Vegetation Types, Climatic Conditions and *Trigona* sp. Honey Quality in Onewila Village, Ranomeeto District South Konawe Regency

Jenis Vegetasi, Kondisi Iklim dan Kualitas Madu Trigona sp.
di Desa Onewila Kec. Ranomeeto Kab. Konawe Selatan

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ABSTRAK

Hutan di Indonesia memiliki potensi yang cukup besar karena disamping dimanfaatkan dalam bentuk kayu untuk berbagai kepentingan, juga memiliki potensi hasil non kayu yang dapat dimanfaatkan untuk berbagai hal, salah satunya adalah sebagai vegetasi pakan bagi lebah madu khususnya lebah *Trigona* sp. Penelitian ini bertujuan untuk mengetahui jenis vegetasi, kondisi iklim dan kualitas madu *Trigona* sp. di desa Onewila Kecamatan Ranomeeto. Variabel yang diamati adalah jenis vegetasi dan populasi, kondisi iklim (suhu udara dan curah hujan), dan kualitas madu berdasarkan standar SNI 2013. Hasil penelitian menunjukkan bahwa jenis vegetasi yang terdapat pada lokasi budidaya *Trigona* sp ada 13 jenis dengan populasi berbeda-beda, yaitu: jenis *kaliandra (Calliandra calothyrsus* = 10), kelapa (*Cocos nucifera* =12), jati (*Tectona grandis* = 20), ruruhi (*Syzygium polycephalum Merr* = 7), mangga (*Mangifera indica* = 5), langsat (*Lansium domesticum* =15), kedondong (*Spondias dulcis* = 3), jambu (*Psidium guajava* = 4), pinang (*Areca catechu* = 10), kopi (*Coffea arabica* =15), jambu mete (*Anacardium occidentale* = 15), Sirsak ((*Annona muricata* = 2), bunga asoka (*Saracca asoca* =5). Kondisi suhu udara dan curah hujan di lokasi budidaya sangat menunjang budidaya *Trigona* sp karena rata-rata suhunya berkisar 29°C, dan curah hujan rata-rata bulanan di stasiun Ranomeeto tertinggi pada bulan Januari (135 mm) dan terendah pada bulan Agustus (16.8 mm). Kualitas madu dari madu *Trigona* sp. *dari* beberapa variabel seperti kadar air, kadar keasaman, kadar HMF, dan kadar gula pereduksi masing-masing adalah 16.98%, 33.94 mg/kg, 17.3 mg/kg, 69.31% b/b. Hal ini berarti kualitas madu *Trigona* sp yang terdapat di desa Onewila memenuhi Standar Nasional Indonesia (SNI 01-3545-2013 2013).

Kata kunci: budidaya, iklim, lingkungan, pakan, trigona

ABSTRACT

Forests in Indonesia have considerable potential because besides being used in the form of wood for various purposes, it also has the potential of non-timber products that can be used for various things, one of which is as a vegetation for honey bees, especially bees *Trigona* sp.This study aims to identification of vegetation types, climatic conditions and honey quality of *Trigona* sp. in the Onewila village, Ranomeeto District South Konawe

Regency. The observed variables were vegetation, temperature, rainfall, and honey quality based on SNI 2013 standards. The results found the vegetation types at the cultivation location was Caliandra (*Caliandra calothyrsus* =10), coconut (*Cocos nucifera* = 12), teak (*Tectona grandis*= 20), peat (*Syzygium polycephalum* Merr = 7), mango (*Mangifera indica* =5), langsat (*Lansium domesticum* =15), kedondong (*Spondias dulcis* =3), guava (*Psidium guajava* =4), areca (*Areca catechu* = 10), coffee (*Coffea Arabica* = 15), cashew nut (*Anacardium occidentale* =15), areca nut (*Areca catechu*), coffee (*Coffea arabica*), cashew nut (*Spondias dulcis*), Cashew nut (*Anacardium occidentale* = 15), *Sirsak* ((*Annona muricata* = 2), and asoka flowers (*Saraca asoka*= 5). The air temperature and rainfall conditions in the location is very supportive of *Trigona* cultivation because the average of air temperature ranges from 29°C, and the average monthly rainfall at Ranomeeto station is highest in January (135 mm) and lowest in August (16.8 mm). The honey quality of *Trigona* sp, from several variables such as water content, acidity, HMF levels, and reducing sugar levels are 16.98%, 33.94 mg/kg, 17.3 mg/kg, 69.31 % b/b. This means that the honey quality of *Trigona* sp found in Onewila village meets the Indonesian National Standard (SNI 01-3545-2013 2013).

Keyword: climate, cultivation, environment, feed, trigona

INTRODUCTION

Forest with various functions and benefits provides a huge influence, either directly or indirectly to the ecological, economic and social. (Torres-Rojo *et al*., 2016) states that the use of forests to extract timber are now starting to switch to the use of non-timber forest products that lead to sustainable forest management. By Sidik (2009), NTFPs that many try by farmers in Indonesia one of which is a wild honey bee. Further explained that a honey bee is an insect that has long been known to man, where since the first humans seek beehive in caves, in holes, trees, and in other places to get the honey.

Nowadays people have started cultivating honeybees. Beekeeping honey if modern managed intensively and will provide direct and indirect benefits. Siregar *et al*., (2011) states that the direct benefits that can be derived from honeybees, which produces a wide range of honey bee products such as honey, royal jelly, propolis, pollen, wax, adhesive and bee venom. The indirect benefits to be gained beekeeping that is related to the preservation of forest resources, increasing crop productivity and their mutually beneficial symbiotic relationship (Melissa, 2008); Siregar *et al.* (2011). Susanto (2012) states that the

production and the type of honey produced by honey bees depend on natural vegetative flowers that bloom in different seasons. Indonesia has several types of honey based flora is the source of the nectar. According to Sihombing (2005) composition of honey is determined by two main factors namely, the origin of honey nectar composition in question and certain external factors resulting quality of honeybee products is determined by climatic conditions and vegetation types. The state of the elements of this climate will affect behavior and metabolism take place in living organisms (Prawirowardoyo, 1996). Honeybees produce their products by utilizing the feed source (vegetation) that is around, while vegetation is affected by climatic conditions around it. *Trigona* sp. Village Onewila Ranomeeto District of South Konawe, with the aim to determine the vegetation types and population, climatic conditions and the honey quality of *Trigona* sp. compared with the Indonesian National Standard (SNI 01-3545-2013 2013) (BSN, 2013).

MATERIALS AND METHODS

A. Location and Time Research

The research was conducted in the village of Onewila, District Ranomeeto,

South Konawe on the location of bee *Trigona* sp owned by farmers. Continued Laboratory and Laboratory of the Science Faculty of Forestry FHIL UHO. The research was conducted at the beginning of January - end of June 2019.

B. Materials and Tools

The materials used for this study are: Tally sheet, sample honey *Trigona* sp*.,* Reagents used to test the honey quality, which is comprised of: A solution Carrez I, a solution of Carrez II, Sodium bisulfite (NaHSO$_2$), solution of sodium hydroxide, NaOH 0, 1 N free karbonal, fenoftalein Indicators, pp 1% in ethanol, neutral, distilled water. Tools used: GPS, camera, thermometer, oven, spectrophotometer, analytical balance, volumetric flask, pipette, burette, beaker, heating, test tubes, stationery and paper filter.

C. Observation Variables

The observed variables in this study:
1. Vegetation types,
2. Climate conditions,
3. Test the honey quality by the standards of ISO 2013.

D. Obsevation Procedure

1. Observing the vegetation types, the vegetation to collect samples from farms *Trigona* sp to be identified;
2. Viewing the climate conditions, especially the air temperature at the location of the cultivation of *Trigona* sp*,* while precipitation derived from weather stations Ranomeeto;
3. Test the honey quality by the standards of ISO 2013, collecting honey samples were further tested by several indicators, namely the Water Content, Acidity levels, levels of HMF and reducing sugar levels.

E. Data Analysis
1. The vegetation Types and population

The identification results of vegetation, tabulated by type so we get many types of vegetation and abundance of each species found in the field;

2. The Climatic Conditions

a) The air temperature, calculated based on the measurement of thermometer placed in farms *Trigona* sp.
b) The rainfall of annual averages and monthly averages, calculated from the average rainfall every month for 4 years of observation (2015-2018) in the Month of year Jan-Des, data from Ranomeeto Station;
c) The rainfall is the monthly average of the highest and lowest calculated based on the monthly average rainfall;
d) The climate type, analyzed using Schmidth-Fergusson, where the climate is divided into eight types based on comparison of average amount in dry and wet months stated in the Q value (*quotient*) in Table 1. Dry Months (DM), the months with rainfall <60 mm, wet months (WM) rainfall > 100 mm, humid month (HM) ≥ rainfall 60-100 mm (Lakitan, 2002).

Table 1. Climate classification methods schmidth-fergusson

Climate type	Vegetation	Criteria
A. Very wet	Tropical rain fores	$0,000 < Q < 0,143$
B. Wet	Tropical rain fores	$0,143 < Q < 0,333$
C. Somewhat wet	Jungle	$0,333 < Q < 0,600$
D. Medium	Forest season	$0,600 < Q < 1,000$
E. Somewhat dry	Savanna forest	$1,000 < Q < 1,670$
F. Dry	Savanna forest	$1,670 < Q < 3,000$
G. Very dry	Grassland	$3,000 < Q < 7,000$
H.Extraordinary dry	Grassland	$7,000 < Q$

3. The Honey Quality

To determine the honey quality *Trigona* sp testing multiple parameters compared with SNI requirements (Table 2).

Table 2. Value of honey quality requirements

The Parameters Tested	Unit (%)	Good Quality Value
Water Content (Ka)	%	22 Min
Acidity Levels (KK)	ml NaOH 1 N/kg	50 Min
HMF Levels	Mg/kg	50 Min
Reducing Sugar Levels	% W / w	at least 65

Source: National Bureau of Standards (2013)

RESULTS

1. The Vegetation Types and Population

The results of the identification of the vegetation types and the population at about *Trigona* sp farming area (Figure 1).
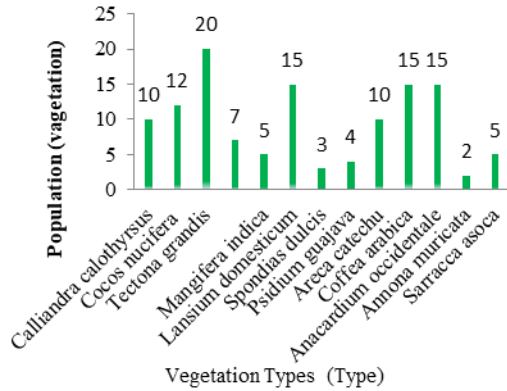

Figure 1. The presence of vegetation and population on farms *Trigona* sp in the village of the district Onewila Ranomeeto South Konawe
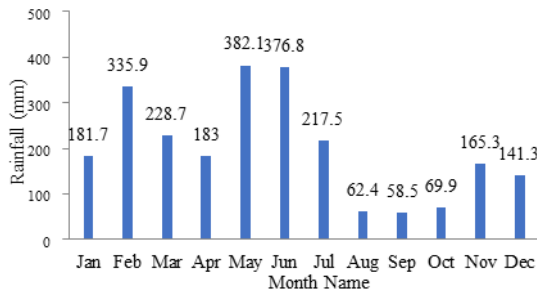

Figure 2. Fluctuations rainfall (mm) monthly average in the village Onewila Ranomeeto District of South Konawe Based in Climatology Station Recording Ranomeeto the last four years (2015-2018)

Table 3. Results of honey quality testing *Trigona* sp on raising bees village location Onewila Ranomeeto District of South Konawe

Quality Indicators Honey	Test Results	SNI	Description
Water Content (%)	16.98	22	Maximum
Levels of Acidity (kg)	33.94	50	Maximum
Level of HMF (mg kg^{-1})	17.73	50	Maximum
Levels of Reducing Sugars (% w/w)	69.31	65	Minimum

Primary data is processed, 2019

2. The Climatic Conditions

In general, the village Onewila Ranomeeto District of South Konawe located at an altitude of 30 m above sea level, has two seasons namely dry and rainy with an average annual rainfall of the last 4 years (period 2015-2018) of 2402.9 mm/yr and air temperature ranging between 23-32°C with an average of 29°C. Substitution of the dry season and the rainy season is influenced by the wind direction is West wind power in June to January and wind East/Southeast February to August. Fluctuations in rainfall monthly averages presented in Figure 2.

3. The Honey Quality

The results of the analysis of the honey quality *Trigona* sp derived from the study site are presented in Table 3.

DISCUSSION

Based on the results of the identification of the type of vegetation and the population in Figure 1), it can be argued that the type of vegetation in the research area covers vegetation bloom, so automatically have nectar and is suspected to be a source of feed bees. The fact that according to the statement Kasno (2001) that the bees happy at that flowering vegetation to feed. Sarwono (2001) stated that all types of flowering plants (plants of forest, agricultural crops, plantation crops, horticultural crops and wild plants) which lack the element of nectar as an ingredient of honey, pollen and propolis resin as the material can be used as feed for bees. The fact is also in line with the report Ilton (2019) about the types of vegetation found on farms around *Trigona* sp. in the village of the District Onewila Ranomeeto Konsel district (Figure 1).

Ramalho *et al.* (1990) states that honey and propolis produced by *bees Trigona* sp is determined by the presence of plants as a food source around the nest. Further explained that the abundance of sources of high feed will increase the production of honey and bee propolis Trigona, especially the type of vegetation or plants as a food source in the form of pollen and nectar,

such as *Impatiens balsamina, Carica papaya, Ageratum houstonianum, Psidium guajava, Helianthus* sp*, Acacia* sp*, Caliandra brevipes, Mimosa pudica, Capsicum* sp *and Cocos nucifera.*Such plants are mostly found in farms Trigona on empirically location. This means that farms in the village Trigona Onewila according to the location because of the availability of plant cultivation, which feed the bees *Trigona* .

Figure 2 shows that the average rainfall is the highest monthly occurred in May that is 382.1 mm, while the lowest occurred in September which is 58.5 mm. Based on the criteria according to the monthly rainfall Schmidth method - Fergusson, then in the village Onewila study sites are the average number of wet months (WM) and averaged 9.3 dry months (DM) 2.0 so that it has a Quetion value of 0:22. The condition indicates that the location of tropical research of type B or relatively wet climate with tropical rain forest vegetation, however, observations of air temperature ranging between 23-32°C with an average of 29°C, indicating also that the farming location *Trigona* sp the village Onewila rather hot tropical climates. This fact is also in line with the statement Devanesan *et al.* (2002) that the bees *Trigona* sp are found in tropical regions with hot climates compared to temperate with four seasons.

Widhiono (1986) stated that in the life and development, the bee is strongly influenced by environmental factors. In addition to the availability of food, environmental factors such as temperature, humidity, rainfall and altitude also determine the development of the honey bee. According Koneri *et al.* (2010), the success of live bees *Trigona* sp in the tropics can not be separated from its ability to live in a wide temperature range. Further stated that the diversity of insects that exist in each place including bees *Trigona* sp influenced by several factors, one of which is the height of the place including the air temperature. According to Pratama (2016) colonies of bees *Trigona* sp can live in coastal areas up to 800 m above sea level, and is therefore in accordance study site because it has a height of 30 m above sea level.

Marhiyanto (1999) states that the rainfall influence the development of *Trigona* sp, especially on the feed provided when the rainfall is too high then the bees will be difficult to find food but it also will lead to the nectar and pollen of plants feed the bees is reduced along with the high rainfall somewhere, otherwise the low rainfall caused the bees can thrive, especially in the research area which is characterized by ever-growing number stup.

Relation to the quality of honey, the test results showed all the indicators are in the appropriate category SNI, even on the indicator of water content is much lower than the SNI with a maximum value of 22% while in the farming area of *Trigona* in the village Onewila water level is only 16.8%, thus indicating that the honey *Trigona* sp The village Onewila is of high quality. This fact is consistent with the Priyanto (2012) statement that the lower the water content in honey produced the better the quality. According to Siregar (2002) and Sihombing (2005), the water content can determine the degree of durability of honey, affect the crystallization and fermentation, where low water levels will keep the honey of damage for a relatively long period, while the higher the water content, the more easily the fermentation. White (1979) states that the acidity of honey is an important criterion to determine the quality of honey, which if high acidity means that the honey has undergone fermentation and low acidity level if the mean has not undergone fermentation. Further explained that the acidity of honey is strongly influenced by the origin of the most dominant nectar as a source of honey bee food.

According Tanuwidjaya (2014), honey with a low HMF content value indicating the low addition of invert sugar in honey, also indicated still in a fresh state (Boussaid *et al.*, 2014; Amalia, 2016). Increased levels of HMF in honey after heating within

60 minutes, Chua *et al.* (2014); Amalia (2016). According to Zakaria (2013) that the levels of HMF in honey can be affected by several factors such as temperature, heating time, the storage conditions and the source of the nectar. According Achmadi (1991) and Wulandari (2017) the longer storage and higher storage temperature will reduce the activity of the enzyme that produced reducing sugar will also be lower.

Based on the survey results revealed that out of the four parameters of honey quality obtained results that match the quality of honey quality standards according to SNI 01-3545-2013.

CONCLUSION

Based on the research results, it can be summarized as follows:

1) The vegetations types found on farms *Trigona* sp in Rural Onewila there are 13 types with a different population, namely: the type Caliandra (*Caliandra calothyrsus=10*), coconut (*Cocos nucifera=12*), teak (*Tectona grandis=20*), ruruhi (*Syzygium polycephalum* Merr=7), mango (*Mangifera indica=5*), langsat (*Lansium domesticum=15*), kedondong (*Spondias dulcis=3*), guava (*Syzygium aqueum=4*), peat (*Areca catechu=10*), coffee (*Coffea Arabica=15*), cashew (*Anacardium occidentale=15*), soursop (*Annona muricata=2*), and interest Ashoka (*Saraca asoka=5*).

2) The climatic conditions of the location study strongly support the cultivation of *Trigona* sp*,* because the average temperature fluctuates between $29^{°}$C and rainfall is the highest monthly average in May (382.1 mm) and the lowest in September (58.5 mm), rainfall annual average of 2402.9 mm, classified as a type B climate or vegetation wet with Tropical Rain.

3) The honey quality *Trigona* sp of several variables such as moisture content, acidity, HMF levels, and reducing sugar levels, respectively 16.98%, 33.94 mg/ kg, 17.3 mg/kg, 69.31% w/w. This means that the quality of honey *Trigona* sp located in the village Onewila meet the Indonesian National Standard (SNI 01-3545-2013 2013) (BSN, 2013).

ACKNOWLEGEMENT

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