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Decrease of Malondialdehyde Levels by Consuming Red Guava Fruit Juice in Maximal Physical Activity

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Abstract: ***Maximum physical activity can cause an increase in malondialdehyde levels due to increased production of free radicals. The amount of free radicals can be neutralized by giving antioxidants. Red guava fruit is known to have high antioxidant content. The purpose of this study was to determine the effect of giving red guava during exercise on malondialdehyde levels when performing maximum physical activity. This research is an experimental research with a randomized control group pretest-posttest design. The study was conducted at the Physical Laboratory of the Faculty of Sport Sciences, State University of Medan. The population and sample were students of Sports Science as many as 20 people who met the criteria. Sample was divided into 2 groups, namely the group that consumed red guava fruit juice (RGF) during the exercise program and the control group (C). Malondialdehyde examination was carried out before the administration of red guava gruit juice and after maximum physical activity. Based on statistical analysis obtained there were differences in malondialdehyde levels between the experimental group and the control group after doing maximum physical activity (p <0.05). Conclusion is by giving red guava fruit juice during exercise can reduce malondialdehyde levels in maximum physical activity***

Keywords: red guava fruit juice, maximum physical activity, free radicals, antioxidants, malondialdehyde

1. Introduction

Physical activity can cause an increase in the production of various types of free radicals that can cause damage to cells [1]. Free radicals formed in the body will be neutralized by a defense system between antioxidant enzymes such as catalase (CAT), superoxid dismutase (SOD), glutathione peroxidase (GPx) and a number of non-enzyme antioxidants including vitamins A, E and C, glutathione , ubiquinone and flavonoids [2]. If the production of free radicals exceeds the cellular defense antioxidants, oxidative stress can occur [3]. In conditions of oxidative stress, free radicals will cause lipid peroxidation [4]. Malondialdehyde (MDA) is a result of lipid peroxidation, so MDA is a general indicator used to determine the amount of free radicals and indirectly assesses the body's oxidant capacity [5].

The results of the study by Moflehi et al. [6] reported an increase in exercise intensity can cause an increase in MDA and creatine kinase (CK) levels. Ugras reported that Muay Thai (MT) athletes who underwent high intensity interval training programs produced an increase in MDA levels from 32.67±2.47 to 45.52±4.01 (nmol / ml) [7]. MDA increase was also reported by Meihua in athletes who performed physical activity until exhausting using the Bruce test [8].

The increase in MDA in maximal physical activity was supported by Colgan's statement which suggested that athletes under heavy training and competition were not able to maintain antioxidant levels optimally in the tissues [9]. Therefore, Gomez et al. said oxidative damage due to physical activity might be prevented by optimizing nutrition, especially by increasing the antioxidant content of food [10].

One alternative natural ingredient that has antioxidant content is red guava fruit. Red guava fruit is known to contain vitamin C five times greater than citrus fruit [11]. Other compounds in guava fruit that function as antioxidants are carotenoids such as beta-carotene, lycopene, beta-cryptoxanthin and polyphenols [12,13]. The specialty of guava fruit which has various types of antioxidants and high antioxidant activity potential makes researchers feel interested and need to examine the antioxidant effects of red guava fruit on malondialdehyde levels on maximum physical activity.

2. Methods

2.1 Tools

The tools used in this research were laboratory glassware, vortex (Thermo), test tube (Iwaki), spectrophotometer (Shimadzu), analytical balance (Boeco), flask 10 ml, syringe 5 ml, funnel, blender

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

Research materials were including red guava, 1% EDTA solution, Aquades.

2.4 Chemicals

Commercial assay kits for the detection of MDA were purchased from PT. Biozatix Indonesia. All other chemicals used were of analytical grade and purchased from local suppliers.

2.5 Experimental design

This type of research is experimental research with randomized control group pretest-postest design research design. The study was conducted at the Medan State University Stadium and the Regional Health Laboratory of North Sumatra Province. The population and sample of the study were 20 students of Sports Science who met the criteria. Pretest is done by checking malondialdehyde (MDA) levels. The sample is then divided into 2 groups, namely control group (CON) and experimental group (RGF). During the training program group RGF was given red guava fruit juice, control is given mineral water Then all samples performed to their maximum physical activity by performing a bleep test, and re-examined malondialdehyde (MDA) levels.

2.6 Blood sampling and blood analysis.

Blood is taken from the cubital vein using 5 ml size syringe and 23 G size needle. Blood is inserted into a tube that has been given EDTA to prevent agar blood doesn't freeze. The tube is then placed in a cool box before centrifuging. Blood is centrifuged at 3000 rpm for 15 minutes. Blood plasma fluid that has been separated from solid parts immediately transferred to in the empty vial tube for further analysis MDA level.

2.7 Statistical analysis

Data of research were tested for homogeneity and normality to determine the type of statistics to be used. Data were analyzed using the students t-test to determine the mean difference between treatments using SPPS 19.0 program. Based on the significance value, $p<0.05$ is considered statistically significant.

3. Results and discussion

3.1 Group characteristics

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	Control	10	59.5	0.918
	Experiment	10	59.7	
Height	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 Effects of red guajava fruit (RGF) on malondialdehyde (MDA) level

Malondialdehyde (MDA) is one of the most indicators of lipid peroxidation often used for. Malondialdehyde (MDA) is also used widely as a biological marker oxidative stress because it is sensitive and can be used in internal research large number. Malondialdehyde (MDA) is a relatively constant lipid peroxidation product the proportion of lipid peroxidation, because that is an indicator appropriate to determine the speed of the lipid peroxidation process in vivo.

Maximum physical activity can produce free radicals which cause an increase in malondialdehyde (MDA) levels. One way to reduce the production of free radicals triggered by heavy physical activity is to increase the body's antioxidant status.

In our study, the effect of giving red guava fruit juice in this study is shown in Figure 1.

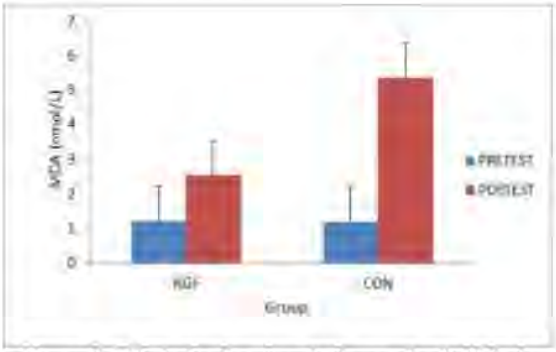

Figure 1: Effect of red guajava fruit on malondialdehyde level. Data are mean ± standard deviation (SD); n = 10, *$p <$ 0.05 compared with control (C) group

The results showed that the control group and experimental group malondialdehyde (MDA) levels before being given red guava fruit juice were 1.21±0.10; 1.24±0.04 respectively. After performing maximum physical activity, the control group and experimental group levels were 5.39±0.27; 2.55±0.18 respectively. The results of statistical tests showed no difference in MDA levels between the control group and the experimental group before giving red guava fruit juice. After administration of red guava fruit juice for 28 days malondialdehyde (MDA) measurements were carried out after performing maximum physical activity, and obtained an increase in malondialdehyde (MDA) levels in both the control group and the experimental group. In the control group there was an increase in malondialdehyde (MDA) levels of 77.55%, while in the experimental group an increase of 51.37%. The results of statistical tests using independent samples t- test between the control group and the experimental group obtained significant differences ($p=0.000$). The increase in malondialdehyde levels in the control group and the experimental group showed that maximum physical activity could lead to an increase in free radical production. Free radicals formed will react with cell membranes and produce malondialdehyde as a result of lipid peroxidation. The increase in malondialdehyde levels in the

experimental group was lower than the control group due to the antioxidant content in red guava fruit juice. It is known that red guava fruit contains vitamin C, carotenoids such as beta-carotene, lycopene, beta-cryptoxanthin and polyphenols [12-13]. The results of our study are supported by the results of the research conducted. Maryanto reported that red guava fruit is able to reduce lipid peroxidation showed by the increase of Superoxide Dismutase (SOD) and the decrease of malondialdehyde (MDA) levels in animal experiment. In his study it was reported that red guava fruit has the same antioxidant potential as vitamin C [14]. Rahmat et al. reported that guava consumption resulted in significant increase in the levels of total antioxidants and reduced oxidative stress, as indicated by decreased levels of antioxidant enzymes (glutathione peroxidase and glutathione reductase) [15].

4. Conclusion

Giving guava fruit juice during the training program can reduce malondialdehyde levels triggered by maximum physical activity.

5. Other recommendations

The result of this research is expected to contribute to the body of knowledge, especially as the basic for further research in developing natural medicine for athlete health. The results can be applied during training program and competitions for athlete.

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