

The Effect of Red Fruit Oil on Maximum Physical Activity on Leukocyte Counts

Yohanis Manfred Mandosir¹, I Putu Eka Wijaya Putra², Budi Kristanto^{3*}

^{1,2}Cenderawasih University, ³Jayapura Ministry of Health Polytechnic

Corresponding Author: Budi Kristanto bkbudikristanto@gmail.com

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ABSTRACT

The purpose of this study was to determine the effect of giving red fruit oil on maximum physical activity and the number of leukocytes. This type of research is quasi-experimental with a randomized pretest and posttest design. The sample for this research is 10 (ten) people who are students of the Sports Science Study Program at the Faculty of Sports Science, University of Cenderawasih. Furthermore, the data were processed with statistics at a significance level of 5% with the help of the SPSS version 22 program. The results showed that: 1) in the group given red fruit oil, there was an increase in the number of leukocytes, which was less before maximum exercise than in the group not given red fruit oil; and 2) in the group given red fruit oil, there was a decrease in the number of leukocytes after maximal exercise compared to the group not given red fruit oil.

INTRODUCTION

In December 2019, cases of mysterious pneumonia were first reported in Wuhan, Hubei Province. The source of transmission of this case is still not known for certain, but the first case is associated with a fish market in Wuhan. From 18 December to 29 December 2019, there were five patients treated with Acute Respiratory Distress Syndrome (ARDS). From 31 December 2019 to 3 January 2020 these cases increased rapidly, marked by the reporting of 44 cases. In less than a month, the disease has spread to other provinces in China, Thailand, Japan and South Korea. The samples studied showed the etiology of the new coronavirus. Initially, this disease is called transientas2019 novel coronavirus (2019-nCoV), then WHO announced a new name on 11 February 2020 namely Coronavirus Disease (COVID-19) caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) virus. The virus can be transmitted from person to person and has spread widely in China and more than 190 other countries and territories. On March 12, 2020, WHO declared COVID-19 a pandemic. As of March 29, 2020, there have been 634,835 cases and 33,106 deaths worldwide. Meanwhile, in Indonesia, there have been 1,528 positive cases of COVID-19 and 136 cases of death (Susilo et al., 2020).

The corona virus works by attacking the respiratory system, causing upper respiratory tract infections (ARI), mild and even severe pneumonia (Kemendagri, 2020). A strong body's immune system is a weapon to fight corona virus infection, besides that it also requires the condition of the respiratory tract to function properly. The Ministry of Home Affairs through the General Guidelines for Facing the Covid 19 Pandemic suggests several things that each individual can do to avoid Covid 19, including eating regularly and nutritiously and exercising diligently (Kemendagri, 2020).

Consumption of nutritious food and exercise have a good impact on health in preventing infection and helping to improve respiratory function. Exercise can increase the body's immunity such as aerobic exercise for 30 minutes can activate the function of leukocytes as the main component of the body's immunity. However, if physical exercise is carried out with heavy intensity it can reduce the body's immunity. Strenuous physical exercise has the potential to produce free radicals which result in damage to cells (Dékány et al., 2008). Exercise is a stress factor that can cause physiological cellular changes to the function of the hematological system, such as changes in the number of leukocytes. Changes in the number of leukocytes depend on exercise frequency, exercise intensity, type of exercise, and duration of exercise (Bhatti & Shaikh, 2007; Hazar & Yilmaz, 2008).

Found in the community, there are still many people who do not understand about good, right and proper sports so that the exercise they do does not follow the FITT principles (Frequency, Intensity, Time and Type). Exercise that is done excessively will be at risk of hypoxic conditions or lack of oxygen in the body, which is characterized by an increase in the number of leukocytes. So that oxygen levels in the blood are always maintained, it is advisable to eat foods that are rich in vitamins A, B2, B3, B5, B9, and B12;

minerals such as iron and copper; and nitric oxide molecules. Red fruit is a typical fruit from Papua which is known to be very high in vitamin A.

Red fruit (*Pandanus conoideus*) is a medicinal plant that contains many active ingredients which act as antioxidants. One of the active substances contained in red fruit and useful for counteracting or inhibiting the formation of free radicals in the body is beta-carotene. The function of β -carotene itself is very vital which is as pro-vitamin A which will later be converted into vitamin A (retinal) (Grune et al., 2010). Based on the description above, researchers are interested in conducting a study on the impact of giving red fruit oil on maximum physical activity on the number of leukocytes. The hope is that leukocytes that are formed due to the condition of the body lacking oxygen due to maximum physical activity can be prevented by administering red fruit oil.

THEORETICAL REVIEWS

Fruit Red (*Pandanus conoideus* Lamk.)

Bred fruit (*pandanus conoideus* Lamk.) is a plant native to Papua which is widely found in the mountainous areas of Jayawijaya (Wamena and Tolikara), Manokwari, Jayapura, Timika, Nabire and Sorong. Red fruit can grow in areas with rainfall of 186 mm each month with temperatures below 17 degrees Celsius and sunlight intensity of around 57%. Usually red fruit grows in clusters in one area (Kennedy and Clarke in Sabru, 2017).

Since being introduced by Drs I Made Budi MS, red fruit is emphasized for alternative treatment of tumors/cancer, HIV/AIDS, stroke, heart disease, hypertension, hepatitis, rheumatism, gout (Subroto, in Sabru, 2017). In several studies conducted by Drs I Made Budi MS with the direct treatment method with red fruit juice, the research revealed very high success in the treatment efforts carried out for several diseases, most cases of healing occurred in patients in Papua and sufferers of disease in Java Island (Budi, 2005).

Red fruit can boost the immune system and the body's metabolic processes, because red fruit contains lots of natural substances. According to (Pohan et al., in Sabru, 2017). Red fruit compound components include carotenoids, beta-carotene, tocopherols, alpha tocopherols and fatty acids which function as anti-free radical compounds that control various diseases such as cancer, hypertension, lung and infectious diseases. The content of antioxidants, especially β -carotene and α -tocopherol in red fruit is higher than other fruits and vegetables, such as tomatoes, carrots, papaya, bean sprouts. The main content of red fruit is fatty acids. The fatty acids contained in red fruit oil consist of; palmitic acid, oleic acid, and linoleic acid.

Antioxidants (tocopheol and beta-carotene) are substances that help slow or prevent the oxidation process (Arafah in Sabru, 2017). Tocopherol has a role as an antioxidant that can help cure several diseases. Its function is to strengthen the immune system and ward off free radicals (Revelation and Bernard, 2005). Tocopherol also improves the body's immune system thereby reducing the morbidity and mortality of body cells. Tocopherol also helps the formation of new cells to replace cells that have been damaged (Clarke in Sabru, 2017). In addition, beta-carotene also has a role as an antioxidant and functions

to prevent the proliferation of cancer cells (Wahyu and Bernard, 2005). Antioxidants which are compounds that can prevent the process of free radical oxidation, can play a role in preventing the onset of cancer, premature aging process and reduce the occurrence of other degenerative diseases such as; diabetes mellitus, coronary heart disease, hypertension, and cancer (Kusmita and Limantara, 2008).

Physical Activity

Physical activity is any movement of the body due to the activity of the skeletal muscles which results in energy expenditure. Everyone does physical activity between individuals with one another depending on individual lifestyle and other factors. Physical activity consists of activities during work, sleep, and at leisure. Planned, structured, repetitive physical activity including physical exercise is part of physical activity. Moderate physical activity that is carried out continuously can prevent the risk of non-communicable diseases such as blood vessel disease, diabetes, cancer and others (Kristanti et al., 2002). There are several definitions from experts regarding physical activity, including according to Almatier (2003) physical activity is the physical movement carried out by the body's muscles and their supporting systems. Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure. Absence of physical activity (lack of physical activity) is an independent risk factor for chronic disease, and is estimated to cause death overall globally. Physical activity is physical work involving the body's locomotor system which is aimed at carrying out activities of daily living, if a physical activity has a specific purpose and is carried out according to certain rules systematically such as time rules, target pulse, the number of repetitions of movements and others is called exercise. Meanwhile, what is meant by sport is physical activity carried out with elements of recreation (Lesmana and Syahmirza, 2001).

The simplest way to boost immunity is to do physical activity/exercise and get enough rest and sleep. Even mild physical activity, such as aerobics for 30 minutes, can activate the work of white blood cells, which are the main components of the body's immunity in blood circulation. Ideally do aerobic physical activity for 30 minutes (Musdalipa, 2018). According to Kristanti (2002) the effects of physical activity can be instantaneous, which is called an acute response, and long-term effects due to regular and programmed physical activity, which are called adaptations. Included in the acute response are increased heart rate, increased respiratory rate, increased blood pressure and increased body temperature. This includes adaptations, including increased muscle mass, increased bone mass, increased antioxidant defense system and decreased resting heart rate frequency. Physical activity occurs in various domains/places, for example at work, when traveling, in special sports places, and at leisure or recreation.

Leukocytes

Leukocytes are blood cells that contain a nucleus, also called white blood cells. The average number of leukocytes in normal human blood is 5000-

9000/mm³, if the number is more than 10,000/mm³, this condition is called leukocytosis, if less than 5000/mm³ is called leukopenia (Effendi, 2003). Leukocytes consist of two main groups, namely agranular and granular. Agranular leukocytes have a cytoplasm that appears homogeneous, and their nuclei are round or kidney-shaped. Granular leukocytes contain specific granules (which in the living state are semi-liquid droplets) in their cytoplasm and have a nucleus that exhibits great variation in shape. There are 2 types of agranular leukocytes namely; lymphocytes consisting of small cells with little cytoplasm, and monocytes consisting of cells that are rather large and contain more cytoplasm. There are 3 types of granular leukocytes, namely neutrophils, basophils, and acidophiles (eosinophils) (Effendi, 2003).

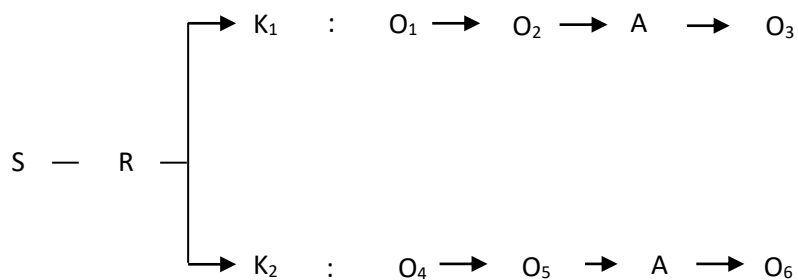
Leukocytes have a role in cellular and humoral defense of organisms against foreign substances. Leukocytes can carry out amoeboid movements and through the process of diapedesis leukocytes can leave the capillaries by breaking between endothelial cells and penetrating into the connective tissue (Effendi, 2003). The number of leukocytes per microliter of blood, in normal adults is 5000-9000/mm³, at birth it is 15000-25000/mm³, and by the fourth day it drops to 12000, at the age of 4 years according to the normal amount (Effendi, 2003).

Inflammatory Reaction

Inflammation is the body's reaction to the entry of foreign objects, invasion of microorganisms or tissue damage. In the first attempt to destroy foreign bodies and microorganisms and clean damaged tissue, the body will deploy elements of the immune system to the entry point of foreign bodies and microorganisms or damaged tissue (Baratawidjaja, 1998).

METHODOLOGY

The research to be carried out is a quasi-experimental research with the research design The Randomized Pretest and Posttest Design (Zainuddin, 2000) as follows:



Information:

S : Sample (The sample of this research was 10 (ten) people who were students of the Sports Science Study Program at the Faculty of Sports Science, University of Cenderawasih. 5 (five) people each get red fruit oil, and 5 (five) 5 (five) people who do not get red fruit oil.

R : Randomization

K₁ : Treatment group 1 (those who received red fruit oil)

K₂ : Treatment Group 2 (Which tidl will be given red fruit oil)

O₁ : Observation 1 (Examination of Initial Leukocyte Count in K₁)

O₄ : Observation 4 (Examination of Initial Leukocyte Count in K₂)

A : Maximum Physical Activity

O₂ : Observation 2 (Examination of Leukocyte Count Pre Maximum Physical Activity K₁)

O₅ : Observation 5 (Examination of Leukocyte Count Pre-Maximum Physical Activity K₂)

O₃ : Observation 3 (Examination of Leukocyte Count Post K₁ Maximum Physical Activity)

O₆ : Observation 6 (Examination of Leukocyte Count Post K₂ Maximum Physical Activity)

Implementation of Data Collection

1. Provision of Red Fruit Oil

What is meant by giving red fruit oil in this study is giving red fruit oil capsules to respondents. Provision of red fruit oil supplementation was given before the respondent did maximum physical activity.

2. Physical Activity

The physical activity referred to in this study is maximum physical activity, this activity is designed in the form of running back and forth on a 20-meter track until the respondent is completely exhausted.

3. Leukocytes

The leukocytes referred to in this study were leukocytes obtained from the results of blood tests on the respondents. Leukocyte data collection was carried out 3 times for each respondent, ie 2 times before maximum physical activity before giving red fruit oil and 1 time after giving red fruit oil.

Data Analysis

This data processed with statistics at a significance level of 5%, with the help of the SPSS version 22 program.

1. Descriptive Statistics Test
2. Prerequisite Test: Normality Test
3. Hypothesis Test with Independent T Test and Paired Sample T Test

RESULTS

Age of Respondents

The following is data on the number of respondents who received red fruit oil and respondents who did not get red fruit oil by age:

Table 1. Number of Respondents by Age

No	Age Group Getting Red Fruit Oil (K1) in Years	N	Age Group Not Getting Red Fruit Oil (K2) in Years	N
1	17	2	17	2
2	18	1	18	1
3	19	1	19	-
4	20	1	20	2
	Amount	5	Amount	5

Processed Data, 2023

Based on table 1 above, it is known that in the group of respondents who received red fruit oil, the most ages were 17 years, totaling 2 people, while in the group of respondents who did not get red fruit oil, the most ages were 17 years and 20 years, 2 people respectively.

1. Respondents Nutritional Status

The nutritional status of respondents in this study used the BMI (Body Mass Index) indicator, which is the quotient between body weight and height. The following is data on the number of respondents who received red fruit oil and respondents who did not get red fruit oil based on BMI:

Table 2. Number of Respondents Based on BMI

No	BMI of the Group Obtaining Red Fruit Oil (K ₁)			Cate gory	BMI of the Group Not Getting Red Fruit Oil (K ₂)			Cate gory
	BB	TB	BMI		BB	TB	BMI	
1	156.9	50	20.31	Good	164.2	66.5	24.66	Good
2	158.6	62.5	24.84	Good	161.8	64.5	24.63	Good
3	155	59.4	24.72	Good	155.2	53.4	22.16	Good
4	160.8	59.7	23.08	Good	167.2	67.7	24.21	Good
5	159	51.1	20.21	Good	159.7	50.1	19.64	Good
	Average		22.63	Good	Average		23.06	Good

Processed Data, 2023

Based on table 2 above, it is known that the nutritional status as measured by body mass index in both the group of respondents who received red fruit and those who did not receive red fruit were all in the category of good nutrition.

2. *Leukocyte Count*

The following is leukocyte count data for both respondents who received red fruit oil and respondents who did not receive red fruit oil:

Table 3. Number of Leukocytes

No	Number of Leukocytes in the Group Getting Red Fruit Oil (K ₁)			Number of Leukocytes in the Group That Didn't Get Red Fruit Oil (K ₂)		
	Beginning	Pre	Post	Beginning	Pre	Post
1	6,200	6,500	6,400	7,200	7,200	7,300
2	7,400	7,300	8,000	6,900	11,200	10,900
3	7,300	7,800	7,200	7,900	7,800	8,000
4	10,900	12,000	12,000	6,400	6,800	6,700
5	9,500	9,200	8,400	7,800	6,400	6,800
Average	8,260	8560	8,400	7,240	7,880	7,940

Processed Data, 2023

Based on table 3 above, it is known that: 1) In the group that received red fruit oil; the average initial leukocyte count was 8,260, after 4 hours of giving red fruit oil the number of leukocytes (leukocytes before maximum physical activity) was 8,560 (an increase of 300 points), then after doing maximum physical activity (leukocytes after maximum activity) the number of leukocytes was 8,400 (reduced by 160 points). 2) In the group that did not receive red fruit oil; the average initial leukocyte count was 7,240, after 4 hours the leukocyte count (leukocytes before maximum physical activity) was 7,880 (plus 640 points), then after doing maximum physical activity (leukocytes after maximum activity) the leukocyte count was 7,940 (plus 60 points) .

Based on the average values above, it can be concluded that giving red fruit oil at maximum physical activity decreases the number of leukocytes.

a. Prerequisite Test

Prerequisite test is a test of each variable data that has been collected before proceeding to the hypothesis test. The prerequisite test will determine what type of statistical test is appropriate to use to test the hypothesis of the research being carried out. The test used as a condition for the t test is the data normality test.

Table 4. Results of the Normality Test for the Number of Leukocyte Variables

Sig. Value Group Leukocytes Obtaining Red Fruit Oil (K ₁)			Sig. Value Group Leukocytes Not Getting Red Fruit Oil (K ₂)		
Beginning	Pre	Post	Beginning	Pre	Post
0.854	0.940	0.759	0.976	0.698	0.807

Processed Data, 2023

Based on table 4 above, it is known that the Sig. each variable in both group (K₁) and group (K₂) is > 0.05. this means that the data for each variable is normally distributed.

b. Hypothesis Testing

The hypothesis test used in this study isand Paired Sample T Test and Independent T Test. The Paired sample T Test was used to test the difference in mean values in groups K₁ and K₂, while the Independent T Test was used to test the difference in mean values between groups K₁ and group K₂.

1) Paired T Test Results

Following are the results of the paired t test for the variable leukocyte count K₁ and the number of leukocytes K₂, which includes the initial leukocyte count, the number of leukocytes before maximum physical activity and the number of leukocytes after maximum physical activity.

Table 5. Results of the Paired T Test for Leukocyte Count

Variable	Sig	Information
Leuko K ₁ Early - Leuko K ₁ Pre	0.288	Ho Rejected
Initial K ₁ Lauko - Leko K ₁ Post	0.724	
Leuko K ₁ Pre - Luuko K ₁ Post	0.574	
Leuko K ₂ Early - Leuko K ₂ Pre	0.543	
Initial K ₂ Lauko - Leko K ₂ Post	0.459	
Leuko K ₂ Pre - Luuko K ₂ Post	0.646	

Processed Data, 2023

Based on table 5 above, it is known that the sig values of the six variables tested show a sig value > 0.05, this means that Ho is rejected or does not indicate a significant difference between variables.

2) Independent T Test Results

The following are the results of the independent t test for the variable leukocyte count K₁ with the number of leukocytes K₂, which includes the initial leukocyte count, the number of leukocytes before maximum physical activity and the number of leukocytes after maximum physical activity.

Table 6. Independent T Test Results for Leukocyte Count

Variable	Sig	Information
Early Leuko K ₁ - Early Leuko K ₂	0.307	Ho Rejected
Leuko K ₁ Pre - Leuko K ₂ Pre	0.614	
Leuko K ₁ Post - Leuko K ₂ Post	0.720	

Processed Data, 2023

Based on table 6 above, it is known that the results of the independent t test of the three variables tested show a sig value > 0.05 , this means that H_0 is rejected or does not show a significant difference between the variables.

DISCUSSION

Giving red fruit oil is expected to be able to inhibit free radicals formed due to maximum exercise, which is characterized by an increase in the number of leukocytes.

Red fruit (*Pandanus conoideus*) is a medicinal plant that contains many active ingredients which act as antioxidants. One of the active substances contained in red fruit and useful for counteracting or inhibiting the formation of free radicals in the body is beta-carotene. The function of β -carotene itself is very vital which is as pro-vitamin A which will later be converted into vitamin A (retinal) (Grune et al., 2010).

The results showed that there was a difference in the mean number of leukocytes before and after maximum physical activity between the groups given red fruit oil and those not given red fruit oil, although statistically there was no significant difference. Based on the results of research conducted by Sinaga et al., (2018) concluded that administration of red fruit oil has a hepatoprotective effect in rats that perform maximum physical activity, meaning that the amount of oxidative stress that occurs due to maximum physical activity can be reduced through the administration of red fruit oil. functions as an antioxidant.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research and data processing, it can be concluded that: 1) In the group given red fruit oil, there was an increase in the number of leukocytes that was less before maximal exercise than the group not given red fruit oil, 2). In the group given red fruit oil, there was a decrease in the number of leukocytes after maximal exercise compared to the group not given red fruit oil.

As a recommendation, for further research it is necessary to consider the method of administering red fruit oil, meaning that red fruit oil is not only given when carrying out maximum physical activity but is given as a supplement which is consumed some time before carrying out maximum physical activity.

ADVANCED RESEARCH

Study using quasi-experimental technique, where this method is considered to have lower variable control, so that sometimes the research results are less accurate and difficult to interpret. Therefore, researchers must be very careful in interpreting the results of research that has been done. In the future, it is hoped that there will be similar studies using different methods to enrich references as comparison material.

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