Conference Paper

Exploring Anticancer Potential in Bajakah Tampala by In Silico Virtual Screening

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Abstract.
Incidences of cancer have increased sharply throughout the world. The process of finding a targeted cancer drug takes a long time and a lot of money. One method that can help overcome this is computational methods, such as virtual screening. It can be an important alternative in early-stage drug discovery. The aim of this study is to explore and analyze the potential protein targets of *Bajakah tampala (Spatholobulus littoralis)* as an anticancer chemotherapy. This is a bioinformatics study that uses the in silico method through the pathway analysis method with PubChem software, Swiss Target prediction, String and Cytoscope. The results showed that many phytochemicals present in *Spatholobulus littoralis Hask* are predicted to be anticancer.

Keywords: Anticancer, Bajakah tampala, In silico, Spatholobulus littoralis

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1. INTRODUCTION

Cancer is a degenerative disease that is a global burden of disease and is expected to be the leading cause of death in the coming decades. In 2018 there were 18.1 million new cancer cases and 9.6 million cancer deaths. GLOBOCAN projects an increase in cancer incidence in 2025 to an estimated 19.3 million new cases per year [1,2]. The highest cancer cases globally in men are prostate, lung, and colon cancer. Simultaneously, it is breast, lung, and colon cancer in women [2].

Cancer therapy modalities are surgery, radiotherapy, and chemotherapy, the choice of therapy adjusted to the type of cancer and its stage. Currently, the effectiveness of chemotherapy is not optimal, and there are still many side effects. The most frequent chemotherapy side effects are kidney damage, bone marrow depression, nausea, vomiting, hematotoxic, and cardiotoxic [3,4]. Therefore, the search for new anticancer agents has become a significant interest in drug discovery and development. One of the efforts to find new anticancer agents is to explore medicinal plants

Bajakah tampala wood is an herbal plant from the interior of Central Kalimantan Province that has not been found in other areas. The bajakah tampala plant (*Spatholobus littoralis hassk*) is spread mainly in subtropical and tropical Asia [5]. This plant is a traditional medicinal plant that has empirically been used by the interior community of Central Kalimantan province to cure several diseases. Based on previous research, this plant contains bioactive compounds such as phenolics, flavonoids, tannins, and saponins, which are useful in the treatment of cancer [6].

Finding a cancer drug that has a specific target takes a long time and much money. One method that can help overcome this is by computational methods before in vitro and in vivo tests [7]. The targets for cancer treatment are proteins that play a role in apoptosis, cell cycle, invasion and migration, and metastasis. This study aimed to analyze the potency of the Bajakah tampala wood for anticancer using in silico.

2. METHODS

The research method used in this research is descriptive qualitative, to process and interpret the data obtained from the database and the software used. The steps that must be taken include: Searching for the active substance content of the tampala wood based on the previous research literature. Then the in silico test used the pathway analysis method with PubChem Software. The compound structure search is carried out through the PubChem Database, then selects the 4D structure of the compound and canonical SMILE data. The data will be used in the next step.

Furthermore, the search for protein targets from active compounds of tampala steel wood based on SMILE's canonical structure uses Swiss Target Prediction, Swiss Target Prediction (http://www.SwissTargetPrediction.ch/), which can predict the target protein interactions of a compound based on structural similarities. The similarities predicted were between the structure to predict the target or query structure and the structure of drugs that have been approved by the FDA (FDA-approved drugs). It also for non-drug compounds that have been analyzed in vitro and in vivo [8,9].

Based on the target protein findings, selected the target proteins whose probability is above 60%. After that, pathway analysis is carried out. These proteins are targeted for proteins that play a role in the melanogenesis process using a string and cystoscope.

STRING is a database that can be used to predict the interaction of a protein, expression in a network and trace its association with other proteins in a mechanism within the cell.

3. RESULTS

The results of literature search Bajakah tampalah contain several active compounds [10,11] shown in Table 1, the table also shows the canonical smile structure for the associated active compound and its target protein. Results Tracing the pathway analysis of these proteins on protein targets that play a role in proteins that play a role in apoptosis is shown in Fig. 1.

TABLE 1: Active compounds of Bajakah tampala.

No.	Active Compound of Bajakah Tammpala
1.	(-)- Duartin
2.	20-O-Methylisomucronulatol
3.	3',4',7-Trihydroxyflavone
4.	6-Methoxyeriodictyol
5.	7-O-Methylisomucronulatol
6.	8,30-Dihydroxyvestitol
7.	Bryaflavan
8.	Butin
9.	Calycosin
10.	Catechin
11.	Daidzein
12.	Dihydrokaempferol
13.	Dihydroquercetin
14.	Epicatechin
15.	Epigallocatechin
16.	Eriodictyol
17.	Formononetin
18.	Gallocatechin
19.	Isomucronulatol
20.	Liquiritigenin
21.	Mucronulatol
22.	Plathymenin
23.	Procyanidins
24.	Quercetin

Results tracing the pathway analysis of these proteins on protein targets that play a role in proteins that play a role in cycle cell is shown in Fig. 2.

Results tracing the pathway analysis of these proteins on protein targets that play a role in proteins that play a role in tumour suppressor gene shown in Fig. 3.

Results Tracing the pathway analysis of these proteins on protein targets that play a role in proteins that play a role in invasive and metastasis is shown in Fig. 4.

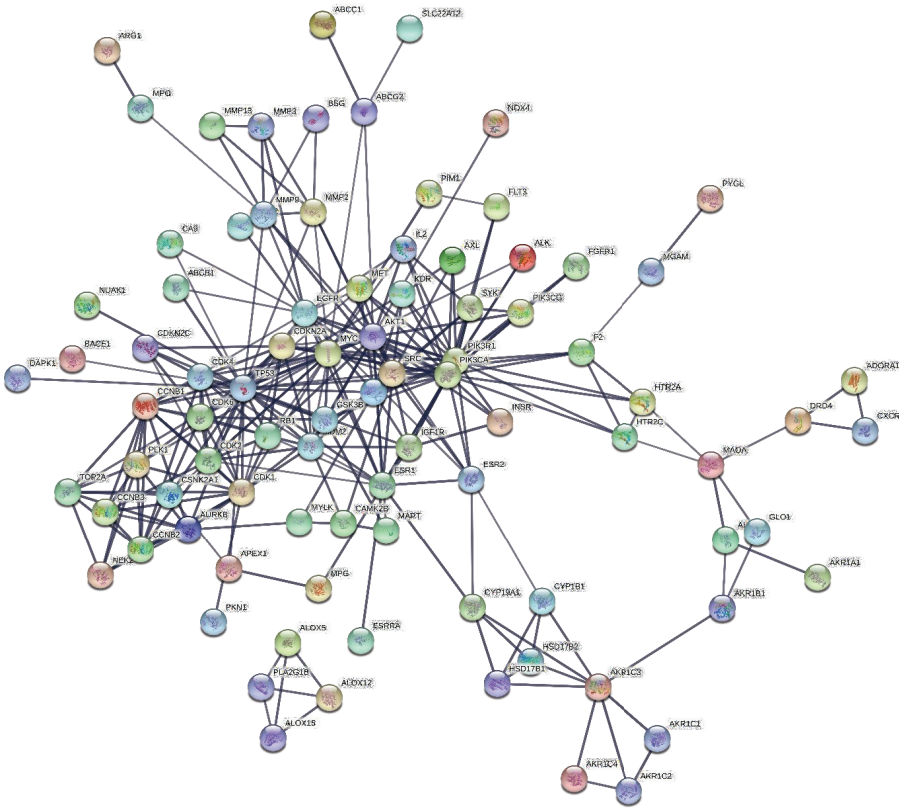

Figure 1: Analysis of the apoptotic target protein pathway of the active compounds of bajakah tampala on protein.

4. DISCUSSION

Bajakah tampala contains flavonoids, alkaloids, tannins, and phenolic acids which have anticancer effects. The important mechanism of flavonoids is to prevent the metabolic activation of carcinogens through the interaction of phase I metabolic enzymes (cytochrome P450) which can metabolically activate most of the procarcinogens that can trigger carcinogenesis [12].

This flavonoid compound works by inhibiting the activity of certain P450 isozymes, such as CYP1A1 and CYP1A2, so that it has a protective role against induction of cell damage by carcinogen activation. Alkaloids and phenolic acids have the ability to inhibit cell proliferation processes, stimulate apoptosis and inhibit the formation of new blood vessels (Angiogenesis) [12-14]. Phenolic acid is a substance that has bioactivities such as high antioxidants. Alkaloids also have the ability to inhibit cell survival, proliferation, invasion and angiogenesis in human glioma cells. In addition, it has the ability to induce HeLa cervical cell death by apoptosis and necrosis [15].

Bajakah tampala contains Duartin and Catechin, based on PubChem, Duartin chemical structure is similar to catechins. Catechins have an anticancer effect by inhibiting

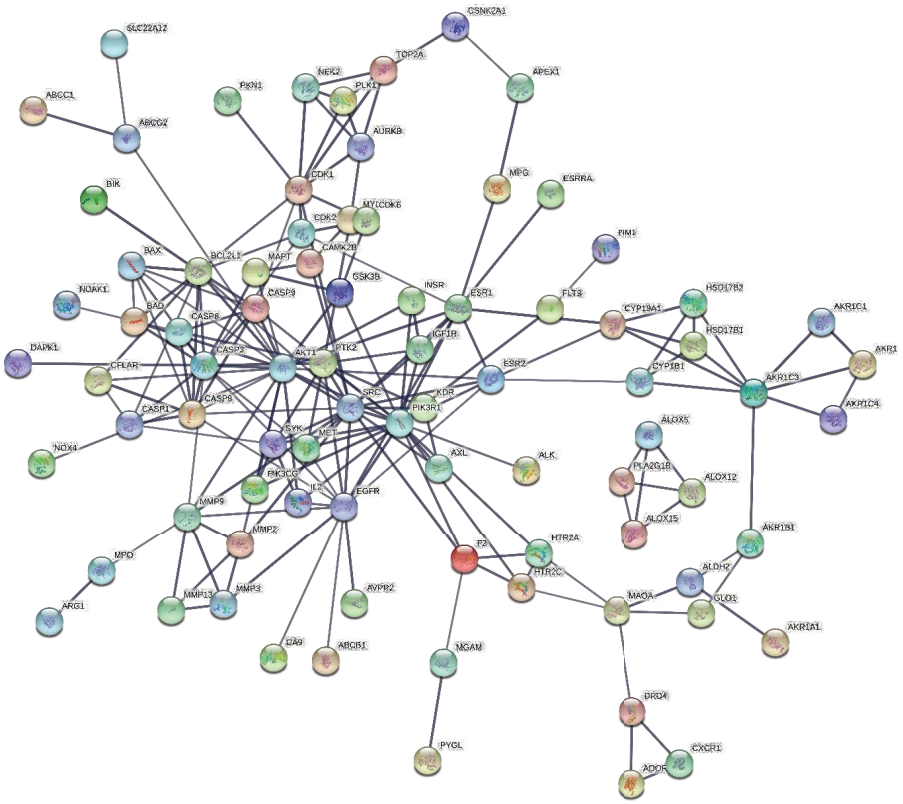

Figure 2: Analysis of the cycle cell target protein pathway of the active compounds of bajakah tampala on protein.

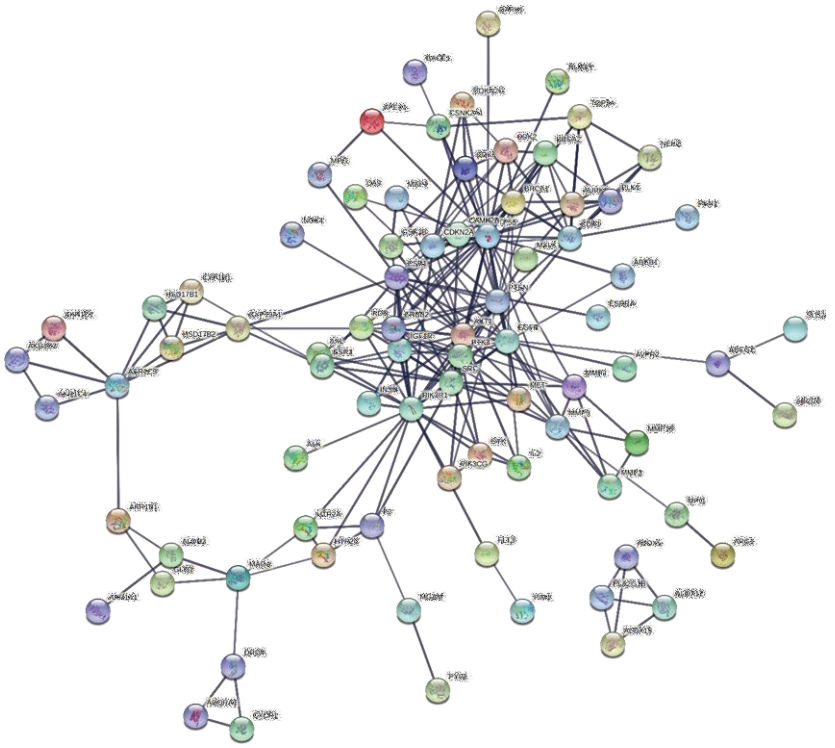

Figure 3: Analysis of the tumor suppressor gene target protein pathway of the active compounds of bajakah tampala on protein.

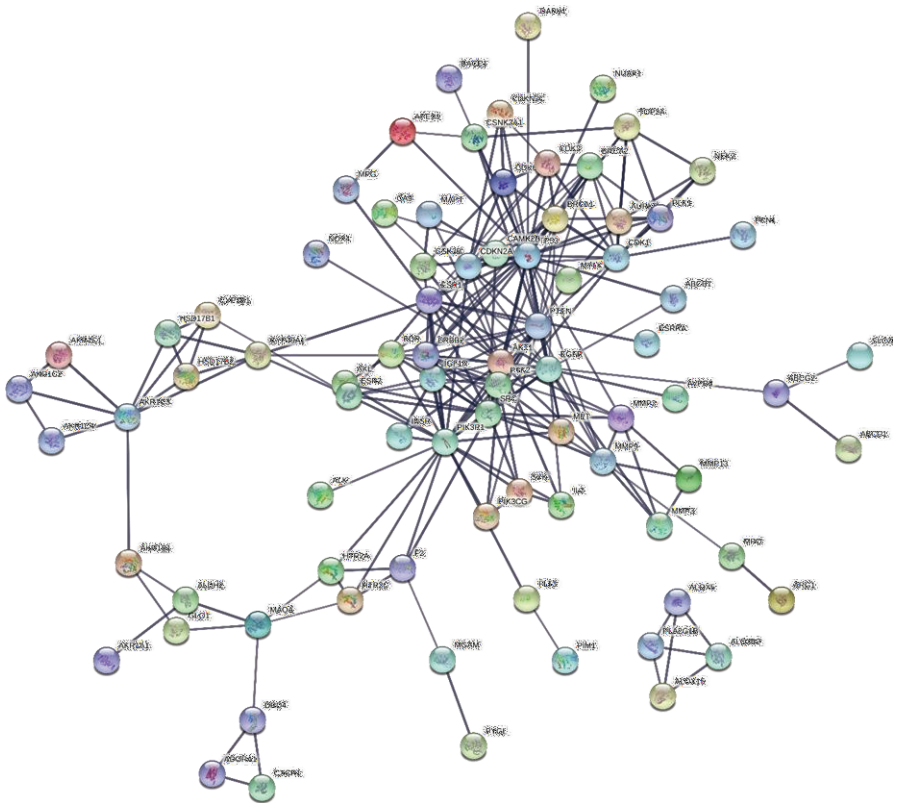

Figure 4: Analysis of the migration and metastasis target protein pathway of the active compounds of bajakah tampala on protein.

cancer cell proliferation through inhibition of IGF-1R tyrosine-kinase receptor phosphorylation, inducing apoptosis by activating Caspase-9 and -3, and modulating

autophagic activity [16]. In animal studies with liver cancer models, catechins inhibit hepatoma growth, suppress tumour development, and induce apoptotic activation. Possible mechanisms are related to suppression of hepatocyte progenitor cell / stem cell populations, activation of the AMPK protein in the liver, modulation of self-renewal pathways and associated genes [17].

The limitation of this study is that it does not perform molecular docking analysis.

5. CONCLUSION

The conclusion is in silico analysis that *Spatholobulus littoralis Hask* component have anticancer activity in cancer, through inhibition of proliferation, inducing apoptotis, and inhibition of metastasis.

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