



BIOINFORMATIC STUDY OF *ZIZIPHUS JUJUBA* (RHAMNACEAE) IN PREVENTING THE GROWTH OF BREAST CANCER

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ABSTRACT

Breast cancer is a disease that occurs in the breast when abnormal cell growth occurs in the glands, ducts and tissues. Preventing its growth can be done by consuming organic foods such as *Ziziphus jujuba* (Rhamnaceae) plant which functions to prevent the growth of breast cancer because this plant contains protein, calcium, iron, magnesium, vitamins, active compounds such as flavonoids, carotenoids, alkaloids, phenols, quercetin, methyl esters, terpenoids, saponins, and so on that function to prevent the growth of free radicals that can damage cells in the body. The purpose of this study was to see the bioactivity of plants in bidara *Ziziphus jujube* (Rhamnaceae). The method used is a computational study using various bioinformatics applications. From the research it was found that the bidara plant *Ziziphus jujube* (Rhamnaceae) plant has many useful ingredients including protein, calcium, iron, magnesium, vitamins, active compounds such as flavonoids, carotenoids, alkaloids, phenols, quercetin, methyl esters, terpenoids and saponins.

Keywords: *Ziziphus jujuba*, cancer, medicinal plant

1. INTRODUCTION

Cancer is one of the number 2 deadly diseases in the world after heart disease. The prevalence of tumor or cancer in Indonesia is 4.3 per 1000 people. An estimated 12 million people get cancer every year.

Breast cancer is a disease in the form of malignant neoplasms originating from the parenchyma, abnormal breast tissue growth that does not follow the surrounding tissue grows infiltrative and destructive, and can metastasize [1, 2]. Breast cancer can cause misery and cause death in humans. Breast cancer does not only occur in women but can also occur in men, but the prevalence in women is much higher [3, 4].

The search for new sources to produce anticancer compounds continues. Examples of plants that can be used as anticancer drugs from natural ingredients are *Ziziphus jujube* (Rhamnaceae) bidara plant. *Ziziphus jujube* (Rhamnaceae) bidara plant are plants that are widely known as family medicinal plants. *Ziziphus jujube* (Rhamnaceae) bidara plant also contain lots of compounds that can prevent cancer growth, one of it is flavonoids.

2. LITERATURE REVIEW

The main risk factors for breast cancer are hormonal and genetic conditions (family history) [5] Hormonal factors can be influenced by several things, including age at menarche, age at first pregnancy, parity, history of breastfeeding, infertility and long-term use of hormonal contraception [6, 7]. Early menarche or first menstruation at a relatively young age (less than 12 years) is associated with an increased risk of cancer with an OR = 1.5 [8]

Based on the evaluation results, the latest evidence relating to diet and cancer, some recommendations to prevent cancer include a diet with organic types of food, balanced and varied nutrition, and a diet to maintain a normal body mass index and an active lifestyle [9, 10, 11]. This preventive approach, if widely implemented by international agencies, governments, industry, health professionals, consumers, and consumer advocacy groups, could reduce the global incidence of cancer by 10-20% within 10-25 years [12, 13]

One of the plants that can prevent the growth of breast cancer is *Ziziphus jujube* (*Rhamnaceae*) bidara plant [14, 15, 16]. The bidara plant has many useful ingredients including protein, calcium, iron, magnesium, vitamins, active compounds such as flavonoids, carotenoids, alkaloids, phenols, quercetin, methyl esters, terpenoids, saponins, and so on [17, 18, 19, 20].

3. EXPERIMENTAL

This study uses the literature review method or the SLR (systematic literature review) approach to examine research, assess and interpret and gather information about the compounds contained in white turmeric and their role in helping cure cancer [21, 22, 23, 24]. To determine the content, phytochemicals were used, then chemdraw ultra 12.0 and chem 3 D pro 12.0 to make the structure of the compound that was in the previous <https://pubchem.ncbi.nlm.nih.gov/compound/101010101> parameter (internal and cartesian coordinate table) [25, 26, 27, 28]. In addition, <http://swisstargetprediction.ch/> is also used to predict that these compounds are more active in healing any disease. cbi.nlm.nih.gov/ and specify [29, 30].

4. RESULTS AND DISCUSSION

The process of cancer formation takes a long time and is divided into three stages, namely initiation, promotion and development. At the initiation stage, the condition of the cell has undergone permanent changes in the genome due to DNA damage that ends in gene mutation. These transformed cells grow faster than the normal cells around them. The initiation stage takes one to several days. The second stage is the promotion stage. The period

during which this stage takes up to ten years is more because this stage is a long process caused by damage inherent in the genetic material of the cell. Beginning with the epigenetic mechanism, there will be expansion of damaged cells to form premalignancy (leading to cancer). The last stage is the stage of development (Progression). At this stage, genetic instability occurs which causes mutagenic and epigenetic changes. The result of this process is new clones of tumor cells that have continuous division activity, are malignant, multiply, invade surrounding tissues, and then spread to other places.

Picture 1. Bidara plant and Taksonomy

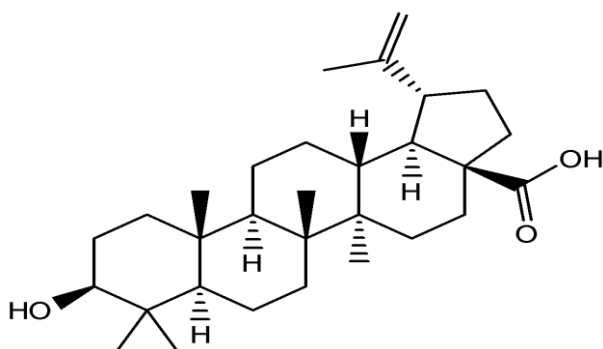


Kingdom : Plantae
 Clade : Angiospermae
 Clade : Eudikotil
 Clade : Rosids
 Ordo: : Rosales
 Family: : Rhamnaceae
 Genus: : *Ziziphus*
 Spesies: : *Z. jujuba*

Source : courtesy of Elfitri Ramadani

The active chemical compound found in *Ziziphus jujube* (*Rhamnaceae*) is Betulinic Acid which is found in skin 60 ppm and deviation standard is -0, 69 . In *Ziziphus jujube* (*Rhamnaceae*) there is cytochrome P450 17A1 where this enzyme functions as an oxidizing catalyst in the metabolic pathways of steroids, fatty acids, xenobiotics, including drugs, toxins and carcinogens. The properties of the active compounds in *Ziziphus jujube* (*Rhamnaceae*) which were identified using ChemDraw and Chem3D can be seen as follows:

Picture 2. BETULINIC ACID



Boiling Point: 1152.75 [K]
Melting Point: 795.7 [K]
Critical Temp: 974.92 [K]
Critical Pres: 10.8 [Bar]
Critical Vol: 1461.5 [cm³/mol]
Gibbs Energy: -42.28 [kJ/mol]
Log P: 7.38
MR: 131.71 [cm³/mol]
Henry's Law: 7.47
Heat of Form: -768.19 [kJ/mol]
tPSA: 57.53

5. CONCLUSION

Based on the descriptive results and data analysis of bidara plant *Ziziphus jujube* (*Rhamnaceae*) has active chemical compound found Betulinic Acid. In *Ziziphus jujube* (*Rhamnaceae*) there is cytochrome P450 17A1 where this enzyme functions as an oxidizing catalyst in the metabolic pathways of steroids, fatty acids, xenobiotics, including drugs, toxins and carcinogens.

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