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The Effect of Red Fruit Oil on Hematological Parameters and Endurance Performance at the Maximal Physical Activity

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Abstract: ***Maximal physical activity can produce an imbalance between reactive oxygen species (ROS) and antioxidants which is possibly related to fatigue and tissue injury. Red fruit oil contains high betacarotene and tocopherol. This study was investigated the effect of red fruit oil on hematological parameters and endurance performance at maximal physical activity. This study was used pretest-posttest control group design. Thirty athletes are used as samples were divided into two groups. While undergoing the training program, the experimental group consumed the red fruit oil 5 ml every day. After undergoing the training program, all athletes perform maximum physical activity by doing a bleep test. Blood samples were collected before and after the test to measure hematological parameters. The result of the research was concluded that red fruit oil can affect hematological parameters and increase endurance and delay fatigue induced by maximal physical activity in athletes.***

Keywords: Red Fruit Oil, Antioxidant, Hematological, Maximal Physical Activity

1. Introduction

Strenuous physical activity can lead to oxidative stress occurs due to the production of free radicals exceeds the amount of antioxidants in the body [1-2]. Under conditions of oxidative stress, free radicals cause lipid peroxidation of cell membranes [3]. Malondialdehyde (MDA) is one of the results of lipid peroxidation [4-6], so that the MDA is a common indicator used to determine the amount of free radicals and indirectly assess body antioxidant capacity.

Some studies claim that oxidative stress may result in a decrease in the amount of antioxidants [7], decreased immunity [8], sport anemia [9], damage to the muscle tissue [10] which is thought to be involved in the process of fatigue, causing muscle pain [11], changes in the value of hematocrit, erythrocytes and leukocytes [12], decreased hemoglobin levels and morphological changes in the cells of erythrocytes [13], which in turn can affect performance.

In the body there is a mechanism of antioxidant or anti-free radicals that endogenous. Free radicals are formed will be neutralized by the antioxidant defense system elaboration of the enzymes and a number of non-anti-oxidant enzymes [14]. The results of the study reported that the administration of antioxidants derived from natural or synthetic sources from outside the body is required to neutralize the free radicals formed during physical activity, especially strenuous physical activity [15-18].

One of the known natural sources of antioxidants is red fruit (Pandanus conoideus Lam) contained in Papua. Red fruit contains beneficial nutrients or active compounds in high levels, such as beta carotene, tocopherol, as well as fatty acids [19-20]. In many research activities tocopherol and beta carotene as an antioxidant believed to be its ability to prevent chronic diseases such as cardiovascular disease, atherosclerosis, and cancer. In addition, the Papuan people believe that red fruit can improve physical performance, but it still needs to be proven scientifically.

The specialty of the red fruit that contains high antioxidant makes researchers feel interested and need to examine the antioxidant effects of red fruit oil at maximum physical activity.

The purpose of this study was to determine the antioxidant effect of red fruit oil to the MDA at maximum physical activity. The results are expected to contribute to the development of science and technology, especially as a basis for further research and development phytopharmaca for the improvement of public health, especially for the health of athletes. The results could be applied to athletes during training programs or during the competition so as to support program development, especially the development in the field of sports achievement and health. In terms of the development of science and technology, this research is a form of contribution to disciplines other than sports disciplines to support the athlete's performance.

2. Method

Subject
Subjects of research using trained athlete. The number of athletes was 30 peoples with the criteria of having a good level of VO2max, male gender, age 20-22 years old, have a BMI that is good, not smokers, not taking supplements and antioxidants 2 weeks before and during the study

Treatment
Before starting an exercise programs all samples were measured levels of hematology parameters and VO2max. During the training programs for 3 months, group I (treatment group) consume red fruit oil once a day after meals, while the second group (control group). After the training programs, re-measured levels of MDA and

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VO2max. While undergoing training program, all athletes undergoing the same diet to maintain homogeneity of the sample during the study.

Statistical analysis

All collected data were in average ± SD manner for the athletes in each group. The data normality was tested using Kolmogorov-Smirnov test. Data homogenity was tested using Levene test. The normal and homogenous data were then analyzed using t-paired with $\alpha = 0.05$ in SPSS version 23.0 program to determine the difference among groups.

3. Result and Discussion

3.1 Result

Based on the results of the research it was conducted that hematology parameters before and after administration of red fruit oil at the time of maximum physical activity are shown in Table 1

Table 1: Hematology Parameter Data athletes before and after giving MBM during maximum physical activity

Parameter		Group	
		Control	Experiment
RBC (10^6/µL)	Before	5,50	5,74
	After	5,30	5,75
WBC (10^3/ µL)	Before	8013,33	8033,333
	After	14466,67	8080,000
PVC (%)	Before	46,45	6447,29
	After	43,96	6447,29
Hb (gr/dl)	Before	15,48	15,51
	After	14,65	16,09

Note: The data was average of ± SD. A group of experiment was gave the MBM 5 ml/day, RBC (Red blood cells), WBC (White Blood Cells, PVC (Packet Cell Volume), Hb (Hemoglobin).

The results of normality and homogeneity test showed that pretest and post test data the parameters were observed normally distributed (p>0,05). From the results of the t test (*Independent Samples Test*) there is no difference between the treatment group and control group (p>0,05) before the administration of red fruit oil.

Statistical test results was conducted by using the t test (Paired Samples Test)) there was different levels of results obtained hematological before and after administration of red fruit oil either experimental group or control group. In control group in the control group was decreased in the number of erythrocytes, hematocrit, and hemoglobin while the number of leukocytes was increased. It was different in experimental group, where an increase in the number of erythrocytes, hematocrit and hemoglobin while the number of leukocytes has increased but the increase was not significant.

If we compared the hematological levels between control and experimental groups after treatment using t test (*Independent Samples Test*) was obtained the differences of hematological in levels between the control group and the experimental group.

The results of studies that reported the effect of red fruit oil against VO2max is shown in figure 1

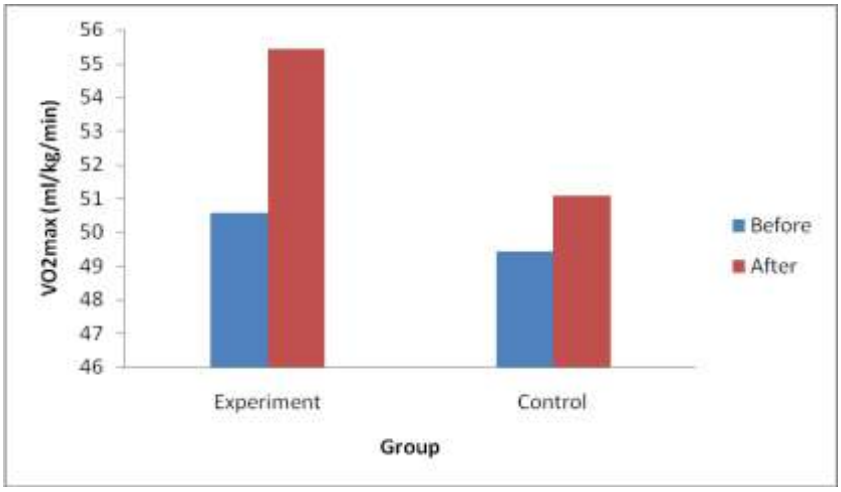

Figure 1: Effects of red fruit oil on VO_2max in athletes. Data were given in average ± SD manner of 15 athletes in each group. t-test result showed the significantly increasing VO_2max in treatment groups compare to control group ($p<0.05$).

4. Discussion

The Effect of MBM toward Hematology Parameter

From the result of this study it was find out that there was decrease significantly the number of erythrocytes, hemoglobin and hematocrit in the control group while in the treatment group was increased.

In control group a number of erythrocytes was decreased caused by hemolysis in the cell of membranes of erythrocytes. The cause of hemolysis is due to take place erythrocyte cell membrane lipid peroxidation by free

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radicals formed during maximal physical activity. It has been known, membrane cell is a part of cell that highly susceptible to the effects of free radicals on cells. The results are consistent with research conducted by Senturk et al who reported an increase in physical activity can cause damage to red cells such as cells become fragile erythrocytes **[13].** The result of this study supported by a statement by Cooper that says if the rate of formation of free radicals greatly increases triggered by excessive exercise, the number of free radicals exceed the capacity of the immune system and in the body can't be neutralized by antioxidants. it can make a cause damage to cell membranes, muscles, bones and system. Some of the research was also reported during the physical exercise can occur destruction of red cells that can cause anemia or commonly called "sport anemia".

Furthermore, the results showed the provision of MBM in athletes during training programs to increase the number of erythrocytes, hematocrit and hemoglobin levels, if compared with the control group after maximal physical activity. This increase was obtained to the MBM is one source of antioxidants, which neutralize free radicals that are formed when rats maximal physical activity. The number of the antioxidant content of MBM is the total carotenoid 11.500 ppm, Beta carotene 694,80 ppm, total tocopherol 11.200 ppm and α-tokoferol 495,50 ppm [20].

Based on the result of the study was also obtained maximum physical activity can increase the number of white blood cells in the control group ($p<0,05$) while there is no increasing in the group treatment from the statistical test by using t-test ($p>0,05$).
According to Cooper as a result of strenuous physical activity if the free radicals formed exceed 5%, the antioxidants in the body is unable to neutralize the production of free radicals causing oxidative strees that will stimulate leukocyte cells.

After activity the increase of the number of leukoytes caused by too many leukocytes which is follow (entry) into the walls of blood vessels (endothelium) by diapenesis into circulation from storage (backup) suddenly Demarginasi influenced by the hormone adrenaline which causes decreased adhesion of leukocytes to the endothelium. The results was consistent with studies reported in a short activity (<1 hour), only the influence of catecholamine that cause an increase in circulation to the ratio of non-circulation of the cell, resulting in increased mobilization of leukocytes from the bone marrow into the blood causing demarginasi process of blood vessel walls in dispenses [27].

The effect of red fruit oil on endurance

The results showed that administration of red fruit oil can improve VO2max athlete during training programs.. Several theories are supporting this result, namely the high antioxidant content in red fruit oil. Antioxidants in red fruit oil were considered to prevent lipid oxidation in cellular membrane especially in erythrocyte cells. Several researches showed that physical activities were able to induced the formation of oxidized lipid and generate the oxidative stress condition. Oxidized lipid are able to cause erythrocyte cell damage and thus caused the "sport anemia" [9], and muscle tissues damage [10] The damage of muscle and blood cells were considered to be involved in exhaustion processes or the disability to generate energy and therefore decrease the endurance. Several researches about the effect of antioxidant on the endurance have been conducted Ozaslan et al reported that vitamin C was able to increase endurance in rat model [24]. Bing and Wang reported that Ginkgo biloba extract was able to increase the activities of antioxidant enzymes in rat liver tissues, reduce the level of oxidized lipid generated by free radicals and increase endurance and healing processes after maximal physical activities [25]. Similar result was also reported by Miao et al using corn peptide [26].

5. Conclusion

1) By giving a red fruit oil for training program can increase the levels of hemoglobin, erythrocytes and hematocrit athletes during maximal physical activity
2) By giving a red fruit oil for training program can increase endurance of athletes during maximal physical activity.

This research will be better if when measuring antioxidant status as measured levels of concentration betacaroten, tocopherol, glutathione peroxidase, superoxide dismutase and catalase.

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