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A Review of the Phytochemistry, Biological Activities, and Therapeutic Prospects of *Artocarpus integrifolia* (Jackfruit)

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Abstract

The jackfruit tree (*Artocarpus integrifolia*), a prominent species in the *Moraceae* family, is globally valued for its nutritious fruit and longstanding use in traditional medicine systems like Ayurveda. This review systematically consolidates current scientific evidence on its phytochemistry and therapeutic potential. Rich in diverse bioactive compounds including phenolics, flavonoids, tannins, lectins (jacalin), and prenylated flavonoids (artocarpin) jackfruit exhibits a broad spectrum of pharmacological activities. Its potent antioxidant capacity is linked to high polyphenol content, while antidiabetic effects are demonstrated through blood glucose regulation, improved insulin secretion, and inhibition of carbohydrate digestion. Antimicrobial properties are evident against various bacterial and fungal pathogens, with compounds like jacalin showing biofilm disruption and immune stimulation. Notably, extracts and purified compounds exhibit selective anticancer activity by inhibiting proliferation in breast, colon, and leukemia cell lines, inducing differentiation, and enhancing the efficacy of conventional chemotherapeutics. These multifaceted bioactivities validate its ethnomedicinal applications and underscore its potential as a source of safe, natural therapeutic agents. The findings highlight *Artocarpus integrifolia* as a promising, sustainable resource for developing nutraceuticals and complementary medicines. To fully realize this potential, future research must prioritize the isolation of novel compounds, detailed mechanistic studies, rigorous *in vivo* validation, and clinical trials to establish efficacy, dosage, and safety for pharmacological applications.

Keywords- *Artocarpus integrifolia,* Antioxidant, Antidiabetic, Anticancer, Antimicrobial, Traditional medicine, Phytochemistry

INTRODUCTION

The genus Artocarpus (*Moraceae*) includes approximately 50 species of evergreen and deciduous trees. It is economically significant for its edible fruits, valuable timber, and widespread use in traditional medicine [1]. *Artocarpus integrifolia*, popularly called jackfruit, holds a prominent place in Ayurveda due to its rich nutritional profile and therapeutic significance [2]. Jackfruit is a high-yielding tree that produces the world's largest edible fruit. The ripe fruit is nutrient-rich, providing potassium, calcium, and carbohydrates, and is widely consumed as an affordable seasonal food. The seeds are eaten boiled or roasted or used in cooking, while the tree also provides durable, anti-termite timber [3]. Different parts of *Artocarpus* species are used in traditional medicine. Leaves, fruits, seeds, roots, and bark are important in Ayurvedic and Unani systems. Ripe fruits are nutritious, cooling, and laxative; seeds are used for dysentery and are considered aphrodisiac. Leaves are used for asthma, diabetes, skin infections, wound healing, and to promote lactation [4]. While Lectin from seeds od *Artocarpus integrifolia* (Jackfruit) enhances immune function by stimulating T-cell proliferation and activating B cells, indicating potential immunomodulatory use [5,6]. Despite increasing scientific interest, research on this species has been slow and often repetitive, highlighting the need for a systematic approach to its evaluation and medical application [7].

This review objective is to summarize current research on *Artocarpus integrifolia* (Jackfruit), as a natural source of antioxidants, antidiabetic, anticancer, and antimicrobial agents, highlighting its phytochemistry, biological activities and therapeutic potential.

Literature review strategy

The information for this review was gathered from multiple sources, including Google Scholar, ScienceDirect, and PubMed. Both meta-analyses and systematic reviews were considered, as they provide evidence-based recommendations. The search focused on both experimental and non-experimental studies published between 1981-2025. The studies identified through the search engines were initially screened for relevance. Selected studies were imported into Microsoft Excel and categorized based on their abstract, objectives, and conclusions. This process allowed for systematic organization and comparison of findings, ensuring that only the most pertinent and high-quality studies were included in the review.

Antioxidant and Phytochemistry Insights from Artocarpus integrifolia (Jackfruit)

Plant-derived phytochemicals are important anti-inflammatory agents, and studies have shown that both crude extracts and isolated compounds from medicinal plants can effectively regulate inflammatory responses [8]. Fig 1 shows medicinal properties of *Artocarpus integrifolia* (Jackfruit).

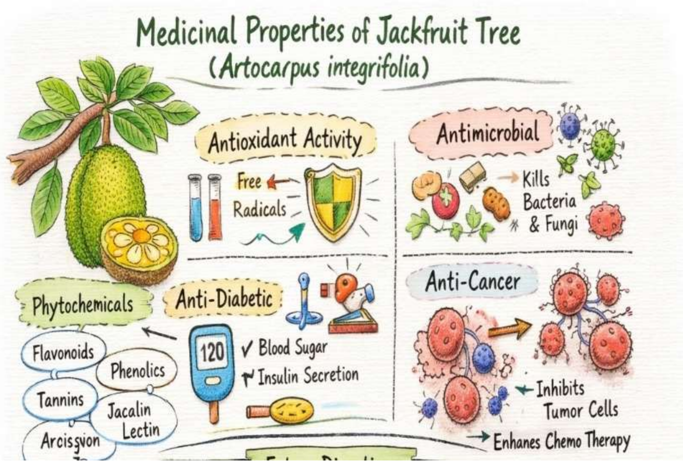

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Fig 1. Medicinal properties of *Artocarpus integrifolia* (Jackfruit)

Seed oils from five jackfruit varieties (*Artocarpus heterophyllus, Artocarpus integrifolia, Artocarpus hirsutus, Artocarpus incisus,* and *Artocarpus. integer*) were extracted using Soxhlet with hexane. Antioxidant activity (DPPH, FRAP, reducing power, hydroxyl radical assays) and fatty acid composition (by gas chromatography) showed that these oils are rich in essential fatty acids and exhibit strong antioxidant properties, supporting their nutritional and therapeutic potential [9]. Jackfruit is rich in phytochemicals, including phenolic acids, flavonoids, and tannins, which contribute to its strong antioxidant activity. Extracts from fruits at different maturity levels showed high total polyphenols (844–1,178 mg EAG/100 g) and flavonoids (37–68 mg QE/100 g), with significant antioxidant potential. These findings highlight jackfruit as a valuable source of natural antioxidants [10]. Phytochemical screening plays a key role in identifying bioactive compounds, with jackfruit peel extracts showing the presence of flavonoids, tannins, carbohydrates, saponins, alkaloids, triterpenoids, and proteins [11]. Ethanol extracts of Indonesian *Artocarpus* fruit flesh contained alkaloids, flavonoids, saponins, tannins, triterpenoids, and phenolics, while leaves lacked alkaloids and saponins. Both extracts showed strong antioxidant activity [12].

Artocarpus integrifolia (Jackfruit): A Natural Remedy for Diabetes

The global prevalence of diabetes mellitus is rising, leading to serious health risks and higher mortality. Poor blood glucose control can result in severe complications. Although conventional antidiabetic drugs are effective, they often cause side effects, making medicinal plants promising alternatives with potentially fewer adverse effects [13]. Jackfruit is widely used in traditional medicine, particularly for managing diabetes mellitus. Its leaves, bark, stem, and fruit contain bioactive compounds such as flavonoids, stilbenoids, aryl benzofurans, and the lectin jacalin, which contribute to its therapeutic effects. Studies indicate that jackfruit extracts and metabolites can help regulate blood glucose and improve insulin activity, supporting their potential as natural antidiabetic agents. Current research is increasingly exploring these compounds for developing safe and effective plant-based therapies for diabetes [14]. Jackfruit (demonstrates antidiabetic effects by inhibiting hemoglobin glycation. Phytochemicals like carotene and lycopene, along with its antioxidant activity, help lower HbA1c levels, supporting its potential in diabetes management [15]. Jackfruit seed extracts exhibit antidiabetic potential by reducing glucose levels in yeast cells in a dose-dependent manner, with methanolic extracts showing the strongest effect. Prepared from seeds collected during the fruiting season, both ethanolic and methanolic extracts demonstrated significant glucose uptake, using metformin as a standard. These findings suggest jackfruit seeds may serve as a natural agent for managing blood glucose [16]. *Artocarpus* species (jackfruit) contains bioactive compounds like flavonoids and sterols, and its leaves, bark, and fruit have traditional medicinal uses. Studies show jackfruit extracts, especially leaf decoctions, exhibit hypoglycemic effects, supporting their potential as natural antidiabetic agents [17]. Jackfruit seed powder, rich in dietary fiber, reduces high-sugar diet-induced overeating, weight gain, improves glucose tolerance, and lowers LDL cholesterol, supporting its role in managing metabolic disorders [18]. Antidiabetic potential of jackfruit (*Artocarpus heterophyllus*) seed extracts in streptozotocin-induced gestational diabetic rats and identified active compounds through molecular docking. Rats treated with 70% ethanol seed extract (100–400 mg/kg BW) showed dose-dependent reductions in blood glucose, with the 400 mg/kg dose reducing levels by 61.73%, comparable to glibenclamide. In silico analysis indicated that beta-carotene epoxide interacts strongly with sulfonylurea receptors, suggesting it may lower blood glucose by enhancing insulin secretion [19]. Ethanol extract of unripe *Artocarpus* enhances insulin secretion, promotes β-cell proliferation, and inhibits carbohydrate digestion, improving glucose tolerance in high-fat-fed obese mice. It also lowers fasting blood glucose, body weight, and lipid levels. These effects, likely due to bioactive compounds like flavonoids and alkaloids, support EEAH as a potential natural antidiabetic agent [20]. Hot-water extracts of *Artocarpus heterophyllus* leaves and *Asteracanthus longifolia* significantly improved glucose tolerance in both normal subjects and maturity-onset diabetic patients at oral doses [21].

Artocarpus integrifolia (Jackfruit): A Source of Natural Antimicrobial Compounds

Plant-derived compounds with strong antimicrobial properties are increasingly studied as potential therapies against bacterial, fungal, viral, and parasitic infections. Plant extracts remain valuable sources for developing effective antimicrobial agents [22]. Jacalin-functionalized silver nanoparticles (JAgNPs), derived from *Artocarpus integrifolia* seed lectin, show potent antimicrobial activity against *S. aureus*. JAgNPs kill bacteria within 30 minutes, induce oxidative stress and membrane damage, and inhibit biofilm formation at lower concentrations than unmodified AgNPs. Microscopy analyses confirm reduced biofilm thickness and exopolysaccharide production, highlighting jacalin functionalization as an effective strategy for controlling bacterial infections [23]. Artin M and jacalin from *Artocarpus integrifolia* seed extract enhance host defense by stimulating Th1 and Th17 immune responses, boosting phagocytic activity, and promoting pathogen clearance. Pretreatment with the extract improved survival and reduced tissue damage, demonstrating its potential as a natural antimicrobial agent [24]. Artocarpin, an isoprenyl flavone from *Artocarpus* species, has been isolated from several species. Beyond its cosmeceutical effects, artocarpin exhibits notable antimicrobial activity against bacteria, fungi, and parasites, along with other pharmacological properties such as antioxidant, anti-inflammatory, and wound-healing effects, highlighting its potential as a natural therapeutic agent [25]. Jackfruit seeds an underutilized by-product, are rich in bioactive compounds such as flavonoids, lectins, tannins, saponins, and phenolic acids. These phytochemicals exhibit significant antimicrobial activity against a range of bacterial and fungal pathogens. Recent studies highlight the seeds' potential as a natural source for developing plant-based antimicrobials and functional therapeutics, emphasizing their role in sustainable pharmaceutical and nutraceutical applications [26]. Methanol and hexane seed oil extracts from *Artocarpus* species showed strong antibacterial and antifungal activity, with methanolic extracts They inhibited Gram-positive (*S. aureus, B. cereus, B. subtilis*) and Gram-negative (*E. coli, P. aeruginosa*) bacteria, as well as fungi (*A. niger, A. flavans, C. albicans*), with MICs of 7–10 mg/50 µL, demonstrating significant therapeutic potential [27]. Jackfruit contains bioactive compounds in its seeds, fruit, and leaves with potent antimicrobial and antifungal properties. Studies show its extracts can inhibit bacteria and fungi, supporting traditional medicinal uses. Despite this potential, jackfruit remains underutilized in developing natural antimicrobial products [28]. Antimicrobial potential of *Artocarpus species* from five regions of Grande Comore, finding that extracts inhibited most tested bacteria except *Escherichia coli* and *Pseudomonas aeruginosa*. Inhibitory halo diameters ranged from 8–16 mm, with *Salmonella enterica*, *Clostridium perfringens*, and *Vibrio fischeri* being most sensitive. MIC values varied by extract, with *Bacillus megaterium* highly susceptible and ExHAM showing strongest activity against *Staphylococcus aureus* and *Salmonella enterica* [29].

Bioactive Compounds from Artocarpus integrifolia (Jackfruit) with Anticancer Activity

Cancer poses a significant public health challenge worldwide, impacting people regardless of economic status. Medicinal plants hold promise for cancer prevention and therapy, primarily because of their antioxidant activity and tumor-suppressing effects [30]. Jackfruit seeds exhibit significant anticancer activity while showing no toxicity. Extracts effectively inhibited growth in T47D, HT29, and B16F10 cancer cell lines, with IC_{50} values of 46.67 µg/mL, 23.42 µg/mL, and 74.31 µg/mL, respectively. These findings highlight the seeds' potential as a safe natural source for anticancer agents, warranting further investigation [31]. *Artocarpus heterophyllus* leaf ethanolic extract shows significant anticancer activity against triple-negative breast cancer and HPV-16–positive cervical cancer cells by reducing cell viability, proliferation, and tumor growth. It also enhances the efficacy of standard chemotherapeutic drugs at lower doses, highlighting its potential as an adjuvant anticancer agent [32]. In vitro anticancer potential of a methanolic latex extract of *Artocarpus integrifolia* against the MCF-7 human breast cancer cell line using the MTT assay. Cytotoxic activity was evaluated at concentrations ranging from 100 to 1000 µg/mL. The extract produced a concentration-dependent inhibition of cell proliferation, with growth inhibition of 68.3%, 74.4%, 77.5%, and 79.9% at 100, 500, 750, and 1000 µg/mL, respectively, after 24 h exposure. These findings indicate that *A. integrifolia* latex exhibits significant anticancer activity, warranting further studies to identify its active compounds and explore its potential in cancer therapy [33]. Jacalin, a lectin from *Artocarpus integrifolia*, specifically recognizes tumor-associated T-antigen structures. This study showed that jacalin binds various free and metal-based porphyrins, commonly used as photosensitizers in photodynamic cancer therapy, with moderate to strong affinity. Porphyrin binding occurs at a site distinct from the carbohydrate-binding domain and is largely driven by hydrophobic interactions, suggesting jacalin's potential as a carrier for targeted porphyrin delivery to tumor tissues [34]. *Artocarpus* hows dose-dependent anticancer activity in vitro, particularly from seed extracts rich in jacalin, artocarpin, and ArtinM. Studies mainly report inhibitory effects against breast, lung, and colon cancer cells, highlighting jackfruit as a promising natural anticancer source [35]. Jackfruit (*Artocarpus integrifolia*) seed lectin demonstrates notable anticancer relevance due to its strong ability to agglutinate tumor cells, including Ehrlich ascites cells. Its specific recognition of galactose-containing carbohydrate structures commonly expressed on cancer cell surfaces highlights its potential role in tumor targeting and cancer-related therapeutic applications [36]. *Artocarpus integrifolia*, a galactose-binding lectin, rapidly induces morphological and biochemical changes in K562 human erythroleukemia cells. Treated cells adhere and spread on culture surfaces, adopt monocyte-like morphology, and show increased expression of CD61 and CD14, indicating jacalin-induced differentiation toward the monocyte lineage [37]. Jacalin, a lectin from jackfruit (*Artocarpus integrifolia*) seeds, showed dose-dependent antiproliferative effects on MDA-MB-468 triple-negative breast cancer cells, with reversible action and no effect on normal PBMCs. Pre-incubation with galactose neutralized its effect. Combined with taxol, Jacalin enhanced anticancer activity, allowing a lower taxol dose to achieve similar inhibition, potentially reducing drug side effects [38]. Cadmium sulfide (CdS) quantum dots (QDs) were conjugated with jacalin, a lectin from jackfruit seeds, to target cancer cells. The jacalin-CdS QD complex retained T-antigen recognition and selectively labeled K562 leukemia cells, highlighting its potential for cancer cell detection and targeted diagnostics [39].

Pharmacological Activities of Artocarpus integrifolia (Jackfruit)

Table 1. Summary of Pharmacological Activities of *Artocarpus integrifolia* (Jackfruit)

Activity	Bioactive Compounds	Effects	References
Antioxidant	Phenolics, flavonoids, tannins, carotene, lycopene, seed oils	Strong antioxidant activity; high polyphenols & flavonoids	[9-12]
Antidiabetic	Flavonoids, jacalin, carotene, alkaloids, seed powder	Lowers blood glucose, improves insulin, reduces HbA1c, enhances β-cell function	[13,21]
Antimicrobial	Jacalin, Artin M, artocarpin, flavonoids, tannins, saponins	Inhibits bacteria & fungi, disrupts biofilms, stimulates immune response	[22,29]
Anticancer	Jacalin, artocarpin, ArtinM, seed & leaf extracts	Inhibits cancer cell proliferation, induces differentiation, enhances chemo efficacy	[30,32,39]

Table 1 indicates the major pharmacological activities of *Artocarpus integrifolia* (Jackfruit), highlighting the key bioactive compounds responsible and their observed therapeutic effects. The table summarizes antioxidant, antidiabetic, antimicrobial, and anticancer activities.

CONCLUSION

Artocarpus integrifolia (Jackfruit) is a highly valuable plant both nutritionally and pharmacologically. It contains diverse bioactive compounds including phenolics, flavonoids, tannins, carotene, lycopene, jacalin, artocarpin, and ArtinM which collectively contribute to its potent antioxidant, antidiabetic, antimicrobial, and anticancer activities. Scientific studies demonstrate its efficacy in regulating blood glucose, enhancing insulin activity, reducing oxidative stress, inhibiting microbial pathogens, and selectively targeting cancer cells without significant toxicity. These findings support its extensive use in traditional medicine and highlight its potential as a natural, safe, and cost-effective source of therapeutic agents and functional nutraceuticals.

Future research should prioritize isolation, purification, and structural characterization of novel bioactive compounds from different parts of jackfruit, including seeds, peel, leaves, and latex. Detailed mechanistic and molecular studies are needed to elucidate pathways responsible for its antidiabetic, anticancer, immunomodulatory, and antimicrobial effects. Comprehensive in vivo studies and clinical trials are essential to validate efficacy, determine optimal dosage, and ensure safety for human use. Additionally, development of functional foods, nutraceuticals, and targeted drug delivery systems using jackfruit bioactives can provide innovative therapeutic solutions. Sustainable utilization of underexploited parts, combined with exploration of synergistic effects with conventional therapies, offers opportunities for environmentally friendly and cost-effective pharmaceutical applications.

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AUTHORS CONTRIBUTIONS

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CONFLICT OF INTEREST

Authors declare no competing or conflict of interest.

REFERENCES

[1] C. P. Khare, "Artocarpus integrifolia Linn. f.," in *Indian Medicinal Plants*, Springer Nature, , Vol.1, No.2, pp. 158–159, 2014.

[2] U. B. Jagtap and V. A. Bapat, "Artocarpus: A review of its traditional uses, phytochemistry and pharmacology," *Journal of Ethnopharmacology*, Vol.129, No.2, pp.142–166, 2010.

[3] O. Prakash, R. Kumar, A. Mishra, and R. Gupta, "Artocarpus heterophyllus (Jackfruit): An overview," *Pharmacognosy Reviews*, Vol.3, No.6, pp.353–358, 2009.

[4] A. Hari, K. G. Revikumar, and D. Divya, "Artocarpus: A review of its phytochemistry and pharmacology," *Journal of Pharma Search*, Vol.9, No.1, p.7-11, 2014.

[5] M. M. Bunn-Moreno and A. Campos-Neto, "Lectin(s) extracted from seeds of *Artocarpus integrifolia* (jackfruit): Potent and selective stimulator(s) of distinct human T and B cell functions," *The Journal of Immunology*, Vol.127, No.2, pp.427–429, 1981.

[6] R. Shaikh, F. Mohammed, and A. S. Uzgare, "Lectins as bioactive molecules: Emerging applications and therapeutic insights-A review," *International Journal of Chemistry Research*, Vol.10, No.1, pp.12–18, 2026.

[7] F. M. R. Shaikh and A. S. Uzgare, "A review on *Terminalia catappa*: A natural source of bioactive compounds," *International Journal of Scientific Research in Biological Sciences*, Vol.12, No.6, pp.56–62, Dec. 2025.

[8] F. M. R. Shaikh and A. Uzgare, "From pathogens to probiotics: The antimicrobial spectrum of lectins – A review," *International Journal of Scientific Research in Biological Sciences*, Vol.12, No.6, pp.40–47, 2025.

[9] S. Nagala, M. Yekula, and T. Raghava Rao, "Antioxidant and gas chromatographic analysis of five varieties of jackfruit (*Artocarpus*) seed oils," *Drug Invention Today*, Vol.5, No.4, pp.315–320, 2013.

[10] J. O. Chavez-Santiago et al., "Phenolic content, antioxidant and antifungal activity of jackfruit extracts (*Artocarpus heterophyllus* Lam.)," *Food Science and Technology*, Vol.42, p.e41421, 2022.

[11] P. S. S. Devi, N. S. Kumar, and K. K. Sabu, "Phytochemical profiling and antioxidant activities of different parts of *Artocarpus heterophyllus* Lam. (Moraceae): A review on current status of knowledge," *Future Journal of Pharmaceutical Sciences*, Vol.7, No.30, 2021.

[12] M. T. S. Dela Rosa et al., "Phytochemical, antioxidant, and antibacterial screening of *Artocarpus integer* from Indonesia," in *Proceedings of the Global Conference on Innovation in Science Technology Engineering and Mathematics*, 2021, p.7.

[13] B. Salehi et al., "Antidiabetic potential of medicinal plants and their active components," *Biomolecules*, Vol.9, No.10, p.551, 2019.

[14] K. Tripathi et al., "Efficacy of jackfruit components in prevention and control of human disease: A scoping review," *Journal of Education and Health Promotion*, Vol.12, p.361, 2023.

[15] S. Banerjee, S. Roy, R. Sabui, S. Bhattacharjee, and S. Nandi, "Jackfruit (*Artocarpus heterophyllus*): An organic cure against diabetes," *Human Journals*, Vol.24, No.1, pp.111–122, 2022.

[16] N. Haritha, S. Gopalakrishnan, and L. Karpagavel, "Anti-diabetic activity of *Artocarpus heterophyllus* (jackfruit) seed extract: An *in-vitro* study," *Journal of Chemical Health Risks*, Vol.14, No.2, pp.342–346, 2024.

[17] M. S. Baliga, A. R. Shivashankara, R. Haniadka, J. Dsouza, and H. P. Bhat, "Phytochemistry, nutritional and pharmacological properties of *Artocarpus heterophyllus* Lam (jackfruit): A review," *Food Research International*, Vol.44, No.7, pp.1800–1811, 2011.

[18] C. Goswami et al., "Jackfruit seed powder supplementation attenuates high-sugar diet-induced hyperphagia and hyperglycemia in mice," *Biology and Life Sciences Forum*, Vol.6, No.1, p.92, 2021.

[19] D. Dwitiyanti et al., "*In vivo* activities and *in silico* study of jackfruit seeds (*Artocarpus heterophyllus* Lam.) on the reduction of blood sugar levels of gestational diabetes rate induced by streptozotocin," *Open Access Macedonian Journal of Medical Sciences*, Vol.7, No.22, pp.3819–3826, 2019.

[20] P. Ansari et al., "Insulinotropic and beta-cell proliferative effects of unripe *Artocarpus heterophyllus* extract ameliorate glucose dysregulation in high-fat-fed diet-induced obese mice," *Diabetology*, Vol.6, No.8, p.83, 2025.

[21] M. R. Fernando, N. Wickramasinghe, M. I. Thabrew, P. L. Ariyananda, and E. H. Karunanayake, "Effect of *Artocarpus heterophyllus* and *Asteracanthus longifolia* on glucose tolerance in normal human subjects and in maturity-onset diabetic patients," *Journal of Ethnopharmacology*, Vol.31, No.3, pp.277–282, 1991.

[22] F. M. R. Shaikh and A. S. Uzgare, "Antimicrobial efficacy of *Eleusine coracana* (finger millet): Phytochemical insights and therapeutic prospects – A mini review," *Journal of Advanced Academic and Functional Research*, Vol.3, No.12, pp.468–474, 2025.

[23] S. B. Subramaniyan, S. Megarajan, K. S. Dharshini, and A. Veerappan, "*Artocarpus integrifolia* seed lectin enhances membrane damage, oxidative stress and biofilm inhibition activity of silver nanoparticles against *Staphylococcus aureus*," *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, Vol.624, p.126842, 2021.

[24] L. A. Custodio, W. Loyola, I. Conchon-Costa, G. F. da S. Quirino, and I. Felipe, "Protective effect of Artin M from extract of *Artocarpus integrifolia* seeds by Th1 and Th17 immune response on the course of infection by *Candida albicans*," *International Immunopharmacology*, Vol.11, No.10, pp.1510–1515, 2011.

[25] E. W. C. Chan, S. K. Wong, J. Tangah, and H. T. Chan, "Chemistry and pharmacology of artocarpin: An isoprenyl flavone from *Artocarpus* species," *Pharmacognosy Reviews*, Vol.9, No.1, pp.58–63, 2018.

[26] P. Somase, A. Gayke, S. Sangale, and S. Jadhav, "Jackfruit seed as a source of natural bioactives: A review on its therapeutic potentials," *International Journal of Pharmaceutical Sciences*, Vol.3, No.10, pp.281–298, 2025.

[27] S. Nagala, G. Rapaka, and R. R. Tamanam, "A comparative study of the antimicrobial activities of five varieties of essential oils from the seeds of *Artocarpus*," *IOSR Journal of Pharmacy and Biological Sciences*, Vol.10, No.6, pp.17–25, 2015.

[28] S. Nansereko and J. H. Muyonga, "Exploring the potential of jackfruit (*Artocarpus heterophyllus* Lam)," *Asian Food Science Journal*, Vol.20, No.9, pp.97–117, 2021.

[29] T. Soifoini et al., "Phytochemical composition, antibacterial activity, and antioxidant properties of the *Artocarpus altilis* fruits to promote their consumption in the Comoros Islands as potential health-promoting food or a source of bioactive molecules for the food industry," *Foods*, Vol.10, No.9, p.2136, 2021.

[30] Y. M. Mandour, E. Refaat, and H. D. Hassanein, "Anticancer activity, phytochemical investigation and molecular docking insights of *Citrullus colocynthis* (L.) fruits," *Scientific Reports*, Vol.13, p.20038, 2023.

[31] L. M. Burci et al., "Acute and subacute (28 days) toxicity, hemolytic and cytotoxic effect of *Artocarpus heterophyllus* seed extracts," *Toxicology Reports*, Vol.6, pp.1304–1308, 2019.

[32] A. Cabrera-Licona et al., "Exploring the anticancer activity of *Artocarpus heterophyllus* leaves: Selective effects on triple-negative breast cancer and HPV16-positive tumorigenic cells," *Life*, Vol.15, No.7, p.1090, 2025.

[33] E. Prakash and D. K. Gupta, "Jackfruit (*Artocarpus integrifolia*) latex extract has anti-cancer property as checked on MCF-7 human breast cancer cell line," *International Journal of Agriculture and Food Science Technology*, Vol.4, No.2, pp.79–83, 2013.

[34] S. S. Komath, K. Bhanu, B. G. Maiya, and M. J. Swamy, "Binding of porphyrins by the tumor-specific lectin, jacalin [jackfruit (*Artocarpus integrifolia*) agglutinin]," *Bioscience Reports*, Vol.20, No.4, pp.265–276, 2000.

[35] N. S. Abdul Razak and M. A. Rostam, "The anti-cancer properties of *Artocarpus heterophyllus* (jackfruit): A systematic review," *IIUM Journal of Orofacial and Health Sciences*, Vol.3, No.1, pp.20–28, 2022.

[36] H. Ahmed and B. P. Chatterjee, "Further characterization and immunochemical studies on the carbohydrate specificity of jackfruit (*Artocarpus integrifolia*) lectin," *Journal of Biological Chemistry*, Vol.264, No.16, pp.9365–9372, 1989.

[37] M. Yagi, A. Campos-Neto, and K. Gollahon, "Morphological and biochemical changes in a hematopoietic cell line induced by jacalin, a lectin derived from *Artocarpus integrifolia*," *Biochemical and Biophysical Research Communications*, Vol.209, No.1, pp.263–270, 1995.

[38] B. A. Kumar, M. Waseem, S. Jamal, and N. Ahmed, "Effects of Jacalin—a galactose binding lectin on MDA-MB-468, a triple-negative breast cancer cell line, and its combinatorial effect with taxol," *Research Square*, Preprint, 2022.

[39] K. B. Ahmed, M. R. C. Raja, S. K. Mahapatra, and V. Anbazhagan, "Interaction of cadmium sulfide quantum dots with jacalin for specific recognition of cancer cells," *Journal of Luminescence*, Vol.182, pp.283–288, 2017.

