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# The Effect of Giving Avocados (*Persea americana* Mill) and Guava (*Psidium guajava* Linn) on Hemoglobin Levels in Traditional Rice Farmers

R Utari<sup>1</sup>, Y Setyaningsih<sup>2</sup> and A Suwondo<sup>2</sup>

<sup>1</sup> Master Student of Health Promotion Program

<sup>2</sup> Faculty of Public Health, Diponegoro University

rirautari95@gmail.com

**Abstract.** Data of Puskesmas (Public Health Center) profile was obtained from Hiang Lestari village midwife, showed that 38% of rice farmers develop anemia. The objective of research was to find out the effect of Avocado (*Persea americana mill*) and Guava (*Psidium guajava linn*) administration on Hemoglobin level in Traditional Rice Farmers in Hiang Lestari village. This study was a quasi-experiment research with *Pretest-Posttest with control group design*. The population of research was all traditional female farmers fulfilling the inclusion criteria. The sample consisted of 30 persons, taken using purposive sampling, divided into 3 treatment groups: avocado, guava, and combined avocado and guava consumption. Analysis was conducted using *T Paired Sample Test*. The result of research showed that there was a difference of hemoglobin level with sig. value (2-tailed) of  $0.000 < 0.05$  having treated with avocado fruit consumption, with average hemoglobin level increase of 1.3 g/dl, with sig. value (2-tailed) of  $0.002 < 0.05$  having treated with guava fruit consumption, with average hemoglobin level increase of 1.6 g/dl, and with sig. value (2-tailed) of  $0.000 < 0.05$  having treated with combined avocado and guava fruit consumption, with average hemoglobin level increase of 2.8 g/dl.

## 1. Introduction

Hemoglobin is a protein in the form of oxygen-carrying red pigment that is rich in iron, has a tube style to oxygen to form hemoglobin in red blood cells. With the presence of this function, the oxygen is carried from the lungs into the tissue. Normal adult hemoglobin level is 12.0 g/dL s/d to 15.0 g/dL for women and 13.5 g/dL s/d to 18.0 g/dL for men. Avocado is a fruit rich in vitamin A, 180 SI/100gram and iron. Vitamin A has a role in erythropoiesis associated with its functions to synthesize proteins that would affect the growth of bone cells. The bone marrow is the place for erythrocytes formation. Vitamin A is needed in some essential processes in the body such as metabolism, hematopoiesis, erythropoiesis, sexual differentiation setting and plays a role in the immune system. One of the other functions of vitamin A is involved in the formation of red blood cells through the interaction with the Mineral Fe so as to prevent the occurrence of anemia [1]. Guava contains the highest vitamin C compared with those in any other fruit species. The levels are doubled compared with orange that has a vitamin C content of 49mg / 100 gram. Besides the high content of vitamin C, guava also contains vitamin A. Vitamin C and Vitamin A is an antioxidant substance. Most vitamin C of guava concentrated in the skin and outer flesh which is soft and thick. Vitamin C of guava reaches its peak towards mature. In addition to the high



content of vitamin C, guava is also rich in fiber, especially pectin (soluble fiber), which can be used to gel or jelly-making material [2]. Rice farmers work in the sun and under rain. Sometimes it doesn't matter how the weather is at work because it can reduce yield productivity. So that this erratic weather can cause the health of farmers disturbed, things that have been experienced by farmers after working in hot or cold weather are fever, fatigue, dehydration to anemia. These health problems can also reduce productivity because farmers must rest sufficiently so they can work as usual. Puskesmas profile data obtained from the village midwife Hiang Lestari, there are 38% of rice farmers who are anemic [3].

## 2. Materials and methods

This research is a quasi-experimental with pretest-posttest design with control group design. The sampling technique used was purposive sampling in accordance with the inclusion and exclusion criteria [4][5]. Total sample of 30 people were divided into three groups with different interventions. Group 1 received the avocado intervention of 100g/day, group 2 received guava intervention of 100g/day and group 3 received a combination of avocado and red guava of 100g/day. The tools used for measuring hemoglobin levels are Hemoglobin Testing System Quick-Check and blood sampling performed by health analysts. Statistical test used is a test of Paired Samples T Test.

## 3. Result

To determine differences in hemoglobin levels before and after having the intervention of an avocado, the Paired sample t-test was used because the distribution of data is normal. Based on the statistical test using the Paired sample t-test, p-value is 0,000. If the p-value <0,05, this means that there is a difference of hemoglobin levels before and after having the intervention of avocado.

**Table 1.** Analysis of differences in hemoglobin levels avocado intervention

	Hemoglobin Levels before avocado intervention (gr/dl)	Hemoglobin Levels after avocado intervention (gr/dl)	Range	<i>p-value</i>
Mean	11,1	12,4	1,3	
Minimum	9,8	12,0	2,2	0,000
Maximum	11,9	13,2	1,3	
$\alpha=0,05$				

To determine differences in hemoglobin levels before and after getting the intervention of red guava, Paired sample t-test was used because distribution of data is normal. Based on the statistical test using the Paired sample t-test, p-value is 0.002. If the p-value <0,05, it means that there is a difference of hemoglobin levels before and after having the intervention of guava.

**Table 2.** Analysis of differences in hemoglobin levels guava intervention

	Hemoglobin Levels before guava intervention (gr/dl)	Hemoglobin Levels after guava intervention (gr/dl)	Range	<i>p-value</i>
Mean	11,3	12,4	1,1	
Minimum	10,2	12,0	1,8	0,002
Maximum	11,9	13,0	1,1	
$\alpha=0,05$				

To determine differences in hemoglobin levels before and after getting intervention of avocado and red guava combination, Paired samples t-test was used because the distribution of data is normal. Based on the statistical test using the Paired sample t-test, p-value is 0.000. If the p-value <0.05, it means that

there is a difference of hemoglobin levels before and after getting the intervention of avocado and red guava combination.

**Table 3.** Analysis of differences in hemoglobin levels

	Hemoglobin Levels before combination of avocado and guava intervention (gr/dl)	Hemoglobin Levels after combination of avocado and guava intervention (gr/dl)	Range	<i>p-value</i>
Mean	10,2	13,0	2,8	
Minimum	9,1	12,0	2,9	0,000
Maximum	11,3	14,8	3,5	
$\alpha=0,05$				

## 4. Discussion

### 4.1 Analysis of hemoglobin levels before and after avocado intervention

The results showed that there were differences in hemoglobin levels before and after getting the intervention of an avocado for 14 days as much as 100g/day, this result was proved by statistical tests of Paired Sample T test with p-Value of 0.000 (<0.05). The formation of hemoglobin in the blood requires three basic materials which are iron, vitamin C and folic acid. Avocado contains nutrients vitamin C of 13mg/100g, 1 mg iron/100gr and vitamin A of 146 IU/100gr [6]. This study is in line with research conducted by Feriyal which also states that there was an effect of feeding avocado for 14 days to increase hemoglobin levels [1], Avocado is rich in vitamin A which can help the formation of red blood cells. Vitamin A has a role in erythropoiesis associated with its functions to synthesize a protein that would affect the growth of bone cells.

Vitamin A is needed in some of the essential processes in the body, one of the other functions of vitamin A is involved in the formation of red blood cells through the interaction with the mineral Fe so as to prevent the occurrence of anemia [7]. The content of vitamin C in avocados acts as an anti-inflammatory to prevent inflammation and reduces the risk of infection and another function of vitamin C is to accelerate the absorption of iron. Avocados are one of the fruits that are rich in vitamin A and iron, Vitamin A in avocados plays a role in mobilizing iron reserves in the liver, increasing erythropoiesis and reducing anemia accompanied by infection [8][9], while the iron in the avocado is iron along with protein (globin) and protoporphyrin have an important role in the formation of hemoglobin, so that if the body lacks iron it will inhibit the formation of hemoglobin. The process of formation or synthesis of hemoglobin takes less than 7-10 days to become mature and ready to be circulated throughout the body with red blood cells [10][11].

When the research was being carried out, the intervention was given for 14 days and there were no major complaints of respondents. There were only minor complaints which did not disrupt during the study. Characteristics of respondents were in the normal point with productive working age of 20 years to 49 years with a high school education level and working years of 5-10 years.

### 4.2 Analysis of hemoglobin levels before and after guava intervention

The results of the study showed that there were differences in hemoglobin levels before and after having the interventions of red guava for 14 days of 100g per day. This result was proved by statistical test. The statistical test used was Paired Samples T Test with p-value 0.002 (<0, 05). Red guava contains so many nutrients that are beneficial to health and the formation of red blood cells. Guava contains 83mg of vitamin C per 100g. The function of vitamin C in guava can be antioxidants and neutralize free radicals

and prevent infection. This study is consistent with previous studies conducted by Pagdya which concluded that there is an effect of red guava to increase hemoglobin levels [12].

The increase in hemoglobin levels and the amount of erythrocytes is due to vitamin C having a dual function, which is as an aid in the absorption of iron and anti-oxidants when the body produces free radicals due to physical work, vitamin C is an antioxidant needed by the body when maximum physical activity, so that stress does not occur oxidative which can damage enzymes, protein receptors, lipid membranes and DNA [13].

In the intervention of avocado, most respondents' ages ranged between 36-49 years with a junior high education levels and tenure of 5-10 years. Judging from the age, their immune and stamina are no longer as 20-36 years of age as for the intervention of avocado. Thus, the intervention of red guava has the increasing number of hemoglobin levels which was not so high compared to the intervention of avocados.

#### 4.3 Analysis of hemoglobin levels before and after the combination of avocado and guava intervention

The intervention of avocado and red guava combination was carried out for 14 days. Each respondent got 100g per each fruit. In this intervention, the respondents got much nutrient content of iron, vitamin C and vitamin A because of the combination of avocado and red guava. Therefore, the amount of fruit consumed in a day was 200gr. Hemoglobin is a protein that is rich in iron. Globin from hemoglobin is broken down into amino acids to be used as a protein in tissues, iron in hem from hemoglobin is released for use in subsequent red blood cells [14][15]. Protein also functions to transport iron through transferrin. Lack of protein intake can cause disruption of iron transport and the formation of hemoglobin and red blood cells so that it can ultimately cause iron deficiency anemia.

Iron is the most micro minerals available in the human and animal body, which is 3-5 grams in the adult human body. Iron has several essential functions in the body, namely as a means of transporting oxygen from the lungs to body tissues as a means of transporting electrons in cells and as an integrated part of various enzyme reactions in the body's tissues. Iron is needed for the formation of hemoglobin, which is a constituent of red blood cells. Hemoglobin plays an important role in the transport of oxygen and carbon dioxide between the lungs and tissues [16]. Hemoglobin is a pigment that gives red color to red<sup>17</sup>. Characteristics of respondents in this intervention were those aged between 36-49 years old with a high school education and tenure of 5-10 years. It is the same with the characteristics of respondents in the intervention of red guava who have experienced decreasing health which is not really visible compared to the respondents aged between 20-35 years.

## 5. Conclusion

There are differences in hemoglobin levels before and after consuming avocado, guava and a combination of avocado and guava.

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