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Forewords

Praise and gratitude to Allah SWT, because of Allah's love for us so that we are still given a long life and can carry out our various daily activities. May all our activities become our acts of worship, Aamiinnn

in accordance with the commitment of the Jurnal Serambi Ilmu Journal to continue to improve the quality of its manuscripts since the volume 22 number 1 has been published full in English.

We are also be proud that the number of submitted manuscripts is quite large, but only a few are acceptable and worthy of publication. This means that Jurnal Serambi Ilmu has become one of the scientific publications that are considered by experts and education enthusiasts.

For this reason, Jurnal Serambi Ilmu is committed to continuing to maintain the quality, service and discipline that applies in scientific publications.

September 30, 2021

Editor in chief,

Dr. Abubakar, M. Si

Indexing By :

Thickening of Rubber Sap (*Hevea brasilliensis*) Through the Utilization of Natural Ingredients Noni Fruit Extract (*Morinda citrifolia L.*) (Students Field Practice of Human and Environmental Subject)

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Abstrak

The purpose of this study was to increase students' knowledge about the benefits of noni fruit extract (*Morinda citrifolia L.*) for thickening of rubber latex (*Hevea brasilliensis*). This research was conducted in 2020 in the village of Terutung Pedi, Babussalam District, Southeast Aceh Regency, The method used in this research is the experimental method with a non-factorial Randomized Block Design (RAK) designed in five treatments and three replications. The tools is the mineral water bottle, blender, notebook, camera, plastic bucket, measuring cup, measuring pipette, knife, filter, stopwatch/Hp and scale. The ingredients is noni fruit (*Morinda citrifolia*) which is ripe with the characteristics of a white skin and fruit flesh that contains a lot of water and rubber latex (*Hevea brasilliensis*) that has been tapped. The conclusion was that the administration of noni fruit extract (*Morinda citrifolia L.*) had a significant effect on the thickening of rubber latex (*Hevea brasilliensis*).

Keywords: *extract morinda citrifolia l.*, thickening, *hevea brasilliensis*, field practice

INTRODUCTION

The teaching process or learning is an activity to implement the curriculum in educational institutions so that students can achieve the goals that have been set (Ibrahim, et al. 2018). Learning is a teacher/lecturer activity programmed in instructional design, to make learning active, which emphasizes the provision of learning resources (Maysara, 2016).

Teaching and learning activities are the most basic activities of the entire learning process at the university, which means that the success or failure of achieving educational goals is highly dependent on how the learning process takes place. The main principle in biology learning at this time is generally to improve and prepare learning activities that are beneficial for students, aiming to shift from the paradigm of "teaching biology" to "learning biology" (Ibrahim, et al. 2018).

According to Arifin (2014) said Field Work Practice (PKL) is a form of systematic and synchronous implementation between educational programs at schools/campuses with certain skill mastery programs. In addition, PKL are one of the academic activities that must be followed by all students in certain study programs. Action (responsible behavior towards the environment) was studied in several different meetings (Evi, 2017).

Human and environmental learning is one of the subjects that discusses humans and the environment, how to interact with components of the physical environment, both biotic (animals and plants), and abiotic (soil, water, rocks and others). For example, biotic plants, namely rubber trees and noni trees are used in this study.

With direct experience in the field, students easily understand about pollution due using of chemicals in the tapping process, so the researchers want to provide information that thickening rubber after tapping can use noni fruit extract so that it is environmentally friendly.

Rubber plant is one of the plantation commodities which occupies an important position as a source of non-oil and gas foreign exchange for Indonesia, so it has bright prospects. Therefore, efforts to increase the productivity of rubber farming continue to be carried out, especially in the field of cultivation technology (Anwar, 2012).

Rubber is an annual plantation crop in the form of straight trunk trees. The first time rubber only grew in Brazil, South America, but after repeated experiments by Henry Wickham, Rubber was successfully developed in Southeast Asia and even to Southeast Aceh, where now this plant is widely developed so that it reaches Indonesia (Setiawan and Andoko, 2010).

Tapping is one of the main activities of the rubber plantation business.The purpose of tapping is to open the latex vessels in the bark of the tree so that the latex flows quickly. The velocity of latex flow will decrease if the dose of latex liquid on the skin is reduced to a height of 260 cm from the ground, rubber farmers tap fields to earn income for a period of about 30 years. Therefore, tapping must be done carefully so as not to damage the skin. If an error occurs in tapping, then rubber production will decrease (Setiawan and Andoko, 2010).

Rubber trees (*Hevea brasilliensis*) can be tapped when they are up to five years old. Based on the observations of tappers conducted in Kutacane, Southeast Aceh Regency on average starting at 08.00 WIB, and the latex is not collected immediately, but waits for the thick sap to be in the shelter (storage shell). This collection is also known as pre-coagulation, for pre-coagulation that produces lumps or lumps in the lead sap fluid (Ulfah, dkk. 2015).

The latex will naturally clot or freeze a few hours after collected. The natural clumping is caused by the emergence of acids due to the decomposition of non-rubber materials contained in latex due to the activity of microorganisms. That's also the reason why the lump as a result of natural clumping smells bad. This pre-coagulation is strongly influenced by several factors, including microorganisms, enzymes, climate, plant conditions, types of plant clones, fertilizer ratios, transportation, and external impurities.

The content of rubber latex (*Hevea brasilliensis*) or latex consists of rubber particles and non-rubber materials dispersed in water. Latex is also a colloidal solution with rubber and non-rubber particles suspended in a medium containing various substances.

The latex contains 25-40% crude rubber and 60-75% serum which consists of water and dissolved substances. The raw rubber material contains 90-95% pure rubber, 2-3% protein, 1-2% fatty acids, 0.2% sugar, 0.5% kinds of salts of Na, K, Mg, Cn, Cu, Mn and Fe. Rubber particles are suspended or evenly distributed in latex serum with a size of 0.04-3.00 microns with round to oval particle shapes.

The condition of raw materials for the rubber industry in terms of quantity, quality and continuity of supply is influenced by the source of the raw material itself. On large plantations this is not tobe big a problem. Raw materials that come from smallholder rubber plantations are usually very varied in quality (Maryanti dkk. 2016).

Latex as a raw material for various rubber products, must have good quality. There are several factors that affect the quality of latex, as follows (Vevi Oktaviana, 2014).

1. Factors from the garden (type of clone, tapping system, tree cleanliness, etc.).
2. Climate (rainy season encourages precoagulation, dry season unstable latex).
3. Tools used in collection and transport (which are either made of aluminum or stainless steel).
4. Transport (shock, state of the tank, distance, time period).
5. Water quality in treatment.
6. Chemicals used.
7. Latex composition.

To find out the composition of the ingredients contained in latex can be seen in the table from the ingredients contained in fresh latex there is still a yellow fraction of latoid (2-10 ppm), peroxidase and tyrozinase enzymes. The yellow fraction is considered normal when it reaches 0.1-1.0 mg per 100 grams of dry latex.

Table 1
Ingredients in Fresh Latex and Dried Latex

Ingredients	Fresh Latex (0%)	Dried latex
Rubber content	35,62	88,28
Resin	1,65	4,10
Protein	2,03	5,04
Ash	0,70	0,84
Sugar	0,34	0,84
Water	59,62	1,00

Source : Purwanta and Slameto, 2008

How to prevent precoagulation:

1. By means of good technical culture

Good farming methods according to the recommendations, the growth of rubber plants will grow and develop fertile and healthy. For this reason, it is necessary to pay close attention to the maintenance and technical culture including the selection of superior seeds, fertilization and so on (Purwanta and Slameto, 2008).

2. How to Wiretap

Tapping rubber plants must pay attention to the factors that affect pre-coagulation. Tapping must be carried out at low temperatures like in the morning, because in the morning rubber plants have high turgo pressure so that latex flow is expected to be higher and faster and longer, besides not being affected by direct sunlight, so latex drainage in the field tapping will run smoothly and a larger volume of latex can be obtained.

3. Wiretapping tools and transportation

All tapping support tools to be used must be clean and rust-resistant, so that it will prevent pre-coagulation. Likewise, equipment for the transportation of latex products must be careful not to get too much shock during the transportation journey.

4. The use of anticoagulant substances in latex

At the time of tapping rubber plants, it is necessary to add anticoagulant substances to the latex produced, can be in the form of a diluted solution, including ammonia, soda, formaldehyde, sodium sulfite, and borax. To accelerate the occurrence of pre-coagulation of latex sap that has accumulated in the reservoir, people in Southeast Aceh add noni juice (Setiawan and Andoko, 2010). Noni (Morinda citrifolia L.) is one of the medicinal plants that in recent years has been in great demand, it is a wild tropical plant. Noni can grow on the coast to an altitude of 1500 m above sea level (above sea level), both on fertile and marginal land (Setyamidjaja, 2005).

Noni plants, especially the fruit, have many uses, including: for high blood pressure, beriberi, urinary, kidney inflammation, inflammation of the gallbladder, colitis, dysentery, constipation, spleen pain, swollen spleen, liver pain, bloody saliva, diabetes. (diabetes mellitus), intestinal worms, chicken pox, obesity (obesity), back pain (lumbago), stomach pain (colic), and heartburn due to colds, rough skin on feet (skin softener), removes dandruff, antiseptic, menstrual laxative (emenagogue), and blood purifier.

The juice of grated ripe fruit is used to gargle (gargle) in diphtheria or tonsillitis. Godogan fruit, bark or roots are used to wash wounds and eczema (Setiawan and Andoko, 2010). Noni (*Morinda Citrifolia*) is a plant that is widely used as traditional medicine (Saf-ur *et al.*, 2010), antioxidant (Brett *et al.*, 2011), heal wounds caused by diabetes (Nayak *et al.*, 2007), *Angiotensin Converting Enzim* (ACE) (Yamaguchi *et al.*, 2002), This activity is thought to be partly due to the antioxidant activity in noni with its flavonoid and phenolic compounds content (Rao dan Subramanian, 2009). The maximum age of the noni plant is about 25 years (Sari, 2015)

Figure 1
Noni (Morinda citrifolia) Seeds

source: Sari, 2015

The content of noni (*Morinda citrifolia*) consists of terpenoid compounds. Terpenoid compounds are isometric hydrocarbon compounds that are also found in fats or essential oils, which is a type of fat that is very important for the body. Terpenes help the body in the process of organic synthesis and recovery of body cells (Sjabana, 2002).

Anti-bacterial substances, namely Acubin, L. asperuloside, alizarin and several anthraquinone substances have been proven as anti-bacterial substances. The substances contained in the noni fruit have been shown to show strength against infectious bacterial groups: *Pseudonzonas aeruginosa, Proteus morganii, Staphylococcus aureus, Bacillus subtilis dan Escherichia coli* (Waha, 2000).

Noni (*Morinda citrifolia*) also shows that the activity of anti-bacterial substances in noni fruit can control two groups of deadly bacteria (pathogens), namely: Salmonella and Shigella. The discovery of anti-bacterial substances in noni juice supports its use for treating skin infections, colds, fever and various health problems caused by bacteria (Waha, 2000).

The ascorbic acid present in the noni fruit is an excellent source of vitamin C. Vitamin C is a great antioxidant. Antioxidants are useful for neutralizing free radicals (harmful particles formed as a by-product of metabolic processes, which can damage genetic material and damage the immune system). Caproic acid, caprylic acid and capric acid are included in the fatty acid group. Caproic acid and capric acid is what causes the pungent odor of noni fruit (Waha, 2000).

Overall noni is a complete nutritional food. Most of the past and present Polynesian cultural customs use noni fruit as the main food. The indigenous people of the South Pacific islands consume noni fruit to survive in times of famine. Similarly, the soldiers who settled in the Polynesian islands during World War II were encouraged to consume noni fruit to increase strength and power (Waha, 2000).

Nutrients that the body needs include: carbohydrates, protein, vitamins, and essential minerals are also available in noni fruit and leaves. Selenium is an example of a mineral that is abundant in noni and is a great antioxidant (Sjabana, 2002). Nutrients that the body needs include: carbohydrates, protein, vitamins, and essential minerals are also available in noni fruit and leaves. Selenium is one example of a mineral that is abundant in Noni and is a great antioxidant.

In 1993, University of Hawaii researchers succeeded in separating scopoletin substances from noni fruit. These scopoletin substances have medicinal properties, and in addition, experts believe that scopoletin is one of the substances found in noni fruit

that can bind to serotonin, one of the important chemicals in the human body (Waha, 2000).

Scopoletin functions to widen the constricted blood vessels and improve blood circulation. In addition, scopoletin has also been shown to kill several types of bacteria, is fungicidal (mushroom killer) against Pythium, sp and also has anti-inflammatory and anti-allergic properties (Waha, 2000).

Several recent studies on noni were conducted to determine the content of anticancer substances (damnacanthal). Four Japanese scientists succeeded in finding anti-cancer substances in noni extract when they were looking for substances that can stimulate the growth of the normal structure of abnormal cells K-ras-NRK (pre-cancer cells) in 500 types of plant extracts. most effective against abnormal cells (Waha, 2000).

One of the important alkaloids contained in the noni fruit is xeronine. Xeronine is also produced by the human body in limited quantities which functions to activate enzymes and regulate protein function in cells (Sjabana, 2002). Proxeronine is a kind of colloidal acid that does not contain sugar, amino acids or nucleic acids like other colloids with a relatively large molecular weight, more than 16,000. When we consume proxeronine, xeronine levels in the body will increase. In the human body (intestine) the enzyme proxeronase and other substances will convert proxeronine into xeronine. The main function of xeronine is to regulate the shape and rigidity (hardness) of specific proteins found in cells (Sjabana, 2002).

In Terutung Pedi Village, the noni fruit (*Morinda Citrifolia*) is underutilized by the local community, and the noni fruit (*Morinda Citrifolia*) is left scattered on the community's plantations. Therefore, the authors are interested in socializing the benefits of noni fruit (*Morinda Citrifolia*) to the community through the role of students as well as thickening agents for rubber latex (Hevea bransilliensis).

RESEARCH METHODS

Population and Sample

Population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by researchers to be studied and then drawn conclusions (Sugiyono, 2005). The sample of this research is Terutung Pedi village farmer, Babussalam District, Southeast Aceh Regency. And this research held in the Pebruari 2021.

Table 2
Practical Tools and Materials

No.	Tools	Ingredients
1.	Mineral water bottle	Noni fruit (*Morinda citrifolia*) which are ripe with the characteristics of fruit skin white and the flesh of the fruit contains a lot of water
2.	Blender	
3.	Notebooks	
4.	Camera	
5.	Plastic bucket	
6.	Measuring cup	Rubber sap (*Hevea brasilliensis*) which has been tapped.
7.	Measuring pipette	
8.	Knife	

9.	Filter	
10.	Stophwatch/Hp	
11.	Scales	

Research Design

The method used in this study is an experimental method with a non-factorial Randomized Block Design (RAK) designed in five treatments and three replications. The treatments carried out are as follows:

P0 : Control (without administration of noni fruit extract).
P1 : 200 ml of gum + 4 ml of noni fruit extract
P2: 200 ml of gum + 6 ml of noni fruit extract
P3 : 200 ml of gum + 8 ml of noni fruit extract
P4 : 200 ml of gum + 10 ml of noni fruit extract
P5: 200 ml of gum + 12 ml of noni fruit extract

Data analysis

The data analysis technique of this research uses analysis of variance (ANAVA) or F test. The steps in carrying out the data analysis are as follows:

SK	**DB**	**JK**	**KT**	**Fhitung**	**F label 5%**
Media	V_1	J (P)	KT (P)	KT(P)KT(G)	F (V_1 – V_2)
Galat (Error)	V2	J (G)	KTG	-	-
Total	(R.T-1)	J (T)	-	-	-

Information : 5K= Skeleton source, V_1 = Degree of free treatment, DB= Free degrees V_2= Free degrees error, t = Treatment.

The steps in carrying out the data analysis are:

1. To calculate the square factor (FK) with formula:

$$FK = \frac{Tij^2}{r\ x\ t}$$

2. To calculate the sum of the squares of factors (JKT) with formula:

$$JKT = \frac{T\ (Tij)^2}{r} - FK$$

3. To calculate the number of squares of treatment (JKP) with formula:

$$JKP = \frac{(TA)^2}{r} - FK$$

4. To calculate the total degrees of freedom (DBT) with formula:

dbt= dbp +dgb

5. To calculate the degree of freedom of treatment (DBP) with formula:

dbp= t - 1

6. To calculate degrees of error free (DBG) with formula:

dbg= (r.t – 1) (T-1)

7. To calculate the sum of the squares of errors (JKG) with formula:

JKG= JKT - JKP

8. To calculate the total square of treatment (KTP) with formula:

$$KTP = \frac{JKP}{r-1}$$

9. To calculate F calculate with formula:

$$F^{count} = \frac{KTP}{KTG}$$

(Source: Hanafiah, 2010)

Hypothesis testing

The hypothesis is tested at the significant level 0,05. If value F_{count} > of value F_{table}, then the alternative hypothesis (ha) accepted. Jika F_{count} < dari F_{table}, then the alternative hypothesis (ha) is rejected.

Working Method

As for how to make noni fruit extract to thicken latex sap. The efficacy of rubber latex using noni fruit extract in liquid form will be carried out in a garden of the residents of Terutung Pedi Village, Babussalam District, together with students and the community. The steps for making liquid extract are as follows:

1. Provided noni fruit weighing 1000 grams as many as 8 pieces
2. The noni that has been provided is washed first
3. After the noni is clean, then cut into small pieces using a knife
4. The next step is to put the pieces of noni into a blender for the smoothing process
5. After smooth poured into a bucket for the filtering process
6. Filtering using a filter so that the noni pulp is not mixed
7. The filter results are transferred to a mineral water bottle
8. Noni fruit extract is ready to be applied
9. By adding noni fruit extract (Morinda citrifolia) 4 ml, 6 ml, 8 ml, 10 ml and 12 ml to 200 ml of rubber latex (interviews from rubber farmers.

RESULTS AND DISCUSSION

Research result

This research was carried out on February 18, 2021 in Terutung Pedi Village, Babussalam District, Southeast Aceh Regency. The results of the study indicate that the thickening of rubber latex can be seen in the data presented in the table below:

Table 3
Rubber Sap Thickening Time (*Hevea brasilliensis*)

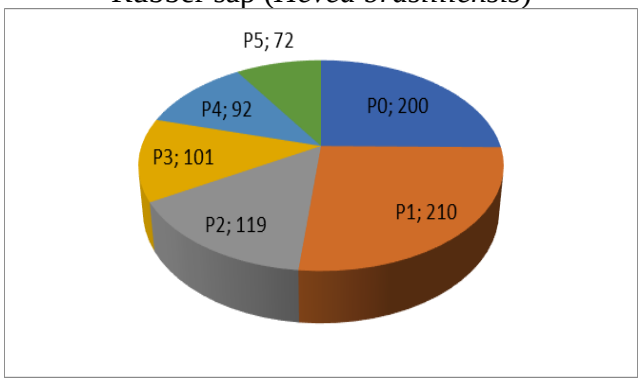
Treatment	Test			Amount	average
	I	II	III		
P0	400	-	-	200	66,67
P1	70	70	70	210	70,00
P2	40	40	39	119	39,67
P3	34	34	33	101	33,67
P4	30	30	32	92	30,67

P5	24	24	24	72	24,00
Amount				594	264,67

Source: field data, 2021

The table above shows that the noni fruit extract has a significant effect on the thickening of the rubber sap, meaning that the use of the noni fruit extract for its thickening is based on human and environmental studies, it can be seen in terms of the fastest time average data on the thickening of the rubber sap. (*Hevea brasilliensis*) found in P_5= 24 minute, P_4= 30,67 minute, P_3= 33,67 minute, P_2= 39,67 minute, and the longest time for the thickening process is in P_1= 70,00 menit. Furthermore, the observational data on the average time of thickening of rubber latex (Hevea brasilliensis) can be presented in the form of the salt below:

Figure 2
Clumping Time Average Chart
Rubber sap (*Hevea brasilliensis*)



Source: field data, 2021

From the histogram above, it can be explained that the lowest average time value for the rubber latex thickening process is in P_5= 72 minute, P_4= 30,67 minute, P_3= 33,67 minute, P_2= 39,67 minute, and the longest time for the thickening process is in P_1= 70,00 minute. For more details, the data obtained were analyzed for variance as shown in the table below:

Table 4
The results of the calculation of the Average Time Variety Analysis
Rubber Gum Thickening.

SK	DB	JK	KT	F count	F Table	
					0,05	0,01
treatment	4	27294,80	6823,70	5,58	3,33	5,64
Error	10	12226,00	1222,60			
Total	14	39520,00				

Source: field data, 2021

From the table above, data processing with analysis of variance shows that the administration of noni fruit extract has a significant effect on the thickening of rubber latex (*Hevea brasilliensis*), where the calculated F value = 5.58 > F Table = 3.33 at a significance level of 0.05% , and at a significance level of 0.01% = 3.64. Thus the hypothesis Ha is accepted, and Ho is rejected.

The hypothesis which states that there is an effect of noni fruit extract on the thickening of rubber fruit (*Hevea brasilliensis*), is "accepted". This can be seen from the results of data analysis at the time of thickening of rubber latex (*Hevea brasilliensis*). The effective thickening time of rubber latex (Hevea brasilliensis) was 24 minutes + 200 ml rubber latex + 25 ml noni fruit extract, with a value of F_{count}= 5,58 greater than value of F_{table} (0,05)= 3,33 dan F_{table} (0,01)= 3,64.

DISCUSSION

Based on the results of the study, it can be seen that there is a very significant effect on the thickening time of rubber latex (*Hevea brasilliensis*) in various treatments with different concentrations. The average time of rubber thickening shows that the noni fruit extract *(Morinda citrifolia L.*) at P5 (25 ml of extract) thickens the rubber latex (Hevea brasilliensis) which has a faster thickening time.

Then P4 (20 ml extract) with an average value of 24 minutes, at P3 (15 ml extract) with an average thickening time of 33.67 minutes, P2 (10 ml extract) an average thickening time of 39.67 minutes, and the longest average-coagulation time was at P1 (5 ml extract) 70 minutes. While P0 (control) with an average thickening time of 400 minutes (± 7 hours).

Thickening of the rubber sap (Hevea brasilliensis) can occur because the mixture of noni fruit extract contains the chemical Acit (acidic substance) which can thicken the rubber sap, where “hard water or water is water that has a chemical reaction usually reacts acid. Precoagulation will occur more quickly if this water is mixed into the latex (Djoehana, S, 2006).

Based on interviews with rubber farmers, it can be stated that the length of time the rubber sap thickens is also influenced by the age of the plant and the type of rubber plant (Hevea brasilliensis). The differences between the types planted produce different latex. Automatically different cloidal stability or stability. Certain clones have a low level of stability. However, many species have high levels of cloidal stability. This level of cloidal stability more or less affects other factors that can cause precoagulation (Purwanto, J.H, et al., 2008).

The content of noni fruit in the form of Proxeronine, flavonoids, Acit (acidic substance), and its phenolic compounds, has the potential as a precoagulation of rubber latex (Hevea brasilliensis). (Rao and Subramanian, 2009).

From the information above, it can be concluded that the thickening or pre-coagulation of rubber latex (Hevea brasilliensis) has a different thickening time, the older the age of the rubber, the thickening time (precoagulation) is faster and vice versa if the age of the rubber is young, the thickening time will be slower. As explained earlier, field practice provides double benefits, in addition to learning the material in a course, students can understand the problems faced by the surrounding community. For example, excessive use of chemicals can damage the environment, from this problem students can introduce alternative materials that are environmentally friendly with better benefits, as has been socialized in this study. So that this success can be used as a program to perpetuate the tridharma of higher education.

CONCLUSION

Based on the results of these studies, it can be concluded that Using of noni fruit extract (Morinda citrifolia L.) has a significant effect on the thickening of rubber latex (Hevea brasilliensis). Noni fruit extract (Morinda citrifolia L.) which has the most effect on thickening rubber latex (Hevea brasilliensis) is found at (25 ml extract + 24 minutes) with a value of F_{count}= 5,58 greater than F_{table} (0,05)= 3,33 and (0,01) = 3,64. The most effective volume was found in treatment P5 with an estimated average thickening time of 24 minutes.

Using of noni fruit extract is better than the use of chemicals. Learning through field practice able to providing practical experience also able to disseminate information about the use of natural materials and the dangers of chemical substances

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