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Evaluation Nutrients Content in Salak Sidimpuan Leaves (*Salacca sumatrana* Becc.)

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Abstract **– Production optimal salak sidimpuan could be achieved when factors that support growth and development a plant either internal and external available to plants. There are three elements nutrients essential that very much determined growth, development and production salak Sidimpuan plants that is nitrogen, phosphorus and potassium Research aims to understand relations nitrogen, phosporus and potassium leaves with the production salak Sidimpuan. This research has been carried out in pertanaman salak in the village Palopat Maria kecamatan Padangsidimpuan Hutaimbaru Padangsidimpuan City, in May 2016 up to September 2016. This research in a survey and purposive sampling. Hara nitrogen, phosporus and potassium of the leaves analysis, do on the leaves salak on the following in : DI = the leaves on the midrib not open full of, DII = the leaves on the midrib in there are flowers and DIII = leaves on the midrib in there are fruit.**

This research result indicates that level hara nitrogen and potassium is low while phosphorus is quite. Based on analysis of the linear multiple nitrogen, phosporus and potassium correlation is a very strong with the of production salak Sidimpuan. Based on the result of this research, so efforts to improve salak sidimpuan production, of them have to take activities fertilizing will guarantee the availability of element nutrient nitrogen, phosphorus and potassium to plants in supporting growth, development and production salak Sidimpuan plants.

Keywords **– Nutrient, Leaves, Salak Sidimpuan, *Salacca sumatrana*, Evaluation.**

I. INTRODUCTION

Based on data from the Departement Statistics centrals South Tapanuli, production potential should Salak Sidimpuan can reach 30 tons / ha, but the salak Sidimpuan production that cannot be achieved by farmers salak Sidimpuan. A few years ago up to the current, salak Sidimpuan production continuously decreasing. Even to obtain maximum production only reached 10 tons / ha every year and even this achievement is very difficult and rarely achieved by salak Sidimpuan farmers (1).

Low productivity and quality of salak Sidimpuan caused by inadequate farming practices, including the farmer's very rare that fertilizing the plants. It was indeed affects the soil fertility and crop productivity. Fertilization practiced by farmers simply by using fertilizers which come from local organic materials like midrib or weeds that are in the field salak.

The maximum production can be achieved if the limiting factor for the growth, development and production of internal and external factors that are available at its optimum. Plant internal factors, among others include nutrient needs, for example, there are three essential nutrients that determine growth and yield that nutrient nitrogen, phosphor and Potassium. If the salak Sidimpuan plant shortage one of the three elements, the plants will suffer from stunted growth, development and production of both quality and quantity.

Analysis of plant tissue more effectively to determine the nutrient content of plant bark Sidimpuan compared with other means. Determination of plant tissue analysis method is more effective, it is taking into account the nutrient content in plant tissue is a picture of nutrient content in the soil. It is based on the principle that the concentration of certain nutrients in plants is the result of the interaction of all the factors affecting the absorption of these elements from the soil. Plant tissue analysis is often used as a sample is a leaf. This is because the leaves are most active places on photosynthesis and other metabolic processes. Leaves also one carbohydrate storage place of photosynthesis. Hara contained in the leaves in addition to a role in photosynthesis also described the status of nutrients in plants (2).

Analysis of leaf tissue can be taken into consideration in order to obtain the data interpretation is the method often used is a critical limit and the range of nutrient adequacy (3). The interpretation derived from the relationship between growth or production with nutrient levels in the leaves in order to obtain status haranya. Another method is the default value. The default value is the average nutrient concentrations obtained from the analysis of plant leaves and the growth of normal production (4). Warnita et al. (5) reported that leaf is an organ to perform photosynthesis to produce carbohydrates that can be used for growth and development. Increase the number of leaves will cause the amount of light, CO2, and water that enters through the stomata of the leaves so as to increase photosynthesis.

The nutrients that were most responsible for the quality and yield of salak and nutrient status would require an approach through nutrient status in the leaves, this is a great way for the nutrient status leaves reflect the soil nutrient status available for plants (6).

Analysis of the leaves has been used as a guide in diagnosing the problem as a basic nutrient and fertilizer recommendations on plant fruits. Some of the objectives of leaf tissue analysis is to diagnose or confirm the diagnosis of symptoms seen in plants, identifying covert symptoms, determine nutrient deficiencies in plants as early as possible and as a tool in determining fertilizer recommendations (6).

Based on the above, is necessary to do research on the relationship content of Nitrogen, Phosfor and Potassium leaves with Production Salak Sidimpuan (*Salacca sumatra-*

-*na* Becc.)

II. Materials and Methods

A. Location and Period of the study

This research was conducted in the Salak Sidimpuan Estate in the village of Maria in the District Padangsidimpuan Palopat Hutaimbaru Padangsidimpuan City. This study began in May 2016 until August 2016.

B. Materials and Equipments

The materials used in this study is the leaves of salak Sidimpuan plant contained in samples and materials needed in the analysis of nutrients nitrogen, Phosphorus and Potassium. The equipments used in this study is the ovens, scales, meters, stationery, knife, camera, signboards, sample labels and other materials that can support this research.

C. Research Methodology

This research was conducted by survey method and the determination of plant samples by purposive sampling sampling technique with a certain considerations. Criteria plant samples in this study is the salak Sidimpuan of plants that are producing. Analysis of nutrient nitrogen, hosphorus and potassium will be performed on leaf tissue with the following criteria, namely:

DI : The leaves on the midrib not open full
DII : The leaves on the midrib which had lowers on its base
DIII : The leaves on the midrib which had fruits on its base

Stages of implementation carried out are as follows: (1) Determination of sample plants with criteria for healthy and productive salak plants. Then the determination of sample plants is 10 plants with code sample R1 to R10 and each plant of the sample taken DI leaves, II and III to be analyzed. Leaf samples I, II and III were taken from one plant; (2) Install the label on each sample plant; (3) Observations on each sample plant in one flowering season for all observed parameters that have been determined; (4) All plant leaf samples from each plant in the form of DI, II and III, analyzed Nitrongen, Phosphorus and Potassium laboratory content. Nutrient analysis of NPK on each plant leaf sample DI, II and III were composed from 2 plants into one sample; (5) Collect and perform data processing of observations during the study.

To see the correlation between the content of Nitrogen, Phosphorus and Potassium to the production of bark regression analysis in the form of a systematic equation, namely:

$$Y = a + b1x1 + b2x2 + b3X3.$$

Where;
Ŷ: Weight of fruit
a: Y axis intercept of the line
b: coefficient of linear regression
xI: Nitrogen
x2: Phosfor
x3: Potassium

The magnitude of the coefficient of correlation ranged between +1 s / d -1 correlation coefficient indicates the strength (strength) linear relationship dan arah relationship between two random variables. If the correlation coefficient is positive, then the two variables have a relationship searah. Artinya, if the value of the variable X is high, then the value of the variable Y will be high anyway. Conversely, if the correlation coefficient towards the negative, then the two variables lmempunyai inverse relationship. That is, if the value of the variable X is high then the value of the variable Y low. To make it easier to interpretation regarding the strength of the relationship between the two variables with the following criteria (7);

r = 0: There is no correlation between the two variables
r = 0 - 0:25: The correlation is very weak
r = 0:25 to 0:50: Correlation enough
r = 0:50 - 0.75: The strong correlation
r = 0.75 - 0.99: The correlation is very strong
r = 1: Correlation perfect

D. Parameter of Research

Parameter of research were observed and measured in this study are:

1. Nitrogen Analysis

Measures Nitrogen analyzes carried out as follows:

a. Leaf nitrogen concentration analysis
b. Begins with clean up leaves with a tissue, and dried in an oven at 70 ° C for 1 times 24 hours.
a. Then the leaf sieved with 0.5 mm sieve.
b. Determinants of N total is done by using the method of generating blue color indofenol.
c. Nitrogen is measured by means of distillation / colorimetry.

2. Analysis of Potassium

Steps analyze Potassium performed as follows:

a. Potassium concentration analysis begins with clean up leaf leaf with a tissue, and dried in an oven at 70 ° C for 1 times 24 hours.
b. Then the leaves sieved with 0.5 mm sieve.
c. Determinants K total is done by using the phosphate ions in the extract will react with ammonium molybdate under acidic acid forming fosfo molibdat
d. Potassium is measured by using Flamefotometer.

3. Analysis of Phosporus

Steps analyze phosphorus done as follows:

a. Analysis leaves the concentration of phosphorus was preceded by clean up leaves with tissue, and in dry with an oven at a temperature of 70^0 C for 1 times 24 hours. Leaves
b. Then leaves sifted with 0.5mm sieve.
c. Determining total done by means of organic element of the macro and micro.
d. Phosphorus in solution measured with the means of the spectro photometer at wavelengths 693 mm.

4. Fruit Weight (kg)

Observations made fruit weight at harvest, performed in one season flowering, by weighing the whole fruit contained in bunches buah. kegiatan harvest is done only in fruit are the size of footballs pimpong, age ranging from 3-4 months (after the formation of flowers).

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III. Result and Discussion

A. Production of salak sidimpuan (Kg / samples)

The average production of salak sidimpuan ranged from 2.6 kg to 5.4 kg. The average production of salak sidimpuan on one season flowering can be seen in table 1.

Table 1. Average production of salak sidimpuan (kg / samples)

Sample code	Production (kg / sample)
R1 & R2	5.4
R3 & R4	5.1
R5 & R6	2.6
R7 & R8	3.6
R9 & R10	3.4

B. The Content of the Nitrogen, Phosporus and Potassium Leaves Salak Sidimpuan

The results of the analysis of nitrogen on the criterion of plant leaves salak Sidimpuan highest DIII 2.264) and the lowest DI (1.804). (Table 2).

Table 2. Results of the analysis of average levels Nitrogen, Phosporus and Potassium Leaaves salak Sidimpuan

Leaves Criteria	Nutrient (%)		
	Nitrogen	**Phosporus**	**Potassium**
DI	1.804	0.239	0.353
DII	1.824	0.173	0.396
DIII	2.264	0.195	0.383
Mean	**1.964**	**0.202**	**0.377**

Total nitrogen levels on plant leaves salak sidimpuan is low. It is alleged the amount of nitrogen in the soil in the form of available only slightly. Three forms of nitrogen in the soil namely 1) a nitrogenous organic, part of organic materials ground. Nitrogen in this form not immediately available to plant growth 2) nitrogen ammonium, difiksasi by clay minerals. In the form of ammonium who difiksasi by clay, availability for a low plant and 3 and ions ammonium nitrate or dissolved compound used plant (8).

Compared to the total average the nitrogen content leaves salak pondoh namely 2.19 % then the total the average nitrogen content leaves salak Sidimpuan is lower namely 1.984 % (9). Plants that element of the nitrogenous deficiency symptoms is slow growth, colored leaves become pale yellowish green and the longer looks dull and dries (10).

The analysis of the total content of phosphorus on leaves of salak Sidimpuan plants is highest at 0.239 % and the lowest at 0.173 %. This shows that the level of total phosphorus on leaves salak sidimpuan plant is enough, this is in accordance with syafitri opinion, said that the level of element hara posfor in leaf tissue palm oil ranged from 0.15 -- 0.18 % are enough (11). The level of phosphorus on leaves salak Sumedang range from 0.078-0.11% and 0.100 -0.11 on leaves salak pondoh (9).

Phosphorus is present in all living tissues, concentrated in younger plant parts, flowers and seeds. Phosphorus is necessary for photosynthesis, breakdown of carbohydrates and energy transfer in plants. This role helps plants store and use energy from photosynthesis to develop roots and resist stress. Phosphorus is involved in nutrient uptake and translocation. Phosphorus is also important for cell division and enlargement. Accordingly, plant growth decreases when supply phosphorus is too low (12). Based on the results of the analysis posfor content leaves in table 1, in plants salak sidimpuan found no symptoms deficiency posfor element.

The results of the analysis of total content of potassium on leaves of salak Sidimpuan plants is highest at 0.396% and the lowest at 0.353%. These results indicate that the total potassium levels in leaf of salak Sidimpuan plants low. Nutrient levels of potassium in leaf tissues of plant oil palm <0.75% is relatively low, while the range of 0.90-1.20% is enough (11). Potassium is a nutrient that is essential for all living bodies, in the plant tissue is high, from 1.7 to 2.7% potassium arrange normal leaf dry matter (12).

The Low nutrient content of potassium in leaf salak Sidimpuan, allegedly because the potassium in the soil decomposes and produces K + ions and the residual acid and other cations, such as K-Mg-sulfate, ion K will soon be bound complex adsorption of soil in a form that can be exchanged (forms available) until perilous available (fixation), the solution phase (ion) that can be mobilized and can be lost through leaching (10).

Nutrient status in the plant tissue is also an overview of the status of nutrients in the soil. It is based on the principle that the concentration of a nutrient in dalarn plant is the result of the interaction of all the factors affecting the absorption of these elements from the soil (10). Needs of plants against K + ion can not be replaced by other alkali cations. Some functions of potassium in the body of plants, among others: as activator of enzymes, play a role in protein synthesis and transfer of photosynthesis.

C. Nutrient Nitrogen, Phosphorus and Potassium Correlation on Leaves with the Production Salak Sidimpuan.

The analysis of multiple regression equation of nitrogen, phosphor and potassium in leaves consisted of the midrib not open full of (DI), the midrib which had a flowers on its base (DII) and the midrib which had a fruits on its base (DII) can be seen in table 3.

Table 3. Multiple linear regression equation nitrogen nutrient relationship on the leaves with the production of salak Sidimpuan.

Nutrient	**r**	**r^2**	**Regression Equation**
Nitrogen	0.933	0.870	Y = 11.246 – 3.442 x1 – 15.029 x 2 + 11.664 x3
Phosphor	0.933	0.871	Y = 12.687 – 3.701 x1 – 16.150x2 - 25.582 x3
Potassium	0.950	0.902	Y = 27.510 – 24.750 x1 –5.026 x2 - 32.457 x3

Based on table 2 shows that the nutrient, nitrogen, phosphor and potassium relationships with very strong production. It is based on the correlation coefficient value (r) reach 0.933 and 0.950. This result is based on opinion, that the correlation coefficient value 0.75-0.99 = very strong relationship. (7)

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Based on the determination value (r2) in table 2, the effect of leaf nitrogen on the production of salak is 87.0%, phosphor 87.1% and potassium 90.2%. While the influence of other factors such as growth regulators, other nutrients and climate is between 9.8-13.9%.

Based on the results of the above analysis of the relationship and the influence of nitrogen, phosphorus and potassium on the production of salak is very strong and influential between 87% -90.2% it further reinforces that nutrient-3 nutrient this is including part of macro nutrients are very influential growth and plant development. According to (13) states that nitrogen is a major macro nutrient that is very important for plant growth and can increase the production of plants, protein levels, and cellulose levels, plants require nitrogen for growth, especially in the vegetative phase of branch growth, leaves, and stems. Nitrogen is also useful in the process of forming green leaves or chlorophyll. Chlorophyll is very useful to help the process of photosynthesis.

Phosphorus is an essential part of various sugar phosphates that play a role in the reactions in photosynthesis, respiration, and other metabolic processes. Phosphorus is also a part of nucleotides (RNA and DNA) and membrane constituent phospholipids, other than that phosphorus acts as a constituent of metabolites and complex compounds, activators, cofactors or enzyme constituents, and plays a role in physiological processes. (14)

Potassium nutrients serves as a transport medium that carries nutrients also trans locating the assimilate from the leaves to the entire plant tissue, lack of nutrients Potassium in plants can inhibit transport in plants therefore for the process of nutrient transportation and assimilate in plants can take place optimally then the potassium nutrients in the plant must be optimal (15).

In Figure 1. can be seen diagram spread of nutrient nitrogen with Salak Sidimpuan production.

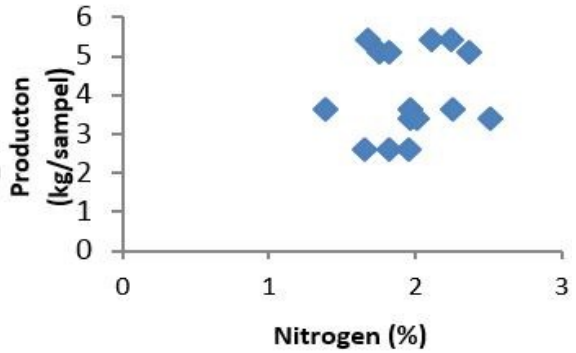

Fig. 1. Nitrogen nutrient distribution diagram on leaves with salak Sidimpuan production.

Based on figure 1, it is found that the scatter diagram of the leaf nitrogen relationship with the production of bark meet the model of linear properties. So the increase of salak production can be explained by the increase of leaf nitrogen. This is in accordance with the opinion of (16) and (17) that macro nutrient functions include Nitrogen (N), which stimulates overall plant growth, for the synthesis of amino acids and proteins in plants.

In Figure 2., the diagram shows the relationship of nutrient phosphorus to the leaves with the production of Salak Sidimpuan.

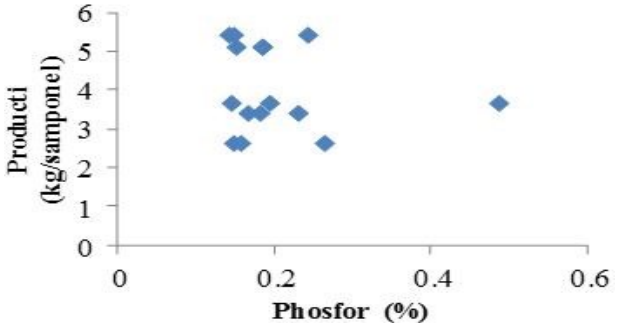

Fig. 2. Phase distribution of Phosphor nutrient diagram on leaves with salak Sidimpuan productuin.

Based on Figure 2, the relationship of phosphor nutrients to the leaves with the production of Salak Sidimpuan is randomly distributed, but there is a tendency to follow a certain pattern, thus less to meet the liner properties. The increase of nutrient phosphor in the leaf can not be explained will directly increase the production of salak. Sidimpuan. However, the role of phosphor as a part of macro nutrients for plants sdalah very high.

Based on Figure 2, the nutrient relationship. According to (16) and (18) in plants, phosphate is never reduced and remains high in oxidized form.

Phosphorus is easily redistributed from one organ to another, easily dissipated from older leaves and accumulates to younger leaves, the phosphorus function is as a macromolecular structure constituent that is particularly prominent in nucleic acids as a bridge between two units of ribonucleoside and also constituents of energy-forming compounds (ATP and ADP)

The results of the analysis simple and multiple linear correlation nutrients potassium equation in leaf of the salak Sidimpuan production can be seen in Table 3.

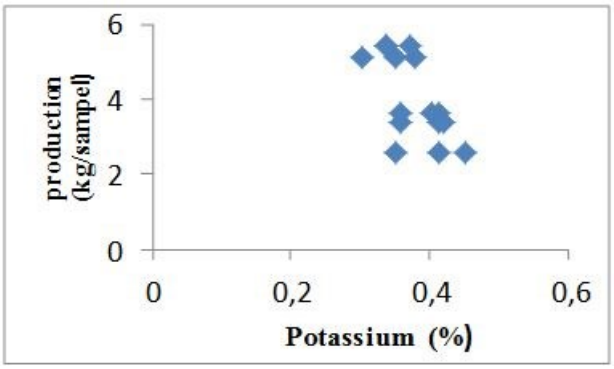

Fig. 3. Diagram of potassium nutrient distribution with the production of Salak Sidimpuan

In Figure 3, it can be seen that the diagram of the potassium nutrient relationship in leaves has a tendency to meet the linear properties. If the potassium nutrient requirement in the plant is met then the increase of production will be achieved. The increase in the production rate of salak crops can be explained by the presence of

potassium nutrient present in the plant. Potassium was the most accumulated nutrient in fruits, followed by N and P. (20)

Phosphorus and potassium along with nitrogen resulted in a maximum increase in nutrient uptake due to increased photosynthesis, resulting in an increased leaf area. Hence application of all three nutrients resulted in larger leaf area. (21)

Based on the results of the evaluation of nitrogen, phosphor and potassium on the leaves of Salak Sidimpuan plant and continued with multiple linear regression analysis, it can be used as the basis of consideration that to improve production salak Sidimpuan, then one solution that can be done by farmers is to fertilize. Fertilization activity is an effort to meet the needs of plants to the nutrients needed for growth and development so that it is expected to be able to increase the production of Salak Sidimpuan. Supardjono [22] report the nutrients the plant becomes a very important factor to support the continuity of the process of plant metabolism so that growth and development are getting better. It is necessary to apply the fertilizer that contains all three macronutrients like N, P and K.

The type of fertilizer most needed by salak Sidimpuan, based on the results of this study is a fertilizer that has nitrogen and potassium nutrients (23). Prerequisite is a fertilization strategy that is based on several N applications and not on a one-go approach (24). While phosphor nutrient because it is in sufficient status on the leaf of salak Sidimpuan. Phosphor fertilization is not too needed by salak Sidimpuan.

IV. Conclusion

This research result indicates that nutrition level nitrogen and potassium is low while phosphorus is quite. Based on analysis of the linear multiple nitrogen, phosporus and potassium correlation is a very strong with the production salak Sidimpuan.

Based on the result of this research, so efforts to improve salak sidimpuan production, of them have to take activities fertilizing will guarantee the availability of element nutrition nitrogen, phosfor and potassium to plants in supporting growth, development and production salak Sidimpuan plant.

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