Bioprospecting of Kerangas Forest as Natural Medicine Material Sources: Screening Phytochemistry Compound of Kerangas Forest Tree Species

Kissinger, Ahmad Yamani, Gusti Ar Thamrin, and Rina Muhayah Np

Faculty of Forest, Lambung Mangkurat University, Indonesia

ABSTRACT

Bioprospecting is an effort to create a value for biodiversity. Bioactivity identification of tree species is an important step to get high economic value from Kerangas forest. Screening bioactivity of plants was conducted by ethnobotanical survey and qualitative phytochemistry compound tests. Data collection in the ethnobotanical survey was conducted using a structured interview. Dried leaves and barks of selected trees from Kerangas forest were tested for qualitative phythochemistry compound. Qualitative phytochemistry analyzed by detected of color visualization. There are a total of 42 plants located in heath forest, 38 species of which are used by the people as a medicine (90.48%). There are 10 species of tree that is always found in various locations all in heath forest. 8 tree species are commonly used as a medicine by community. Result showed that parts of selected trees from Kerangas forest had various phythochemistry compounds. It can be concluded that methanol extract of Kerangas tree species have potential bioactivities. Phytochemical content of some trees species may have potential as antibacterial, antidiabetic, antiinflamation, antioxidant, anti-plasmodium, asthma treatment and vitality.

Key words: ethnobotanical, Kerangas forest, phytochemistry, tree species

INTRODUCTION

Kerangas (heath forest) is a type of land which is characterized by poor soil nutrient of podsol with soil material that is rich in quartz sand, low pH and often has a thin layer of peat above ground level. Vegetation that grew is too limited and has a special character as a result of adaptation to the limiting environment (Bruenig, 1995). The International Union for the Conservation of Nature-World Conservation Union (IUCN) has categorized the status of heath forest area as vulnerable.

General perspective consider that the existence of heath forest does not significantly provide direct economic benefits to society and development. The case in South Kalimantan, from the heath forest only wood is collected and material sources for dug outs. Utilization of the heath forest has damaged vegetation, land and environment. Heath forest ecological damage and its impact to the community must be addressed with heath forest conservation action.

The new paradigm of biodiversity conservation is how we can take advantage of biodiversity which is relatively save to environment. Utilization of biodiversity should not be permanently damaging natural resources and have high value of potential economic benefits from sustainable of natural resources (Zuhud, 2007).

Bioprospecting is a process of finding benefits or added value in the form of materials or services of natural resources. The potential benefits and heath forest ecological characteristics can be used as one of the priority conservation action. Nature is the source of many treatment (Sneader, 1996), and ethno pharmacology or traditional medicine to contribute knowledge about the medicinal ingredient such as morphine, quinine, dogitoxin, ephedra and tubocurarine (Harvey and Gericke, 2011).

Bioprospecting is a choice based on natural management of the heath forest resource utilization. Ability of heath forest to become a source of treatment material

Correspondence: Kissinger. Faculty of Forest, Lambung Mangkurat University Email: durror2ali@yahoo.com

associated with the basic theory that the process of secondary metabolites that produce certain phytochemical compounds related or can be triggered by stress or environmental stress. Bioprospecting is a choice based on natural management of the heath forest resource utilization. Limitations character of health making plant species there adapt and trigger the process of secondary metabolites.

This management option of bioprospecting when arranged properly will potentially be the choice of sustainable natural resource management. Heath forest management approach based on bioprospecting and utilization of forest resources development is form а of management that is in line with the new paradigms of conservation of biodiversity. Exploiting bioactivity materials of plants as an alternative to the use of a relatively less and more environmentally destructive friendly. This study tried to find the bioactivity of some plants in heath forest. The discovery of the bioactivity of plant in heath implemented based forest approach ethnobotany knowledge of forest communities results and the of the preliminary identification of qualitative phytochemical compounds from heath forest plants.

Results from this study are expected to be as important information for the development of bioactivity of heath forest. This research will further enrich the knowledge of the heath forest biodiversity for the conservation and development of the small business community in the field of health and medicine on the basis of traditional knowledge and empirical evidence of science and technology.

MATERIALS AND METHODS

Materials and Tools

Materials and tools used in this study consisted of materials and tools for ethnobotany survey, sample collection and phytochemical laboratory analysis for compounds. Materials in this research are medicinal plants in the kerangas forest, community around the kerangas forest. Tools in this research are questionnaires, camera, GPS, container samples. The plant materials

used are the leaves and barks of some tree species of kerangas forest. Materials used in laboratory analysis are methanol, leaves and bark of plant, chemical material for qualitative phytochemistry. Chemical testing conducted at the laboratory of Study Center of Biopharmaca Bogor Agricultural Univ.

Data Collection and Analysis

The scope of research activities includes an inventory of field and laboratory testing. Ethnobotany research locations covering heath forest located in Guntung Ujung Village Banjar district of South Kalimantan, Sanggu Village South Barito district, and East Kotawaringin district of Central Kalimantan. A test of qualitative phytochemical was conducted in the laboratory of Study Center of Biopharmaca Bogor Agricultural Univ.

Stages of activities undertaken in the selection of tree species that have the potential as natural resource for diabetes cure are as follow:

- 1) Survey of ethnobotany: Ethnobotany survey aims to make inventory of the types of tree from heath forest potential as medicinal plant. Data collection was conducted using a structured interview (Rahayu *et al.* 2008). Data were descriptively analyzed by using matrix tabulation.
- Identifying qualitative phytochemical compounds (Harborne, 1987). The test of qualitative phytochemical was conducted by using color visualization.

Phytochemical Analysis

Test for Alkaloids: To the test solution in 10 ml methanol, add 1 % (w/v) HCl and any of Mayor's reagents, Wagner's reagent or Dragendroff reagent (6 drops). A creamish or brownish red or orange precipitate indicated the presence of alkaloids.

Test for Flavonoids: 5 ml of dilute ammonia solution was added to a portion of the aqueous filtrate of each plant extract followed by addition of concentrated H_2SO_4 . A yellow color in each extract indicated the presence of flavonoids. The yellow color disappeared on standing. Few drops of 1 % aluminum solution were added to portion of each filtrate. A yellow color indicates the presence of flavonoids. A portion of the powdered plant sample was in each case heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution. A yellow color indicates opposite test for flavonoids

Test for Phenolhydroquinon: About 500 mg of powdered sampel add with 50 mL of water and boiled for 5 minutes. 3 drops of concentrated sample was added to form layer. Few drops of NaOH 1 N. The red color indicated the presence of phenol hydroquinone.

Test for Steroids: About 500 mg sample powder mixed with 20 mL eter and 2 hours. 3 maseration for drops of concentrated sample was added to form layer. Few drops of glasial asetat acid-H₂SO₄ (Lieberman-Bourchard reagent) to the concentrated sample. The red color indicated the presence of steroid.

Test for Triterpenoids: 5 ml of each extract mixed with 2 ml of chloroform, and 3 ml concentrated H_2SO_4 was carefully added to form a layer. A reddish brown color of the inter face was formed to show positive results for the presence of triterpenoids.

Test for Tannins: About 0.5 g of the sample of plant was dried and powdered samples was boiled in 20 ml of water in a test tube and then filtered. A few drops of 0.1% ferric chloride was added and observed for brownish green or a blue-black colouration.

Test for Saponins: About 2 g of the powdered sample was boiled in 20 ml of

distilled water in a water bath and filtered. 10ml of the filtrate was mixed with 5 ml of distilled water and shaken vigorously for a stable persistent froth, which indicates the presence of saponins.

RESULTS AND DISCUSSION

The ethnobotany knowledge about medicinal trees species of kerangas forest

Based on the information obtained from the local community in heath forest, there are a total of 42 plants located in heath forest, 38 species of which are used by the people as a medicine (90.48%). There are 10 species of tree that is always found in various locations all in heath forest. Table 1 describes 10 species of trees that are available in heath forest and its benefits for the medicine based on information obtained from local society.

Based on the results shown in Table 1. there are eight tree species that are commonly used as a medicine by community, while two other types are still unexplored. Trees native species that used as medicinal plant are Adina minutiflora, *Combretocarpus* rotundatus, Cratoxylon arborescens, Melaleuca cajuputi, Shorea belangeran, Tristaniopsis obovata, Vitex pubescens. The benefits obtained from the plants sufficiently varied as analgesic, antibacterial, antidiabetic, anti-plasmodium, vitality, cough and others. These findings indicate that the adaptability of a species in a limited land (forest heath) are associated with the potential of trees as a natural medicine.

No	Species	Utilization	Parts of trees that used		
1	Akasia (Acacia mangium)	unexplored	unexplored		
2	Alaban (Vitex pubescens)	stomach pains, wound, fever	Leaves and bark		
3	Bati-bati (Adina minutiflora)	stomach pains	Leaves		
4	Belangiran (Shorea belangeran)	malaria, diabetes, diarrhea,	Leaves, bark and root		
		stamina, antidote			
5	Bintangur (Callophylum lowii)	analgesic, festering scars	Leaves and bark		

Table 1. Potential utilization of kerangas forest trees species as natural medicine

No	Species	Utilization	Parts of trees that used		
6	Galam (<i>Melaleuca cajuputi</i>)	stomach pains, wound, analgesic	Leaves and fruit		
7	Gerunggang/irat (<i>Cratoxylon arborescens</i>)	Fever, cough, stomach pain, diarrhea, wound.	Leaves and bark		
8	Merapat (Combretocarpus rotundatus)	unexplored	unexplored		
9	Palawan (Tristaniopsis obovata)	stomach pain, lever, mag, stamina	Leaves, bark, root and water from stem		
10	Rambuhatap (Baeckea frutescens)	Stomach pain, analgesic, antiacne	Leaves		

Phytochemical compounds of some heath forest trees

Identifying phytochemical compounds conducted on 10 species of trees. Selection of the 10 trees species is based on the existence of species in all area of heath forest research sites. Results of phytochemical compounds identification of some species of trees are always found in heath forest are shown in Table 2.

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Table 2	Phytochemistry	compound	of kerangas	torest trees speci	Ies
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No.	Plant species	1	2	3	4	5	6	7	Part of plant
1	Akasia (Acacia mangium)	-	+	+	-	+	+	+	bark
2	Alaban (Vitexpubescens)	-	+	+	+	+	+	-	leaves
3	Bati-bati (Adina minutiflora)	-	+	+	+	+	+	+	leaves
4	Belangiran (Shoreabelangeran)	+	+	+	-	+	+	+	bark
5	Bintangur (Callophylumlowii)	-	+	+	+	+	+	+	leaves
6	Galam (Melaleucaleucadendron)	+	+	+	+	+	+	+	leaves
7	Irat (Cratoxylonarborescens)	-	+	+	+	+	+	+	bark
8	Merapat (Combretocarpusrotundatus)	-	+	+	+	+	+	-	leaves
9	Palawan (Tristaniopsisobovata)	-	+	+	+	+	+	+	leaves
10	Rambuhatap (Backeafrutescens)	-	+	+	+	+	+	+	leaves

Description: 1.Alcaloid, 2.Flavonoid, 3.Phenolhidroquinon, 4.Steroid, 5.Triterpenoid, 6.Tanin, 7. Saponin

Phytochemical analysis is very useful in the evaluation of some active biological components of medicinal plants (Sundaram et al. 2011). The results are shown in Table 2 indicate that almost all samples containing plavonoid, phenolhidroquinon and tannins. Phytochemical content of some tree species may have potential as an antioxidant, antibacterial, antiplasmodium, antidiabetic and other bioactivities. Flavonoids have potential as antibacterial and antidiabetic (Jung et al. 2006). According to Naim (2004) cited Rambe et al. (2012) flavonoids have lipophilic properties so that possible damage cell membranes of bacteria. The content of

flavonoids in Acalyphaindica plant extracts is as potential antidiabetic (Still et al. 2011). Flavonoids from plant have used as alternatives in treatment of type 2 diabetes (Hussain and Marouf 2013). Flavonoids are phenolic compound that act as primary antioxidants or free radical scavengers (Seth and Sanin. 2010). Many antioxidant capacities associated with the flavonoid (Sarastani et al. 2002; Arini et al. 2003). Epidemiological studies have shown that flavonoids and carotenoids intake are inversely related to mortality from coronary heart diseases and to the incidence of heart attacks (Donald and Cristobal, 2006).

Flavonoids have been referred to as nature's biological response modifiers because of strong experimental evidence of their ability to modify the body's reaction to allergies, virus and carcinogens. They show antiallergic, anti-inflammatory, antimicrobial and anticancer activity (Seth and Sarin, 2010). Flavonoid has potential as asthma treatments (Yang *et al.* 2012).

The presence of flavonoids and tannins in plants are likely to be responsible for the free radical scavenging activity. Flavonoids and tannins are phenolic compounds and plant phenolics are a major group of compounds that act as primary antioxidants or free radical scavengers. These findings give credence to the traditional medicinal application of the leaves as remedies for sores, rash and be witchment, internal and external wounds and infections. Many antioxidant capacities associated with phenol hydroquinone, plavonoid and tannin (Sarastani et al. 2002; Arini et al. 2003). Tannin contained in some foods have potential as an antidiabetic (Kunyanga et al. 2011). Tannin associated with adhesion ability to inactivate microbes, enzymes and transport proteins in the cell membrane.

Alkaloids contained by two types of stem Belangiran (S. belangeran) tree bark and leaves of Galam (Melaleuca cajuputi). Alkaloids are a class of organic compounds that most found in nature. Almost all alkaloids derived from plants and widespread in many kinds of higher plants. Most of the alkaloid found in dicotyledonous plants while monocotyledonous and Pteridofita contain alkaloids with a lower rate. Alkaloid used as an antibacterial and antiamoeba (Hasibuan and Nainggolan, 2007). Alkaloid from plant sympodialis extract) had using as (*C*. medicinal for asthma treatments, antiinflammation, anti-allergic (Bezerra-Santos et al. 2012)

Saponins possess hypocholesterolemic and antidiabetic properties. Saponins have used for asthma treatment (Yuan *et al.* 2011). Terpenoid compounds known to be active against bacteria, fungi, viruses and protozoa. The antimicrobial mechanism of terpenoid associated with damage to cell membranes by lipophilic compounds. terpenodis have potential as antibacterial and antidiabetic (Jung *et al.* 2006). Steroids have anti-inflammatory effects (Seth and Sarin, 2010).

There are relationship between phytochemical compounds and bioactivity of plants. It also been widely observed and accepted that the medicinal value of plants lies in the bioactive phyto components present in the plants (Veeramuthu et al. 2006). Relating to the information from the society ethnobotany knowledge and phytochemical content, there are indications that plants from kerangas forest have the capacity as an antibacterial (stomach pain, diarrhea, wound), anti-inflammation (analgesic, fever), asthma (cough), anti-plasmodium treatment (malaria), antioxidant (stamina, vitality) and anti-diabetic. All information about а medicine based on society ethnobotany knowledge and screening plant phytochemical compounds are preliminary findings that indicate potential heath forest as a source of natural medicine and become an important information for the development of bioprospecting in heath forest.

CONCLUSION

There are a total of 42 plants located in heath forest, 38 species of which are used by the public as a medicine (90.48 %). The number of tree species that are always available in all locations of heath forest are 10 species. There are 8 species of which are commonly used by the community as a medicine. The benefits obtained from 10 species are as analgesic, antibacterial, antidiabetic, anti-plasmodium, asthma treatment and vitality.

The result of this research indicates that there is a relationship between the use of plants as a medicinal treatment by the community with the phytochemical content of plants. Almost all plants in heath fores contain flavonoids, phenols hydroquinone and tannins. Alkaloid contained only by two species of trees, bark stem of Belangiran (S.belangeran) and leaves of Galam (Melaleuca cajuputi). Phytochemical content of some tree species may have potential as an antioxidant, antibacterial, antiplasmodium, asthma treatment, antidiabetic or other bioactivity.

Ethnobotany knowledge of society and screening plant phytochemical compounds are preliminary findings that indicate potential heath forest as a source of natural medicine and become an important information for the development of bioprospecting in heath forest. Utilization of leaves and bark of plants as a source is relatively safe cure to preserve the plant. The use of plant parts that can permanently damage the plants such as the roots, can be addressed with actions in situ breeding and plant population arrangements are relatively safe to be harvested. Advanced testing necessary to strengthen the evidence of potential bioactivity of trees in the forest heath.

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