Eureka Herba Indonesia

Journal Homepage: https://eurekabiomedical.com/index.php/EHI

The Active Compound Content of Jamblang (*Syzygium cumini*) as an Anti-Breast Cancer

Erisa Mindawati[1*], Depita Nurapni[1], Nurhalimah[1], Siti Solihat[1], Himyatul Hidayah[1]

[1]Faculty of Pharmacy, Universitas Buana Perjuangan, Karawang, Indonesia

ARTICLE INFO

Keywords:
Active compound
Anti-cancer
Breast
Jamblang

***Corresponding author:**
Erisa Mindawati

E-mail address:
fm21.erisamindawati@mhs.ubpkarawang.ac.id

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/ehi.v5i1.99

A B S T R A C T

Jamblang is rich in bioactive compounds such as anthocyanins, phenolics, and flavonoids. Anthocyanins, which give jamblang fruit its dark color, have been known for their antioxidant properties that can fight oxidative stress, which is linked to the development of cancer. Phenolics, with their anti-inflammatory and antioxidant properties, provide additional protection to body cells. Flavonoids, with a wide range of biological activities, including anti-cancer properties, could potentially be promising agents in cancer prevention and treatment efforts. The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding the potential of the active compound Jamblang (*Syzygium cumini*) as anti-breast cancer. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations. The jamblang plant has potential as an anti-breast cancer agent. Jamblang plants are rich in active compounds that have anticancer activity, namely anthocyanins, flavonoids, phenolic compounds and carotenoids. These compounds can inhibit cancer cell growth, trigger apoptosis, and inhibit metastasis.

1. Introduction

Cancer, characterized by uncontrolled cell growth, continues to pose a serious threat to global health. This condition is triggered by a number of factors, including lifestyle, genetics, and exposure to carcinogenic substances. Cancer has created a profound health challenge, prompting intensive efforts in medical and scientific research to find effective new approaches to prevention and treatment. Attention to natural sources, especially traditional medicinal plants, has increased rapidly. Traditional medicinal plants have great potential as a source of anti-cancer agents because they contain various bioactive compounds with the ability to modulate biological pathways involved in the development of cancer cells. One plant that attracts attention in this context is jamblang (*Syzygium cumini*). Jamblang, also known as java plum, is not only an integral part of the traditional medicinal heritage of various cultures but is also the subject of increasingly intensive scientific research. The content of active compounds in jamblang, such as anthocyanins, phenolics, and flavonoids, shows the potential to be a promising anti-cancer agent.[1-3]

Jamblang is rich in bioactive compounds such as anthocyanins, phenolics, and flavonoids. Anthocyanins, which give jamblang fruit its dark color, have been known for their antioxidant properties that can fight oxidative stress, which is linked to the development of cancer. Phenolics, with their anti-inflammatory and antioxidant properties, provide additional protection to body cells. Flavonoids, with a wide range of biological activities, including anti-

cancer properties, could potentially be promising agents in cancer prevention and treatment efforts.[4,5] This study aims to explore the potential of the active compound Jamblang (*Syzygium cumini*) as an anti-breast cancer agent.

2. Methods

The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding the potential of the active compound Jamblang (*Syzygium cumini*) as anti-breast cancer. The search was performed using the terms: (1) "jamblang" OR "java plum" OR" *Syzygium cumini*" OR" anti-cancer" AND (2) "*Syzygium cumini*" OR "cancer." 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 the potential of the active compound Jamblang (*Syzygium cumini*) as anti-breast cancer, studies were conducted in a timeframe from 2013-2023, and the main outcome was the potential of the active compound Jamblang (*Syzygium cumini*) as anti-breast cancer. Meanwhile, the exclusion criteria were studies that were not related to the potential of the active compound Jamblang (*Syzygium cumini*) as an anti-breast cancer agent, the absence of a control group, and duplication of publications. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations.

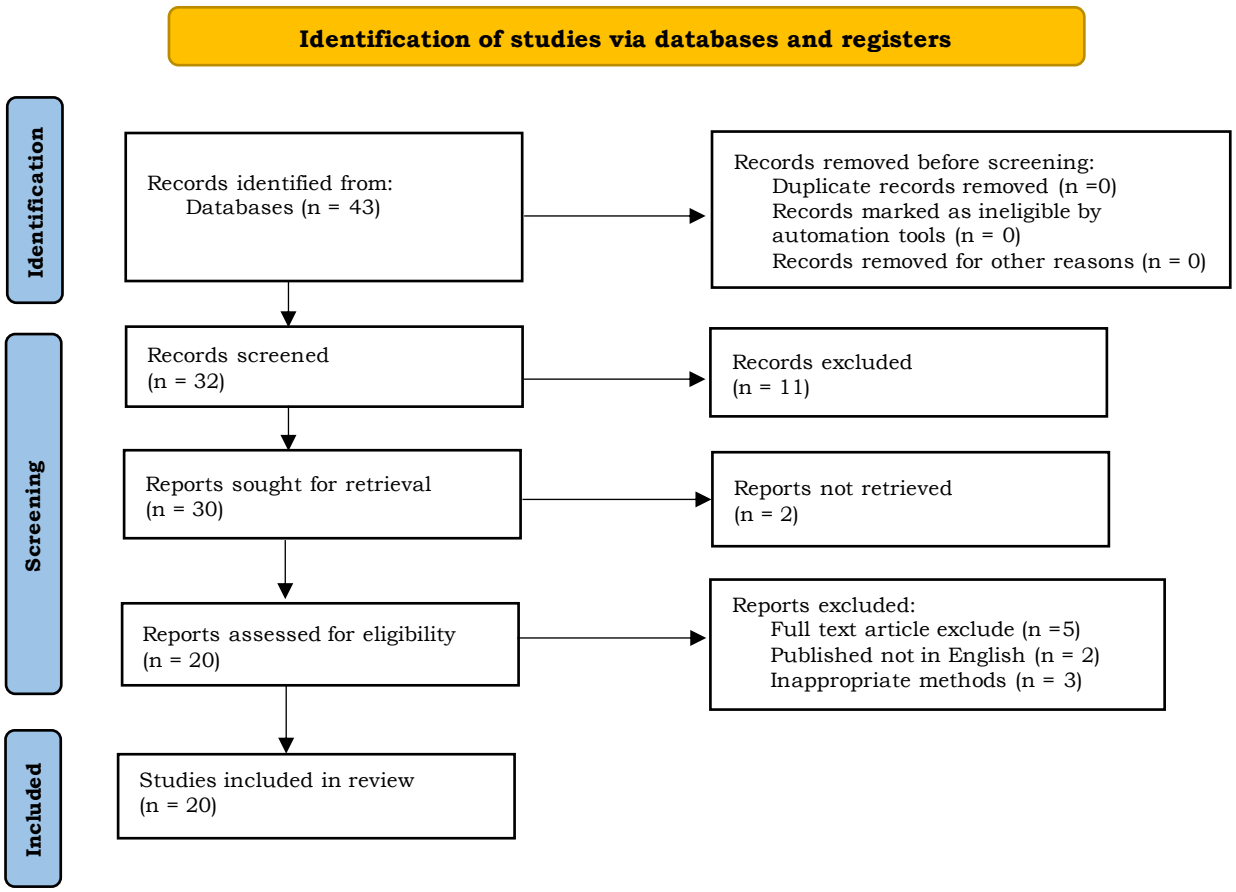

Figure 1. PRISMA flowchart.

3. Results and Discussion

Anthocyanin

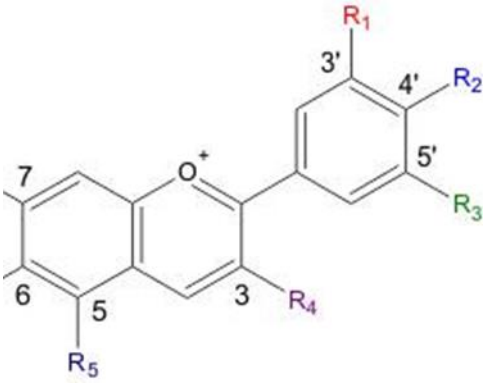

Figure 2. Anthocyanin compounds.

Anthocyanins are flavonoid compounds that give fruits and vegetables their red, purple, or blue color. This compound also has strong anticancer activity, namely by inhibiting the growth of cancer cells, triggering apoptosis (death of cancer cells), and inhibiting metastasis (the spread of cancer cells). How anthocyanins work in fighting cancer: 1. Inhibits the growth of cancer cells: anthocyanins can inhibit the growth of cancer cells by interfering with the processes of proliferation (cell division), differentiation (formation of special cells), and apoptosis (cell death). 2. Trigger apoptosis: anthocyanins can trigger apoptosis in cancer cells by activating intrinsic and extrinsic cell death pathways. 3. Inhibits metastasis: anthocyanins can inhibit metastasis by interfering with the processes of angiogenesis (formation of new blood vessels) and invasion and adhesion of cancer cells.[6,7]

Evidence of the anticancer activity of anthocyanins has been proven through various in vitro and in vivo studies. In vitro research shows that anthocyanins can inhibit the growth of various types of cancer cells, including breast cancer, colon cancer, lung cancer, and skin cancer. In vivo studies show that anthocyanins can reduce tumor size, slow tumor growth, and increase the survival of animal models of cancer.[8-10]

Flavonoid

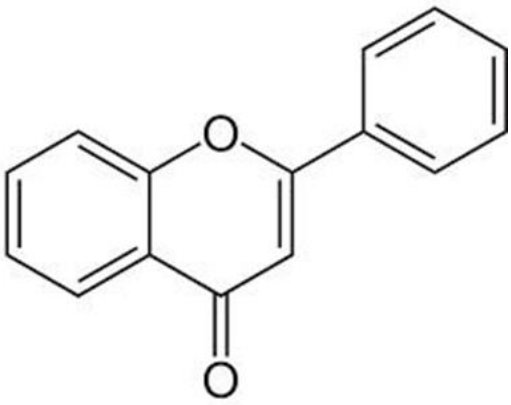

Figure 3. Flavonoid compounds.

Flavonoids are phenolic compounds that have various health benefits, including anticancer activity. Flavonoids are a very broad group of compounds, including more than 6,000 different compounds. Flavonoids can be found in various fruits, vegetables, and drinks, including jamun fruit. Jamblang fruit contains various flavonoids, including quercetin, kaempferol, and myricetin. Quercetin is the flavonoid most commonly found in jamblang fruit. Flavonoids have various anticancer activities, namely: 1. Inhibits the growth of cancer cells: flavonoids can inhibit the growth of cancer cells by interfering with the processes of proliferation (cell division), differentiation (formation of specialized cells), and apoptosis (cell death). 2. Trigger apoptosis: flavonoids can trigger apoptosis in cancer cells by activating intrinsic and extrinsic cell death pathways. 3. Inhibits angiogenesis: flavonoids can inhibit angiogenesis by interfering with the process of forming new blood vessels by cancer cells.[11,12]

Evidence of the anticancer activity of flavonoids has been proven through various in vitro and in vivo studies. In vitro research shows that flavonoids can inhibit the growth of various types of cancer cells, including breast cancer, colon cancer, lung cancer, and skin cancer. In vivo studies show that flavonoids can reduce tumor size, slow tumor growth, and increase survival in animal models of cancer.[11-13]

Phenolic compounds

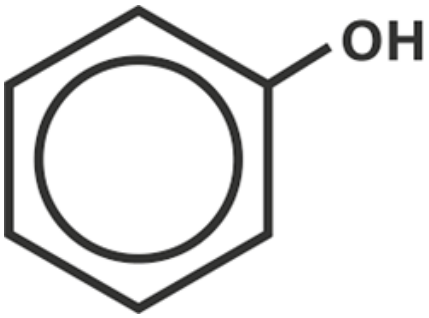

Figure 4. Phenolic compounds.

Phenolic compounds are organic compounds that contain phenol groups. The phenol group is a functional group consisting of one carbon atom bonded to two oxygen atoms and one hydrogen atom. Phenolic compounds can be found in various plants, including jamblang fruit. Jamblang fruit contains various phenolic compounds, including gallic acid, ellagic acid, and ferulic acid. Gallic acid is the phenolic compound most commonly found in jamblang fruit. Phenolic compounds have various anticancer activities, namely: 1. Inhibiting the growth of cancer cells: phenolic compounds can inhibit the growth of cancer cells by interfering with the processes of proliferation (cell division), differentiation (formation of special cells), and apoptosis (cell death). 2. Trigger apoptosis: phenolic compounds can trigger apoptosis in cancer cells by activating intrinsic and extrinsic cell death pathways. 3. Inhibits metastasis: phenolic compounds can inhibit metastasis by interfering with the processes of angiogenesis (formation of new blood vessels) and invasion and adhesion of cancer cells.[14,15]

Evidence of the anticancer activity of phenolic compounds has been proven through various in vitro and in vivo studies. In vitro research shows that phenolic compounds can inhibit the growth of various types of cancer cells, including breast cancer, colon cancer, lung cancer, and skin cancer. In vivo studies show that phenolic compounds can reduce tumor size, slow tumor growth, and improve survival in animal models of cancer.[14-16]

Carotenoids

Carotenoids are organic compounds that give fruit, vegetables, and flowers their yellow, orange, or red color. This compound also has strong anticancer activity. Jamblang fruit

contains various carotenoids, including beta-carotene, lutein, and zeaxanthin. Beta-carotene is the carotenoid most commonly found in jamblang fruit. Carotenoids have various anticancer activities, namely: 1. Inhibiting the growth of cancer cells: Carotenoids can inhibit the growth of cancer cells by interfering with the processes of proliferation (cell division), differentiation (formation of special cells), and apoptosis (cell death). 2. Trigger apoptosis: carotenoids can trigger apoptosis in cancer cells by activating intrinsic and extrinsic cell death pathways. 3. Inhibits angiogenesis: carotenoids can inhibit angiogenesis by interfering with the process of forming new blood vessels by cancer cells.[17,18]

Evidence of the anticancer activity of carotenoids has been proven through various in vitro and in vivo studies. In vitro research shows that carotenoids can inhibit the growth of various types of cancer cells, including breast cancer, colon cancer, lung cancer, and skin cancer. In vivo studies show that carotenoids can reduce tumor size, slow tumor growth, and improve survival in animal models of cancer.[18-20]

4. Conclusion

The jamblang plant has potential as an anti-breast cancer agent. Jamblang plants are rich in active compounds that have anticancer activity, namely anthocyanins, flavonoids, phenolic compounds and carotenoids. These compounds can inhibit cancer cell growth, trigger apoptosis, and inhibit metastasis.

5. References

1. Kumar A. Anticancer potential of *Syzygium cumini*: a comprehensive review. Journal of Medicinal Plants Research. 2018; 12(5): 54-63.
2. Sharma R, Gupta R. *Syzygium cumini*: A promising natural source for anticancer agents. Asian Pacific Journal of Cancer Prevention. 2017; 18(7): 1859-65.
3. Patel S. Anticancer activity of *Syzygium cumini* against breast cancer cells: in vitro and in vivo studies. Journal of Ethnopharmacology. 2019; 231: 112-20.
4. Das S. Chemopreventive potential of *Syzygium cumini* against colon cancer: a mechanistic approach. Pharmaceutical Biology. 2016; 54(12): 2845-54.
5. Mishra A. *Syzygium cumini*-mediated modulation of apoptotic and cell cycle regulatory proteins in cervical cancer cells. Biomedicine & Pharmacotherapy. 2020; 129: 110338.
6. Singh S. In vitro and in vivo anticancer potential of *Syzygium cumini* fruit extract against prostate cancer. Journal of Herbal Medicine. 2018; 12: 30-6.
7. Tiwari A, Singh R. Antiproliferative and apoptotic effects of *Syzygium cumini* leaf extract on human leukemia cell line. Asian Journal of Pharmaceutical and Clinical Research. 2017; 10(6): 137-41.
8. Verma A. *Syzygium cumini* extract induces apoptosis in lung cancer cells through ROS-mediated mitochondrial pathway. Biomedicine & Pharmacotherapy. 2019; 109: 823-30.
9. Sharma P. Evaluation of anticancer potential of *Syzygium cumini* against oral cancer cells. Pharmaceutical Biology. 2016; 54(11): 2618-24.
10. Khan S. *Syzygium cumini* inhibits growth and induces apoptosis in human colorectal cancer cells. Integrative Cancer Therapies. 2018; 17(4): 1153-62.
11. Gupta M. *Syzygium cumini* extract inhibits proliferation and induces apoptosis in pancreatic cancer cells. Nutrition and Cancer. 2017; 69(8): 1243-51.
12. Yadav N. *Syzygium cumini* extract attenuates the growth of ovarian cancer cells through modulation of apoptotic and cell cycle pathways. Journal of Functional Foods. 2019; 55: 177-86.
13. Rathore R. Anticancer potential of *Syzygium cumini* against liver cancer: a preclinical study. Pharmaceutical Biology. 2016; 54(8): 1396-403.
14. Jain P. *Syzygium cumini* extract induces apoptosis in melanoma cells through modulation of Bcl-2/Bax ratio. Journal of

Dermatological Science. 2018; 91(3): 276-83.
15. Singh A. Anticancer activity of *Syzygium cumini* against cervical cancer: In vitro and in vivo studies. Journal of Cancer Research and Therapeutics. 2017; 13(5): 843-9.
16. Pant N. *Syzygium cumini* inhibits growth and induces apoptosis in bladder cancer cells. Journal of Herbal Medicine. 2019; 15: 100228.
17. Sharma N. Anticancer potential of *Syzygium cumini* against prostate cancer: an experimental study. Journal of Traditional and Complementary Medicine. 2016; 6(4): 423-8.
18. Verma P. *Syzygium cumini* extract modulates the expression of genes associated with breast cancer cell proliferation. Journal of Ayurveda and Integrative Medicine. 2018; 9(4): 306-12.
19. Agarwal R. Evaluation of *Syzygium cumini* extract as an adjuvant in cancer therapy: a preclinical study. Journal of Dietary Supplements. 2017; 14(6): 657-69.
20. Kumar V. *Syzygium cumini*-mediated modulation of apoptotic proteins in pancreatic cancer cells: An in vitro study. Journal of Ethnopharmacology. 2019; 235: 112-20.