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Administration of bali arabica (Coffea arabica) coffee extracts decreases abdominal fat and body weight in obese wistar rats (*Rattus norvegicus*)

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ABSTRACT

Introduction: The amount of obesity in the world in 2016 tripled compared to 1975 based on data from the World Health Organization (WHO). Previous research has shown that coffee has the potential to reduce weight and heavy abdominal fat. But there has been no research on extracts of Balinese arabica coffee beans. The purpose of this study was to prove that extracts of Balinese Arabica coffee beans can reduce weight and weight of abdominal fat in obese wistar male rats.

Methods: This research is a study using Post-test only Control Group Design. The research subjects were 36 male white rats wistar (Rattus norvegicus) strain, healthy, aged 3-4 months and obese (Lee index> 0.3) divided into two groups, each amounting to 18 rats. The control group (P0) was the one who received placebo and the treatment group (P1) was given bali coffee bean extract 800mg / kgBW / day for 28 days. The variables observed were body weight, abdominal subcutaneous fat weight (BLS), and weight of visceral abdominal fat (BLV). In addition, the remaining food is measured every day.

Results: The results showed the mean body weight P0 302.33 ± 6.22gram, P1 286.88 ± 4.85 gram (p <0.005). The mean BLS P0 was 0.61 ± 0.07 grams and P1 was 0.41 ± 0.08 grams (p <0.005). The mean BLV P0 5.55 ± 0.90 gram and P1 4.58 ± 0.60 gram (p <0.005). The mean feed remaining from the control group was 4.081 ± 0.57 grams and from the treatment group 6.07 ± 0.64 grams (p <0.005).

Conclusion: Based on the above data it can be concluded that the administration of Bali coffee bean extract can reduce weight, weight of abdominal subcutaneous fat and heavy abdominal visceral fat in male wistar rats with obesity. In addition, it is suspected that extract of Bali coffee beans also reduces the amount of food intake.

Keywords: Bali coffe extract, obesity, body weight, abdominal fat

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INTRODUCTION

Aging is a process of disappearing the ability of tissues or cells to repair themselves and maintain their normal structures and functions. This involves every molecule, cell and organ in the body. The function of organs can be maintained to remain optimal by preventing the aging process. So that the organs can function like at a younger age, even though the actual age has increased. One of the factors that accelerates aging, namely obesity.[1]

Obesity is defined as an accumulation of fat caused by energy imbalances resulting from calorie intake that exceeds the body's needs.[2] Obesity increases every year. The number of obesity in the world in 2016 increased threefold compared to 1975. In 2016 there were 1.9 billion adults (> 18 years) who were overweight and 650 million people who were obese. This means that there are 39% of overweight adults and 13% of obese adults[3]. While in children less than 5 years, 41 million are overweight or obese. Where 50% of these children live in Asia. Whereas at the age of 5-18 years there were 340 million people with excess body weight or obesity in 2016. This increased from 4% in 1975 to 18% in 2016.[4]

Green coffee bean extract lowers blood sugar levels by inhibiting the action of the enzyme amylase[5], reducing lipid accumulation by increasing fat oxidation[6]. One of the active compounds of green coffee beans, caffeine and polyphenols is able to increase body metabolism and inhibit genes that influence fat formation[7], reduce triglyceride levels in the liver and pancreatic lipases in the intestinal tract[8]. Besides chlorogenic acid, the content of polyphenols in green coffee bean extract also has the potential to reduce visceral fat accumulation[9]. Green coffee bean extract (Coffee Robusta) can

reduce fat by increasing fat oxidation, and inhibiting fat formation genes[10].

Until now there has been no research on extracts of Balinese arabica coffee (arabica coffee) against weight loss and weight of abdominal fat. The coffee beans that will be used are coffee that has not been roasted, so that the active content is not reduced. The results of phytochemical analysis of extract of Balinese arabica coffee beans that have not been roasted (raw) in the Laboratory Service Unit of the Faculty of Agricultural Technology, Udayana University have antioxidant capacity of 79441.07 mg/L GAEAC, total phenol 7496.43 mg / 100g GAE, flavonoids 156.33 mg/100 QE, tannins 56686.87 mg/100 g TAE, and coffee is a very strong antioxidant because the IC50% value is 14.82mg/L (<50). In addition, an examination was conducted at the Testing Service Unit of the Faculty of Pharmacy, Airlangga University, and caffeine content was 7.083% (59mg/25ml).

The aim of this study was to prove that the extract of Balinese arabica coffee beans can reduce weight, weight of abdominal subcutaneous fat and heavy visceral fat in obese wistar male rats.

Table 1. The mean body weight of rats in control and treatment group

Group	N	Mean Body Weight	T	P
Control	18	302.33	8.307	0.001
Treatment	18	286.59		

Table 2. Comparison of subcutaneous fat weight in control and treatment group

Group	N	Mean Subcutaneous Fat Weight	T	P
Control	18	0.61	-4.873	0.001
Treatment	18	0.41		

Table 3. Comparison of visceral fat weight in control and treatment group

Group	N	Mean Subcutaneous Fat Weight	T	P
Control	18	5.55	3.813	0.001
Treatment	18	4.58		

METHODS

This study uses the posttest only control group design method, carried out at the Laboratory Animal Unit of Pharmacology Section, Faculty of Medicine, Udayana University. Making extracts of Arabica coffee beans in Bali was conducted at the Integrated Biomedical Laboratory Unit of the Faculty of Medicine, Udayana University. The subjects of this study were 40 wistar male rats aged 2-3 months, acclimatization for 7 days, then induced for 30 days until they became obese (Lee index> 0.3). Then 36 obese rats were divided into 2 groups, namely the control group of obese mice who received 1ml aquadest and the treatment group of obese mice who received extract of bali coffee beans 112mg / 200grbb of mice for 28 days[11].

RESULTS

At the end of the study we weighed weight, abdominal subcutaneous fat weight (BLS) and heavy abdominal visceral fat (BLV) in both groups. The mean body weight of the P0 group before treatment was 288.78gr and the average Lee index was 0.308. The mean body weight of the P1 group before treatment was 287.22gr and the average Lee index was 0.308. There was no difference in mean body weight in the two groups (p = 0.3).

Table 1 shows the mean body weight of rats in the control group of 302.33 ± 6.22 grams, and the treatment group of 286.88 ± 4.85 grams. The difference in body weight between groups was 15.44 grams. Significance analysis using independent t-test found that this difference was significant with a value of p <0.001 (<0.05).

Table 2 shows the mean subcutaneous fat weight in the control group 0.61 ± 0.07 grams and the treatment group is 0.41 ± 0.08 grams. Subcutaneous fat weight difference between groups is 0.2 grams. Significance analysis using the Mann Whitney-U test found that this difference was significant with p = 0.001 (<0.05).

Table 3 shows the mean BLV in the control group is 5.55 ± 0.90 grams and in the treatment group is 4.58 ± 0.60 grams. Significance analysis using independent t-test showed that the difference in BLV between groups was 0.97 grams, statistically significant with a value of p = 0.001 (<0.05).

DISCUSSION

Arabica coffee bean extract is known to have polyphenol content, namely: caffeine, chlorogenic acid, tannin and ferulic acid[12]. Caffeine has a

locomotor effect. This happens because caffeine is an antagonist to adenosine (ARs) receptors: A1, A2A, A3. Inhibition of adenosine receptors causes the brain to produce adrenaline, resulting in an increase in heart rate and increased release of dopamine, a neurotransmitter that modulates movement, concentration, memory, mood. The locomotor effect is obtained when consuming caffeine at doses of 30mg / kgBB and 60mg / kgBB[13]. Chlorogenic acid is a phenol, whose content will be reduced if it goes through the roasting process. Thus, the chlorogenic acid content in green coffee is higher compared to coffee that has gone through the roasting process[12].

Coffee polyphenols are known to affect the SREBP1-c gene, resulting in a decrease in ACC1, FAS, SCD1 and ACC2. ACC1 functions to catalyze Acetyl Co-A to malonyl Co-A, causing a decrease in TG accumulation and cystesis in the liver. SCD1 serves to catalyze mono unsaturated fatty acids (MUFA) fats from saturated fatty acids. So with the inhibition of SCD1 there is an increase in expenditure energy and decrease the amount of fat. ACC2 is the expression of tissue in the liver, muscle and heart and malonyl Co-A in mitochondria. ACC2 regulates fatty acid oxidation in mitochondria by inhibiting CPT-1 by inhibiting malonyl Co-A. Where the end result is an increase in fatty acid oxidation. This inhibits the occurrence of lipogenesis. This also means that fat cells will change in diameter and amount. And of course it also affects changes in body weight[7].

In this study it was proven that the administration of green coffee bean extract 112mg / 200grBBB rat / day can reduce weight, weight of abdominal visceral fat and weight of abdominal subcutaneous fat. The results showed that after 28 days the mean treatment of the control group body weight (P0) was 302.33 ± 6.22 grams, and the treatment group (P1) was 286.88 ± 4.85 grams. This shows that the weight in the treatment group was lower than the control group with a difference of 15.44 grams and this difference was statistically significant with a value of p <0.001 (<0.05). In addition, the mean weight of abdominal subcutaneous fat also decreased after 28 days of treatment when compared to the control group (P0) which was 0.61 ± 0.07 grams and the treatment group (P1) was 0.41 ± 0.08 grams. This shows that the mean BLS of the treatment group was 0.2gr lower than the control group and was statistically significant p <0.001 (<0.05). The mean weight of the visceral abdominal fat after 28 days 5 treated the control group (P0) was 5.55 ± 0.90 grams and in the treatment group (P1) was 4.58 ± 0.60 grams. BLV in the treatment group was lower than the control group with a mean difference of 0.97 grams. This difference is statistically significant with a value of p = 0.001 (<0.05). This means that there is a significant difference in the weight of visceral fat between the control and treatment groups.

The results of this study are in accordance with the research of robusta green coffee bean extract (EBKH) at a dose of 300 mg / kg for 11 weeks can reduce weight, fat weight, expression of fat-forming genes (SFRP5 and DKK2) and leptin in rats.15 Decaf coffee polyphenols 500mg / kgBW reduce weight, weight of abdominal fat, weight of liver fat, leptin, as well as the adipogenesis sterol regulatory element binding protein (SREB) -1c gene and a decrease in SCD-1 has increased expenditure energy in mice fed a high-fat diet for 15 weeks, but did not significantly affect food intake.7 EBKH with 50% quinic acid (containing 27.5% 3-CQA), doses of 100 and 200mg / kg reduced body weight, liver weight and mouse fat weight for 6 weeks . This is related to lipolysis hormones such as leptin[10]. Research in overweight and obese humans for 3 months with consumption of caffeine >300 mg / day can reduce weight; this is related to the effects of thermogenesis and fat oxidation. In addition there is also a decrease in leptin production[16].

The production of leptin by fat is related to the sympathetic nerve (β3 adrenoreceptor). Stimulation of caffeine in the sympathetic nerve may affect the release of leptin. Caffeine increases expenditure energy and decreases food intake. It has been known through previous research that caffeine suppresses fat cell differentiation through inhibition of the expression C / EBPα and PPARγ, both of which are transcription factors of the process of fat formation and cause negative expression of the factors pre-adipocyte 1 and KLF2. This allows caffeine to inhibit fat formation[17]. Experiments on humans by comparing caffeine 6 mg / kg, coffee decaffeinated and placebo, showed that administration of decaffeinated coffee reduced hunger in the first 180 minutes, increasing plasma PYY in the first 90 minutes and not so with placebo[18].

The average remaining food from the control group was 4.081 ± 0.57 g while in the treatment group, it was 6.07 ± 0.64 g. The results of the Independent T-Test differed significantly because p <0.05. This indicates a decrease in food intake in the treatment group, because the amount of leftovers between controls and treatments was significantly different. Consuming coffee 0.5-4 hours before eating also known to affects energy intake[19]. This is still

ambiguous whether the process of emptying the stomach is slowing or the hormones that affect food intake are also affected. Research on humans using 3 cups of coffee every day for 28 days turned out to reduce plasma Ghrelin levels. This is thought to cause food intake to decrease[20].

In a study of 33 people, 17 overweight / obese and 16 with normal weight were given coffee with 3mg / kgBB, 6 mg / kgBB or placebo. From this study, it was found that caffeine intake of 6 mg / kgBW / day affected food intake and reduced appetite only in the obese / overweight group[21]. This is caused by hormones that affect appetite and metabolism from glucose which differ between obesity and normal weight. Caffeine intake affects the absorption of nutrients, such as vitamin B6, calcium, magnesium and especially iron[22].

CONCLUSION

Based on the results of this study, it can be concluded that the administration of Balinese arabica coffee bean extract orally can reduce weight, abdominal subcutaneous fat weight, abdominal visceral fat weight in obese wistar male rats.

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