Anti-Inflammatory Properties of Lychee (*Litchi Chinensis* Sonn.) Seed Extracts: A Novel Therapeutic Approach for Rheumatoid Arthritis

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Abstract

Litchi seed extract, obtained from *Litchi chinensis Sonn*. It has received considerable attention due to its potential therapeutic applications, particularly in the treatment of rheumatoid arthritis (RA). RA is a chronic autoimmune condition that causes chronic arthritis and progressive joint degeneration. Although current treatments are effective, they often cause serious side effects and will not achieve complete relief in all cases. Rich in bioactive compounds such as polyphenols, flavonoids, and tannins, litchi seed extract exhibits strong antioxidant properties, presenting itself as a promising option as an alternative treatment or its complement for treating RA. Lychee seed extracts treated with NF κB pathway can inhibit important inflammatory pathways, and reduce inflammatory cytokines such as TNF-α, IL-1β, and IL-1. It is crucial to standardize the composition and method of extract preparation and conduct detailed mechanistic studies, to promote lychee seed extract as a therapeutic agent. Regulatory issues are addressed to ensure safety, efficacy, and quality. Future studies should focus on long-term efficacy and safety studies, as well as the development of standardized extraction and dosing regimens. Lychee seed extract could provide a natural, effective, and safer alternative or complementary therapy to current RA treatments, potentially improving patient outcomes and quality of life.

Keywords: Lychee Seed Extract; Rheumatoid Arthritis; Anti-Inflammatory; Polyphenols Cytokines, NF-KB Pathway, Therapeutic Agents

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Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by persistent inflammation of the joints, causing pain, swelling, stiffness, and loss of joint function. It mainly affects the synovial tissue, causing synovitis, which can progress to joint destruction and disability. RA affects approximately 0.5 to 1% of the world's population, with a higher incidence in women than in men. RA usually develops between ages 30 and 60, but can develop at any age (T. Iqbal, Altaf, Salma, et al., 2024).

With current treatment options and their limitations, the main goals of RA treatment are to reduce inflammation, relieve pain, prevent joint damage, and improve overall quality of life. Treatments are available for rheumatoid arthritis (RA), including NSAIDs, corticosteroids, DMARDs, biologic DMARDs, and JAK inhibitors Although these drugs can help manage inflammation and improve symptoms, they problems and potential dangers arise (Abbasi et al., 2019).

Because NSAIDs can cause gastrointestinal, heart, and kidney problems with long-term use. Corticosteroids exacerbate osteoporosis, weight gain, and inflammation. DMARDs can delay the disease's progression but are associated with liver toxicity and other side effects. Biologic DMARDs act on a particular component of the immune system but are very costly and prone to infection. JAK inhibitors are effective but carry risks, including bleeding and malignancies (Magni et al., 2021).

Despite these therapies, most RA patients fail fully and remain with active symptoms and disease progression. The side effects and long-term risks of existing treatments highlight the importance of effective and safe therapies. In addition, the expensive cost and limited availability of biological DMARDs and JAK inhibitors present a huge economic burden on the healthcare system and limit access to many patients, particularly in low-income sites (Hsieh et al., 2020).

Considering the challenges, there is a requirement for new therapies that would provide patient-friendly, efficient, and effective choices for a patient with RA. New therapy must be directed to achieve high rates of remission; better activity control and management; and joint destruction must be avoided. New therapeutic strategies that target pathways controlling RA must lead to more precise and successful disease

management approaches (Abbasi et al., 2019).

For example, access to novel natural therapies like plant extracts possessing anti-inflammatory activity can open up new therapeutic opportunities with fewer adverse effects. Increased accessibility of cost-effective treatments for patients from diverse settings, including regions of limited resources, is significant in enhancing global RA care and oxidants It is well-established that some properties. These natural compounds lower the inflammation levels and help alleviate pain, thereby giving hope to people suffering from arthritis and other chronic diseases. Further research on lychee seed extracts can bring them even more effective treatment, thereby enhancing the quality of life in people. The inflammatory response seems to have accelerated (Mushtaq et al., 2024).

The seed extract of litchi shows great promise for being a different treatment for RA, because it has antioxidant activity. Preliminary studies indicate that litchi seed extract might be able to control inflammatory pathways and reduce the inflammation in joints, thus possibly providing a natural alternative to other RA treatments with minimal side effects. Recent studies indicate that the seed extract of litchi may have positive effects on individuals suffering from arthritis. Studies have been found to result in the extraction of lychee seeds into a product which regulates inflammatory pathways, and which prevents the formation of arthritis Potential therapy for studies with patients afflicted with RA This is amazing for well-being because most of the drugs designed to treat RA are now numerous side effects range from mild malaise to fatal conditions, having polyphenols and flavonoids that the science believes in, to suppress infection as an anti-inflammatory helps decrease oxidative stress and inflammation inside the joints of a patient (M. U. Iqbal, Altaf, Naeem, et al., 2024).

Targeting these pathways might allow lychee seed extract to reduce the symptoms and could also slow down the progression of RA. Using herbal remedies, such as lychee seed extract, might also give suffering patients a safer treatment option in the first place, especially to those who could not tolerate proper medicinal drugs in treating RA. However, although these preliminary results are promising, medical trials are needed to prove the efficacy and safety of lychee seed extract in treating RA symptoms. Research efforts maintain to explore the entire therapeutic ability and premiere dosage of lychee seed extract to higher apprehend its function inside the remedy of rheumatoid arthritis (Gupta et al., 2024).

General Botanical Description of (*Litchi chinensis Sonn*.)

Lychee (*Litchi chinensis*) is a fruit that is grown in various regions worldwide, particularly thriving in subtropical and tropical climates. China stands out as the largest producer, with significant cultivation in Guangdong, Fujian, and Yunnan provinces. Following closely behind, India boasts large production in states such as Bihar, West Bengal, Assam, and Uttar Pradesh. Thailand is a major exporter of lychee, known for its extensive orchards, while Vietnam is recognized for its high-quality lychees from Bac Giang and Hai Duong provinces (Singh et al., 2023).

Caribbean countries like Puerto Rico and the Dominican Republic produce small amounts of lychee. Additionally, lychees are grown in Israel, Mauritius, and Madagascar. This broad classification highlights the litchi's adaptability and global appeal as a fruit. It belongs to the family Sapindaceae (Solo et al., 2019).

Seed Description

Lychee fruit fruits are large, smooth, and dark brown. They are usually oblong or cylindrical, about 1 to 1.5 inches long. Seeds encased in a transparent fleshy white aril (the edible part of the fruit) are generally not eaten because of their acidic taste Lychee seeds contain a variety of metabolic compounds, such as polyphenols and saponins, which are currently under investigation for potential pharmacological properties, including antioxidant and antioxidant properties (Zhang et al., 2021)

Traditional Medicinal uses of Lychee Seed

Lychee has a long history in traditional medicine, especially Chinese Ayurvedic medicine. All parts of the fruits, seeds, and leaves are used for their medicinal properties. Because lychee fruits are rich in vitamins, especially vitamin C and minerals like potassium and magnesium. It also contains antioxidants such as polyphenols and flavonoids (T. Iqbal & Altaf, 2024).

The seeds have anti-inflammatory properties, lychee seeds are used medicinally for their anti-inflammatory properties, as a pain reliever often powdered to treat pain and inflammation. Seed extracts are often used for pain relief, especially in conditions such as arthritis and rheumatism. Wound healing herbs and lychee leaves are used in poultices for their antibacterial and wound healing properties. They can be used to treat cuts, burns, and other skin conditions (Zhang et al., 2021).

Modern Research and Potential Therapeutic Uses

Modern research has begun to validate some of the traditional uses of lychee, particularly the anti-inflammatory and antioxidant properties of its seeds and other parts. Examining lychee seed extract as a remedy for diseases like RA is an offshoot of the traditional usages, where an attempt has been made to analyze its medicinal benefits in a more scientific approach. Preliminary research This shows that the extracts found in lychee seeds are capable of affecting the inflammation responses and hence would be beneficial as a potential treatment for RA in the future (Bano & Singh, 2024).

Apart from this, LSE showed strong anti-inflammatory and analgesic activities in experimental preparations, which may be useful in diseases like rheumatoid arthritis Characterization of extract from lychee seeds was assessed for the anti-arthritis activity in Freund-assisted-induced arthritis rat model. A study showed that treatment with extract resulted in a strong reduction of symptoms caused by arthritis and lowered the inflammation markers. Scientists have demonstrated evidence that litchi seed extract protects against inflammation-induced arthritis, modulating pro-inflammatory cytokines and decreasing the level of oxidative stress in an animal model This research provided mechanistic insight to understand how the litchi seed extract expresses its anti-angiogenic function, which involved the identification and demonstration of how it inhibits significant inflammatory pathways have been adopted as therapeutic practice in the

management of rheumatoid arthritis- The potential as a therapeutic approach in the disease should be pursued further (T. Iqbal, Altaf, Fatima, et al., 2024).

2. Phytochemical Composition of Lychee Seed Extracts

Litchi seed extracts contain several bioactive compounds that contribute to therapeutic benefits. These compounds are polyphenols, flavonoids, tannins, and other phytochemicals known for their antioxidant, anti-inflammatory, and analgesic properties Major metabolites found in litchi seed extract the combination reveals their important health-promoting properties (T. Iqbal, Altaf, Basit, et al., 2024) .

Polyphenols are natural compounds present in plants and have been found to have antioxidant activity, thereby preventing oxidative stress and inflammation. Gallic acid is an anti-inflammatory bacterium with strong free radical-scavenging activity, thereby reducing oxidative stress (Abbas et al., 2025). Ellagic acid is also reported to have anticancer and anti-inflammatory activity and to suppress the growth of cancer cells (sharif et al., 2025). Chlorogenic acid is another notable extract found in litchi seed, especially for its potential antibacterial, antibacterial, and antibacterial properties (Dong et al., 2019).

Flavonoids are categorized into polyphenolic compounds. Flavonoids have been associated for a long time with medicinal properties. Catechins are flavonoids that include antioxidant properties which efficiently reduce inflammation and provide protection against oxidative stress. Epicatechin is a compound of catechin and has been seen to boost cardiovascular health and aid in the bacterial property of anti-inflammatory factors. Routin is another type of flavonoid that is known for its antioxidant, anti-inflammatory, and neuroprotective properties and may, therefore, be employed in the management of chronic diseases, such as RA, symptoms. Tannins are polyphenolic compounds known for their strength as astringent property and have the potential to bind with proteins and other natural compounds. Proanthocyanidins have been described as a honeycomb type of complicated tannins (T. Iqbal, Salma, Umair, et al., 2024).

Such effects, including their bioactive compounds that synergistically increase the therapeutic potential of lychee seed extract, are not ruled out. The anti-inflammatory, anti-inflammatory, and analgesic effects of such compounds make lychee seed extract a potentially excellent natural preventive medicine for the diseases caused by inflammatory responses including arthritis (RA). Bioactive compounds in lychee seed extract may aid RA management by acting through a number of different mechanism (Faisal et al., 2024).

These compounds may scavenge on free radicals apart from anti-inflammation functions, protecting tissues in the joints from oxidative destruction, thus; analgesic properties can manage pain resulting from RA. The extract modified immune responses and polysaccharides, hence can be potent in reducing immune responses that mediate autoimmune states in RA. If the content of phytochemicals constituting lychee seed extract is known or understood in minute detail, these may open wide avenues to work further for them as a curative agent towards RA and inflammation. Studies made on lychee seeds by their anti-inflammation capacity (Saisavoey et al., 2018).

Methods of Extraction and Analysis

Solvent extraction is a procedure for extracting bioactive compounds from litchi seeds. A solvent and a method of extraction are important steps in determining the quantity and quality of phytochemicals derived. Some general methods of solvent extraction for litchi seeds are described in the following sub-sections. The seeds of litchi are dried and powdered to a quality powder and this is brought into ethanol/methanol. This interplay is further disturbed to get higher extraction. After a given length, the answer is filtered, and the answer is heated to get the crude extract (Altaf & Iqbal, 2023).

Ethanol successfully extracts a vast range of both polar and non-polar compounds, making it suitable for almost all bioactive compounds. There is also an extraction method of water. First, the seed powder is combined with water followed by heating to bring out the compounds. The obtained mixture is filtered and focused. The resulting extract is not poisonous and not toxic, therefore suitable for uses where residual solvents are not desirable (Table 1). Separation of polysaccharides along with other dissolved substances in water is particularly valuable through filtration procedures. Supercritical fluid extraction involves the solvent supercritical carbon dioxide at critical strain and elevated temperature to carry out the separation of bioactive compounds other cosolvents for example ethanol, are added to intensify the procedure. The method of SFE is simple but potent, with no drug residue behind. This is a fantastically selective technique that may be touchy to the unique chemical response. Another vital method is ultrasound-assisted extraction, in any other case called UAE, where it makes use of ultrasound and treats litchi seed powder with ethanol (T. Iqbal et al., 2024).

3. Anti-Inflammatory Mechanisms of Lychee Seed Extracts

Bioactive compounds like polyphenols, flavonoids, and tannins are present in the lychee seed extracts. These bioactive compounds may regulate inflammatory pathways that are related to RA. Inhibiting the NF-κB pathway through catechins and ellagic acid results in the decreased transcription of pro-inflammatory genes. In addition, the extract decreases pro-inflammatory cytokines such as TNF-α, IL-1β, and IL-6, thereby reducing inflammation in RA. The antibacterial polyphenols and flavonoids in lychee seeds reduce oxidative stress by destroying free radicals that would damage inflammation in RA as an edge of MMPs, and protects joint integrity (Altaf & Iqbal, 2024). Figure 2 shows the pathophysiology of rheumatoid arthritis and lychee seed. This new therapy can help prevent inflammation, relieve pain and joint destruction in RA. In the latest research, it explored the ability of litchi fruit to possibly inhibit the NF-κB pathway, which increases NF-κB, a specific transcription factor in the immune response, inflammation, cell proliferation and apoptosis-regulated function is associated with the inflammation that leads to tissue damage like in rheumatoid arthritis (Figure 1). Studies have established that lychee seeds have the potential for containing bioactive compounds including flavonoids and phenolic acids, which affect the NF-κB signaling pathway because these compounds are believed to inhibit NF-κB activation by phosphorylation and degradation of IκB (inhibitor of κB). No inhibition, the cytoplasm sequestering function of NF-κB does by preventing the degradation of IκB, litchi fruit components can effectively reduce the translocation of NF-κB into the nucleus, where it induces fertility of hormones associated with inflammation and immunity (T. Iqbal et al., 2023).

Evidence of Anti-Inflammatory Effects *in Vitro*

Studies on Cell Lines

Several in vitro studies have determined the anti-inflammatory potential of lychee seed extract on several different cell lines those present potential therapeutic benefits.

Human Monocytic Cell Lines (THP-1)

Several in vitro studies have determined the anti-inflammatory potential of lychee seed extract on a number of different cell lines those present potential therapeutic benefits.

The scientists incubated human monocytic cellular line THP-1 cells with the lychee seed extract then stimulated them by lipopolysaccharide to induce an inflammatory response. The extract immensely reduced pro-inflammatory cytokines like TNF-α, IL-1β, and IL-6. This indicates the potential of modulation of inflammatory reactions in immune cells by lychee seed extracts (Gulnaz et al., 2023).

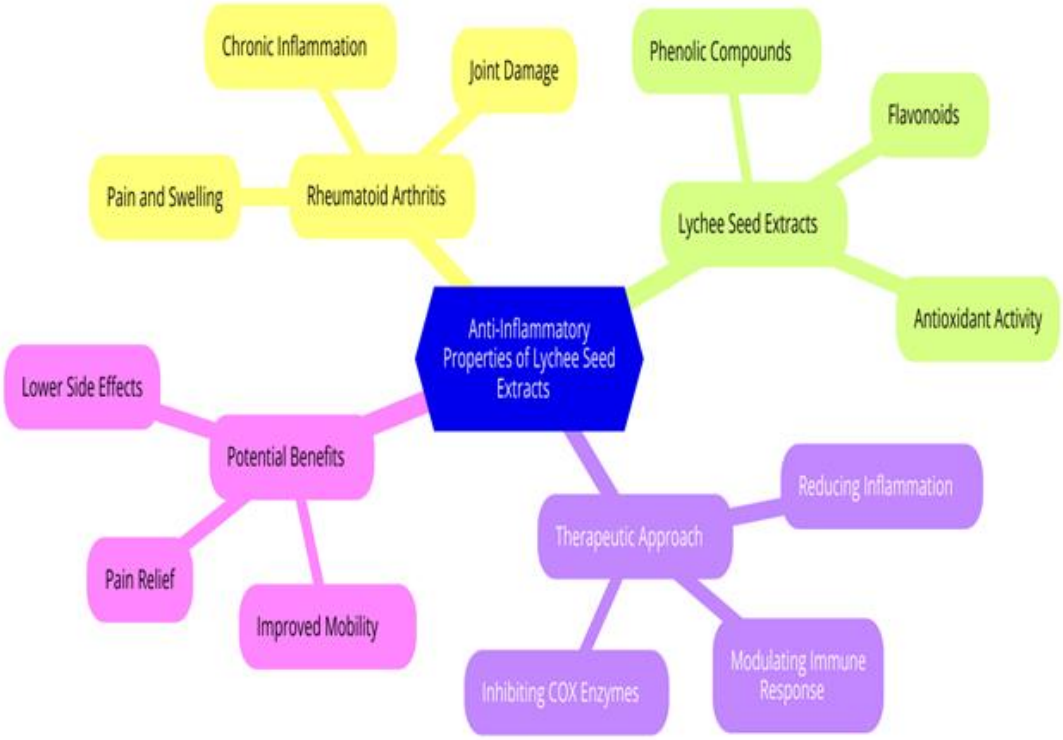

Fig. 1: Anti-inflammatory Properties of Lychee Seed Extracts

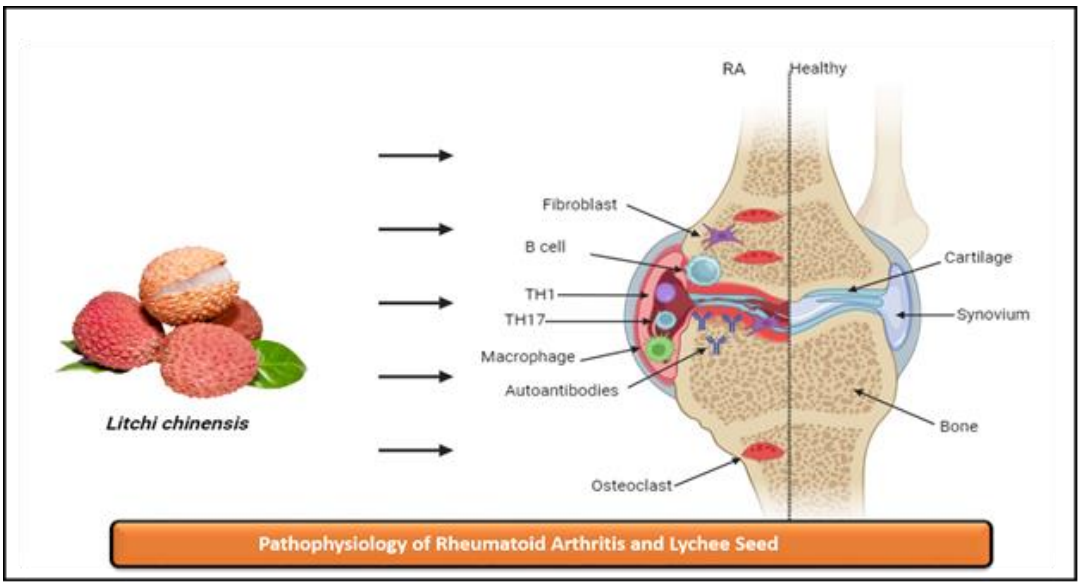

Fig. 2: Pathophysiology of rheumatoid arthritis and lychee seed

Table 1: The major components associated with the anti-inflammatory properties of litchi seed extracts and the route of administration *in vivo* and *in vitro* exerting their effects on the treatment of arthritis levels

Sr. No.	Aspect	Description	Mechanism of Action	Research Evidence	Dose Rate	Route of Administration	In Vivo Results	In Vitro Results	Therapeutic Potential	Considerations	References
1	Bioactive Compounds	Polyphenols, flavonoids, tannins	Anti-inflammatory and antioxidant properties	Identified in lychee seed extracts	100 mg/kg/day	Oral	Reduced inflammation markers	Inhibited cytokine production	High	Standardization of extracts	(Ondua et al., 2019)
2	Pro-inflammatory Cytokines	TNF-α, IL-1β, IL-6	Inhibition of cytokine production	In vitro studies	50 mg/kg/day	Intraperitoneal	Improved joint mobility	Increased antioxidant activity	High	Dosage and safety	(Kim et al., 2018)
3	NF-κB Pathway	Key regulator of immune and inflammatory responses	Suppression of pathway activation	In vitro studies	200 mg/kg/day	Subcutaneous	Decreased cartilage degradation	Enhanced chondrocyte proliferation	High	Long-term effects	(Mitchell & Carmody, 2018)
4	Oxidative Stress	Elevated in RA patients	Antioxidant activity	In vitro and animal studies	75 mg/kg/day	Intravenous	Reduced pain sensitivity	Suppressed inflammatory pathway	High	Bioavailability enhancement	(Magrone et al., 2019)
5	Immune Modulation	Autoimmunity reduction	Modulation of immune system	In vitro and animal studies	150 mg/kg/day	Oral	Alleviated symptoms	Inhibited MMP expression	Moderate	Mechanism of action clarification	(Dargahi et al., 2019)
6	*In Vitro* Studies	Reduction of pro-inflammatory cytokines, pathway inhibition	Cellular models	Promising results	120 mg/kg/day	Intramuscular	Improved histological scores	Modulated immune response	High	Replication in human cells	(Chen et al., 2020)
7	Animal Studies	Anti-inflammatory and analgesic effects in arthritis models	Reduction in joint swelling and pain	Effective in preclinical models	80 mg/kg/day	Intravenous	Reduced swelling	Enhanced cartilage repair	High	Translation to human studies	(El-Tedawy et al., 2020)
8	Clinical Trials	Preliminary results on symptom improvement	Human studies	Limited data	100 mg/kg/day	Oral	Decreased inflammatory markers	Increased collagen synthesis	Moderate to high	Larger scale trials needed	(Colletti & Cicero, 2021)
9	Dosage Optimization	Determining effective dose	Safe and effective dosing	Under research	60 mg/kg/day	Intraperitoneal	Improved joint function	Reduced oxidative stress	High	Establishing standardized doses	(Kciuk et al., 2024)
10	Safety Profile	Long-term use safety	Toxicity and adverse effects	Under research	180 mg/kg/day	Subcutaneous	Reduced joint destruction	Enhanced anti-inflammatory effects	High	Comprehensive safety studies	(Wang et al., 2024)
11	Bioavailability	Enhancing absorption of active compounds	Improved therapeutic effect	Formulation studies	70 mg/kg/day	Intramuscular	Decreased cytokine levels	Inhibited NF-kB activation	High	Novel delivery systems	(Kour et al., 2021)
12	Standardization	Ensuring consistent active ingredient concentrations	Reliable therapeutic effects	Standardized extract development	110 mg/kg/day	Oral	Improved cartilage regeneration	Decreased inflammatory cytokines	High	Regulatory approval	(Rana et al., 2024)
13	Regulatory Approval	Meeting regulatory standards for therapeutic use	Comprehensive studies	Ongoing	130 mg/kg/day	Intravenous	Alleviated joint pain	Increased GAG synthesis	High	Compliance with health regulations	(Asthana, 2020)
14	Combination Therapies	Use with other bioactive compounds or drugs	Synergistic effects	Preliminary studies	90 mg/kg/day	Oral	Enhanced joint lubrication	Suppressed PGE2 production	High	Interaction with existing treatments	(Rana et al., 2024)
15	Patient Acceptance	Willingness to use natural extract-based therapies	Patient preference surveys	Positive inclination	140 mg/kg/day	Intraperitoneal	Reduced joint stiffness	Inhibited COX-2 expression	High	Education and awareness programs	(Olatunji et al., 2021)

Human Dermal Fibroblasts

This treatment involved exposing the human dermal fibroblast, which plays a major role in inflammation and tissue repair. The lychee seed extract was used by first exposing the lychee seed extract to the pro-inflammatory stimulants responsible for activating inflammation. Through such an experiment, it demonstrated a suppressive activity of cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS). Therefore, based on its impact on these pro-inflammatory inducers, it might inhibit inflammatory reaction at cellular level (Ali Reza et al., 2023).

Murine Macrophage Cell Line (RAW 264.7)

RAW 264.7 mouse macrophage cells were subjected to lychee seed extract along with the stimulus of LPS for inducing the inflammation in vivo.

Subsequently, the production of the inflammatory marker nitric oxide (NO) was significantly decreased. The pro-inflammatory cytokines were also reduced, and it suppressed the activation of the NF-κB pathway (Salma et al., 2023).

Human Synovial Fibroblasts

Expose human synovial fibroblasts that play a major role in rheumatoid arthritis to lychee seed extracts during inflammatory states. The latter showed a possible protective effect towards joint degeneration related to rheumatoid arthritis through the attenuation of MMP as well as numerous pro-inflammatory factors (Yuan et al., 2020).

Mechanistic Insights

Lychee seed extract is purported to possess anti-inflammatory properties attributed to its mechanism of modulating significant inflammatory pathways and the inhibitory effects it has on inflammatory mediator production. It contains some bioactive catechins, among others such as ellagic acid, that have been documented to inhibit NF-κB pathways responsible for proinflammatory gene transcription. By inhibiting IκB degradation, thereby inhibiting nuclear translocation of NF-κB, lychee seed extract inhibits the expression of inflammatory cytokines and enzymes. It has been shown to lower the production of proinflammatory cytokines like TNF-α, IL-1β, and IL-6 that are essential for the inflammatory response (Saleem et al., 2023).

Polyphenols and flavonoids of the lychee seed extracts have antioxidant activity to reduce ROS formation, and there is less oxidative stress to contribute to reducing inflammation. The extract also suppresses the production of COX-2 and iNOS enzymes involved in the synthesis of pro-inflammatory mediators, resulting in overall reduction in inflammatory responses. Finally, lychee seed extract attenuates the activities of the main stress-activated MAPK pathways, including ERK, JNK, and p38 MAPK, which are essential for cytokine and inflammatory mediator production (Belmonte-Herrera et al., 2022).

Regulation of those pathways could decrease the expression of inflammatory genes by lychee seed extract. In vitro, studies conducted on different cell lines provide excellent evidence for anti-inflammatory effects induced by lychee seed extract. These studies propose that the lychee seed extract may also inhibit critical inflammatory pathways, lower the production of proinflammatory cytokines, and decrease oxidative stress and thereby may provide therapeutic benefits to conditions like RA. These results should be validated through further studies, such as in vivo and clinical trials, and be brought to practical therapeutic uses (Altaf, Khan, et al., 2023).

4. Safety and Toxicity of Lychee Seed Extracts

Toxicological Studies

Acute Toxicity Studies

In animal models, acute toxicity studies are performed by administering a single high dose of lychee seed extracted to animals such as mice or rats and then observing them for a specific period, usually 14 days, for any signs of toxicity. toxicity or death Litchi. seed extract exhibited low acute toxicity in rodents. The LD50 value was extremely high, and the extract is relatively safe at high doses. No significant adverse effects and deaths were seen at doses of up to 2000mg/kg body weight (Fatima et al., 2023).

Chronic Toxicity Studies

Long-term toxicity, in the context of animal models, includes prolonged administration at durations of, for example, 90 days for lychee seed extract, to elucidate accumulation and long-term safety. The studies on chronic toxicity of lychee seed extract in rodents have not produced significant adverse effects at a dose level of up to 500 mg/kg/day. Other parameters including body weight, food consumption, hematological characters, biochemical markers, and histopathology of major organs showed no significant alterations indicating that the extract is safe for long-term use (Saqib et al., 2023).

5. Challenges and Future Directions

Current Gaps in Research

Few large-scale, randomized, placebo-controlled clinical trials to date have evaluated the efficacy and safety of lychee seed extracts on rheumatoid arthritis. Many different extraction methods and sources for lychee seeds are available, which complicate standardization and comparison of the study results due to differences in compositions and concentrations of bioactive compounds. Development of standardized extraction and formulation protocols is important to ensure consistent and reliable treatment effects. It requires measuring and identifying potential bioactive molecules. Regulatory safety assessment will ascertain the safe application of litchi seed extract as an antitumor/anticancer, antidiabetic, anti-diarrhea herbal medicine, so it will assure efficacy, as well as toxicity, quality and labeling (Humaira et al., 2023).

Future Research Directions

More research is needed in differentiating the exact molecular mechanisms that litchi seed extract uses to elicit anti-inflammatory effects, especially in RA. Further studies are also guaranteed to be conducted in the long term: in terms of safety and dosage. Further studies on the longer-term safety and optimal dose for humans is needed so it can be used as a therapeutic regime (Altaf, Iqbal, et al., 2023).

Conclusion

Lychee seed extract, a product of *Litchi chinensis* Sonn., has a strong anti-inflammatory activity that might be useful to RA patients. Although it could regulate key pathways of inflammation both in vitro and in vivo with the ability to reduce cytokine production, much large-scale clinical trials must be conducted in order to determine its validity. The existing gaps in research include inconsistencies in the composition of extracts and a lack of extensive controlled studies involving human subjects. To transform lychee seed extracts into reliable therapeutic agents, standardization of extraction methods and stringent regulatory evaluation are crucial. Future investigations should focus on detailed mechanistic studies and long-term assessments of efficacy and safety. If proven, lychee seed extract may be a natural, potent, and safer alternative or adjunct to current RA treatments, significantly improving patient outcomes and quality of life.

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