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The Effect of Giving Red Guava Fruit Juice Towards Haemoglobin and Vo_2max Contents on Maximum Physical Activity

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Abstract: ***Physical activity can cause to increased production of free radicals that can be reduced the antioxidant so as to affect performance athletes due to happened sport anemia. Free radicals can be prevented or reduced to the delivery of antioxidant. It have been known fruit red guava containing various types of natural antioxidant but never researched for its usefulness to reduce free radical production triggered by physical activity. This study aims to know the effect of giving guava fruit juice towards haemoglobin and VO_2max contents on maximum physical activity. Type of this study was experimental research with Randomized Control Group Pretest-Posttest Design. It was conducted at Medan State University Stadium and Physiology Laboratory Faculty Of Sport Science, Medan State University. It was conducted in 3 Months. The population and sample were 20 students of sport which fulfilled the criteria and it was divided into group, namely experimental group and control group. In this study was conducted by measurement Haemoglobin and VO_2 content when doing pretest and posttest. Based on the results of data analysis, it found that the red guava juice during training program can increase Hb and VO_2max levels in maximum physical activity.***

Keywords: Red Guava, Maximum Physical Activity, Antioxidant Haemoglobin VO_2max

1. Introduction

Physical activity can cause to increased Production various types of free radicals that can cause damage to cells (**Dekany *et al,* 2008).** Free radicals formed in the body will be neutralized by the elaboration of defense systems between antioxidant enzymes such as catalase (CAT), superoksid dismutase (SOD), glutathione peroxidase (GPx) and a number of non-enzyme antioxidants including vitamins A, E and C, glutathione, ubiquinone and flavonoids **(Urso, 2003)**. When the production of free radicals exceed antioxidant cellular defense and can occur oxidative stress (**Daniel et al,) 2010**. On the condition of oxidative stress , free radical will cause the occurrence of lipid peroksidasi **(Evans , 2000)** , damage to muscle tissue **(vina , et al . , 2000)** activity and change antioxidant enzymes **(urso , 2003)** that eventually can affect the performance of athletes.

The results of the study showed that oxidative stress is one of the factors responsible for the damage of erythrocytes during and after physical exercise and can cause anemia commonly called "sport anemia" **(Senturk et al 2001**) due to decreased haemoglobin levels **(Senturk et al. 2005., Senturk, et al., 2004).** And it also causes damage to muscle system (**Vina, *et al.,* 2000**). The damage of muscle and blood system is considered to be involved in the process of fatigue, or inability to generate power. Damage caused by oxidative stress can also alter the histochemistry of the blood and cause muscle pain (**Dekkers., *et al* 1996 dan Kuipers, 1994**). Increased free radicals the sport also affect the energy aerobic in mitochondria, caused exhaustion **(Kendall dan Eston, 2002).** Meanwhile, according to (**Zhu dan Haas, 1997**) stated that a decrease in VO2 max can occur in anemic patients with decreased Haemoglobin levels and consequently a decreased oxygen transport capacity in the blood so that it can attain athlete performance. In addition, due to severe physical exercise in individuals who are not conditioned or unaccustomed to physical exercise can also result in oxidative damage and muscle injury **(Evans, 2000).**

A decline in the levels of antioxidants and lipid peroxidase which really make an impact to reduction of haemoglobin and vo2max due to physical activity maximum in line with a statement of 's **Colgan , 1986** suggested that that athletes under heavy training and competition among not capable of retaining antioxidant levels at an optimal level on the network. In connection with that, **Gomez (2008**) stated that oxidative damage due to physical activity may be prevented by optimizing nutrition, especially by increasing the antioxidant content of food. According to **Silalahi (2006)** antioxidant properties will be more effective when consuming vegetables or fruits that are rich in antioxidants of various types instead of using a single antioxidant such as vitamin E. It may be because by the presence of other components and at that interaction in vegetables and fruits which played the role in a positive way.

One of alternative natural ingredients that contain antioxidant is red guava fruit. Red guava fruit is known has a vitamin C content five times greater than orange fruit **(Kumar, 2012).** Other compounds in guava fruit that function as antioxidants are carotenoids such as beta-carotene, lycopene, beta-cryptoxanthin and polyphenols **(Nascimento et al. 2010; Oliveira et al. 2010; Ordonez-Santos and Vazquez-Riascos, 2010).** As an antioxidant, β-carotene works to capture free radicals, especially peroxyl radicals and hydroxyl and β-carotene works synergistically with vitamins C and E **(Silalahi, 2006).**

Features fruit guava having various types of antioxidant and potent antioxidant activity is great, researchers are interested and need to examine the effect antioxidant guava against the red haemoglobin and vo2max athletes in physical activity maximum

2. Research Methodology

2.1 Research Design

This research was conducted in experimental design which consists of pre-test and post-test with simple randomization.

2.2 Place and Time

This study was conducting in Medan State University stadium, physiology Laboratory Faculty Of Sport Science, Medan State University and regional Health Laboratory North Sumatera.

2.3 Materials and Tools Research

Research materials were including red guava, 1% EDTA solution, Aquades. Research tools include:, Spectrophotometer, Glass Tools, Spuit, Blender.

2.4 Subject of The Research

The number of athletes were 20 people which has a good criteria of vo2max, age 20 – 22 years old of male, who has a good IMT, not smokers, not consume a supplement and antioxidant two weeks before and during the survey, willing to become the subject of study.

2.5 Conducting Research

2.5.1 The Treatment

The research was using 20 athletes who meet a criterion. All of athletes were investigated of hematology for examination haemoglobin and measurements VO_2max. Then athletes were divided into two groups, namely experiment group and control group. During they were training program in 2 months the experimental group was given JBJBM 1x1 day. After an exercise program all of athletes were doing an activities maximum physical by doing bleep test. Furthermore, re-measurement of VO2 max and haemoglobin. Examination haemoglobin was conducted by using spectrophotometer.

3. Result and Discussion

3.1 Weight and High Data

This study activity has examined as many as 20 samples. The sample of age ranges between 19-20 years old. The average data of Weight and height body can be seen in table 1:

Table 1: Mean of Weight and Height body sample

Variable	Group	n	Mean	Sig
Weight of Body	Control	10	59.5	0.918
	Experiment	10	59.7	
Height of Body	Control	10	1.66	0.109
	Experiment	10	1.68	

From the table above, after analyzed by using statistic test independent samples t-test, the result of weight and height of body on control and experiment group was not difference significantly (p>0,05). The similarity of weight and height of body in this research showed that the sample has same capacity between ability and physical strength, so that in the research treatment are expected there is no significant difference that can affect the results of research caused by the inequality ability and strength of the sample.

3.2 Haemoglobin level data before and after giving red guava juice during training.

Based on the result of the research which was conducted Hb level before and after red guava just shown in figure 1.

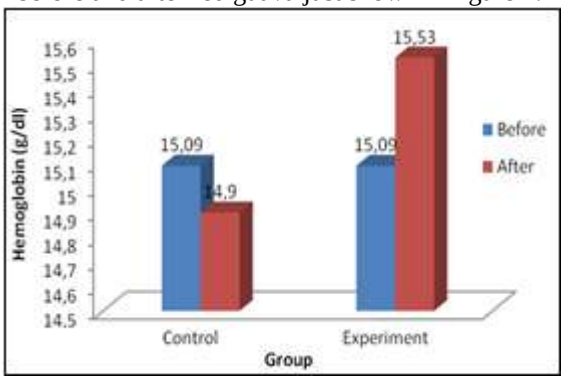

Figure 1: Diagram of Hb Level Before and After Red Guava Juice Fruit during the Exercise Program

From the test results of data analysis before and after the experiment the data obtained are normal and homogeneous distributed both control group and experiment group. Result of statistical test by using t test (Paired Samples Test), the result showed that there was a difference of hemoglobin level both control group and experimental group (P = 0,000). In control group there was a decrease of haemoglobin from 15.09 g / dl to 14.90, while the experimental group increase Hb from 15.09 g / dl to 15.53. When compared to the difference between the experimental group and the control group after consuming the red guava juice at the time of undergoing the training program with the t-test (Independent Samples Test) obtained the difference between the experimental group and the control group (p = 0.001).

The decrease in Hb levels in the control group was in line with studies which were conducted by many other researchers including research which conducted by **(Senturk, *et al.*, 2005)** where in his study found that a decrease in Hb levels in humans after performing the maximum physical activity. A decrease in Hb level was also found in mice that performed maximum physical activity **(Senturk,*et al.*, 2001, Senturk, *et al.*, 2004).** This research also found that maximal physical exercise causes a decrease in hemoglobin levels in humans (**Putman, *et al.*, 2003**). The decline in the haemoglobin is caused by the increasing number of cells erythrocytes damaged in the physical exercise maximum **(Senturk, *et al.*, 2005).** An increased Hb level due to Guava Juice is caused by guava juice it can prevent the hemolysis to a membrane red blood cells caused by an increase in physical activity for exercise. Red Guava is able to prevent the process of lipolysis because antioxidant content of which on guava. As known that red guava is containing antioxidant, vitamin c , vitamin a , iron , calcium and phosphorus. The vitamin c of red guava is 5 times more than orange **(kumar , 2012).** Other compounds in guava fruit that function as antioxidants are carotenoids such as

beta-carotene, lycopene, beta-cryptoxanthin and polyphenols **(Nascimento et al., 2010; Oliveira et al., 2010; Ordonez-Santos and Vazquez-Riascos, 2010).** As one of the natural ingredients containing various types of antioxidants, the antioxidant activity of red guava fruit has been tested in laboratory using DPPH method (2,2-diphenyl-1-picrilhidrazyl) by using visible spectrophotometer. The result of this research showed that red guava extract has IC50 = 45,5 µg / mL whereas vitamin C which used as standard have IC50 = 25,8 µg / mL (**Vyas et al 2010**).

3.3 Data of VO2max Level Before and After Guava Fruit Juice During the Exercise

Based on the result of the research which conducting by VO2max Level before and after giving the treatment of Red Guava it can be seen in figure 2:

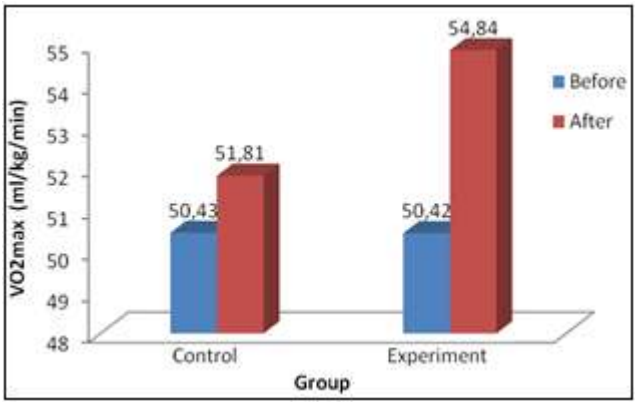

Figure 2: Diagram of VO2max level before and after giving the treatment of Red guava during undergoing training program

The result of VO2max pretest on control group measurement was 50,43ml / kgBB / minute, while on the experimental group obtained VO2max value was 50.42ml / kgBB / minute. From the result of statistical test using t-test (Independent Samples Test), it was found that there was no difference between experimental group and control group with p = 0,988 (p> 0,05). The result of measurement of VO2max value after administration of Red Guava Juice in experiment group increased from 50,42 ml / kgBB / minute to 54,84 ml / kgBB / minute and statistical test results show there was a difference with the value p = 0.000. In the control group also increased from 49.43 ml / kgBW / min to 49.77 ml / kgBW / minute and by using t-test (Paired Samples Test) the increase of VO2max value was statistically different with p = 0,023 (p <0,05). Meanwhile, from the different test results using the t-test (Independent Samples Test), the VO2max posttest between the control group and the experimental group showed a significant difference with the value of p = 0.163 (p> 0.05).

An increase in vo2max good the control and treatment group before and after the provision of red guava juice for undergo successor program exercise caused by because of diffusion pulmonary a person trained better than one who untrained **(fox, 1988).** The better capacity diffusion pulmonary, the bigger volume of gas diffuses; so it will improve the ability a person in do imposition cardiorespiratory without an exhaustion that means. So that the trained person will breathe more slowly and deeply, and the oxygen needed for muscle work in the ventilation process is reduced. As a result with the same amount of oxygen, trained people will work more effectively than untrained people. Thus, during routine exercise activities in this study will increase the VO2max value. Increased VO2max is also due to increased O2 content in the arteries and veins, as well as increased cardiac output maximum. So if we compared to the largest increase in VO2max obtained in the experimental group than the control group. It can be explained by the Guava juice during an exercise program to prevent the occurrence of stressoksidatif which can lead to peroxidation of cell membrane membranes, especially red blood cells. It can be seen from the Hb level of treatment group is greater than the control group. As we known that Hb is one of the factors that affect the value of VO2max.

4. Conclusion and Suggestion

4.1 Conclusion

By giving Guava Juice during an exercise program it can increase Haemoglobin and VO2max levels in maximum physical activity.

4.2 Suggestion

In this study, it should be done measurement malondialdehid levels as an indicator of increased production of free radicals. And then it needs to be studied the status of antioxidants by measuring levels of endogenous antioxidants such as enzyme superoxidismutase (SOD), Guttation Peroxidase (GPx) or catalase.

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