



Study of the Potential of Rice Bran as an Anticancer: A Systematic Literature Review

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ABSTRACT

The bioactive compounds in rice bran have various health benefits, including anticancer potential. Cancer is a disease characterized by uncontrolled cell growth. Cancer cells can originate from any cell in the body and can spread to other parts of the body. Cancer is one of the highest causes of death in the world. The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding analysis of the anti-cancer potential of rice bran. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations. Rice bran contains various bioactive compounds, including antioxidants, anti-inflammatory, anti-proliferative, and apoptosis-inducing agents. These compounds can work together to inhibit the growth of cancer cells and prevent their spread.

1. Introduction

Rice bran is a by-product of rice processing, which is rich in dietary fiber, vitamins, minerals, and bioactive compounds. The bioactive compounds in rice bran have various health benefits, including anti-cancer potential. Cancer is a disease characterized by uncontrolled cell growth. Cancer cells can originate from any cell in the body and can spread to other parts of the body. Cancer is one of the highest causes of death in the world.¹⁻³

Several in vitro and in vivo studies have shown that rice bran has anti-cancer potential. In vitro research shows that rice bran can inhibit the growth of various types of cancer cells, including colon cancer, breast cancer, and lung cancer. In vivo research shows that consumption of rice bran can reduce the risk of

cancer, especially colorectal cancer. Antioxidants are compounds that can neutralize free radicals, which are unstable molecules that can damage body cells, including cancer cells. Antioxidant compounds in rice bran include polyphenols, vitamin E, vitamin C.^{4,5}

Inflammation is the body's natural response to injury or infection. However, chronic inflammation can increase the risk of cancer. Anti-inflammatory compounds in rice bran include flavonoids and saponins. Antiproliferative agents are compounds that can inhibit cell growth. Antiproliferative compounds in rice bran include lignans and phytosterols. Apoptosis is a programmed cell death process that plays an important role in controlling cell growth. Compounds that can induce apoptosis include Anthocyanins, glycosides, and phenolics.⁶⁻⁸

2. Methods

The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding analysis of the anticancer potential of bran. The search was performed using the terms: (1) "analysis" OR "anticancer" OR "bran" OR "antioxidant" AND (2) "antiproliferative" OR "antiapoptosis." The literature is limited to preclinical studies and published in English. The literature selection criteria are articles published in the form of original articles,

an experimental study about analysis of the anti-cancer potential of bran, studies were conducted in a timeframe from 2013-2023, and the main outcome was analysis of the anti-cancer potential of bran. Meanwhile, the exclusion criteria were studies that were not related to analysis of the anti-cancer potential of bran and duplication of publications. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations.

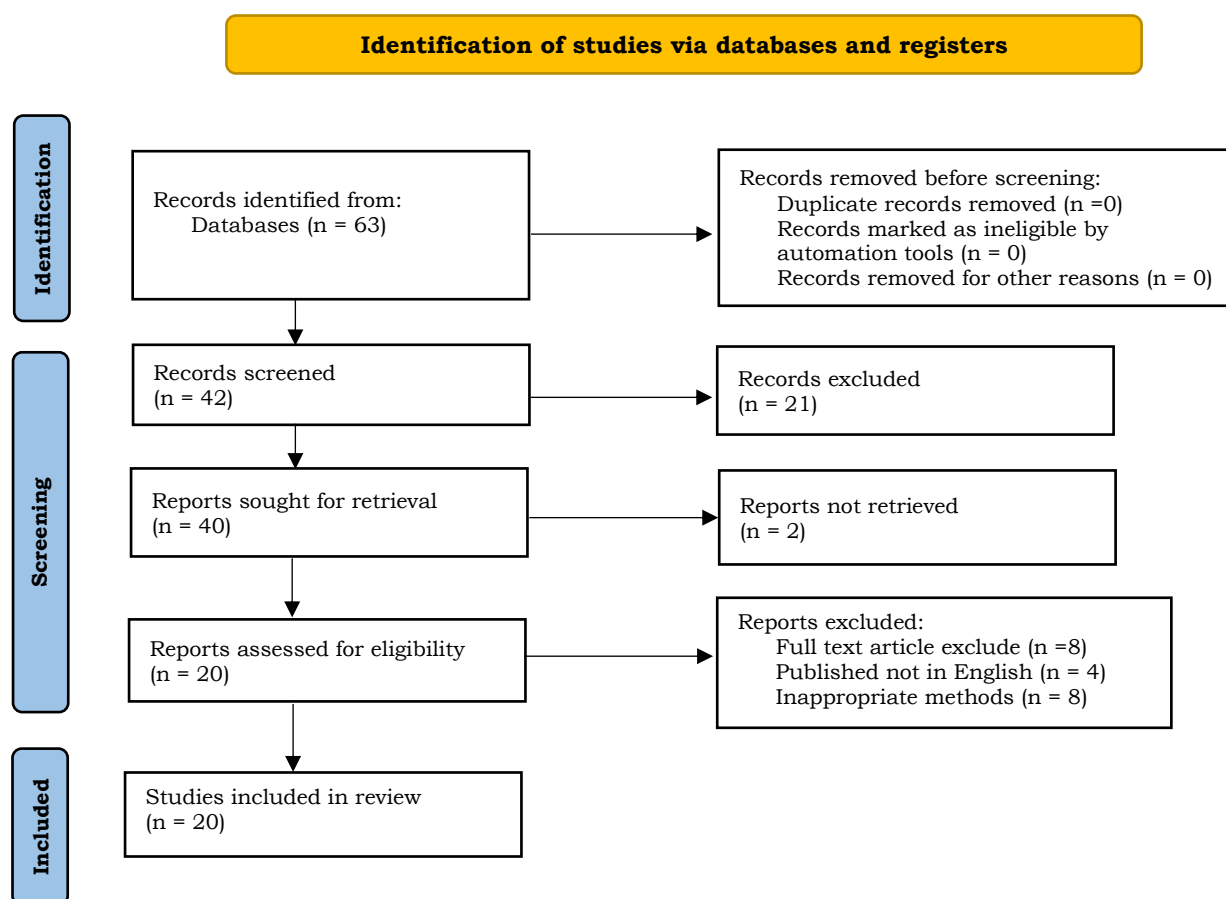


Figure 1. PRISMA flowchart.

3. Results and Discussion

Antioxidant

Antioxidants are compounds that can neutralize free radicals. Free radicals are unstable molecules and have unpaired electrons. These unpaired electrons make free radicals very reactive and can damage body

cells, including cancer cells. Antioxidants work by donating electrons to free radicals. This makes free radicals stable and no longer reactive. Thus, antioxidants can protect body cells from damage caused by free radicals. Rice bran is a good source of antioxidants. Polyphenols are phenolic compounds

that have many hydroxyl groups (-OH). Polyphenols are strong antioxidants and can neutralize free radicals. Polyphenols in rice bran include flavonoids, tannins, and lignans. Vitamin E is a fat-soluble antioxidant. Vitamin E can protect body cells from damage caused by free radicals. Vitamin E in rice bran is α -tocopherol. Vitamin C is a water-soluble antioxidant. Vitamin C can help improve the immune system and protect body cells from damage caused by free radicals. Vitamin C in rice bran is ascorbic acid. Apart from these three compounds, rice bran also contains other antioxidant compounds, such as lignans, phytosterols, and anthocyanins. These compounds also have potential as antioxidants and can help protect the body from various diseases, including cancer.⁹⁻¹²

Anti-inflammatory

Inflammation is the body's natural response to injury or infection. Inflammation is characterized by inflammation, swelling, and pain. Inflammation that occurs in the short term can help the body to repair itself. However, inflammation that occurs in the long term can damage body cells and increase the risk of various diseases, including cancer. Rice bran is a good source of anti-inflammatory compounds. Flavonoids are phenolic compounds that have many hydroxyl groups (-OH). Flavonoids have various biological activities, including anti-inflammatory activity. Flavonoids in rice bran include anthocyanin, flavonol, and proanthocyanidin. Saponins are steroid glycosides that have a complex molecular structure. Saponins have various biological activities, including anti-inflammatory activity. Saponins in rice bran include Triterpene glycosides and steroid glycosides. Anti-inflammatory compounds in rice bran can work by Inhibiting the production of pro-inflammatory cytokines, inhibiting the activity of pro-inflammatory enzymes, and increasing the activity of anti-inflammatory enzymes. In these ways, the anti-inflammatory compounds in rice bran can help reduce inflammation and the risk of cancer.¹³⁻¹⁵

Antiproliferation

Antiproliferative agents are compounds that can inhibit cell growth. Cancer cells can grow and divide quickly, so they can spread to other parts of the body. Antiproliferation can help inhibit the growth of cancer cells and prevent them from spreading. Rice bran is a good source of antiproliferative compounds. Lignans are phenolic compounds that have a molecular structure similar to estrogen. Lignans have various biological activities, including antiproliferative activity. Lignans in rice bran include secoisolariciresinol diglucosyl isoflavone (SDG), matairesinol diglucosyl isoflavone (MDG). Phytosterols are steroid compounds that have a molecular structure similar to cholesterol. Phytosterols have a variety of biological activities, including antiproliferative activity. Phytosterols in rice bran include beta-sitosterol, campesterol, and delta-7-sitosterol. Antiproliferative compounds in rice bran can work by Inhibiting cell division, inhibiting cell growth, and inducing apoptosis. In these ways, the antiproliferative compounds in rice bran can help inhibit the growth of cancer cells.^{16,17}

Apoptosis

Apoptosis is a programmed cell death process that plays an important role in controlling cell growth. Cancer cells can undergo apoptosis, but often, this apoptosis does not occur effectively. Compounds that can induce apoptosis can help increase apoptosis in cancer cells and can help inhibit the growth of cancer cells. Rice bran is a source of compounds that can induce apoptosis. Anthocyanins are flavonoid compounds that give red, purple, or blue color to fruits and vegetables. Anthocyanins have various biological activities, including anticancer activity. Anthocyanins in rice bran include cyanidin-3-glucoside, malvidin-3-glucoside, and peonidin-3-glucoside. Anthocyanins can induce apoptosis in cancer cells by Inhibiting cell growth signals, increasing free radical production, and changing cell membrane permeability and phenolic glycosides. Phenolic glycosides are compounds consisting of sugar and phenolic compounds. Phenolic glycosides have a wide range of biological activities,

including anticancer activity. Phenolic glycosides in rice bran include kaempferol, quercetin, and gallic acid. Phenolic glycosides can induce apoptosis in cancer cells by Inhibiting cell growth signals, increasing free radical production, and changing cell membrane permeability.¹⁸⁻²⁰

4. Conclusion

Rice bran contains various bioactive compounds, including antioxidants, anti-inflammatory, anti-proliferative, and apoptosis-inducing agents. These compounds can work together to inhibit the growth of cancer cells and prevent their spread.

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