

THE EFFECTIVENESS OF JERUJU PLANT EXTRACT (*ACANTHUS ILICIFOLIUS*) AS ANTICANCER: *LITERATURE REVIEW*

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ABSTRACT

One of the plants that live in Indonesia and has many benefits is Acanthus ilicifolius or jeruju. The jeruju plant is included in the Acanthus family plant which is used for traditional medicine. One of the benefits of the jeruju plant is as an anticancer. The literature search process related to Acanthus ilicifolius and anticancer was carried out using an electronic data base. The purpose of this literature review is to determine the effectiveness of jeruju plant extracts as anticancer and research methods used in previous studies. Jeruju plant extract can be used as an anticancer and has the potential to inhibit the proliferation of HeLa cervical cancer cells. In jeruju leaf extract contained flavonoids, saponins and terpenoids as anticancer compounds with cytotoxic activity values in isolates showed an IC₅₀ value of 88.89 µg/mL. The test method is MMT with maceration extraction method and methanol solution.

INTRODUCTION

Indonesia is one of the countries that has abundant biological wealth, more than 30.000 species of higher plants. Until now, in Indonesia, as many as 7.000 species of plants have been recorded, whose benefits and properties for health have been known through various studies (Nugroho, 2017). In 2008 WHO noted that

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68% of the world's population still uses traditional medicine systems and the majority use plants that are used to cure various diseases.

One of the plants that live in Indonesia and has many benefits is Acanthus ilicifolius or jeruju. The jeruju plant (*Acanthus ilicifolius*) is included in the Acanthus family plant which has been used by the wider community for

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traditional medicine (Rahmah et al., 2021). Jeruju plant is a mangrove plant that grows wild in coastal areas, river banks, and places that have muddy soil and brackish water. One of the areas overgrown by jeruju plants is in Purworejo Regency, Central Java Province. More precisely around the Demang Gedi Mangrove Tourism, Purworejo.

The jeruju plant (*Acanthus ilicifolius*) used for traditional medicine is on the leaves, stems, and roots. The leaves of jeruju are processed into tea which is believed to be able to become an anticancer drug.

Cancer ranks highest as a cause of death, especially in developing countries such as Indonesia. Cancer is a form of uncontrolled cell growth and spread that can affect almost any part of the human body (Khoiriyah and Handayani, 2020). Nurses have a role in identifying signs and symptoms in patients caused by cancer. Nurses also act as direct drug providers to patient. Based on 2013 data, cervical cancer and breast cancer are types of cancer that have a very high prevalence rate in Indonesia and are one of the highest causes of death for women in Indonesia (Nita and Indrayani, 2020). The development of increasingly modern technology, a lot of research related to traditional medicine for anticancer drugs. One of them is conducting research on the

efficacy of mangrove plants, namely jeruju plants (*Acanthus ilicifolius*) as anticancer. The purpose of this literature review is to determine the effectiveness of jeruju leaf extract (*Acanthus ilicifolius*) as an anticancer and the research methods used in previous studies.

METHODS AND MATERIALS

In the literature search process is carried out using an *electronic data base*. The databases used in the literature search were Google Scholar by entering the keywords: (“*Acanthus ilicifolius* AND anticancer”) in English on Google Scholar, (“*Acanthus ilicifolius* as anticancer”) in Indonesian on Google Scholar.

Research Population and Sample

The population of this study is a scientific article related to the effectiveness of the jeruju plant (*Acanthus ilicifolius*) as an anticancer. The sample to be used in this study is the same as the population but in accordance with the inclusion criteria.

Inclusion Criteria

1. Research published in the period 2012-2022
2. Articles in Indonesian and English
3. Full text article
4. Original article
5. Anti cancer
6. *Acanthus ilicifolius* Extract

7. All parts of the plant *Acanthus ilicifolius*

Exclusion Criteria

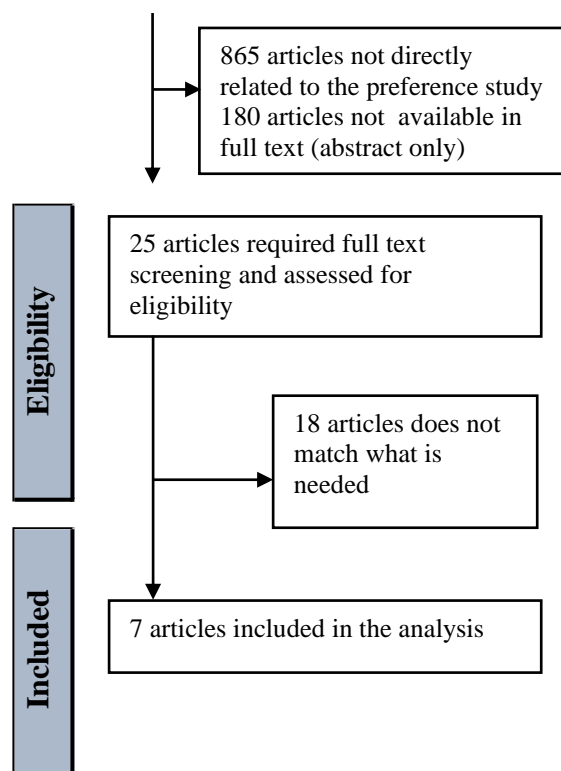
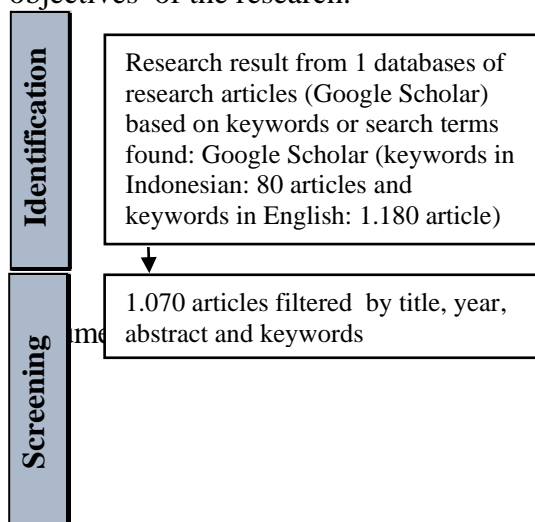
1. Irrelevant article
2. Article is not full text
3. Duplication
4. Article review
5. Not a plant *Acanthus ilicifolius*
6. Published before 2012

Article Collection and Extraction

Research journals that met the inclusion criteria were then collected and a journal summary was made including the authors, extraction methods, test methods, plant parts and solvents used. Review articles are then synthesized in a table using a literature review by grouping the result data. The summary of the journal is then entered into a table sorted according to a predetermined format, namely the author, extraction method, test method and solvent used.

Analisa Data

How to analyze data, namely using literature review analysis and collecting data to collect theories or findings that can be used for results and discussions that can be used answer the objectives of the research.



Gambar 1. Prism Diagram

RESULTS AND DISCUSSION

Previous Research Results

Research conducted by (Fajarullah, 2017) the purpose of this study was to determine the cytotoxic activity of compounds contained in the ethyl acetate fraction in jeruju leaves (*Acanthus ilicifolius*) against HeLa cancer cells and also to characterize these compounds. The results obtained are cytotoxic compounds or isolates from the ethyl acetate fraction of the leaves of jeruju (*Acanthus ilicifolius*) in the form of a green amorphous solid and have an IC_{50} value of $83.81 \mu\text{g/mL}$, which from these results can be incorporated into potential cytotoxic compounds against cancer cells. HeLa.

Cytotoxic activity test and characterization of compounds from the dichloromethane fraction for HeLa cells were carried out by (Suhatri, Ardiningsih and Widiyantoro, 2018) using jeruju leaf extract (*Acanthus ilicifolius*) through maceration, partitioning and chromatography processes. It can be concluded that the cytotoxic activity of the compounds in the isolates showed an IC₅₀ value of 88.89 µg/mL, which means that these compounds are classified as potential cytotoxic compounds against cervical cancer cells (HeLa) because the IC₅₀ value is <100 µg/mL. Meanwhile, the value of cytotoxic compounds in the dichloromethane fraction of jeruju leaves can be predicted to be included in the class of triterpenoid compounds after characterization with a ¹H-NMR spectrometer.

Research conducted by (Suhatri, Ardiningsih and Widiyantoro, 2018) determine the cytotoxic activity of the ethanol extract and the jeruju (*Acanthus ilicifolius*) fraction using the *Brine Shrimp Lethality Test* (BSLT) method. The fraction contains metabolites in the non-polar hexane fraction with a value reaching LC₅₀ of 245.25 ppm. The fraction contains secondary metabolites containing flavonoids, saponins, steroids and terpenoids.

(Paul and Ramasubbu, 2017) carried out research on the phytochemical composition, antioxidant, anticancer and anticoagulant activity of aqueous extracts from the roots of the jeruju plant (*Acanthus ilicifolius*) taken from the mangrove forest of Pichavaram, Tamil Nadu, India. The extraction method used by (Paul and Ramasubbu, 2017) is maceration with water solvent. This study is the first report that provides sufficient evidence for further research to uncover and identify bioactive compounds that can be used as alternative medicine.

Anticancer potential of jeruju leaves (*Acanthus ilicifolius*) methanol extract with taurine by in vitro for HeLa cancer cells was investigated by (Widiastuti et al., 2020) using the maceration extraction method dissolved in methanol solution and the MTT test method. The final result obtained by the researchers was that the methanol extract in jeruju leaves and taurine were cytotoxic to HeLa cervical cancer cells, so they had great potential as anticancer compounds. Jeruju leaf methanol extract and taurine were shown to inhibit the proliferation of HeLa cervical cancer cells.

The roots and root vessels of the jeruju plant (*Acanthus ilicifolius*) can be investigated for their truth as anticancer efficacy. Therefore (Singh and Singh, 2013) conducted a study to determine the

anticancer efficacy of root tissue and root vessels of *Acanthus ilicifolius*. *Acanthus ilicifolius* research results proved to be very effective in having chemoprotective, antimutagenic, antioxidant and anticancer effects.

(Tian et al., 2021) conducted research on the synthesis of the jeruju plant (*Acanthus ilicifolius*) for the inhibition of cervical cancer cell proliferation. The extraction method used is the CCK-8 test

and jeruju leaves as an ingredient. A new type of alkaloid synthesized with *Acanthus ilicifolius* as the basic parent nucleus was synthesized by ring closure reaction after polymerization reaction and inhibition of cervical cancer cell proliferation was carried out. From several experiments concluded that BOABB can inhibit the activity of C-33A cells, inhibit cell migration and induce cell apoptosis.

Table 1. Results of Literatur Review

No.	Penulis & Tahun	Metode Ekstraksi	Metode Pengujian	Bagian Tanaman	Pelarut
1	(Suryati, Elidahanum Husni, 2018)	Maceration	<i>Brine Shrimp Lethality Test</i> (BSLT)	Leaf	Ethanol
2	(Suhatri, Ardiningsih and Widiyantoro, 2018)	Maceration	<i>Microtetrazolium</i> (MTT)	Leaf	Methanol
3	(Rachmadi, Ardiningsih and Widiyantoro, 2018)	Maceration	<i>Microtetrazolium</i> (MTT)	Leaf	Methanol
4	(Widiastuti et al., 2020)	Maceration	<i>Microtetrazolium</i> (MTT)	Leaves and roots	Methanol
5	(Paul and Ramasubbu, 2017)	Maceration	<i>Microtetrazolium</i> (MTT)	Root	Water
6	(Singh and Singh, 2013)	Maceration	DPPH	Root	Chloroform & Methanol
7	(Tian et al., 2021)	Maceration	Uji CCK-8	Leaf	Metanol

Extraction Method

In the manufacture of traditional medicine, currently it has developed with a more modern process so that it can be used as medicine for the wider community. One of the methods used for drug discovery is

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the extraction method. Extraction is the process of separating materials from the mixture using a suitable solvent. The extraction method has many choices according to the nature of the material and

compounds to be isolated (Mukhriani, 2018).

From the discussion that has been presented by (Rachmadi, Ardiningsih and Widiyantoro, 2018), (Paul and Ramasubbu, 2017), (Singh and Singh, 2013), (Suhatri, Ardiningsih and Widiyantoro, 2018), (Suryati, Elidahanum Husni, 2018), and (Widiastuti *et al.*, 2020) they use the selected plant extraction method is maceration.

The choice of this type of maceration extraction method is because this extraction method has many advantages compared to other extraction methods (Lean Syam Proyogo And, 2019). The main advantage of the maceration extraction method is that the procedures and equipment required are very simple and also do not require a heating process so that the natural materials used do not decompose (Nurhasnawati and Samarinda, 2015).

Test Method

The most frequently used test method for cytotoxic testing is the Microtetrazolium (MTT) test method (Widyanto *et al.*, 2020). The MTT test method is a colorimetric toxicity test method that aims to determine the number of living cells based on changes in the yellow MTT solution which will then change color to formazan crystals, which are purple in color by mitochondria that are

still active in living cells. This MTT test is absorbed into living cells and then solved by a reduction reaction by the reductase enzyme in the mitochondrial respiration chain and turns into water-insoluble formazan (Desyi Prana Napitupulu, 2022).

In research related to the effectiveness of jeruju plant extract (*Acanthus ilicifolius*) as an anticancer the most chosen for cytotoxic testing is the MTT test method. The MTT method provides accurate test results because it is able to provide a relationship between the number of active cells and the absorbance resulting from the measurements used to determine the IC₅₀ value. IC₅₀ (*Inhibitory Concentration*) is a concentration value that can produce inhibition of cell proliferation as much as 50%. The value of IC₅₀ can indicate the potential of a compound as a cytotoxic (Rachmadi, Ardiningsih and Widiyantoro, 2018). According to the exposure from The American National Cancer Institute, extracts can be said to have cytotoxic activity if the IC₅₀ value is < 20 µg/ml (Amir *et al.*, 2017).

Solvent

The content of compounds contained in plants can be pulled by a solvent during the extraction process. In choosing the type of solvent, it is the most important factor in the extraction process

because it determines the success of the extraction (Amir *et al.*, 2017).

Differences in the type of solvent can affect the amount of extract produced. In a research journal regarding jeruju plant extract (*Acanthus ilicifolius*) as an anticancer, researchers used methanol as solvent because methanol yielded higher yields than other solvents such as ethanol, acetone, ethyl acetate, etc. which has a lower polarity (Savitri, Suhendra and Wartini, 2017).

Methanol is the solvent that is most widely used in the process of isolating organic compounds from natural materials (Fajarullah, 2017). Methanol is a universal solvent that has a polar group (-OH) and a nonpolar group (-CH₃) so that it can attract polar and nonpolar compounds (Kasminah, 2016). The maceration extraction process with methanol as solvent in jeruju leaves (*Acanthus ilicifolius*) showed that the

CONCLUSIONS AND SUGGESTIONS

From the literature review results, it was found that the extract of the jeruju plant (*Acanthus ilicifolius*) especially the leaves can be used as an anticancer and has the potential to inhibit the proliferation of HeLa cervical cancer cells which contain flavonoids, saponins and terpenoids. The extraction method used is maceration with

methanol extract in jeruju leaves (*Acanthus ilicifolius*) contained saponins, tannins, and flavonoids. The flavonoids contained in jeruju leaves are thought to be cytotoxic compounds in HeLa cells and have potential as anticancer compounds (Widiastuti *et al.*, 2020).

Plant Part

The jeruju plant (*Acanthus ilicifolius*) has plant parts consisting of roots, stems and leaves (Safitri *et al.*, 2018). However, from previous studies the part of the jeruju plant used for research is the leaf part because the leaves are easier to use as extraction (Suhatri, Ardiningsih and Widiyantoro, 2018). The leaves of jeruju (*Acanthus ilicifolius*) contain various secondary metabolites including saponins, tannins, and flavonoids. Flavonoids are contained in jeruju leaves (*Acanthus ilicifolius*) and are known to have cytotoxic activity against several cancer cells (Widiastuti *et al.*, 2020)

methanol solvent and Microtetrazolium cytotoxic test (MTT).

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