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Effects Of Reproductive Pruning On Yield And Yield Components Of Jicama (*Pachyrhizus Erosus* L. Urban) On Coastal Land

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ABSTRACT

This study aims to determine the effect of reproductive pruning at various time intervals on yield components and yields of bengkuang tubers planted in coastal areas. The experiment was carried out at the Experimental Garden of the Faculty of Agriculture, University of Borneo, North Kalimantan. Experiments with experimental plots designed using a Randomized Block Design (RBD) with one factor. The treatments given consisted of 5 time intervals of reproductive pruning, namely pruning at intervals of 3, 7, 11 and 15 days and 1 treatment without pruning. Parameters observed were number of tubers and tuber weight, tuber diameter (cm), tuber length (cm), plant biomass (g), and harvest index (%). Data were analyzed using analysis of variance. Previously, the data were tested for normality assumptions using the Kolmogorov-Smirnov test. Furthermore, the data that had been tested normal were analyzed using Duncan's test at a 5% level of negligent. If the assumption of normality of the data was not met, then the data was transformed before performing the analysis of variance. To get the optimum pruning interval, a regression analysis was performed using a regression model. The results showed that there was an effect of reproductive pruning with varying intervals on the yield and yield components of bengkuang tubers (*Pachyrhizus erosus* L. Urban) on tuber diameter, length, and volume, sweet potato harvest index and yam tuber weight per plant except for the number of tubers planted and plant biomass. Meanwhile, the optimum pruning interval resulted in the yield component and the best yield of bengkuang tubers was with a pruning interval of 7 days and the weight of sweet potatoes was 990.50 g per tuber.

Keywords:

Jicama, reproductive pruning, pruning interval varies, yield components

INTRODUCTION

Jicama is one of the neotropical legumes that produces edible root potatoes, originating from Mexico and Central America (Vaughan and Geissler, 2009). Jicama (Pachyrhizus spp Rich. Ex DC) is a neglected plant that has not been utilized by the community. So far, yam bean in Indonesia has only been used as an ingredient for fresh consumption, even though it actually has a large industrial potential.

Jicama is another alternative for children who want to eat nuggets but don't like vegetables. (Abduh and Septiadi, 2022), usually made from

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ground chicken, now it can also be made from yam which is certainly much healthier. According to Jora, et al (2021) from a health perspective, jicama has several benefits, including improving digestion, controlling sugar levels, being a source of vitamin C and brightening the skin.

Based on the results of the analysis, 100 g of fresh sweet potato in yam contains nutrients, as shown in Table 1.

Table 1. The Component of Tuber Jicama per 100 grams

Component	Content per 100 grams
Water	78 -94%
Starch	2,1-10,7 g
Protein	1- 2,2 g
Fat	0,1- 0,8 g
Vitamin C	14 -21 g
Carbohyudrate	10 - 22 g
Energy	22 - 58 kal

This fact indicates that yam is actually a potential source of starch and protein, therefore, it is very possible to develop a protein-rich flour industry based on yam bean. Jicama can be consumed in fresh form or as a mixture of other foods such as a mixture of syrup, flour, and raw materials for the cosmetics industry (Sorensen, 1996). Jicama plants do not require much water, so they are suitable for cultivation in gardens or rainfed soils that only rely on rainwater. The right planting is at the beginning of the rainy season with the hope when the vegetative growth of the soil is wet and loose. Thus the absorption of nutrients goes perfectly, eventually accelerating the development of sweet potatoes. Although yam plants do not require much water, but in parts of Indonesia such as coastal areas where water is limited, this plant has not been widely cultivated by the community.

Jicama plants grown by farmers are cultivated less intensively, only as side crops or intercrops so that production is getting lower. Whereas with a more intensive cultivation method, it will be able to produce higher production and economic value. Efforts that can be done is pruning. (Dinas Perttanian Binjai, 2011).

Pruning is a cultivation technique carried out for various purposes such as aesthetics, stimulating flowering, forming a productive canopy, and reducing photosynthetic parasitic leaves, namely shaded leaves. Pruning is done to control growth. With pruning, it is hoped that the leaf architecture will become compact and the distance from source to storage (sink) will be shorter so that photosynthesis is more effective and translocation is faster and smoother (Ali, 1996). In addition, pruning can improve the quantity of yield (Zulkarnain, 2010). In the vegetative phase, starch accumulation occurs in the roots which will eventually form sweet potatoes. After the plant enters the reproductive phase, the assimilate will be attracted to the reproductive sink. Therefore, pruning reproductive sinks will be assumed to shift the distribution of assimilate to sink storage (yam) (Karuniawan and Nusifera, 2009). Short cutting intervals cause plant growth to be slow and the opportunity to grow is also short, while at longer cuttings the opportunity to grow is long so that plants can grow optimally.

According to Hobir (2002), longer growth opportunities give plants the opportunity to absorb more nutrients so that they can be sufficient for plant growth. The same results were

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also reported by Mansur et. al. (2005), in Brachiaria humidicola grass with longer cutting intervals, the production was higher along with plant growth. Likewise Dasilveira et.al. (2010) Panicum grass maximum intensity of cutting is more frequent, the length of the leaf stem and flag leaf is longer. The shorter the pruning interval, the shorter the time needed to collect food reserves in growth activities. Primandini (2007) states that heavy defoliation results in inhibition of the formation of new shoots in plants and depletion of plant food reserves.

Treatment of pruning time and spacing in general interacted to increase plant length and number of branches at 7 WAP. Pruning time and spacing did not significantly affect the yield of tuber weight per sample, tuber weight yield per plot, bulb circumference per sample, and harvest index (Panggabean, et al, 2014).

MATERIALS AND METHODS

The field research was conducted at the Experimental Garden of the Faculty of Agriculture, University of Borneo, North Kalimantan. The experimental land used is located at an altitude of 34 asl, the type of soil is Ultisols with a soil pH of 4.62 - 4.9. The experiment was carried out for 5 months starting from February to July 2021. The materials used included; yam seeds of local varieties (kasang pudak), Urea, SP-36, and KCl. In addition, in this experiment used equipment which includes scales, calipers, cameras, stationery and various farming tools. The research method was arranged in a Randomized Block Design (RAK) with one factor. The pruning treatment consisted of 5 time intervals of reproductive pruning, namely pruning at intervals of 3, 7, 11 and 15 days and 1 treatment without pruning. Parameter variables observed were the number of sweet potatoes planted, sweet potato weight per plant, sweet potato diameter (cm), sweet potato length (cm), sweet potato volume (ml), plant biomass (g), harvest index (%) and weight of yam bean planted (g).). Data were analyzed using analysis of variance. Previously, the data were tested for normality assumptions using the Kolmogorov-Smirnov test. Furthermore, the data that had been tested normal were analyzed using Duncan's test at a 5% level of negligent. If the assumption of normality of the data was not met, then the data was transformed before performing the analysis of variance. To get the optimum pruning interval, a regression analysis was performed using the regression modelobserved were the number of sweet potatoes planted, sweet potato weight per plant, sweet potato diameter (cm), sweet potato length (cm), sweet potato volume (ml), plant biomass (g), harvest index (%) and weight of yam bean planted (g).). Data were analyzed using analysis of variance. Previously, the data were tested for normality assumptions using the Kolmogorov-Smirnov test. Furthermore, the data that had been tested normal were analyzed using Duncan's test at a 5% level of negligent. If the assumption of normality of the data was not met, then the data was transformed before performing the analysis of variance. To get the optimum pruning interval, a regression analysis was performed using the regression model.

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Ficture 1. The Jicima Plant, Prunning and Yield harvest of tuber Jicima

water has an impact on plant growth so that plant growth is less than optimal. On the other hand, if the availability of ground water is sufficient for plants, the plant growth will be much better. This can be seen from the very fertile plant

RESULTS AND DISCUSSION

General Conditions of the Environment Field experiments show an environment where the soil conditions are suitable for the conditions for growing yam plants. To make the soil conditions moist for the germination process, watering was carried out 2 times a day, in the morning and evening. Lack of availability of ground growth.

During the experiment, there were several pests that attacked the yam plants, including wild rats (*Ratus, sp*), bugt *(Leptocorisa acuta*), grasshoppers (*Valanga nigricornis*), dome beetle (*Epilachna sparsa*) which caused damage to the leaves. The positions of the affected plants were generally those that were on the edge of the experimental plots. Diseases that attack yam plants are leaf spot disease, which causes the leaves to appear blotchy and bacterial wilt disease which causes the base of the stems of this plant to wither and dry out. Weeds growing in the experimental plots included; alang-alang (Imperata cylindrica), teki grass (Cyperus rotundus), daughter of shame (Mimosa pudica), kakawatan (Cynodon dactylon) and paitan grass (Axonophus compresus). Weed control efforts are carried out manually through weeding. Weeding is done every two weeks. In the cultivation technique of yam (Pachyrrhizus erosus L. Urban) to increase the potential quality of yield and yield of yam tubers, one of the stages of a known cultivation technique is reproductive pruning. The application of this pruning is done when the plant is 2 months old (when 50% of the plants have entered the flowering phase).

The results of observations and analysis of variance on the variable number of tubers planted showed that there was no effect of reproductive pruning at various intervals, namely the number of tubers per plant. The average number of tubers planted due to pruning in this experiment reached 2.09 bulbs, while without pruning was 1.62 bulbs planted. Bulb Diameter The results of the analysis of variance showed that there was an effect of reproductive pruning at varying intervals on tuber diameter. The average diameter of the tubers is shown in table 2. The pruning treatment has an effect on the diameter of

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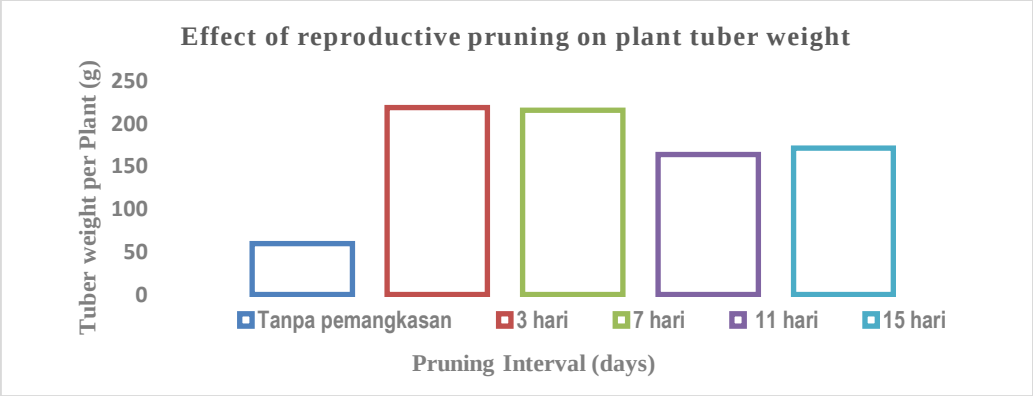
the tubers. However, variations in pruning intervals did not show any effect. Based on Table 2, pruning at 12-day intervals has been able to increase the diameter of yam tubers, while increasing the frequency of pruning can no longer increase the diameter of yam tubers.

The results of the analysis of variance showed that there was an effect of reproductive pruning at various intervals on the length of the sweet potato. The average length of tubers in the crop is shown in table 2. The results of the analysis of variance showed that there was an effect of reproductive pruning with varying intervals on the volume of tubers. The average volume of cropped tubers is shown in table 2. Pruning treatment affects the volume of tubers. However, variations in pruning intervals did not show differences in tuber volume. Based on Table 4, pruning at 12-day intervals has been able to increase the volume of yam tubers, while increasing the frequency of pruning can no longer increase the volume of yam tubers.

Table 2. Yield Components of Jicama Due to Reproductive Pruning Observation of 5%.

Treatment	Varibel pengamatan							
	Number of Tubers	Diameter of Tubers (mm)	Length of Tubers (cm)	Volume of Tubers (ml)	Weight of Tubers (g)	Weight of of Tubers per Plant	Biomass	Harvest Index
No Pruning	1.62 a	48.72 b	6.84 c	68.44 b	296.69 b	480.64 c	59.78 c	8.04 b
3 day interval pruning	2.01 a	98.09 a	10.68 ab	484.54 a	438.55 a	976.24 a	218.69 a	44.64 a
7 day interval pruning	2.27 a	110.24 a	11.23 ab	495.22 a	370.18 a	999.50 a	215.27 a	46.43 a
11 day interval pruning	2.12 a	92.22 a	12.01 a	402.54 a	379.83 a	768.45 ab	163.43 ab	47.02 a
15 day interval pruning	1.96 a	96.46 a	9.08 b	350.45 a	369.62 a	744.46 ab	171.21 ab	43.84 a

Note: The numbers followed by unequal letters show a significant difference according to Duncan's test at the level



Ficture. 1. Effect of Pruning on Yield Weight of Planting (g)

The results of the analysis of variance showed that there was an effect of reproductive pruning with varying intervals on tuber diameter. The average tuber weight per plant is shown in table 2.

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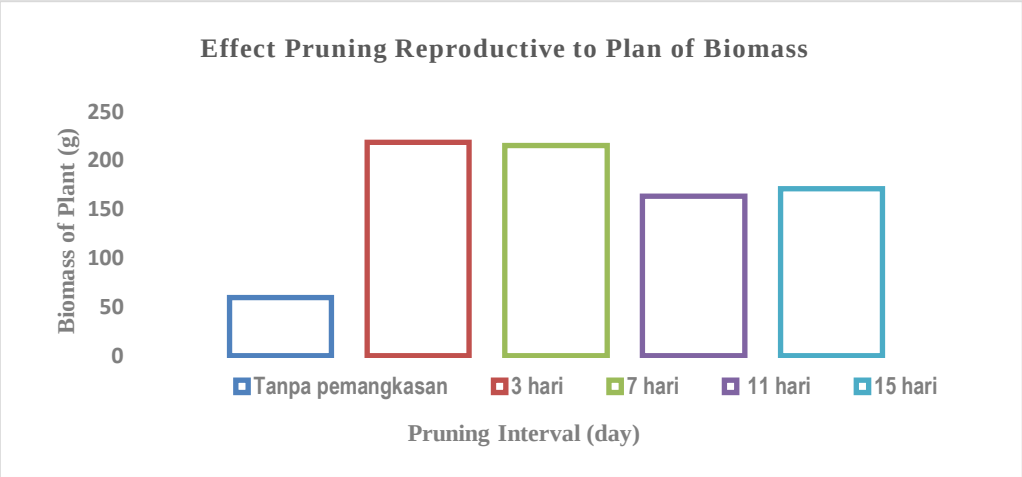
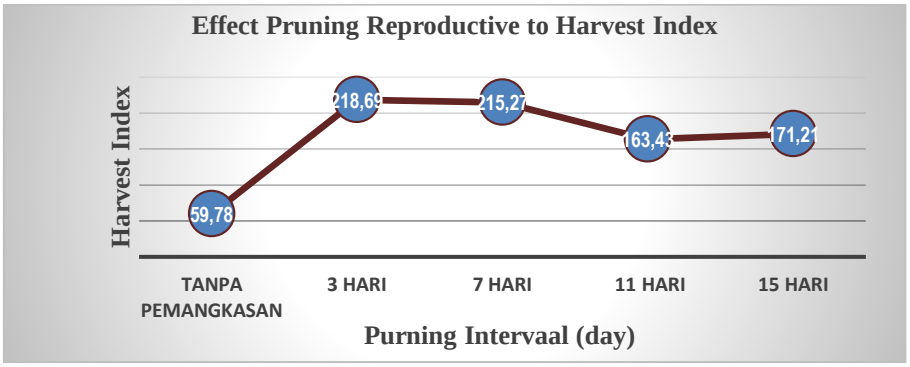
Pruning treatment has an effect on potato weight per plant. However, variations in pruning intervals did not show any effect. Based on Table 2, pruning at 12-day intervals has been able to increase tuber weight per yam plant, while increasing pruning frequency can no longer increase tuber weight per plant.



Gambar. 2. Effect of Pruning Reproductive to Yield Biomass of Plant

The results of the analysis of variance showed that there was an effect of reproductive pruning at various intervals on plant biomass, although there was no difference in the effect of pruning intervals on yam plants. Plant biomass without pruning weighed 59.78 g, while the average plant biomass due to pruning in this experiment was 192.15 g.



Ficture 4. Effect Pruning Reproductive to Harvest Index Jimica Plant

The results of the analysis of variance showed that there was an effect of reproductive pruning at various intervals on the yield index of yam tubers. The average harvest index is shown in table 2. Pruning treatment has an effect on the yield index of yam tubers. However, variations in pruning intervals did not show any effect. Based on Table 2 and ficture 4, pruning with an interval of 12 days has been able to increase the yield index of yam tubers, while increasing the

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frequency of pruning can no longer increase the yield index of tubers.

In the variable number of tubers planted, it can be seen that the reproductive pruning treatment with no pruning time intervals, 3, 7, 11 and 14 days resulted in an average value of one tuber per plant. In general, there are two types of tubers based on their number, namely single tubers (mono tubers) and double tubers (multi tubers) (Sorensen, 1996). Sorensen (1996) said that there is genetic control on this character to determine whether or not the double tuber character is formed in yam. In general, tuber weight is related to tuber length, tuber volume and tuber diameter of yam tubers. The results of tuber weight, yam tuber volume, tuber length and tuber diameter were obtained in accordance with the opinion of Nusifera (2007) which stated that this fact indicated that the addition of volume was followed by the addition of tuber length and diameter without changing the basic shape of the tuber, but there were variations in diameter addition. sweet potatoes so that the addition of volume varies. The increase in the volume, length and diameter of the yam tubers was thought to be due to the pruning effect so that the pruning effect worked well. The effect of this reproductive pruning is expected to give the plant architecture a compact and shorter distance from source to storage (sink) so that photosynthesis is more effective and translocation is faster and smoother (Ali, 1996). This pruning resulted in increased flow of assimilate to the tuber which resulted in changes in tuber size. The increase in the size of the tubers should be in alignment with the basic shape of the tubers. Groundwater availability factor greatly determines the changes and appearance of yam tubers. Plant efficiency in producing assimilate increases if the water requirement is sufficient (Taiz and Zeiger, 1998). Pruning will increase the opportunity for other sinks to get assimilate in greater quantities, especially if the ones that are discarded are strong sinks such as reproductive sinks. In addition, flower pruning can improve plant adaptation to drought conditions (Diouf et al., 1998).

Several researchers have reported the effect of pruning on increasing the yield of yam tubers. The plant biomass and harvest index variables basically aim to study the extent of photosynthate accumulation and how the rate of photosynthate partitioning into economically valuable parts, namely tubers. Plant biomass is the total dry matter of all plant organs (Sitompul and Guritno, 1991) including tuber dry matter, while the harvest index is the proportion of organ dry matter harvested with total plant dry matter. It can be seen that the pupus growth was very fertile, while the assimilate distributed to the tubers tended to be less so that the tuber size was relatively smaller.

Pruning treatment as reported by Nielsen et al. (1999) and Sorensen (1996) were able to significantly increase the weight of sweet potatoes. Nusifera (2007) stated that the dry weight variation was the determining factor for the ratio of tuber weight and plant biomass. If the dry weight loss tends to be high with the assumption that the tuber weight remains, then of course the harvest index value will be smaller, on

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the contrary. Plant biomass and yield index with plant sweet potato weight gave an increase because the photosynthate yield was translocated to storage and increased tuber weight.

The pruning mechanism in increasing tuber weight is by changing the pattern of photosynthate (carbon) partitioning between alternative sinks. Through pruning reproductive sinks, assimilate will be directed to sink storage (tubers) thereby increasing the harvest index. Based on the results of the regression analysis, the optimum pruning interval to obtain the highest tuber weight in this experiment was a 7-day pruning interval with tuber weights of 370.18 g tubers and 999.50 g tubers planted weight. This is presumably because shorter pruning intervals lead to a reduction in food reserves due to more intensive pruning, so that plants only have a short time to grow.

CONCLUSIONS

Based on the results of research and analysis on the effect of reproductive pruning with varying intervals on the yield and yield components of yam tubers (*Pachyrhizus erosus* L. Urban) it can be concluded that pruning with varying intervals has an effect on tuber diameter, tuber length, tuber volume, tuber harvest index and tuber weight. Jicama per plant except for the number of tubers planted and plant biomass. While the optimum pruning interval gave the yield component and the best yield of yam tubers in this experiment was with a pruning interval of 7 days with tuber weights of 370.18 g of tuber weight and 999.50 g of tuber weight for planting.

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