International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

The Effect of Arbuscular Mycorrhizae Fungi Toward The Nutrient Availability of the Gandaria's Rooting(*BoueaMacrophylla*) in the Different Height Places from the Sea Surface in Ambon Island

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Abstract: ***Mycorrhizae was fungi which lived in mutualism symbiosis with its host plant, especially on the plant's roots with the complex structure that can help the plants in absorb the nutrients from the soil.Variation of Environmental condition in Ambon Island can allow the great variety of mycorrhizal species composition on the landscape. Therefore, this study aimed at 1). determine the species composition of mycorrhizal on the Gandaria plant's root (Boue macrophylla); 2). determine the availablity of Nitrogen, Phosphorus and Potassium content; 3)determine the population of mycorrhizal relationship with the availability of the nutrient elements. The research activity used thesurvey method based on the sampling (excerpts), including about 9 villages in 3 altitude from the sea surfaces, namely 0-400 meters: height of 400-700 meters; height above 700 meters which was the object of a study to determine the number of FMA spores. Result of the study showed if the arbuscular mycorrhizal genus that had founded is classified into two genus such as Glomus andScutellospora. The highest number of arbuscular mycorrhizal spores is obtained in the Poka village about 216 spores/100grm, Hatiwe Village about 389spora/100grm, Hutumuri village 336spora/100grm. In the Soya village is founded about 115 spores/100grm, Kusu-Kusu village about 118 spores/grm, Mahia Village about 146 spores/100grm, Waai Village about 210 spores/100grm, in the Tuni village about 40 spores/100grm and Hatalae Village about 173 spores/100grm. There was a significant relationship between the number of simultaneous mycorrhiza population with the nutrient availability of Nitrogen, Phosphorus and Potassium on the 3 altitudes.***

Keyword: Arbuscular MycorrizaFungi, Hara, *Bouea macrophylla*,altitude from the sea level

1. Introduction

Ambon island geographically are composed by two peninsulasnamely Leihitu and Leitimur peninsula. both of these peninsulas were very overgrown by the local species (endemic) that its presence is abundant in the protected forests. One of the most local plant species tha most dominate in this area is Gandaria (Bouea macroplylla). This plant has an important role in protecting the forests in Ambon islandnamely as a hydrological, flood prevention, and erosion, and maintain the soil fertility. The Gandaria plants can be used as a conservation plant because it has crown shape that lush,compact and the well-developed root system as well as strong to prevent the erosion (Tangkuman, 2006 in Taihuttu 2013). The soil type that overgrown by the Gandaria is the alluvial and kambisol soil kind. The Gandaria plant (*Bouea macrophylla* Griff) is the one of special annual fruit plants that needed to cultivated because it was very beneficial, both economically and ecologically.

Gandaria was a Maluku tropical fruit plants that very specific and known as an*exotic fruit* (Rehatta 2005 in Taihuttu 2013). One of the advantages of this plant wasgeographically able to grow naturally in a wide range of altitude from the sea level on the critical land condition, with the very poor nutrient and soils that have a acidity soil that was acidic. Nevertheless, the Taihuttu's result, (2013) described in Ambon island, the Gandaria plant can grow and produce well. One of the factors that played a role in the propagation andexpansion of this plant was the suitability characteristic of theland because the environmental factor was the supporting factor or limiting factor.

It is widely believed that one factor that was influencing the growth and spread of Gandaria everywhere is arbuscular mycorrhizal fungi (AMF). Because the arbuscular mycorrhizal fungi (AMF) can be found virtuallyin all ecosystems, including in the acid land (Kartika, 2006) and alkaline (Swasono, 2006). According to Smith and Read (2008), the AMF may be associated with nearly 90% of plant species. However, the diversity of AMF species composition and population level is influenced by the characteristics of the plant and environmental factors such as temperature, soil pH, soil moisture, content of phosphorus and nitrogen, as well as the concentrations of heavy metals (Subiksa, 2000).

Absorption of various mineral nutrients can be done either by mycorrhizal and it have a broader absorption surface, when compared with the roots of no mycorrhizal plants. Mycorrhizae roots help P can dissolve more of the roots without mycorrhizae, because mycorrhizal hyphae in rooting risosfer will help absorb P in the soil matrix where the roots which is an extension of absorption roots that can not absorb. Therefore mycorrhizae help the plant roots absorb nutrients, especially P. Element P has an important role in plants, especially in the biochemical processes such as ion removal, work osmosis, photosynthesis and glycolysis reaction (Prasetya, 2000). Difference in altitude above the sea level caused the species composition of microorganisms in the soil are quite varied, among which mycorrhizal (Elfiati and Delvian, 2007).

Some microorganisms such as fungi-Mycorrhizal Fungi (AMF) is known to increase absorption of P by plants. Besides being able to increase the absorption of P, Fungir-

arbuscular (FMA) is also able to increase the absorption of other nutrients that available in soil and water, biological control, resistance to drought and protects plants from toxicity of heavy metals, and pathogen roots'attack so can help the plants on the soil conditions are less favorable. In addition, Fungir-arbuscular (FMA) also can produce hormones and growth regulators (Setiadi, 2001).

The use of biological agents on the FMA as Gandaria plants are now starting to get much attention. This is not only because of its ability in symbiosis with plant roots Gandaria, but the main one is the FMA plant Gandaria can help in improving the efficiency of nutrient absorption. Besides, the FMA is also able to conserve land resources, whether physical, chemical, biological or biology so that the balance is always maintained. Likewise, information on potential utilization in acidic soils are overgrown by Gandaria in altitude from sea level are different, not much is known. Thus necessary to study the effects of arbuscular Mycorrhizal fungi on the availability of nutrients in the rooting Gandaria in different height from sea level on the island of Ambon.

This study aims to determine (1) what kind of Fungi-arbuscular mycorrhiza (FMA) populations that are able to provide the availability of nutrients in plants Gandaria; (2) to know the relationship the number of Mycorrhizae population with availability of nutrients in Gandaria plants

2. Material and Methods

The materials needed are on Melzer's soil samples and 70% alcohol. The tools used were a sieve (sieve) of land, a petri dish, binocular microscopes, digital centrifuge, team-ment, GPS (global positioning system) and a small shovel. This research was conducted in two phases, namely:

1. Stages Research
The first stage was assessments doing of potential isolates FMA indigenus on plant growth areas Gandaria at some height above sea level on the island of Ambon, namely (400m asl lowlands, plains medium 400-700m above sea level, and the plateau above 700m asl). Its purpose is to obtain information on the type of soil where Gandaria plants grow.

Research activity used survey methods based on sampling (excerpts) thatinclude of 9 sampling points namely at a height of 0-400 meters include Poka Village, Village Hatiwe, Hutumuri village. At an altitude of 400-700 meters include Soya village, the village of Kusu-Kusu, Mahia village and at an altitude of 700 meters above the village include Waai village, the village of Tuni and Village Hatalae which is the object of a study to determine the number of spores FMA.

2. Inventory Number and Type Spores Fungi Mycorrhizal Arbuskula
For the purposes of calculating the number of spores FMA, materials analysis such as soil and root samples taken under vegetation that grows naturally after hoarding at a depth of 0-60 cm of the soil surface. Sampling is done by determining the sampling points that used *milliacre sampling* with followedazimuth 0° or 360° for determination of observation points. every point (1, 2, 3) is determined to follow the azimuth of 0° or 360°, with first point as an outermost observation point based maps of land (Tallent-Halsell, 1994) and determining the third point as an observation point that represents the center of the land using GPS based coordinates contained in the map area, followed by determining the two points that lie between one point and three points. The sample is a composite of four replicates at each point of observation. Each performed the sampling, a small shovel cleaned with 70% alcohol, in order to avoid contamination between samples and each sample bag is marked with a code location and date of capture. FMA spores obtained by extraction of 100 gram samples of soil and roots using wetsieving method of Gerdemann and using centrifugation techniques (Brundrett et al. 1994 Yovita, 2008). modified. Spores were later identified manually by shape, color, additional structures and reaction to Melzer's solution (Schenck, 1982 in Nurhidayati et al., 2010) to then calculate the spores according to the identification result.

3. Results And Discussion

3.1. The state of soil in the Rooting Gandaria area

Ambon Island is part of the Banda arc, but the nature and composition of the constituent materials are very different. Compiled by two Leitimur and Leihitu peninsula that is connected by a narrow land, and is part of the Central Maluku regency Maluku province and Ambon city. Based on Geological and Topographic Map, Ambon island prepared by the parent material alluvium and coral, with a sandy rock consisting of crystalline grains that are rich in iron. Constituent minerals are plagioclase, muscovite, pyrite, rutile and iron hydroxide (Monk, 2000).

Results of soil analysis is based on "Soil Taxonomy" (Soil Survey Saff, 1990 in Waluyo, 2013) that the land is used as a sample in this study belong to the order Vertisol, Aquerts sub order, great group and subgroup Vertic Endoaquerts Endoaquert. This soil type is characterized by a very smooth texture, slow permeability, soil color gray, red, yellow, impeded drainage and cracks.

Protected forests in Ambon island has an area of 253.82Ha, which consists of a stretch of forest land from the coast to the mountains with a rather sharp peaks and ridges and slopes with a slope is more than 45^{o}. This area generally consists of podzolic soil and surrounded by terraces outcrops of coral reefs and coral fragments that remove water formed small rivers flow in addition there are several other sources of water large enough. Results of soil pH value measurement in the lowlands average of 5.73, in plain medium average of 6.30, and in the highlands of the average 6.46 (Tabel.1).

The pH value of the soil around the roots Gandaria qualitatively is sour on the lowlands that increasevalue in the medium and highland plains. However, this increase did not affect growth Gandaria plant to grow normally. Similarly, the activities of community activities in the forest will not affect the soil's pH value, as the opinion of Brady et al, (1982) in Santosa, (2000), that are naturally the pH value is strongly influenced by the material of its parent and the

process of pedogenesis that shape from external influences other ,

The low pH value of the soil on the land around the roots Gandaria when associated with conditions Ambon island which has high rainfall is one of the causes of low soil pH value. The acidity of the soil commonly found in all regions with high rainfall, so it is quite a lot of bases can be swapped in the surface layer of soil, and wetness occurs when a relatively high degree of base saturation. There is also a carbonate salts, especially calcium, magnesium and sodium ions OH also provide greater number of H ions in the soil solution (Santosa, 2005).

Generally, Ambon Island are generally composed of ground Podsolic in which according Santosa, (2000), these soils poor in nutrients or low fertility rates because less containing N, P, K, C, and Mg. It has acid character with 4-6 pH and low organic matter. The low Availability of nutrients in the research site, qualitatively it is not influenced by the activity of the community, but naturally by soil-forming material. Achmad, (2014) describes the low nutrient available at the location of public forests, it can be caused by soil parent materials derived from sedimentary rocks that are chemically sour already poor of nutrient. Much more soil acidity in the research area is high enough so that the available nutrients, especially P. existing in the soil bound by Aluminium. This is quite reasonable because the results of the analysis of soil pH conditions at the study site, acidity is also quite high, namely 5.6 - 6:46.

3.2. The Result of Mycorrhizae Analysis On Rooting Plant type Gandaria In Different Altitude of Sea Level

Mycorrhizal types found around the roots of Gandaria trees in three heights on the island of Ambon in the lowlands is a species Glomus the number of spores / 100 g soil varies. Mycorrhizal types were found Genus species Glomus and Scutellispora. Mycorrhiza analysis' results are presented in Table 1.

Table 1: Results of Analysis of Total Population Type Mycorrhizae On Rooting Plant Gandaria In Different Altitude Ambon Island

No	*Heightcode*	*The village name Sampling Mycorriza*	*kind mycorrhizae*	*Amount Mycorrhizae spores / 100 g soil*
1	Low	PokaVillage	Genus *Glomus*	216
		HatiweVillage	Genus *Glomus*	389
		HutumuriVillage	Genus *Glomus*	336
2	Medium	SoyaVillage	Genus *Glomus*	115
		Kusu-kusuVillage	Genus *Glomus*	118
		MahiaVillage	Genus *Glomus*	146
3	High	WaaiVillage	Genus *Glomus*	210
		TuniVillage	Genus *Glomus*	40
		HatalaeVillage	Genus *Glomus and Scutellispora*	173

Based on the results of the isolation and identification by wet sieving (wet sieving mod decaunting) to sample soil on the roots Gandaria podsolid found two genera, namely *mycorrhiza Glomus* and *Scutellispora*. Glomus genus generally have hifa characteristics along the relatively straight and branched root cortex layer, its hifa staining is relatively difficult, the vesichel is oval shape, it is always formed between the cell cortex. These vesicles are in the roots and often develop swollen and has a spore walls are layered. On the surface of the spore wall, there are remnants of the walls of hyphae and holes on the surface of which can be seen through a transverse incision spores.

Glomus sp. is a mycorrhizal species that has spread most predominantly found as of 1743 the population was found in nine study sites most common species found is a type of Glomus sp. This suggests that the ability and adaptability Glomus symbiosis with roots of Gandaria plant is wider when compared to the genus Scutellispora which found only in one location the village Hatalae. The high frequency of the presence of mycorrhizal spores with Glomus sp species is related to the type of Glomus very commonly found than other types. As reported by (INVAM 2008 in Hartayo 2011) that the number of individuals who have been identified known species Glomus was the most dominant species in the genus to another. In addition to broad distribution, which dominates the presence of Glomus sp is also associated with the texture of the soil conditions in both locations, where the texture at two locations namely sandy clay loam and clay dusty gray. Podsolid texture red-yellow clay is a condition in accordance with the development of Glomus spores. As proposed by Baon (1998) in Hapsoh (2008) which states that the land is dominated by clay fraction (clay) is the appropriate conditions for the development of Glomus spores and on sandy soil.

Genus Scutellispore, According to Setiadi, et al (2001) is generally characterized by a smooth hyphae are often located in the cell, branching hyphae form together with Acaulospora. But hyphae in the cortex generally have smooth walls and a darker color, non interval-vesikel, branching hyphae are usually longer and thinner than Glomus hyphae. Branching looks like blobs because it has long branching bend.

Results of research conducted by Sintya Goddess, (2014) Glomus also found in the grass reeds that have the structure of mycorrhiza by staining with a solution of trypan blue. It showed that the structure of mycorrhizal apparent that mycorrhizal in grass roots structure vesicular, and hyphae internal , Glomus Mycorrhizae spores are found also in around the roots Gandaria overgrown by reeds and Cassava plants in various high places of the sea surface. The observation based on field conditions which is quite different between regions in three heights, the average natural conditions on the plains and plateaus medium is protected forest areas with dense forest conditions and seemed fairly high. This seemed to play a role in maintaining the stability of the soil physical and biological, and also contributed largely to the decomposition of nutrients as well as to increase mycorrhizal.

Increasing the number of mycorrhizal spores is very helpful supply of essential nutrients, especially N, P, K less available around the roots of Gandaria. As it is known that these elements play an important role in the process of forming Gandaria's fruit (generative) than vegetative

growth. According to Santosa, (2005) serasah also play a role in balancing the litter soil stability and biological balance. This proves that mycorrhizal fungi is one of mycorrhiza-forming fungi are spread very widely in the world ranging from desert, temperate, tropical and can associate with more than 90% of the crop is in the earth (Rao, 2007).

The presence of mycorrhizal symbiosis with plant roots of Gandaria greatly helps in the absorption of nutrients and water. Setiadi, (2003) explains that the roots of plants with mycorrhizal symbiosis can increase the capacity of plants to absorb nutrients and water. It also serves as a biological control and improve resistance to drought. Further it is also described by Setiadi, (2001) nutrient content would be devastating not only to the plant, but also to the process and development of mycorrhizal infection.

Glomus dominant existence in this study is consistent with the amount of spores that have been identified in the "Manual for the Identification of VAM Fungi" (Schenck, 1982 in Nurhidayati et al., 2010). More the number found spores of Glomus clan and other clans like Scutellispora shows that mycorrhizal fungi is strongly influenced by soil temperature, pH, intensity of solar radiation and nutrients. Spore genera Glomus and Scutellispora have durability high enough to be able to live and thrive in different soil types and environmental conditions (Salim and Hidayat, 2003).

Although the fertile soil determines the wealth of mycorrhiza, but this is not always the case, because a lot of other things that more supportthe existence of a population of mycorrhizae. According to Hanafi (2005) plants growing in fertile soil do not always have many mycorrhizae populations than plants that grow in infertile place. This is evident in the discovery of a population of mycorrhizal pretty much on rooting Gandaria in the jungle island of Ambon generally consist of a red-yellow podzolic soil, especially at the study site, has the presence of nutrients that are so very low and varied.

Facilities nutrient uptake by mycorrhiza is a priority in the improvement of crop production, especially ectomycorrhiza against forest plants. Mycorrhizae assist plant roots absorb nutrients and can be stimulated and the addition of N, especially in soils deficient in P element lands podzolic soil (Santoso 2005). This situation is a very big advantage for plants Gandaria as one forest plants that have a high population density and the growing spread on the island of Ambon in podzolic soils.

3.3 Description of Data Analysis Nutrient Content On Rooting Gandaria In Different Altitude Ambon Island

3.3.1. Nitrogen Available

The analysis of the range of N total around rooting Gandaria in three heights on Ambon island is low, because according to the standardization of the range of values Harkat Nitrogen in the soil raised by Achmad, (2004), the range of values the dignity of <0.1 considered very low, although the plant Gandaria grow large and fertile. Smith and Read, (2008) stated that the nature of tropical rain forest soils are poor in nutrients though in this forest found large trees and lush.

Another cause of low Nitrogen in the area around the plant roots Gandaria, also suspected because of the harvest which repeatedly lead to the elements available Nitrogen be absorbed by plants. Hanafi, (2005) explains the high nitrogen loss can occur through the transport of the harvest, when the harvest is done several times a year. This statement is quite reasonable because Gandaria plant on the island of Ambon is a wild plant that grows without maintenance and fertilization as well as having a long enough harvest time which is about four months a year namely from March to June.

Besides, when viewed from the field conditions, the low value of the total N in the forest on the island of Ambon suspected due to natural factors such as fixation as well as by the bodies of certain microorganisms. But also the availability of Nitrogen also influenced by environmental conditions around the roots of Gandaria. N loss rate is quite high due to the nature of N that very mobile. According Hardjowigeno, (2007), the loss of nitrogen in the soil due to the use by plants or microorganisms, in the form of NH4 + N can be bound by a mineral clay wrap so it can not be used by plants. N easily washed by rain water (leaching), and experience the process of denitrification when in a state of stagnant water, berdainase bad, and bad air system.

Table 2: Results of Content of Soil Nutrient and pH Analysis On Rooting Gandaria In Different Altitude on the island of Ambon

No	High code	Village name-Mycorriza Sample place	Nitrogen Total (N.total) %	Fosfor (P. Bray^2) mg kg-1	Kalium NH4OAC1N pH:7 Me/100 g	Soil pH
1	Low	Poka Village	0.09	3.61	0.19	5.6
		Hatiwe Village	0.09	2.06	0.18	5.7
		Hutumuri Village	0.09	2.06	0.19	5.9
2	Medium	Soya Village	0.09	0.54	1.22	6.1
		Kusu-kusu Village	0.06	0.54	0.71	6.3
		Mahia Village	0.07	2.14	0.82	6.5
3	High	Waai Village	0.08	0.53	0.80	6.5
		Tuni Village	0.05	0.59	0.26	6.4
		Hatalae Village	0.08	2.25	1.26	6.4

It is also described by Syekhfani, (2000) nitrogen available in the soil is influenced by climate, vegetation and topography. Climate plays an important role in the activity of plants and microorganisms plants. Increased nitrogen in

the soil due to biological N fixation by plants. Nitrogen is an essential nutrient that most lostin the land, especially from the range area of plant roots. In good environmental conditions, two-thirds of the amount of nitrogen that is given is lost through leaching and denitrification.

Although total nitrogen in the soil around the roots Gandaria qualitatively and quantitatively low but it will not affect the Gandaria plant. Because of the low nitrogen content in the soil around the roots of Gandaria due to initial conditions Nitrogen which is already low. The addition of the leaves Gandaria will not add nitrogen content in the soil, because of the possibility of organic matter from leaf Gandaria that very poor about Nitrogen

3.3.2 Phosphorus Available

The analysis of the range of P available in three heights on the island of Ambon on average is low, because according to the standardization of the range of values available in the soil P. (London, 1984) raised by Achmad, (2004), the range of available P value <4 classified as very low, although Gandaria plants grow large and lush. Smith and Read, (2008) says that the nature of tropical rain forest soils are poor in nutrients though in this forest found large trees and lush.

The low availability of P elements in the study site, qualitatively and quantitatively not affect Gandaria plant, because it is naturally caused by the soil-forming material. Hanafiah (2005) explain the low availability P elementsat the location community forests that are not exploitative can be caused by soil parent materials derived from sedimentary rocks that are chemically sour already poor of P elements. Moreover soil acidity in the study area is high enough so that the P elements which is in the land bound by Aluminium. This is quite reasonable because the results of the analysis of soil pH conditions at the study site, acidity is also quite high, 5.73-6.46.

Observation based on field conditions, low nutrient content P. location research on the soil around the plant roots Gandaria thought to be caused also by Gandaria's saplingplants capability around the mother plant which absorbs a high P element in its infancy. Because, at the age of puppies, Gandaria actively do cell division in the growth so absorbing element P. high. Santoso, (2005) explains, the low P. elements on forest plants caused also by the number of tillers comparison sizeable plants around the mother plant resulted P. elements absorbed by the needs of cell division in the growth of saplings. Because phosphorus is an element important in cell division, and also for the development of the plant meristem tissue. Thus, according to Hanafi, (2005) phosphorus can stimulate the growth of roots and plants easy, accelerates flowering and ripening fruit, seeds, and as a constituent of fat and protein.

Another cause of lower P. elements around the roots Gandaria also influenced by the availability of the decomposition of organic matter in the soil around plant roots Gandaria. Santosa, (2000) suggests the input of organic matter is essential to increase the availability of residual phosphorus utilized by soil microbes, thus mineralization will increase and the release of organic soil. Organic material will decompose CO2 due to increased respiration of microorganisms would enhance the carbonic acid thus decreasing soil pH and P availability will increase Kissel et al (in Praktikno, 2001).

3.3.3. Potassium Available

The result of range of K. available analysis in three heights on the island of Ambon on average is low to high. According to the standardization of the range of values K. available in the soil, according to Achmad, 2004), the range of values K. available <0:25 classified as very low. This condition is found in the lowlands. To 0.25-0.5 classified, found in the plain medium, and> 0.5 is high are found in the highlands.

Low K. available on lowland presumably related to the field conditions which generally consists of sandy soil texture and consists of rocky ground. According to Achmad (2004) that in practice, the problem of potassium can be detected through soil conditions. Generally soils Potassium deficiency is likely to experience the texture of sand, limestone parent material (kalkareous), surly parent and poor of material K, or lands suffered further leaching. Because potassium is the element that is most susceptible to the washing whenever possible, especially on acidic soils (Syekhfani, 2000).

Other factors that also affect the lower element Potassium around the roots Gandaria in the lowlands, according to Santosa (2000), low potassium in forest plants can be due to the amount of potassium in the soil that can be exchanged at any time, often amounted to little because most elements firmly attached by adsorption complex that it is difficult available for plants. Besides the ability of plant roots are able to absorb Gandaria in large quantities.

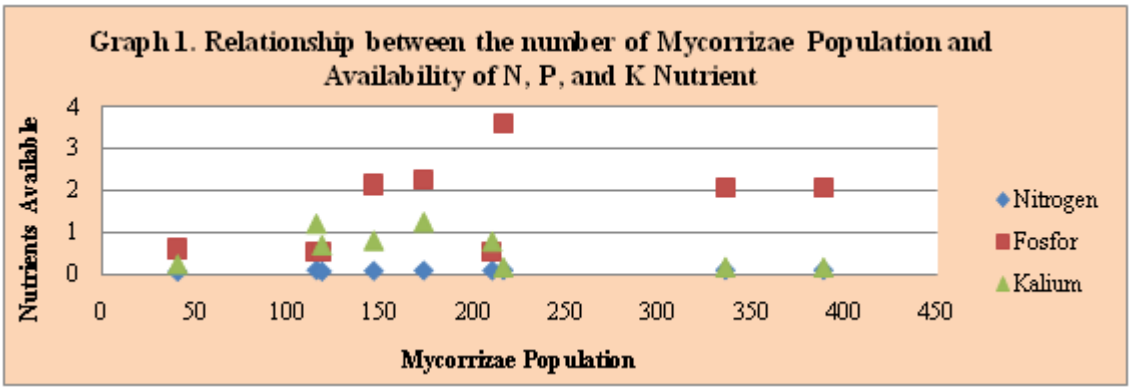
On other way, the high element of potassium in the soil around the roots by (Ahmad, 2004) often occurs fairly high potassium availability of the amount needed and are in a state of excessive (loxurius consumption). K character is very mobile that can be reused for young tissue growth. It is good to Gandaria in the growth of saplings.

3.3.4. The Results of Relationship Analysis of Total Population Mycorrhizae With Nutrient Availability on Plant Roots Gandaria

Results of Mycorrhizae Population Analysis and Content of Nutrient in Rooting Gandaria plant in Ambon island is quite varied at various heights above sea level, it is shown in Table 3 and Figure 1. Results of multiple regression analysis simultaneously among a population of mycorrhizal with nutrients Nitrogen, Phosphorus and Potassium showed a significant relationship

Table 3: Results of Population Analysis and Content Type Mycorrhizae Rooting Plant Nutrient at Gandaria

No	High Code	Village name-Mycorrizae Sample place	Total of Mycorrhizae Spora/100 gram of soil	Nitrogen Total (N.total) %	Fosfor (P. Bray^2) mg kg-1	Kalium NH4OAC1N pH:7 Me/100 g
1	Low	Poka Village	216	0.09	3.61	0.19
		Hatiwe Village	389	0.09	2.06	0.18
		Hutumuri Village	336	0.09	2.06	0.19
2	Medium	Soya Village	115	0.09	0.54	1.22
		Kusu-kusu Village	118	0.06	0.54	0.71
		Mahia Village	146	0.07	2.14	0.82
3	High	Waai Village	210	0.08	0.53	0.80
		Tuni Village	40	0.05	0.59	0.26
		Hatalae Village	173	0.08	2.25	1.26



Results of multiple regression statistical analysis showed a significant relationship between the number of simultaneous mycorrhiza population with nutrient availability either partially or simultaneously. It can be interpreted that the large number of mycorrhizae population has a strong relationship with the availability of nitrogen, phosphorus and potassium for plants Gandaria. Partial mycorrhizae provide enough influence With the symbiosis between mycorrhizal fungi with roots Gandaria can help plants Gandaria in the absorption of nutrients, given the nutrients N, P and K soil at three altitude plateau, with an average concentration is below the standard that set.

A significant relationship between the population of mycorrhizal and availability of nutrientis also showed by the number of individuals found in the village of Hatiwe also higher than other villages. The high number of individuals were found to be influenced by several factors such as the content of N, P, and K. From the measurement results womb, N and K in the village Hutumuri higher than Hatiwe village. Low nutrient availability will optimize the mechanism of action of mycorrhiza by expanding the area of the absorption of nutrients, whereas if the high nutrient availability can reduce the number of spores. Hayman, (1975) in Astuti, (2000) say that the high soil N content can reduce the number of spores, this is due to the high content of nutrients that will cause the mechanism of action of mycorrhizal be decreased conversely a low nutrient content will optimize the work of mycorrhizae. As noted by Smith and Read, (1997) in Yassir, (2006) that the low availability of nutrients resulting in increased colonization of mycorrhizae in root crops and the production of spores.

Unlike the nutrient content of N and K, the content of P in the village of Poka is higher than other villages. Phosphorus in the soil contained in the form of orthophosphate, organic P and P inorganic bonded with Fe, Al, Ca, and other soil minerals. There are a number of 2-5% phosphorus in the form of orthophosphate and most nutrient phosphorus in the form unavailable transform plants (Tisdale et al., 1990 in Yulianitha, 2012). In conditions that are not available phosphorus, mycorrhizal colonization quickly formed. This is due to mycorrhizal infection is the main function of the absorption of phosphorus in the form is not available or phosphorus absorbed clay particles (Moose, 1997 in Yulianitha, 2012). If the phosphorus in the form is not available, mycorrhizal hyphae will issue a phosphatase enzyme to release phosphorus into a form available so that phosphorus can be absorbed by plants. Associated with the phosphorus content, mycorrhizal activity is optimum in soil whichnutrient is not available compared with nutrient sufficient available to plants.

Besides, mycorrhizae are able to improve soil structure improvement around the roots of Gandaria. Since the development of the mycelium can improve the balance of the biological and physical soil (Elfiati, 2007). As we know that nitrogen plays an important role in the formation of the fruit (generative) than vegetative growth (Pfeger and Liderman, 1994 in Diastama, 2015). Mycorrhizal fungi is a kind of symbiotic soil fungi that can be mutualism with various types of agricultural crops, plantations, forestry or grass. Mycorrhizal symbiotic association involving three important components of host plants, growing media and mycorrhizal fungi itself affect each other and establish a system of mutual support. In the association mycorrhizal fungi provide nutrients for plants, while the plants provide nutrients such as mycorrhizal fungi fotosintat for life, resulting in the recycling of nutrients in nature which can maintain soil fertility. The role of mycorrhizal addition to the improvement and plant nutrient cycling, resistance to drought, soil borne pathogens, are synergies with other

microbes, it also improves the stability of natural ecosystems (Setiadi, 2001) and lower levels of heavy metals (Adinurani et al, 2001).

4. Conclusion

a) Potential-arbuscular Mycorrhizae Fungi (MFA) in the root of Gandaria plant is dominated by Glomus sp and sp Scutellispora
b) Type mycorrhizae are found around the roots of trees Gandaria in three heights on the island of Ambon in the lowlands is *Glomus* Species, Glomus species in mediumlands and it is Glomus species and Scutellispora in highlands.
c) There is a significant relationship between the biological environment simultaneously in this population of mycorrhizal with chemicals in the environment of this nutrient, which proves that the population of Mycorrhiza has a very strong relationship with the availability of nutrients.

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