This review focuses on its anticancer activity across different cancer types and underlying molecular mechanisms.

1.Botanical Description

Coix lacryma-jobi L., commonly known as Job's tears or adlay and is closely related to maize. It is a robust annual or perennial grass that typically grows up to 1–2 meters in height. The plant possesses thick, erect stems and broad, lanceolate leaves. It is well adapted to tropical and subtropical climates and thrives in moist, waterlogged conditions.

The plant produces characteristic hard, bead-like seeds enclosed in a shiny involucre, which are often used for ornamental and decorative purposes. Its adaptability to poor soil conditions and environmental stress makes it an important crop in marginal agricultural lands (James A.Duke. 1983, Walker, G. 1971). The Plant picture is given below as figure.1.



Figure : Vegetative parts of *Coix lacryma-jobi* A) Flowers, B) Young seed, C) Dried seeds

figure.1

2 Nutritional Values

The seeds of *Coix lacryma-jobi* are highly nutritious and are considered superior to many conventional cereal grains. They contain:

Starch: 61–83%
Protein: 16–19%
Fixed oil: 2–7%
Minerals: Calcium, iron, zinc, manganese

The relatively high protein content, along with essential amino acids and minerals, contributes to its importance as a functional food. The presence of oil and carbohydrate fractions provides significant energy value (T. K. Bhoomika, S. Suhas, 2025)

3. Phytochemistry

A wide range of bioactive phytochemicals has been identified in *Coix lacryma-jobi*. These include: Polysaccharides, Phenolic compounds, Flavonoids, Phytosterols, Carotenoids, Lactams. Key bioactive compounds: Coixol, Coixin (major storage protein) and Coixenolide (Patel DB, 2017)

These compounds are responsible for the plant's diverse biological and pharmacological activities.

4. Chemistry (Chemical Constituents)

The chemical composition of *Coix lacryma-jobi* includes proteins, lipids, and secondary metabolites:

- Proteins: Coixin (prolamin-type storage protein)
- Lipids: Coixenolide and triglycerides
- Fatty acids: Palmitic acid, Oleic acid, Linoleic acid and Stearic acid
- Sterols: Stigmasterol, campesterol
- Polysaccharides: Composed of sugars such as arabinose, xylose, and galactose

These chemical constituents contribute to its pharmacological effects, particularly anticancer and anti-inflammatory activities (Patel DB, 2017)

Category	Subcategory	Components
Proteins	Storage Protein	Coixin (prolamin)
	Amino acids	Essential amino acids
Carbohydrates	Starch	61–83%
	Polysaccharides	Arabinose, Xylose, Galactose
Lipids	Bioactive Lipid	Coixenolide
	Fatty Acids	Palmitic acid, Oleic acid, Linoleic acid, Stearic acid, hexadecanoic acid (16-C), octadecanoic acid (18-C-1), Octadecadienoic acid (18-C-2),
	Other Lipids	Triglycerides
Phytochemicals	Phenolics	Antioxidant compounds
	Flavonoids	Free radical scavengers
	Sterols	Stigmasterol, Campesterol
	Others	Carotenoids, Lactams, Coixol

5 Ornamental Value

The seeds of *Coix lacryma-jobi* are enclosed in a hard, glossy, bead-like structure, which makes them aesthetically attractive. These beads are traditionally used for:

- Jewellery making (necklaces, bracelets)
- Rosaries and decorative items
- Handicrafts

Due to their natural shine and durability, they are often referred to as “natural beads,” contributing to the plant's ornamental significance. (Patel DB et al., 2017)

6 Medicinal Uses

Coix lacryma-jobi has been widely used in traditional medicine systems, particularly in Asia. Its medicinal properties include Anti-inflammatory, Anticancer, Antioxidant, Immunomodulatory, Antidiabetic, and Gastroprotective.

Traditional uses are, used in the treatment of rheumatism and neuralgia, Management of digestive disorders, Use in inflammatory conditions and Root extract used for snake bites (in some regions of India). Scientific studies have shown that its extracts, Inhibit tumor growth, Induce apoptosis, Suppress metastasis, Enhance immune responses. This plant parts were used for various treatments (Dr. Ashmitha et al., 2026).

Plant Part	Major Compounds	Diseases / Uses
Seeds	Coixenolide, coixol, polysaccharides	Cancer, diabetes, inflammation, digestion
Root	Alkaloids, minor compounds	Snake bite, fever, infections
Leaves	Phenolics	Skin diseases, inflammation
Whole plant	Mixed phytochemicals	Diuretic, tonic, rheumatism
Seed oil	Lipids, triglycerides	Cancer therapy (KLTi), immune modulation

1. Material and methods

Relevant studies focusing on anticancer activity data, phytochemistry, and mechanisms of action of *Coix lacryma-jobi*, data were selected. Both experimental (in vitro and in vivo) and clinical studies were included. Data were systematically analyzed and categorized based on cancer type, mechanism of action, and therapeutic outcomes.

Study Type	Model	Method	Key Outcome
In vitro	Cancer cell lines	SRB assay, apoptosis staining	Anti-proliferative, apoptosis
In vitro (mechanism)	Cancer cells	Migration, pathway assays	ERK, AKT inhibition
In vivo	Xenograft mice	Tumor volume measurement	Tumor suppression
Kanglaite (in vitro)	Cancer cells	Combination therapy	NF- κ B inhibition
Kanglaite (in vivo)	Mice	RT-PCR, Western blot	PI3K/AKT inhibition
Clinical trials	Cancer patients	Randomized Controlled Trial (RCT) studies	Improved survival

Anticancer Activity in Different Cancers

1 Lung Cancer (NSCLC)

Coix lacryma-jobi-derived formulation, particularly Kanglaite injection (KLTi) (Da-Peng Li, 2006) has been widely used in the treatment of non-small cell lung cancer (NSCLC). Kanglaite injection picture is shown as a figure-2. It has been reported that KLTi enhances the effectiveness of chemotherapy and reduces toxicity. Mechanisms involved were, Inhibition of tumor proliferation, Induction of apoptosis and Improvement of immune response.

2. Liver Cancer

KLTi has also been clinically used for primary liver cancer. It has been shown to suppress tumor growth, improve patient survival and enhance therapeutic outcomes when combined with chemotherapy

3.Breast Cancer

Studies have demonstrated that extracts of *Coix lacryma-jobi*, Induced apoptosis in breast cancer cells, Inhibit metastasis and Reduced cell proliferation.

4.Colon Cancer

Bioactive compounds such as coixenolide have shown, Cytotoxic effects on colon cancer cells, Induction of programmed cell death and Inhibition of angiogenesis.

5.Other Cancers

Additional studies suggest activity against, Cervical cancer, Pancreatic cancer and Gastric cancer . These effects are mainly attributed to lipid fractions and polysaccharides.

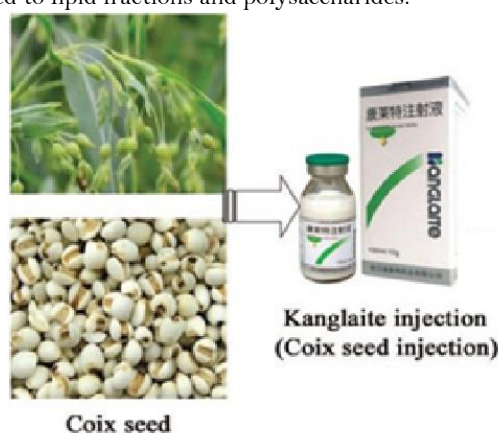


figure-2

Results

The collected data indicates the jobs tear/adlay/coix seed has a potential drug hidden in the plant part of the seed. The plant has been used in various ways as an ornamental, nutritional, and medicinal plant. This plant was recorded first as a folk medicine but due to the development of research values, the plant was transformed from “traditional medicine to translational therapeutics” that *Coix lacryma-jobi* exhibits strong anticancer activity across multiple cancer types. Key findings include, Significant inhibition of tumor cell growth, Induction of apoptosis, Suppression of metastasis and Enhancement of immune response. Bioactive compounds such as coixenolide, coixol, and polysaccharides play a major role in these effects.

Discussion

The anticancer activity of *Coix lacryma-jobi* is attributed to its diverse phytochemical composition and is a promising anticancer agent with significant therapeutic potential. Lipid components, particularly triglycerides present in coix seed oil, have been identified as major active constituents. The use of Kanglaite injection represents a significant advancement, as it has been approved for clinical use in cancer therapy, particularly for lung and liver cancers. It has been reported that this formulation reduces toxicity and improves treatment efficacy when combined with conventional therapies. Kanglaite injection has been successfully applied in the treatment of a variety of malignant tumors such as lung, stomach, colon, liver, kidney, ovaries and leukemias in more than 2,00,000 cases and in 2001

and 2002, the clinical trials were started in USA and Russia (Da-Peng Li 2006). So, we will use the technology present now and create the wonders in research world from nature to lab for healing the pains of human beings.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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