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Diversity And Mapping Clove Varieties (*Syzygium Aromaticum*) On Hiri Island, In Ternate Municipality

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Abstract : *Hiri Island is part of Ternate City of North Maluku Province. On this island, clove trees have existed for a long time. As a herb of indigenous Indonesia, Cloves become an important part in the life of Ternate City residents. This study aims to obtain data on the diversity and spread varieties of clove in each village on Hiri Island. The method used was survey and clove plant interview to clove tree owner in each village and observation of clove plant directly in the field. Each clove in the village was recorded covering the area, type of varieties, production, and documented. The results showed that cloves in Hiri Island were found in all villages with a both of polyculture and monoculture planting pattern. Most cloves are in the Faudu area, which is the area recorded 15 hectares with 350 trees that have a production of six tons. Varieties of cloves obtained in the Hiri Island is Zanzibar, Afo, Siputih, and Posi-posi.*

Keywords: *clove, hiri island, syzygium aromaticum, ternate*.

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I. INTRODUCTION

Clove is an important crop in Indonesia. In the province of North Maluku, cloves are one of the contributors of economic commodities that are highly calculated besides Coconut, Nutmeg, and Cocoa. Recorded data of clove production in 2016 is about 4,484 tons [1]. Clove has been known for a long in the world time and It is known to originate from Eastern Indonesia that is the small island of Maluku that known as Spice Islands [2], [3]. It is possible referred to Ternate and other closed islands in North Maluku provinces. Here, Clove is found on almost every island. In main islands such as Halmahera, Sula, Bacan, Tidore, Ternate and even small islands. One of the small islands is Hiri Island, where the clove exists.

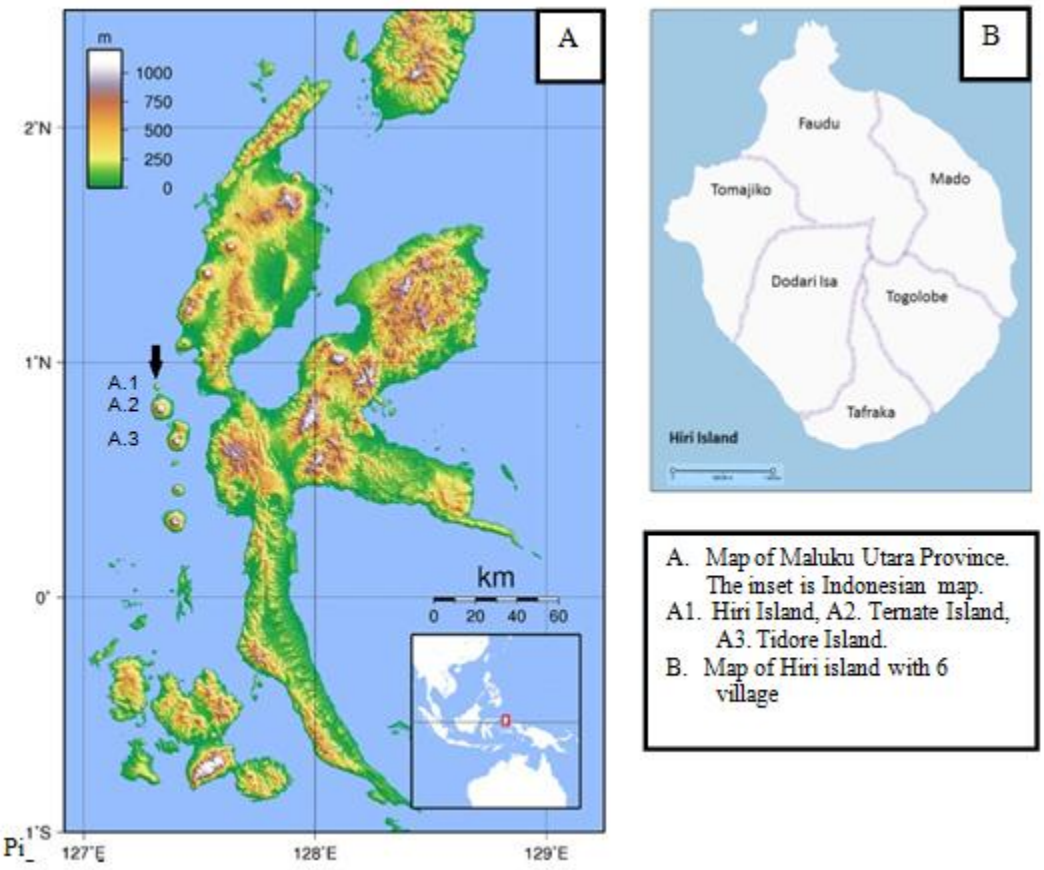
Hiri island is a sub-district of Ternate municipality and it has been the important part of Ternate. Similar to the island of Ternate, the life of the inhabitants of Hiri Island has also been familiar with clove plants. This plant is an important part of the island's economic commodities. Hiri Island also contributes economic income for Ternate City through clove production every year. The sustainability of access to Hiri island and its limited facilities caused the island to tend to be isolated [4]. The only access is to use a motorboat from Sulamadaha Beach, Ternate.The land area of Hiri Island is about 6.70 Km square, with a population density of 466 people per Km. Based on the observation of satellite maps, more than 80% of the area is still non-residential land and dominated by green tree cover. This can be a potential cultivation of plants that have high economic commodities including cloves. In 2016 the production of cloves Ternate city fell to 13% [5]. This is because there are about 1476 clove trees that died burning during the drought in 2015 in nine villages on the island of Ternate [6]. But it does not affect clove production from nearby islands, including Hiri Island, and Hiri Island remains a contributor to clove production during the year.

Clove benefit research has been much, one of which is summarized in the publication of cloves as a champion spice [7]. Clove is also known to have antibacterial activity [8]; Clove (Syzygium aromaticum) is a plant-derived Spice that has been traditionally used as a natural medicine for the treatment for various ailments including dental diseases [9]. But research on the exploration of nature and its wealth on Hiri Island is still very limited. Some research publications conducted around Hiri Island are generally focused on the waters around Hiri Island, such as research by Patty et all that published in 2016 [10].It was about the mapping of seagrass condition in the waters of Ternate, Tidore and surrounding areas; Dharmawan and Purnomo in 2012also published a research on the diversity of mangrove species [11]. There is no detailed data on the amount and production of cloves on Hiri Island, but in daily life can be observed the role of clove plants in the community in the use and harvest of cloves in clove harvest seasons. Type of clove varieties contained in Hiri Island also no clear information. Therefore, this study aims to provide data on clove plants found in Hiri Island from the

amount, an area of land, clove varieties, to plant kinship between accessions located in Pulau Hiri if connected with clove Ternate and Tidore or the surrounding islands.

This data is very important as a database and reference for further studies for the development of clove plant on Hiri Island. The results of this research as a conservation effort of cloves in North Maluku as the origin of clove plants. Based on this information, the potential of clove plant germplasm from Hiri Island is very possible to produce a superior clove that possesses wide adaptability of specific site-specific seeds.

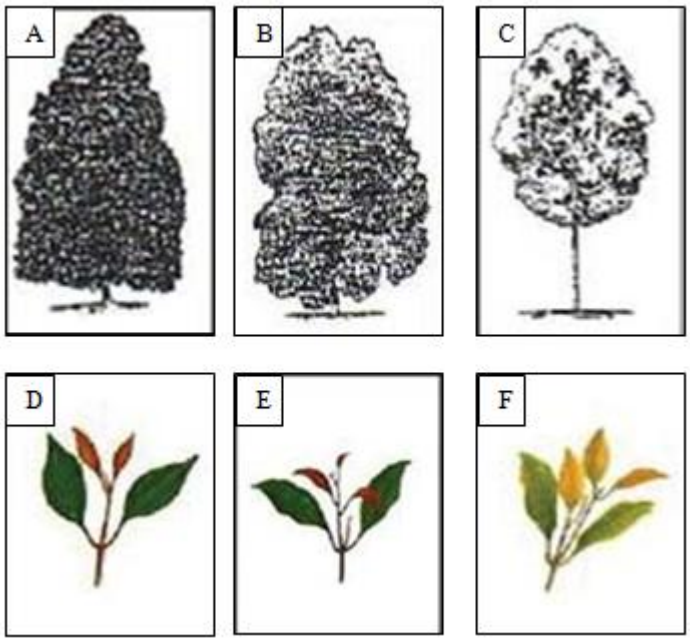
II. Method, Material, And Location



Pig 1. Map of Research Location

The research was located in Hiri Island, a very small island in North Maluku, from May to June 2018. It has 6,7 km square wide and consists of six districts. The capital is Faudu. In picture A: the inset is Indonesian map and the red circle is North Maluku provinces that have about 805 islands. The biggest one is Halmahera island (picture A). On the left side of Halmahera island, there are some islands, three of them are Hiri island, Ternate island, and Tidore island respectively are the sign with A1, A2, and A3 on picture A. Picture B is the map of Hiri island as part of Ternate Municipality. It has a diameter of about 3 km or the area is about 7,06 km square. It is two km from Ternate Island.

The data taken is the data of clove plant potential consisting of diversity and spreading onHiri Island. Methods of data retrieval is done by survey, inventory and identification type clove varieties are recorded. Further data is processed in biology laboratory of FKIP University Khairun. The identification of the number of clove trees was calculated based on a rough estimate of each observation point consisting of one major observation point in each village. Type varieties are identified based on the shape of the branches, the shape of the crown of the canopy and the shape and color of young leaves. The morphological data collection of specimens is done by direct morphological observation. Identification of clove varieties refers to clove cultivation guidance by Wahyuno and Martini (2012) [12] that was modified. The shape of the crown and the shape of the young leaf tip of each variety that is already commonly illustrated in FIG. 2



Pig 2. Character of Clove Varieties. A-C Type of foliage Shape, D-F Color of bud (leaf), A & D is Zanzibar Clove; B & E Sikotok; C & F, Siputih (Modification from Wahyuno and Martini, 2015) [12].

III. Result And Discussion

3.1. Data Spread of Clove on Hiri Island

Cloves on Hiri Island are found in all Villages. As part of the spice islands, the island of Hiri is an important part in the history of clove growing. Cloves are estimated to originate from Indonesia, this is reinforced by the oldest clove tree in Ternate, located in Marikurubu. In addition to cloves, other members of the genus Syzygium also allegedly many originated from Indonesia. Even some recent studies have found five new species of the genus Syzygium in the Territory of Indonesia namely in Sulawesi [13]. It is estimated that on the Maluku Islands there are still species of the genus Syzygium that have not been identified.

The distribution of clove trees and trees area on Hiri Islandin every villages is relatively same. The amount of production is only predicted based on the results of each tree. During the interview, there are trees that produce wet flowers when picking up to 40kg while the other tree only up to four to ten kilogram. The following is the data of the area of clove plantation and the number of trees in each village with the production of cloves every harvest.

Table 1. Area, total of trees and total production of clove in every distric on Hiri Island.

NO	NAME OF DISTRICT	AREA OF CLOVE (Hectare)	TOTAL OF TREES	TOTAL PRODUCTION
1	Mado	4	92	3,5
2	Dodariisa	6	157	5,0
3	Tafraka	2	45	1,5
4	Tomajiko	3	72	1,5
5	Faudu	15	350	6,0
6	Togolobe	4	117	5,0
TOTAL		34	843	22,5 ton

Clove data in Hiri Island based on statistical data center is 33 hectares with the production amount of 5.60 tons. This is different from the data of researchers who received information from local farmers with a total of 22.5 tons. There is a difference of about 16.9 tons. The area of clove plantation area of 34 Ha is not all clove plantation. This is because some clove plantations are not homogeneous gardens especially for cloves but a mixed garden between cloves and other crops.Hiri Island, as part of Ternate City and is very close to Ternate so it has climate tendency and rainfall which is considered equal to ternate. On the island there are two dry months that the best for production of clove[14]. The previous research also showed that the land has ideal condition for clove in the growth and yield [14]. This information needs to be correlated with the cultivation practices and the soil nutrition based on which commercial cropping could be done to improvize the clove sector of the country [15]. A more detailed description of the type of clove that is cultivated is in table 2 below.

Table 2. Type of clove varieties noted in every village on Hiri Island

NO	DISTRICT	OBSERVATION CENTER	CROPPING PATTERNS	TYPE OF CLOVE VARIETIES NOTED
1	Mado	0°53'32.6"N, 127°19'45.2"E	Monoculture, Polyculture	Zanzibar
2	Dodariisa	0°53'16.2"N, 127°18'42.5"E	Monoculture, Polyculture	Zanzibar, Afo
3	Tafraka	0°52'60.0"N, 127°18'57.4"E	Polyculture	Siputih, Afo
4	Tomajiko	0°53'53.1"N, 127°18'25.8"E	Polyculture	Zanzibar
5	Faudu	0°54'23.6"N, 127°18'50.9"E	Polyculture	Zanzibar, Posi-posi
6	Togolobe	0°53'10.8"N, 127°19'34.8"E	Monoculture, Polyculture	Zanzibar

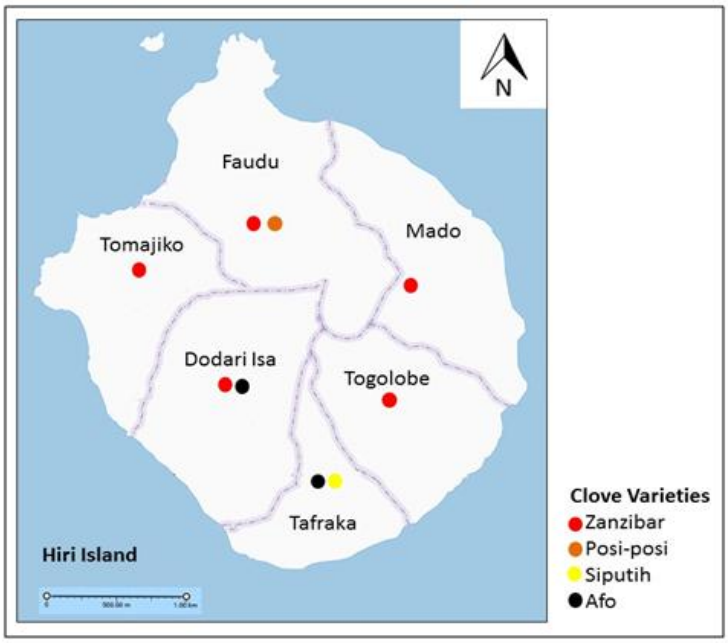
Clove trees are recorded, planted in polyculture in all villages. But monoculture clove implant pattern is also found in three urban villages. The pattern of monoculture means the pattern of clove distribution where in one clove population there are only clove trees alone without interspersed by other trees, whereas the pattern of growing polyculture is the opposite, clove trees combined with other trees, such as coconut nutmeg or other fruit plants. In some plants, mixed cropping patterns have no effect on the production of the crop, but are done by farmers because to increase the economic benefits for farmers [16]. In other crops, namely wheat and tobacco, the intercropping planting model is more efficient than its monoculture [17].

3.2. Map of Clove Varieties on Hiri Island

There are four types of clove varieties recorded on Hiri Island. Clove is dominated by type Zanzibar cloves found in almost all villages based on observation point, except Tafraka village. Zanzibar cloves are preferred by farmers to be cultivated for more and more clove production by industry players. This is because the content of clove Zanzibar eugenol higher than other cloves, one example is the results of research that showed that a very productive zanzibar produce 161.8 kg/tree/year with eugenol 88.39% compared with Siputih clove which only 93, 1 kg/tree/year with eugenol content of 81.5% [18].

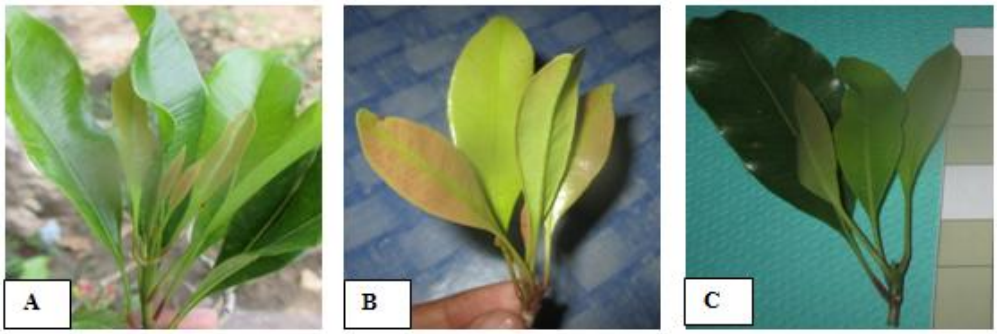
Information from farmers of clove, Zanzibar variety is more economically profitable because it can be harvested at 4-5 years of age while other types of cloves up to the age of seven can only be harvested. In the central Maluku region, Zanzibar cloves are cultivated for reasons of hereditary heritage and more adapted to the environment than other cloves [19]. Observations and interviews of farmers in Hiri Island, Zanzibar cultivation planting is due to the availability of only zanzibar seeds are provided. There are farmers who used to take clove seeds from Ternate especially in Tongole.Other varieties contained in Hiri Island are also mostly due to the availability of seeds. Some farmers grow Afo cloves taken from Ternate as well. In Faudu village, there are cloves of varieties posi-posi. This clove is relatively less in production. Owners of cloves there who continue ownership of their parents so do not know the type of clove they have, they know the type of cloves when there is research. In clove sales, the owner generally mixes all types of cloves to reduce the price of fewer cloves.

Image of modified mapping of clove plant spread on Hiri Island. Cloves spread evenly throughout villages. It is not known exactly where the cloves here originated from. The possibility of origin of cloves on the island is from Ternate, because Ternate is one of the nearby islands that could potentially be the path of dissemination to the island of Hiri. Cloves on the island of Hiri also mostly sold to Ternate. In the 16-17 century, when the clove was monopolized by Dutch with a hongi shipping system that controls clove planting in the Maluku Islands. All clove plantations beyond Dutch control were destroyed [20]. It aims to maintain the stability of clove prices in the World. But clove trees in some areas remain intact because they are hidden from the Netherlands, among them are clove trees located in the *Buku Bualawa* hills. It is hidden place in Jailolo, West Halmahera.The furthermore research as done at clove in Ternate [21] is needed to be investigated about clove kinship in the Hiri Island compared to the close island, so the origin of the ancestor of the plant is known.



Pig. 3. Map for distribution of clove varieties in every district on Hiri Island.

At that time many cloves were hidden on the hills. The possibility of cloves in Hiri also escaped from the Dutch control, so that it grown and was cultivated by the population. But it is also possible that the present clove is a new plantation planted after colonization or circa 1900s. This is indicated by the variety that is clove varieties of Zanzibar. This variety is a newly introduced introduction from Tanzania, although the seeds originally came from Indonesia being smuggled out by the French voyager of the Maluku Islands [20],[22].



Pig 4. Leafs of clove of each varieties from Hiri Island. A-C: Zanzibar, Siputih, and Posi-posi

Clove data collection in Pulau hiri is part of making clove data in Ternate and Tidore. Plant database is an important data for other research. A research that collected and made plant database in North Maluku is Suparman, 2015 [23] that recorded about breadfruit in Ternate. Currently, clove varieties are recorded in Ternate, especially in District of Pulau Ternate are: Afo, Zanzibar, Siputih, Rica, and some clove populations that have not been identified in detail ie (Taduma, Takome, Sulamadaha) and Clove Ordinary which is likely to be clove Zanzibar or Afo [24]. The other variety found in Hiri is Posi-posi.

IV. Conclusion

The research gives very important information about varieties of clove in Hiri island as part of a clove database in Ternate and Tidore. Cloves are distributed in all village on Hiri Island with some variation. There are recorded four varieties namely Afo, Posi-posi, Siputih, and Zanzibar, with the most dominant variety is Zanzibar that almost found in all village except in Tafraka. Clove found most in Faudu island which is 350 trees of clove noted. It is about 15 hectares. Total clove trees on the island are 843 and produce about 22,5 tons clove every season. The next more advanced research is needed to verify clearly the varieties that combined morphology and molecular data

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