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The Effect of Red Dragon Fruit on Tumor Necrosis Factor- α (TNF- α) Tiggered by Sub-maximal Exercise

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Abstract. Sub-maximal exercise also induces changes in the exercise of pro-inflammatory cytokine cell components such as TNF- α (Tumor Necrosis Factor- α). The purpose of this study was to determine the effect of red dragon fruit administration on changes in pro-inflammatory cytokines Tumor Necrosis Factor- α (TNF- α) after sub-maximal exercise. The research was carried out at the Faculty of Sport Science, State University of Medan. This study used experimental pretest and posttest group design. The research sample was twenty students divided into two groups. Group A: given sub-maximal exercise and placebo; Group B: received sub-maximal exercise and red dragon fruit. Sub-maximal exercise is conducted running on a treadmill with a sub-maximal intensity, a frequency of three times a week, lasting four weeks. The TNF- α examination was initially carried out at the end of the treatment and then evaluated in the laboratory using the ELISA method. The results showed a significant decrease in TNF- α levels after exercise in the sub-maximal exercise group given red dragon fruit compared to the sub-maximal exercise group given a placebo. The statistical results of the unpaired t-test showed that there was a significant effect of red dragon fruit on decreasing TNF- α levels after sub-maximal exercise. The conclusion is that red dragon fruit significant effect on decreasing TNF- α levels triggered by sub-maximal exercise in students.

1. Introduction

Physical activity at various levels of intensity can influence changes in the human body. These physiological changes can be acute or adaptive, and can have a positive or negative impact. Physical activity carried out with mild to moderate intensity regularly has a positive impact which is to increase the degree of health and fitness of the body. When physical activity is performed with heavy intensity or sub-maximal negatively impacts the biological functioning of the body [1].

Physical fitness will be achieved through regular early physical activity with the correct intensity, duration, type and frequency without excessive fatigue in order to maintain and maintain the individual's health. In athletes given prolonged heavy exercise causing temporary depression in some aspects of immune function, periods of intensive exercise (overreaching) lasting for 1 week can lead to longer immune dysfunction [2].

The high rate of metabolism and increased oxygen consumption in contracting muscles during sub-maximal exercise will stimulate the production of free radicals incorporated in the Reactive Oxygen Species (ROS) [3]. Free radicals produced during sub-maximal exercise can trigger inflammatory



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reactions characterized by the release of cytokine mediators such as Tumor Necrosis Factor (TNF- α). TNF- α is one of the pro-inflammatory cytokines group as an indicator of assessing the level of inflammation experienced by cells due to trauma that occurs in muscles during heavy physical exercise [4]. The results of the study by Rahman et al showed the concentration of TNF- α in saliva increased shortly after physical exercise [5].

The study found that levels of TNF- α in plasma also increased significantly shortly after exercise. Physical exercise can also cause homosynthetic changes in the body and will affect the body's endurance system and lead to changes in the activity of pro-inflammatory cytokines such as TNF- α [6]. Therefore, the body must have defenses to protect against free radicals, and one of them is by doing regular exercise. Although exercise can increase the antioxidant defense system, long and strenuous periods of exercise will disturb the balance of free radicals and antioxidants, which is called oxidative stress [7].

The body requires exogenous antioxidants to neutralize and prevent chain reactions from free radicals formed by sub-maximal exercise. One way to avoid oxidative stress and inflammatory processes due to heavy physical exercise is to consume endogenous antioxidants such as red dragon fruit. The purpose of this study was to determine the effect of red dragon fruit administration on changes in pro-inflammatory cytokines Tumor Necrosis Factor- α (TNF- α) after sub-maximum physical activity. The research objectives was to determine the effect of red dragon fruit administration on changes in pro-inflammatory cytokines Tumor Necrosis Factor- α (TNF- α) after sub-maximal exercise.

2. Methods

2.1. Design study

This study uses experimental design pretest-posttest group design. The research was conducted at the Faculty of Sports Sciences of Medan State University.

2.2. Subjects

Subjects are students as many as 20 people, divided into 2 groups. Group 1: sub-maximal exercise and placebo (n=10); group 2: given sub-maximal exercise and red dragon fruit (n=10). Sub-maximal exercise is done by running on a treadmill with an intensity of 80-85% maximum heart rate (MHR= 220 - age), frequency three times a week, for four weeks.

2.3. Sub-maximal exercise procedure

The subject warms for 3-5 minutes. Sub-maximal exercise by running on treadmill on intensity 80-85% of maximum heart rate, 30 minutes longer than cooling down for 3-5 minutes. Treadmill done for three days/week, for four weeks. Red dragon fruit drink daily for four weeks. The treadmill is done at Physical Laboratory of Medan State University

2.4. Measurement of tumor necrosis factor- α levels

Blood samples were taken before and after the intervention of the pinch vein in the fold area of the elbow of the hand as much as 5 ml. Then coupled with EDTA in centrifuge at a speed of 3000 rpm for 15 minutes then the plasma is stored in a freezer 20°C. TNF- α is performed at the beginning and end of treatment, at Faculty of Medicine North Sumatra University Integrated Laboratory. The material for examination is Human TNF- α ELISA Kit, Cat No. MBS267654 through ELISA double antibody sandwich method.

2.5. Statistic analysis

The data were analyzed using the t-test by SPSS with a significant value when $p < 0.05$.

3. Results and Discussion

The results showed a decrease in TNF- α levels after exercise in the sub-maximal exercise group given red dragon fruit (106.11 \pm 56.36 ml/pg) compared to the placebo-given sub-maximal group (177.40 \pm 89.24 ml/pg). The statistic results of the t-test showed that there was a significant effect of red dragon fruit administration on the decrease in TNF- α levels after sub-maximal exercise ($p=0.047$; $p<0.05$), as shown in Tables 1 and 2.

Table 1. The means TNF- α levels on two groups

Groups	Pre-test	Post-test	p
	Mean \pm sd	Mean \pm sd	
Exercise	89.71 \pm 47.40	177.40 \pm 89.24	0.025*
Exercise+ RDF	153.04 \pm 53.24	106.11 \pm 56.36	0,093

Note : RDF= Red dragon fruit; sd= standar deviation; *=significant($p<0.05$)

Table 2. The Difference meant NF- α levels after exercise on two groups

Groups	Mean	sd	p
Exercise	177.40	89.24	0.047
Exercise+RDF	106.11	56.36	

Note : RDF= Red dragon fruit; sd= standar deviation; *=significant ($p<0.05$)

The results showed that the administration of red dragon fruit in students whose sub-maximal exercises can decrease TNF- α levels but not significantly ($p=0.093$; $p>0.05$). While in the group that did not get red dragon fruit there was a significant increase in TNF- α levels ($p=0.025$; $p<0.05$). The average TNF- α in post tests showed significant differences between the two groups ($p=0.047$; $p<0.05$). This decrease in TNF- α is due to being influenced by red dragon fruit which is one of the sources of antioxidants that work to neutralize free radicals that are formed when students perform sub-maximal exercise. Antioxidant content in red dragon fruit such as polyphenols, anthocyanins and tocopherol will prevent lipid peroxidation [9-10].

In the exercise group there was an increase in the expression of TNF- α because when sub-maximal exercise stimulated the expenditure of free radicals incorporated in the Reactive Oxygen Species (ROS) [3]. Increased levels of TNF- α during sub-maximum physical activity also cause changes in the number of leukocytes in the blood and lead to increased incidence of respiratory tract infections and decreased endurance resulting in changes in the activity of pro-inflammatory cytokines such as TNF- α [11].

The research conducted on trained male athletes who performed sub-maximal exercise with cycling, reported that there was a significant increase in TNF- α levels in sub-maximal exercises in athletes [12]. The study reported also a significant increase in TNF- α levels immediately after the race of 15 male marathon runners [13]. The levels of TNF- α also increased significantly immediately after maximum acute exercise by cycling the ergometer to a maximum of 7 basketball athletes [6].

The results of this study are in line with research by Sarir et al., (2015) which stated that groups given vitamin E with High Intensity Interval Training (HIIT) can reduce levels of IL-6 and TNF- α [14]. Vitamin E, which is as important as antioxidants such as red dragon fruit, also has the ability to inhibit inflammatory rates by suppressing nf-kB transcription rates, inhibiting the expression of cox2 (Cyclooxygenase) and NOX2 (nitric oxide) genes [15].

TNF- α is a type of pro-inflammatory cytokine produced by macrophags in response to inflammation. Increased TNF- α immediately after physical exercise can be associated with inflammatory reactions induced by muscle damage [16].

4. Conclusion

The conclusion is that red dragon fruit significant effect on decreasing TNF- α levels triggered by sub-maximal exercise in students.

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