SHOOT CUTTINGS RESPONSE OF ATENG COFFEE PLANT (*COFFEA* SP.) ON GIVING THIAMINE (VITAMIN B1)

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Abstract

A concise and factual abstract is required (maximum length 200 words). The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separate from the article, so it must be able to stand alone. References should therefore be avoided, but if essential, they must be cited in full, without reference to the reference list. Non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself. Abstract in italics, spacing 1, size 11, Font Book Antiqua also include keywords. The number of words for the abstract is min. 150-200 words, which contain the problem, objectives, methods and results. While keyword maximum five words that reflect the content of the manuscript. Immediately after the abstract, provide a maximum of five keywords, avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Keywords: Ateng Coffee, Shoot Cuttings, Thiamine.

A. Introduction

Indonesia is coffee (Coffea sp.) producing country world number four after Brazil, Vietnam and Colombia. 67% of the total coffee production is exported and the remaining 33% for domestic needs. Since hundreds of years ago coffee became a very important agricultural commodity and supported the community [1]. Coffee is a third largest trading commodity after oil and gas, as well as foreign exchange producer for the country of Indonesia [2].

Coffee has a very important role for the people's economy because more than 90% of total area coffee plantation in Indonesia are people's plantations. The type of coffee that is widely cultivated including Arabica coffee (*Coffea arabica*), Robusta coffee (*Coffea canephora*), Liberika coffee (*Coffea congensis*) and Ekselsa coffee (*Coffea liberica* var. dewevrei.) [3]. Nowadays extensive coffee plantations in Indonesia it reaches ± 1.3 million hectares, consists of 90% of coffee plantations of Robusta coffee and the remaining 10% are coffee plantations of Arabica type [4]. Arabica coffee producing areas in Indonesia include North Sumatra, Aceh, East Java, Bali, East Nusa Tenggara, etc. [5]. World coffee demand continues to increase along with world coffee consumption which continues to increase, namely 70% from Arabica coffee, 24% from Robusta coffee, 3% from Ekselsa coffee and 3% from Liberika coffee [6].

Ateng coffee is one of the clones of Arabica coffee. This coffee is the favorite choice of farmers because it has advantages compared to other types of coffee, including only ± 2 years during the production of plants [7]. Ateng coffee is also widely developed in North Sumatra, one of its production centers is Simalungun Regency. According to BPS data, Simalungun Regency is an Arabica coffee production area and the clones that are currently being developed are Ateng coffee. Many farmers grow this coffee because the production age is relatively short and can be sold in the form of red spindle (cherry red) [8]. Besides that, Ateng coffee has a short tree but can produce fast fruit and a lot, producing quality fruit within 10 years and coffee fruit can be harvested every 2 weeks or harvest twice a month.

Today, coffee farmers or coffee planters tend do coffee plant propagation with cuttings because this method is easily done by farmers and coffee planters, both small and large scale [9], and has the same characteristics as the parent so that it can provide certainty the level of success and the quality of the results. Propagation of cuttings is also to get superior seeds in large quantities and in a short time [10]. Shoot cuttings are one of the potential alternative ways that can be done to develop a clone. Propagation through shoot cuttings is often used because it has several advantages such as some superior types can be directly propagated, coffee plants will grow faster about 3 years and do not require a long time for germination. Propagation through shoot cuttings also has several disadvantages, among others, plants do not have taproots so they can easily collapse and plants are usually easily attacked by nematodes at the beginning of their growth [3].

Other than that, roots need a long time to grow, therefore hormones or vitamins are needed to accelerate the growth of these roots. Besides hormones, vitamins are one that can affect plant growth and development. Vitamin B1 or thiamine is soluble in water and can affect plant metabolism because it functions to accelerate the formation of primordial roots through cell division in the root meristem [11]. Thiamine can accelerate the regeneration of root growth in rose cuttings [12]. Thiamine is an important ingredient for all plants [13]. Furthermore, it is said that thiamine is essential for the growth function, because thiamine functions as a co-enzyme and catalyst [14], so that the metabolism of Ateng coffee plant cuttings will take place quickly and this can accelerate plant root growth.

Based on the background above then the authors are interested in conducting a study entitled Shoot Cuttings Response of Ateng Coffee Plant (*Coffea* sp.) on Giving Thiamine (Vitamin B1).

B. Method

The research was conducted at the Tissue Culture Laboratory of Agriculture Faculty of Asahan University of Asahan Regency from January to March 2018.

Tools used include plastic tray, knap sprayer, cutter, PP plastic, Plastic, scissor, measuring rollers, measuring cup tube, mortal, measuring lamp, scales to assist observation, cameras and stationery.

The ingredients used were shoots of Ateng coffee plants from Simalungun Regency, thiamine, aquades, PE plastic, oasis, label paper, rubber bands, chlorox, 500 ml mineral water bottles and water.

This study uses a Complete Random Design with one factor. Based on the research [15] the concentration of thiamine used was 5 levels of concentration, namely : B0 = 0 ppm; B1 = 250 ppm; B2 = 500 ppm; B3 = 750 ppm; B4 = 1000 ppm.

The implementation of this study includes the preparation of tools and materials through the manufacture of tubes originating from bottles of used mineral water that have a volume of 1500 ml, the bottle is cut into ¾ and the bottled bottles of mineral water are perforated for aeration; oasis cutting; making thiamine solution; and propagul making treatment of shoot cuttings. Observations and measurements were made on shoot length (cm), number of live shoots, number of dead shoots and number of roots per shoot.

C. Research Finding

Data from observations made on shoot length (cm), number of live shoots, number of dead shoots and number of roots per shoot at a concentration of 0 ppm, 250 ppm, 500 ppm; 750 ppm and 1000 ppm as follows:

Table 1. Average Data on Observation of Shoot Length (cm) of Ateng Coffee Plants

Treatment	Average Shoot Length (cm)			
	2 WAP	4 WAP	6 WAP	8 WAP
BI (0 ppm)	0 a	0b	0c	0c
B2 (250 ppm)	0 a	0,02 b	1,60 c	1,65 b
B3 (500 ppm)	0 a	0,16 a	3,12 b	3,58 b
B4 (750 ppm)	0 a	0,14 a	3,37 b	3,98 a
B5 (1000 ppm)	0 a	0,15 a	3,39 a	4,06 a

Description: Numbers followed by the same letter in the same row or column show not significantly at the 5% level using the BNJ Test.

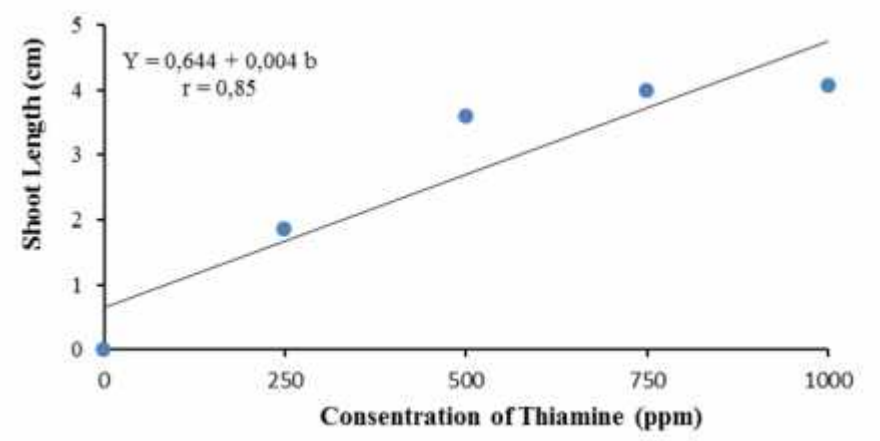

Figure 1. Shoot Length (cm) Response Curves of Ateng Coffee Plants Age 8 WAP.

Table 2. Average Data on Observation Number of Live Shoots of Ateng Coffee Plants

Treatment	Average Number of Live Shoots			
	2 WAP	4 WAP	6 WAP	8 WAP
BI (0 ppm)	0	0 d	0,36 c	1,28 d
B2 (250 ppm)	0	0,20 c	0,50 c	1,96 b
B3 (500 ppm)	0	0,40 b	1,28 d	1,96 b
B4 (750 ppm)	0	0,56 a	1,72 b	2,40 a
B5 (1000 ppm)	0	0,56 a	1,96 b	2,48 a

Description: Numbers followed by the same letter in the same row or column show not significantly at the 5% level using the BNJ Test.

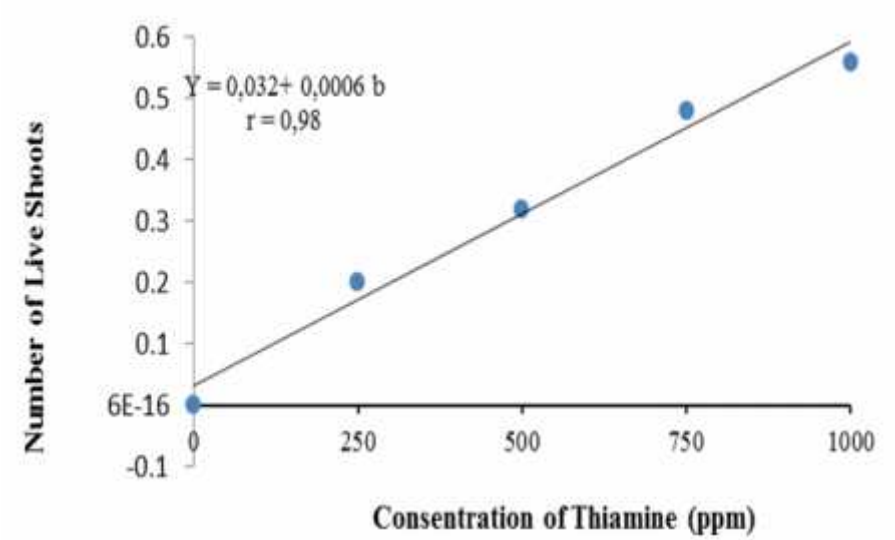

Figure 2. Number of Live Shoots Response Curves of Ateng Coffee Plants Age 8 WAP.

Table 3. Average Data on Observation Number of Dead Shoots of Ateng Coffee Plants

Treatment	Average Number of Dead Shoots			
	2 WAP	4 WAP	6 WAP	8 WAP
BI (0 ppm)	0	0	0,24	0,76
B2 (250 ppm)	0	0,20	0,25	0,92
B3 (500 ppm)	0	0,40	0,52	0,68
B4 (750 ppm)	0	0,56	0,72	0,48
B5 (1000 ppm)	0	0,56	0,64	0,44

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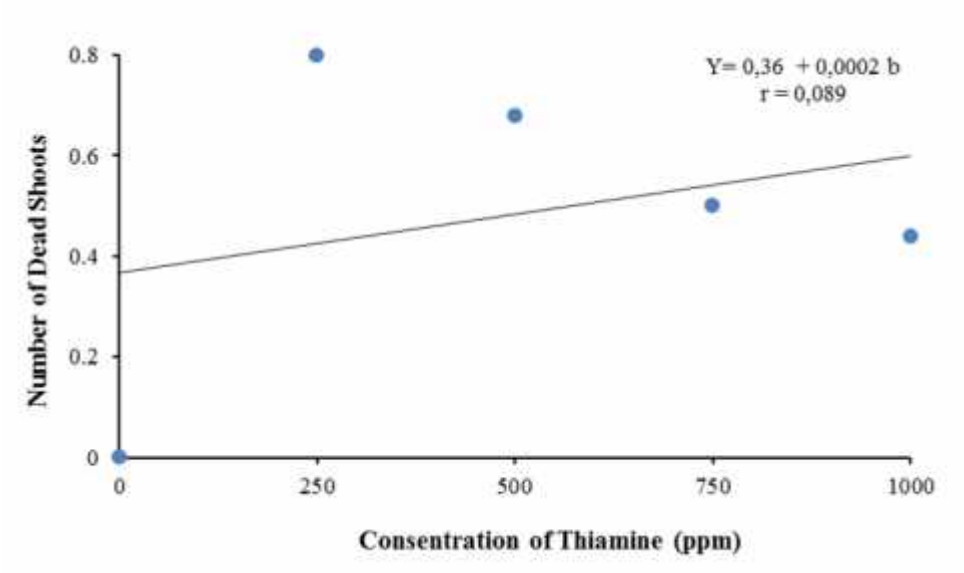

Figure 3. Number of Dead Shoots Response Curves of Ateng Coffee Plants Age 8 WAP.

Table 4. Average Data on Observation Number of Roots per Shoot of Ateng Coffee Plants

Treatment	Average Number of Roots per Shoot			
	2 WAP	4 WAP	6 WAP	8 WAP
BI (0 ppm)	0	0	0	0
B2 (250 ppm)	0	1	1	1
B3 (500 ppm)	0	1	1,13	1,33
B4 (750 ppm)	0	1,33	1,33	1,46
B5 (1000 ppm)	0	1,07	1,6	1,6

Description: Numbers followed by the same letter in the same row or column show not significantly at the 5% level using the DMRT Test.

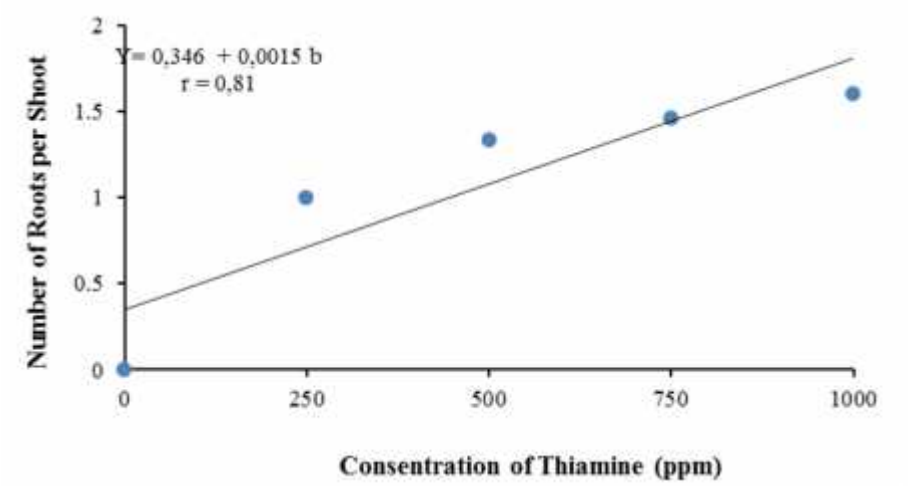

Figure 4. Number of Roots per Shoot Response Curves of Ateng Coffee Plants Age 8 WAP.

D. Discussion

1. Shoot Length (cm)

Thiamine has an effect on shoot length, reduce stress caused by cutting from the parent tree and spur cell division in collaboration with auxin so that the administration of thiamine causes cell division on the tip which then causes the addition of the shoot length. As it was said [16] that thiamine acts as an antioxidant and which can help disrupted plant metabolism and thiamine interacts with auxin so that it can stimulate cell division which causes an increase in shoot length. This is in line with what was said [17] that thiamine as a coenzyme stimulates the acceleration of cell division and increases sensitivity to auxin thereby spurring the increase in shoot length. The results of the study showed that the optimum concentration of thiamine for shoot cuttings in coffee plants was 1000 ppm. In accordance with the results of the study [12] that the use of auxin will be stronger if combined with thiamine of 1000 ppm.

2. Number of Live shoots

Thiamine provides a response to slowing cell damage due to injury to plant parts, this is caused thiamine has antioxidant properties that prevent toxic compounds due to the oxidation process of plant sap by air due to the opening of cut plant tissue, so that the shoot's death process becomes slower. This causes the number of shoots to live higher with increasing concentration of thiamine given. This study showed that the optimum thiamine concentration was 750 ppm, where the number of shoots was high and not significantly different from the concentration of 1000 ppm.

3. Number of Dead shoots

The addition of less thiamine concentrations results in stress on the shoots because the metabolism is inhibited, where thiamine is no longer supplied by plants that have been separated from the mother so that it requires additional thiamine from the outside. This is indicated by the results of research on the number of dead shoots more occurs at a concentration of 0-500 ppm thiamine. As stated [13] that thiamine deficiency can cause plants to experience more rapid decline in shoot growth, loss of leaves and death of plants. This is because thiamine is an essential ingredient of all plants, which affects growth, development and plant resistance.

4. Number of Dead shoots

Thiamine affects the number of roots, this is because thiamine contains organic compounds that can increase rooting on shoot cuttings. In this study cuttings given thiamine treatment showed the ability to form roots even with a low percentage. As said [11] thiamine plays a role in stimulating the formation of primodial roots (root roots) so as to increase the formation of roots in cuttings. This is in line with what was said [18] that administration of thiamine can stimulate root growth in various types of plants that are propagated vegetatively.

E. Conclusion

The conclusion of this study is the administration of thiamine can affect the growth of shoots of Ateng coffee plants especially at 750 ppm and 1000 ppm thiamine concentrations. And the higher the concentration of thiamine given, the greater the value of the observations of all the research parameters.

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