

Relation of Forest Stands to Availability of Secondary Metabolite Content in the Land (A Case Study on HPHTI PT Toba Pulp Lestari, Tbk.)

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Keywords: Secondary metabolites, Eucalyptus, Industrial Plantation Forest

Abstract: This research was carried out in the stands of Eucalyptus plantations and stands of natural forests in the concession area of PT. Toba Pulp Lestari, Tbk, Aek Nauli Plantation. The research was carried out by purposive sampling method of soil sampling at the research sites which were considered representative of all locations involving Eucalyptus Sp planted in 2012, 2014 and 2016, located on slope 0 - 25%, and slope >25% with distance taking soil samples from *Eucalyptus Sp* 0 - 50 cm, 50 - 100 cm and 100 - 150 cm) with 3 replications in industrial plantations and natural forests of protected areas. The analysis result using soil samples by screening method (qualitative) demonstrated that the chemical content of secondary metabolites available in the forest consisted of alkaloid, terpenoids, and saponin, whereas those that were available in the plantation forest were only terpenoid and saponin. And there were three kinds of metabolites found in the protected areas; they were alkaloid, terpenoid, and saponin. Alkaloids were found in flat slope which distance was 50 cm from the trees, Terpenoids were found in flat and tilted slope which distance was 50 cm and 100 cm from the trees.

1 INTRODUCTION

Indonesia is one of the centers of diversity of the world's biological resources which is concentrated in the tropics, namely tropical rainforest area. Has a wealth of abundant biological resources and rank in a second place after Brazil and has the third largest area of tropical forest after Brazil and Zaire. (Myers, 1980; Whitmore, 1990).

The changes in land use / land cover are important causes of loss of biodiversity. Habitat loss is one of the important factors causing the global biodiversity crisis (Sala et al, 2000).

Secondary metabolites are produced through secondary reaction of primary metabolites (ingredients primary organic) such as carbohydrates, fats, and protein. Living things can produce secondary organic material (secondary metabolites) or natural materials through secondary reactions

from primary organic matter (seeds, fats, proteins). This secondary organic material (secondary metabolite) is the end result of a consultation process. This material also discusses physiological processes. Secondary organic matter can be divided into three major groups, namely: phenolic, alkaloid and terpenoid, but pigments and porphyrins are also included (Ergina et al, 2014).

Secondary metabolites in the form of allelopathy is an event where an individual plant produces chemicals and can inhibit the growth of other species that grow competing with these plants. This term began to be used by Molisch in 1937 which was interpreted as the negative influence of a high level of plant species on germination, growth, and fertilization of other species found in plant tissues, such as leaves, roots, aromas, flowers, fruits and seeds. issued in the form of plant residues.

Allelopathy is a direct or indirect influence of a plant on other including microorganisms both positive and stimulating, as well as negative or inhibition of growth, through the release of chemical compounds to their environment (Batish et al 2007). The effect of allelopathy can be used as a factor that influences changes in the composition of weed species (understorey), affects plant growth and yields, and as a tool for weed management (Zimdahl, 2007).

To find out the source of chemical compounds secondary metabolites as well as preliminary research in relation to further research to find out the chemical compounds affect the presence of understorey diversity in Eucalyptus plantations, it is necessary to study the content of chemical compounds of secondary metabolites (alelopathy) on the soil of Eucalyptus and without Eucalyptus.

2 MATERIAL AND METHOD

This research was carried out at Estate A, Aek Nauli Sector, PT Toba Pulp Lestari Tbk, Simalungun Regency, North Sumatra, with coordinates $2^{\circ} 40' 00''$ "LU - $2^{\circ} 50' 00''$ LU and $98^{\circ} 50' 00''$ "BT - $99^{\circ} 10' 00''$ "BT. Has climate type A with annual rainfall ranging from 1,554 mm to 2,155 mm.

The highest monthly rainfall of 293 mm occurs in November and the lowest of 68 mm occurs in June. The research area based on the climate classification Schdemidt and Fergusson (1951) has climate type A (Very wet) with rainfall (on average) 150 mm, the highest month in March and the lowest in February. This research starts from October to December 2018.

This research was conducted with an initial survey consisting of soil samples in plantations and natural forests (protected areas) with purposive representation methods in each planting year with 3 replications on the basis of:

1. Plant age, with 3 replications they are 2 years of plant life in 2016, 4 years of plant life in 2014 and 6 years of plant life in 2012.
2. Slope, Flat 0 - 25% and above slope 25%.
3. The distance of trees to samples is 50-50 cm, 50-100 cm and 100-150 cm.

Soil samples obtained from industrial plantations and natural forests (protected areas) were then analyzed at the Laboratory of Biological Materials for Nature. Faculty of Math and Science, University of North Sumatra.

The tools used for observation were a Map of Work Area of PT. Toba Pulp Lestari, Estate Aek

Nauli, hoes, plastic 2 kg, GPS, topographic map, permanent markers and tally sheet.

3 RESULT AND DISCUSSION

The results of the analysis of soil samples showed that the distribution of secondary metabolic chemical content was:

1. Eucalyptus Plantation Forest Area
 - a. There are terpenoids in Eucalyptus 2 years old at a distance of 50 cm (flat) and 100 cm (flat) distance from the tree.
 - b. There are terpenoids in 4 years old Eucalyptus at a distance of 50 cm from the tree with a flat topography.
 - c. There are terpenoids in Eucalyptus 6 years old at a distance of 150 cm from the tree, sloping topography and spaced saponins 150 cm from the tree with sloping topography.
2. Natural Forests (Protected Areas).
 - a. There are terpenoids with a distance of 150 cm from the tree, and saponins with a distance of 150 cm from the tree, each in the topography flat.
 - b. There are alkaloids and terpenoids and saponin with a distance of 50 cm from the trees, each on a sloping topography.
 - c. There are alkaloids, terpenoids and saponins with a distance of 100 cm from each tree on a sloping topography.

The results of soil analysis showed the presence of secondary metabolic chemicals (secondary metabolites = alelopathy) both in natural forests designated as protected areas and in plantations of Eucalyptus Sp. This condition can raise the question of whether the secondary metabolic chemical compounds present in Eucalyptus plantations are residues or residues sourced from natural forests.

For this reason, it is necessary to investigate the implementation of land clearing and the process of planting Eucalyptus Sp. Leaching of chemical secondary metabolites has occurred. Secondary metabolites that exist in natural forests are left in the soil where Eucalyptus grows. It can occur when the land clearing and planting process (leaching) are small but generally with a secondary metabolic leaching process that has been washed in extreme can be lost / totally washed.

Secondary metabolic chemistry in Eucalyptus Sp plantations is the result of chemical processes in litter of Eucalyptus plants where this situation is supported by several previous studies which stated

allelopathy (secondary metabolic) in Eucalyptus leaves as in the results of Audina, M. (2017). The leaves of Pelita Eucalyptus has a potential to be used as bioherbicide because it contains allelopathic substances to suppress the growth of the number of weed leaves of *Cyperus brachyfolius* and *Eleusine indica*, damaging the weeds of *Asystasia intrusa*, *Borreria alata*, *Cyperus brachyfolius* and *Eleusine indica*. Ayepola And Adeniyi (2008), states that the Eucalyptus Pelita is a family of *Myrtaceae* which contains secondary metabolite compounds in the form of tannins, saponins, phenols and glycos. Woody plants reported as allelopathic include Eucalyptus (Junaedi et al., 2009 in Audina M. 2017). The leaves of Eucalyptus Sp also contain allelochemical terpenoids and contain active compounds such as phenols which can inhibit germination and early stages of plant growth (Gracia et al., 2008).

This study shows that secondary metabolite compounds in Eucalyptus Sp plantations are the result of chemical processes such as from Eucalyptus Sp litter, because leaching has resulted in the loss of chemical secondary metabolites from natural forests.

4 CONCLUSION

The chemical content of secondary metabolites from the quality test results found in the place of Eucalyptus in the form of terpenoids and saponins while in natural forests in the form of terpenoids, saponins and alkaloids.

This study shows that secondary metabolite compounds in Eucalyptus Sp plantations are the result of chemical processes such as from Eucalyptus Sp litter, because leaching has resulted in the loss of chemical secondary metabolites from natural forests.

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