



Investigation of Land Suitability for Duku Plants at Rasuan and Ujan Mas in South Sumatra

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Abstract

Duku becomes a seasonal flagship commodity in South Sumatra. In the process of growth and production of duku, environmental and soil factors are very influential including pH, C-organic, Nitrogen (N), Phosphorus (P) and Potassium (K). The purpose of this study was to find out the suitability class of land for duku plants at two locations of duku plants based on age. The research was conducted by sampling of soil in two locations, namely Rasuan Village of OKU Timur and Ujan Mas of Muara Enim with the grouping of the age of duku plants under 25 years, between 25-49 years, 50-75 years and over 75 years. The results shows that the suitability of land for duku plant in Rasuan Village is more suitable than in Ujan Mas Village. The suitability of land in Rasuan Village is indicated by higher soil pH, C- Organic, N Total, and K values than in Ujan Mas Village. The age of the plant also affects the biological C-Organic and P₂O₅. Fertilization is needed to improve the condition of the Duku plant land.

Keywords : duku, land Suitability, South Sumatra, soil nutrient

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1. Introduction

South Sumatra is a province rich in biodiversity, including horticultural commodities, especially fruit crops. One type of fruit that needs attention is the fruit of Duku (*Lansium domesticum* Corr.), which is one of the famous fruits in South Sumatra. Duku is produced almost from the entire area in South Sumatra. In 2018 South Sumatra produced the largest Duku fruit in Indonesia as much as 49,784 tons. [1].

Duku is also one of the most famous tropical fruit plants [2]. This plant has the potential to be developed in Indonesia as a fruit orchard plant that can be one of the sources of people's livelihoods. Therefore, Duku becomes a seasonal flagship commodity for South Sumatra

Province which has been known nationally as Duku Palembang.[3].

In the era of global markets and increasingly fierce competition, domestic goods are required to have competitiveness and added oil. One way that needs to be taken is to protect the characteristics of an item. [4].

High-quality fruit with superior peculiarities grows in specific land environments, where environmental factors include sunlight, air humidity, temperature. In addition to environmental factors, soil factors that greatly affect the growth and production of Duku are pH, organic material content, Nitrogen (N), Phosphorus (P), Potassium (K) soil and also the effective depth and state of soil drainage.

Each tree produces different duku even though they have the same age. The quality also varies among regions,

such as Duku Komerling. Duku Komerling from Rasuan is famously very sweet (as a seeded fruit) while from other regions such as Muara Enim less sweet. Therefore, it is necessary to evaluate the nature of the soil and environmental characteristics of Duku plants in Rasuan Village, Ogan Komerling Ulu Timur (OKUT) Regency and in Ujan Mas Village, Muara Enim Regency.

The purpose of this study was to determine Land suitability classification for Duku Plant at the two locations based on age.

2. Materials and Methods

The research was conducted in two locations, i.e.: Rasuan Village Ogan Kemering Ulu Timur and Ujan Mas Lama Village Muara Enim since December 2020 to February 2021. Soil analysis was conducted at the Laboratory of Chemistry, Biology and Soil Fertility Faculty of Agriculture, Sriwijaya University.

The method used in this study is a survey method to obtain the characteristics of the Duku plant land. The location of observations is determined based on the results of observations in the field on the age of the Duku plant. Evaluation of land suitability using land acquisition classification methods developed by *the Framework of Land Evaluation* [5].

In the analysis of land quality includes the analysis of nutrient content contained in the soil to support plant growth. The level of land suitability is divided into four orders that are very suitable (S1) enough suitable (S2), marginal (S3) dan not suitable (N) (Table 1).

Table 1. Duku Land Suitability Assessment

| Land use requirements/ characteristics | Land suitability classification | | | |
|--|---------------------------------|-------------|-------------|--------|
| | S1 | S2 | S3 | N |
| Temperature (tc) | | | | |
| Average temperature (°C) | 25 - 28 | 28 - 32 | 32 - 35 | > 35 |
| Availability of water (wa) | 2000 - 3000 | 1750 - 2000 | 1250 - 1750 | < 1250 |
| Rainfall (mm) | | 3000 - 3500 | 3000 - 4000 | > 4000 |
| pH H ₂ O | 5.0 - 6.0 | 4.5 - 5.0 | < 4.5 | |
| C-organik (%) | > 1.2 | 6.0 - 7.5 | > 7.5 | |
| N total (%) | medium | 0.8 - 1.2 | < 0.8 | |
| P ₂ O ₅ (mg/100 g) | medium | Low | Very low | |
| K ₂ O (mg/100 g) | medium | Low | Very low | |

Source: *Land Evaluation Manual for Agricultural Commodities*

The suitability of Duku land is influenced by temperature, water availability, rainfall, pH H₂O, C-organic, and nutrient content is available (N, P₂O₅, dan K₂O). Duku is not suitable if planted on land with temperatures above 35 °C and rainfall > 4000 mm.

3. Results and Discussion

Rasuan Village is the capital of Madang Suku I District located at an altitude of 43 meters above sea level by the Komerling River. [6]. In 2020 Duku experienced the highest production in Madang Suku I reaching seven periods of production of 121,078 quintals [7]. The other location, Ujan Mas of Muara Enim, is a low-land area in the central part of Muara Enim Regency. [8] with an altitude of <500 m.a.s.l [9].

Environmental Characteristics.

Based on BMKG data from the last 5 years (2015-2020), the average annual rainfall of Rasuan Village is 2,473 mm/year while in Ujan Mas Village has an average of 2,391 mm/year. The average daily temperature in both locations in generally 27°C. Referring to the Technical Instructions for Land Evaluation for Agricultural Commodities requirements / characteristics of land average temperature and rainfall in both locations are very suitable (S1) [5]. The rainfall ranging from 1,500-2,500 mm/year make the Duku plant growth optimally[10].

Although the rainfall suitability class at both research locations has the same conformity class, the number of rainy days of the research site is different. The profiles of rainy days in Ujan Mas Village is higher than Rasuan Village. Based on rainfall profile and number of rainy days, ideally Ujan Mas Village is better than Rasuan Village in terms of Duku crop production. Rainfall is related to crop production, the higher the rainfall, the more fruit production will be produced.

Chemical Characteristics of soil.

The chemical properties observed at the research site are the acidity value (pH-H₂O), C-Organic, N-total, K-dd, and P-available.

The nature of the problem or expressed with a pH value indicates the large concentration of hydrogen ions (H⁺) in the soil. [11]. The higher the level of H⁺ ions in the soil, the sour the soil. PH values in both locations indicate different levels of land suitability. the pH of the land in Rasuan Village belongs to a very suitable level. (pH 5,24-5,70). While the pH of the land in Ujan Mas Village belongs to the suitable level (pH 4.59-6.64) (Figure 1).

There is a difference in the tendency of soil pH with the age of plants in both locations. At the location of Ujan Mas Village, the pH of the soil increases as the age of the plant increased. While in the location of Rasuan Village the pH of the soil tends to decrease along with the increasing age of the plant.

The difference in soil pH in both locations is thought to be influenced by the number of rainy days. The number of rainy days at the location of Ujan Mas Village is more than Rasuan Village. The number of rainy days in Ujan

Mas Village resulted in a more acidic soil pH than in the Rasuan Village location. Likewise in the research of Prabowo et al, one of the factors that affect soil pH is the acidic H⁺ ion from rainwater. This causes the soil pH to become more acidic. [12].

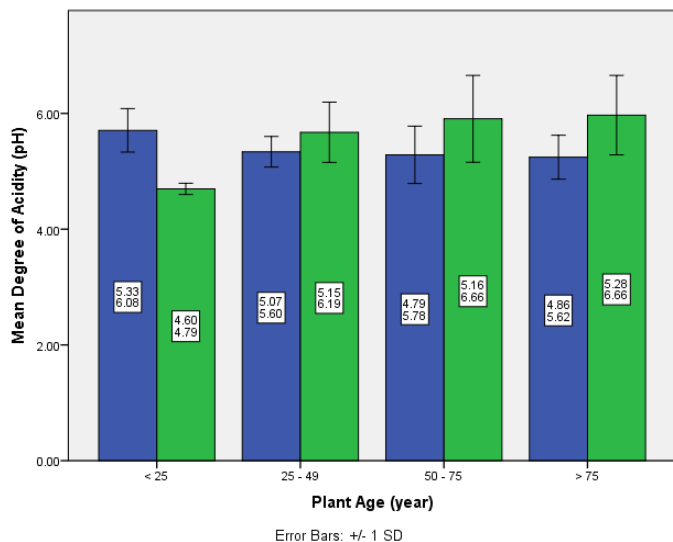


Figure 1. Mean Degree of Acidity (pH H₂O) Ujan Mas and Rasuan per tree of different ages (Blue = Rasuan; Green = Ujan Mas; (+/- 1 SD) = standar error).

The results showed that the content of C-organic in Ujan Mas Village was higher than in Rasuan Village. C-organic content in Ujan Mas Village ranges from 2.3% to 4.03%. C-Organic content in Rasuan Village locations ranges from 1.54- 3.31% with an average of 2.17% (Figure 2).

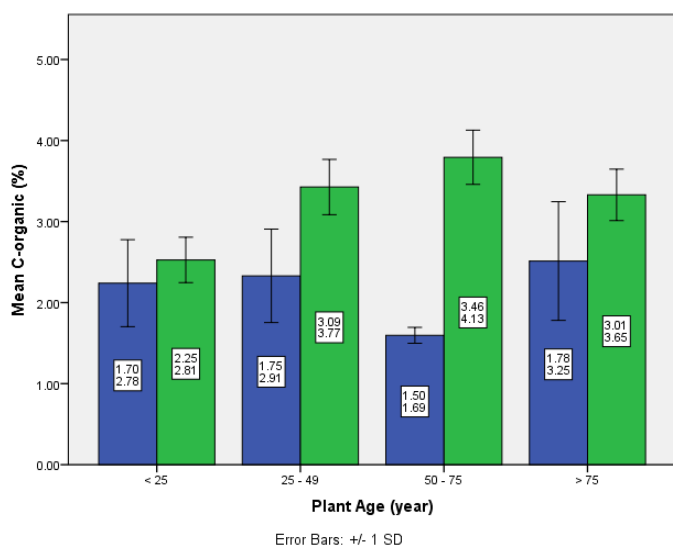


Figure 2. Mean C-organic (%) Ujan Mas and Rasuan per tree of different ages (Blue = Rasuan; Green = Ujan Mas; (+/- 1 SD) = standar error).

The C-organic content of soil in both locations belongs to the criteria very suitable (S1). C-soil organic

shows the content of organic matter that is contained in the soil and resulted important factors determining the quality of soil minerals. In addition, it can be used as one of the parameters of ecosystem sustainability and soil fertility [13]. The higher the total C-Organic content, the better the quality of mineral soils. Soil organic matter is very instrumental in improving the physical properties of the soil, increasing the biological activity of the soil, as well as to increase the availability of nutrients for plants [14].

The village of Ujan Mas shows that the content of C-organic tends to increase with the age of the plant (Figure 2). Soil C-organic value increases with plant age [13]. This is thought to be because with the age of the plant, soil organic matter derived from leaf litter, twigs, and dead roots increases. The increase in soil organic matter will have an impact on increasing the value of C-organic [15].

The total N value of duku land observed in Rasuan Village was higher than in Ujan Mas Village. N-total values in Rasuan Village range from 0.13% - 0.31% with an average value of 0.21%. While the N-total in Ujan Mas Village ranges from 0.10% - 0.20% (Figure 3).

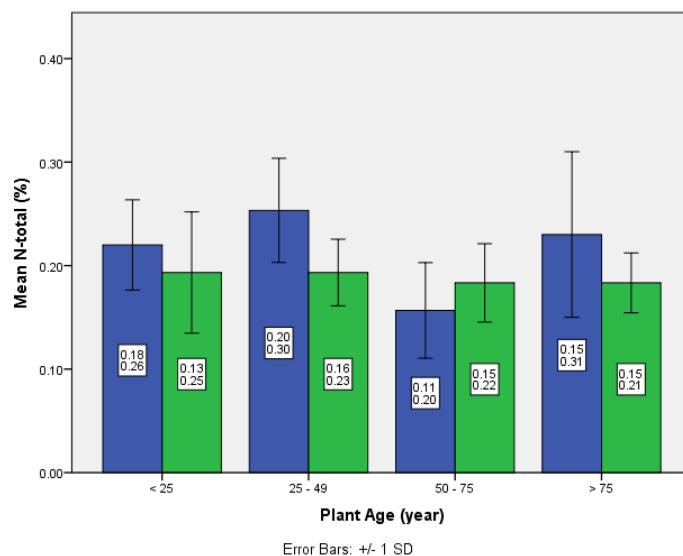


Figure 3. Mean N-total (%) Ujan Mas and Rasuan per tree of different ages (Blue = Rasuan; Green = Ujan Mas; (+/- 1 SD) = standar error).

The N- total value in Rasuan Village is classified as very suitable (medium with a range of 0.21 - 0.50), while in Ujan Mas Village is enough suitable (low with a range of 0.10 - 0.20).

The results showed that P₂O₅ levels in Ujan Mas Village were higher than in Rasuan village. P₂O₅ levels are projected from the conversion of P values available in the ground. Conversion results from P is available P₂O₅ levels in both locations are classified as very low (average 3,21 mg/100gr) (Figure 4). This shows that the specificity of the land in both locations is reviewed from the content of the P₂O₅ less suitable (S3).

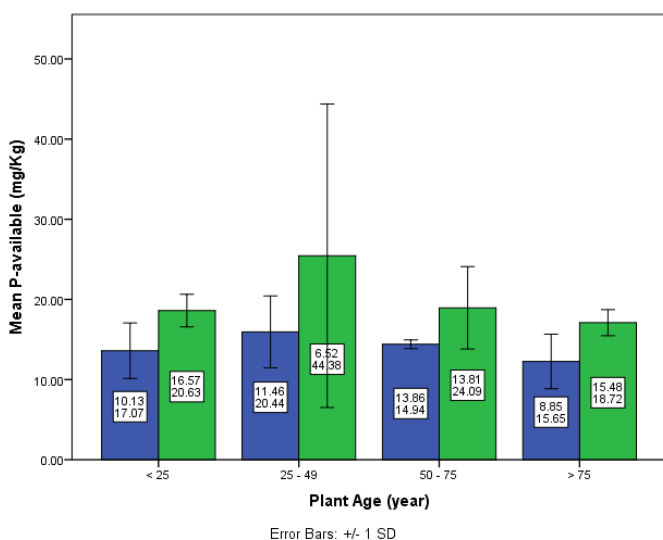


Figure 4. Mean P-available (mg/100g) Ujan Mas and Rasuan per tree of different ages (Blue = Rasuan; Green = Ujan Mas; (\pm 1 SD) = standar error).

The results showed that the K-dd value in rasuan village location was higher than in Ujan Mas village. K-dd levels in both locations ranged from 3.39 mg/100 g to 22.37 mg/100 g with an average of 12.84 mg/100gr. If viewed from the specifics of the land, the level of K-dd is relatively low to moderate and falls into the category of enough suitable (S2) to very suitable (S1). (figure 5).

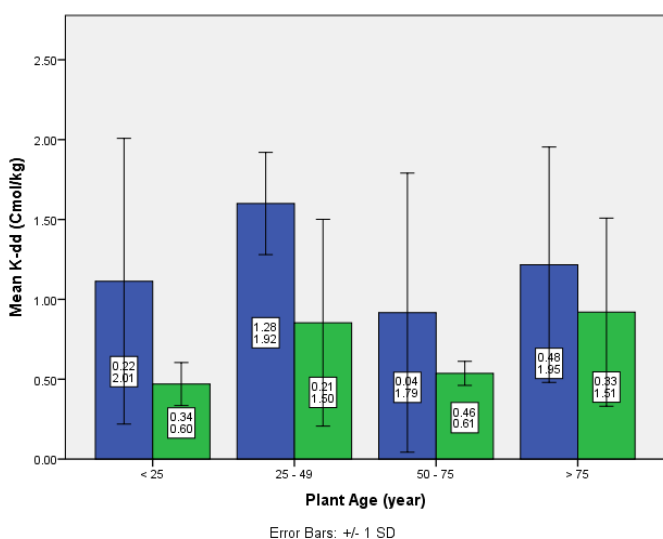


Figure 5. Mean K-dd (mg/100gr) Ujan Mas and Rasuan per tree of different ages (Blue = Rasuan; Green = Ujan Mas; (\pm 1 SD) = standar error).

The high value of K-dd at Rasuan Village is suspected to affect the sweet taste of duku fruit in the location. Potassium is present in plants in the form of K⁺ cations that play an important role in the process of respiration, photosynthesis and can increase sugar content [16].

4. Conclusion

Land suitability for Duku in Rasuan Village is more suitable than in Ujan Mas Village. This is shown in the total N value of S1 in Rasuan Village and S2 in Ujan Mas Village and K₂O S2 scores in Rasuan Village and S3 in Ujan Mas Village.

Plant age affects C-organic and P₂O₅. The organic C content tends to increase with the age of the plant. While the highest P₂O₅ content in plants aged 25-49 years. In addition, this study shows the number of annual rainy days can affect the acidity value of the soil.

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6. Conflict of Interest

The author stated that there is no conflict of interest with any institution or any person related with the research and publication.

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