

## Exploring therapeutic potential of moong extract in osteoarthritis: a Review

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### ABSTRACT: -

The green gram known as mung beans, or "Vigna Radiata," is widely available and consumed throughout most of Asia, particularly in China and Japan. These nutrient-dense foods and natural remedies have shown remarkable results. Both medicinal and non-medicinal qualities are displayed by these. Ash content, protein, lipids, polyphenolic compounds, and five different kinds of fatty acids—stearic acid, palmitic acid, linoleic acid, oleic acid, and linolenic acid—are all present. The most popular usage of the Soxhlet apparatus in the extraction of mung beans is for the extraction of flavonoid compounds. Three different kinds of solvents, including methanol, ethyl acetate, and hexane with distilled water, are used to extract mung beans. Polyphenols include both vitexin and Isovitexin. There is proof that mung beans include bioactive substances. Mung beans have an impact on degenerative illnesses. It is a typical calcium source. Iron, magnesium, phosphorus, potassium, and vitamin B6, K, and folate are among the minerals and vitamins that are abundant in it. It helps treat osteoarthritis by acting as a nutrient. Degenerative joint condition called osteoarthritis causes joints to deteriorate over time. Osteoarthritis patients typically experience joint discomfort and a brief period of stiffness following rest or inactivity. Everybody is affected by osteoarthritis differently. Some people have very mild osteoarthritis that has no effect on their daily activities. Others experience severe pain and incapacity as a result of it.

**KEYWORDS:-**Mung bean, Extraction, Degenerative disease, Osteoarthritis, Soxhlet apparatus.

### I. INTRODUCTION:-

The most common chronic joint illness is osteoarthritis (OA), which is still one of the few aging-related chronic disorders for which there is no proven treatment and little that can slow the disease's progression. It can affect small, medium, and large joints, but the knee is the most commonly afflicted joint in terms of painful condition; up to

one in eight men and women over 60 years of age have knee symptoms OA<sup>10</sup>. In 1990, there were about 23.46 million cases of OA in India; by 2019, there were 62.35 million cases. From 4,895 (95% uncertainty range (UI):4,420-5,447) in 1990 to 5313 (95% UI:4,799-5,898) in 2019, the age-standardized prevalence of OA increased per 100,000 people. Comparably, from 1990 to 2019, age-standardized DALYs increased from 164 (95% UI:83-325) to 180 (95% UI:91-361) per 100,000 persons, whereas DALYs owing to OA increased from 0.79 million (95% UI:0.40-1.55) to 2.12 million (95% UI:1.07-4.23). In India, OA accounted for 1.48% (95% UI:0.88-2.78) of all YLDs in 2019, ranking 20th overall. In 1990, it was the 23rd most common cause (1.25% (95% UI:0.74-2.34))<sup>19</sup>. An OA patient's unique pain phenomenology may be defined by the interaction of several neural processes. Nerve growth factor (NGF) is the mediator of choice for OA pain since antibodies against NGF considerably lessen OA pain. Numerous studies indicate that OA pain may be lessened by blocking TNF and interleukin-1 $\beta$ . Comorbidities include obesity, low grade systemic inflammation, and diabetes mellitus are common in OA patients. These comorbidities can have a major impact on how OA develops, and research on pain has only recently started to examine how important these factors are in producing pain. Psychologic and socioeconomic variables can further exacerbate osteoarthritis (OA) pain, and in certain instances, hereditary factors that impact OA pain have been discovered<sup>11</sup>. Ageing and rising obesity rates are making OA even more common than it was a few decades ago. Approximately 35% of those over 60 worldwide have symptomatic (painful, incapacitating) osteoarthritis (OA). The illness places a heavy financial strain on society and the healthcare system for early retirement, sick leave, diagnosis, and treatment. In addition, the majority of patients have trouble sleeping, have diminished strength for lifting, walking, and exercising, and have difficulty working and leading independent lives. The main issue for patients is incapacity

brought on by pain and degeneration of joint tissue. As of yet, no treatment exists that may successfully correct any of the current structural flaws or effectively stop the structural degradation of bone and cartilage<sup>13</sup>. The incidence and prevalence of osteoarthritis (OA), comorbidities and mortality associated with OA (especially obesity and cardiovascular disease), and multiple joint involvement were the main topics of epidemiologic investigations during this period. The following therapeutic OA techniques were taken into consideration in the papers: non-pharmacologic alternatives, various topical, oral, and intra-articular therapies, as well as the affordability of specific OA treatments. Finding innovative ways to lessen the effects of this extremely common and crippling ailment is desperately needed<sup>15</sup>. No studies have given a thorough summary of the burden of OA in India, despite research using the Burden of Diseases, Injuries, and Risk Factors Study 2019 (GBD 2019) to offer the burden of OA both globally and in particular countries. India is the second most populous country in the world, with a fifth of the world's people living there. It will soon overtake China to take the top spot. There is noticeable difference in the states' socioeconomic level, culture, ethnicity, genetics, and health systems, and several of them have larger populations than some countries. India's life expectancy has increased by more than ten years and health-related epidemiological and demographic indices have significantly improved during the past three decades<sup>22</sup>. This study set out to assess the biological, alcohol dehydrogenase (ADH), and antiproliferative properties of several mungbean seed and sprout extracts. Total phenolics (TP), total flavonoids (TF), and 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity were all higher in all extracts from the sprouts than in those from the seeds. The extract of ethyl acetate (EtOAc) exhibited the highest levels of DPPH and tyrosinase inhibition<sup>7</sup>. An increasing body of clinical research indicates that calorie-dense diets high in fat and carbohydrates but low in protein have been linked to an increase in the prevalence of metabolic syndromes, including inflammation, dyslipidemia, and hyperglycemia. Numerous international health organizations have advocated a range of plant-based functional meals, which has led to a call for significant dietary pattern modifications to improve health and prevent chronic diseases. After cereals (Gramineae), legumes (Fabaceae/Leguminosae) are regarded as the second most significant crop for human food. However, legume seeds—also known as "the poor

man's meat"—are an indispensable component of the human diet because, when compared to cereals, they are superior providers of proteins, bioactive compounds, minerals, and vitamins<sup>6</sup>.

**1. MUNG BEAN: -**

Other names for mung beans include *Vigna radiata*, luteous, look duo, Miyashima, and oorud bean. It was a member of the kingdom Plantae<sup>1</sup> and the family Fabaceae. India and other Asian nations have consumed it. It is a healthy sprout for people<sup>2</sup>. It is a good source of vitamins, essential amino acids, calcium, proteins, carbs, and vitamins. It is quite simple to comprehend<sup>3</sup>. Mung beans are rich in bioactive substances, such as flavonoids and phenolic compounds, which have a wide range of health advantages<sup>4</sup>. The primary sources of mung beans' antioxidant, antibacterial, anti-inflammatory, and anticancer properties are believed to be their high protein, amino acid, oligosaccharide, and polyphenol content, which also plays a role in lipid metabolism regulation<sup>8</sup>.

**Table No. 1. Nutritional composition of Mung bean: -**

1.	Protein	23.86g
2.	Carbohydrate	62.62g
3.	Calcium	132mg
4.	Vitamin B6	0.382mg
5.	Total dietary fiber	16.3g
6.	Total sugar	6.60g

**Table No. 2. Taxonomical classification of mung bean**

1.	Kingdom	Plantae
2.	Subkingdom	Tracheobionta
3.	Supper Division	Spermatophyta
4.	Division	Magnoliophyta
5.	Class	Magnoliopsida
6.	Subclass	Rosidae
7.	Order	Fabales
8.	Family	Fabaceae
9.	Genus	Vigna
10.	Species	Vigna Radiata L.
11.	Common Name	Green gram, Indian mung bean, Moong bean.

### 1.1 MORPHOLOGY: -

The Fabaceae family of plants includes the mung bean (*Vigna radiata*), commonly referred to as green gram. Despite being two distinct species, it is sometimes mistaken for black gram (*Vigna mungo*) because of its similar shape. An annual vine with fuzzy brown pods and yellow blossoms is called the green gram. *Vigna radiata* is divided into three subgroups: *Vigna radiata* subsp. *radiata*, which is farmed, and *Vigna radiata* subsp. *sublobata* and *Vigna radiata* subsp. *glabra*, which are wild. It is around 15–125 cm (5.9–49.2 in) tall. Cotyledons die after emerging, leaves are oval or broad-ovoid, and ternate leaves are generated on two single leaves. Leaves measure 6–12 cm in length and 5–10 cm in width. Yellow racemes with 10–25 self-pollinating flowers per pedicel are carried in the axils and tips of the leaves. Fruits are flat or elongated cylindrical pods that typically number between 30 and 50 per plant. The pods are 5–10 cm in length and 0.4–0.6 cm in width. Within are 12–14 septum-separated seeds, which can have a spherical or cylindrical shape and be colored green, yellow, brown, or blue<sup>9</sup>.



Figure 1. Mung bean seeds

**1.2 THERAPEUTIC USES: -** Mung bean have therapeutic activity: -

#### i. ANTI-INFLAMMATORY ACTIVITY: -

Pro-inflammatory cytokines and nitric oxide, which result from the immune system being activated, are linked to inflammation and can be caused by a variety of factors, including infection, foreign body stimulation, and tissue damage<sup>8</sup>. As demonstrated by its use in cooking and traditional medicine, especially in Asian nations, mung beans have been proved to be helpful in treating a variety of inflammatory responses. An examination of the impact of ethanolic mung bean extract on lipopolysaccharide-stimulated macrophages yielded clinical proof of anti-inflammatory action. The presence of polyphenols, vitexin, Isovitexin, and gallic acid in the extract<sup>2</sup> was linked to this action.

Traditional medicine has used mung beans to alleviate heatstroke caused by thirst, irritability, and these health benefits of the seeds and sprouts. The inflammatory response benefits from the use of mung beans<sup>3</sup>.

#### ii. ANTIOXIDANT ACTIVITY: -

It has been demonstrated that mung beans' seeds, shoots, and even shells have antioxidant properties. High levels of polyphenols and free radicals are present in methanolic mung bean extract. Two primary antioxidant molecules, vitexin and Isovitexin, are responsible for this potent antioxidant activity<sup>8</sup>. Using DPPH and FRPA techniques, the excellent antioxidant potential of the methanolic extract of seed coverings has been demonstrated at a concentration of 100 microgram/mL. Furthermore, the seeds are used to extract acetone since they contain more total flavonoids and phenolic chemicals than raw seeds do. Green tea and vitamin C<sup>2</sup> were contrasted with mung bean seeds and soup's capacity to scavenge free radicals. Free radicals are potentially dangerous chemicals that antioxidants aid in neutralizing. Free radicals can interact with biological components and cause damage when present in big concentrations<sup>3</sup>.

#### iii. ANTIMICROBIAL ACTIVITY: -

Because they have a broad spectrum of interest without a known side effect, biocides, or phytochemicals with antimicrobial interest, are becoming more and more recognized. Many reviews had been published online showcasing the potential of mung beans as an antimicrobial agent<sup>8</sup>. A nonspecific lipid transfer peptide has been identified as having a broad spectrum of antibacterial and antifungal interest, as it is highly energetic against fungi, including *Fusarium oxysporum*. *Sclerotium rolfsii*, *F. solani*, and *Pythium aphanidermatum* are the bacteria that are next to *Staphylococcus aureus*. The sprouts' polyphenol extract shown antibacterial properties against *Helicobacter pylori*, the bacterium that causes gastroduodenal diseases in people<sup>2</sup>. Strong antiviral and preventive properties found in several bean sprouts guard against herpes simplex virus-1 and respiratory syncytial virus; these properties are comparable to those seen in acyclovir. Additional research has revealed that the proteins found in beans have antifungal and antiviral properties. These properties have been shown to block HIV infection-related transcriptase and glycohydrolases<sup>3</sup>.

**iv. ANTICANCER ACTIVITY: -**

Mung bean proteins have been isolated and work against the majority of tumours' host tissues through a variety of underlying mechanisms. By examining anti-most cancers' cytokines, immunological cytokines, mobileular cycle regulatory genes, apoptotic gene expression, tumour suppressor genes, and the percentage of apoptotic cells, the unusual anti-most cancers and immunomodulatory effects of methanolic extracts of mung bean sprouts have been assessed in cervix adenocarcinoma and hepatocellular carcinoma mobile traces<sup>8</sup>. These findings strongly suggest that mung bean sprouts are an effective immunomodulatory agent and anti-most malignancies agent, opening up new avenues for anti-most cancer therapy. Furthermore, studies conducted in vitro have reported that mung beans have antiproliferative effects on a variety of cancer cell lines, including those of the gastrointestinal tract, ovaries, and breast<sup>3</sup>. Even though the proper processes that modify the prevention of the majority of malignancies are well understood. Several studies have demonstrated that mung beans have anticancer effects through unique modes of action<sup>2</sup>.

**v. ANTIDIABETIC ACTIVITY: -**

It has been found that mung bean sprouts or seeds greatly benefit diabetic patients. Type 2 diabetic mice were fed seeds and an ethanolic extract of sprouts orally, which reduced their blood glucose levels and had an impact on plasma C-peptide, triglycerides, total cholesterol, blood urea nitrogen, and glucagon levels. Moreover, there has been a noticeable improvement in glucose tolerance multiplicity and insulin immunoreactive ranges. The high concentration of inhibitors of starch hydrolyzing enzymes in sprout ethanolic extracts made them particularly effective at regulating high blood sugar levels. This extract's capacity to block has been linked to high phenolic content material, which lowers intestinal absorption of carbs and, in turn, lowers blood glucose levels<sup>2</sup>. An analysis revealed that the mung bean's flavonoids and phenolic components reduced the production of reactive oxygen species and demonstrated their scavenging activity against free radicals, hence regulating hyperglycaemia. In a similar vein, extra mung bean starch with 32% amylose was taken into account for people with diabetes<sup>8</sup>. The Chinese

population also stated that there is an inverse relationship between the risk of type 2 diabetes and the consumption of beans, vegetables, and other meals high in legumes. Based mostly on those results, it has been determined that the high fibre and amylose content, slow digestion, and enhanced insulin sensitivity reduce the prevalence of type 2 diabetes<sup>3</sup>.

**2. OSTEOARTHRITIS: -**

Patients with osteoarthritis usually have joint pain and stiffness after resting or not moving for a short while. The following joints are most commonly affected: hands (fingers' tips, thumb bases, and fingers' ends). hips and knees.

Lower back and neck.

Osteoarthritis affects people differently. Very mild cases of osteoarthritis don't interfere with daily activities for some people. For others, it causes excruciating agony and incapacitating weakness. Joint degradation usually happens gradually over years, though it can occasionally develop suddenly<sup>20</sup>. Nowadays, most people agree that OA affects the entire joint. Large observational studies using magnetic resonance imaging (MRI) have provided data suggesting that pain in OA is related to several anatomical variables, such as the presence of synovitis and bone marrow lesions (BMLs). Additionally, there is evidence of changes in how the nerves are processed, and pain in OA may be influenced by sensitization of the peripheral and central nervous systems. Determining the specific sources of a patient's pain may be helpful in determining the best course of action for suitable therapy to assist lower symptoms and enhance function<sup>11</sup>. The incidence and prevalence of osteoarthritis (OA), comorbidities and mortality associated with OA (especially obesity and cardiovascular disease), and multiple joint involvement were the main topics of epidemiologic investigations during this period. The following therapeutic OA techniques were taken into consideration in the papers: non-pharmacologic alternatives, various topical, oral, and intra-articular therapies, as well as the affordability of specific OA treatments. Finding innovative ways to lessen the effects of this extremely common and crippling ailment is desperately needed<sup>16</sup>.



Figure 2. Condition of osteoarthritis

## 2.1 SYMPTOMS OF OSTEOARTHRITIS: -

Osteoarthritis usually begins slowly at first, usually affecting one or more joints. The following are typical location indicators of osteoarthritis:

- Pain during joint use, which may get better with rest. Some patients may experience worsening of the pain at night when they are in the later stages of the illness. Pain could be intense or mild.
- Stiffness in the joints, usually resolved in less than 30 minutes, especially in the morning or after extended periods of relaxation.
- Joint modifications that may limit joint mobility. swelling in and around the joint, typically following extensive use or hobbies in that region.
- Modifies the potential inside the cap to move the joint<sup>21</sup>{21}.
- As the cartilage wears away (in larger superior phases), the joint becomes less mobile over time and has a grinding sensation when moved.

As your signs and symptoms get worse over time, sports that you may take part in emerge as hard to do, which include stepping up, getting on or off the bathroom or inside and outside of a chair, gripping a pan, or strolling throughout a parking lot.

Pain and different signs and symptoms of osteoarthritis can also additionally lead you to experience tired, have troubles sleeping, and experience depressed<sup>20</sup>.

## 2.2 TREATMENT OF OSTEOARTHRITIS:-

There is no official treatment is available for the management of osteoarthritis. But healthy

life style and proper diet is the best way to treat osteoarthritis. If we add some highly calcium containing food for the fulfillment of calcium in the human body. Self-care and exercise are also the good way for treatment of osteoarthritis. Transplantation of knee and other bones are the best way of the management of osteoarthritis. Some treatments are: -

Medications: - Medications that can relieve the primarily pain which is caused by osteoarthritis, include: - 1. Acetaminophen 2. Nonsteroidal anti-inflammatory drugs 3. Cymbalta

Therapy: - Therapies can effective in osteoarthritis, include: -1. Physical therapy 2. Occupational therapy 3. Transcutaneous electrical nerve stimulation

Surgical and other procedures: - 1. Cortisone injections 2. Lubrication injections 3. Realignment bones 4. Joint replacement<sup>21</sup>.

## II. CONCLUSION: -

Mung bean shows many therapeutic activities like anti-inflammatory, antioxidant, antifungal, antiviral, antidiabetic etc. Mung bean contain polyphenols, phenolic, flavonoids and other contents which is very useful for human beings. Mung bean shows the activity against the osteoarthritis and shows very helpful effect against other diseases and disorders. Mung bean contain the calcium content which is beneficial for the human beings.

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