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Effect of Palm Oil on Serum Lipid Profile in Rats

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Abstract: Palm oil is considered as plant oil in which two types of cooking oil, palm seed oil and palm oil are derived. Palm oil has almost 50% saturated fatty acid and 50% poly unsaturated fatty acid. It is considered to be useful due to metabolites products such as prostacycline and antithrombois in cardiovascular disease (C.V.D) and variation in lipoprotein. In the present study we examined the effect of 12% palm oil on 30 days old male rats (149.3±10.7 g) for 60 days. The changes of weight and food intake were recorded. The result showed that the mean value of rats weight was increased with energy intake in diet ($p<0.05$). The serum levels of cholesterol, and HDL_{-C} were increased significantly ($p<0.05$), while the levels of triglyceride and LDL_{-C} were decreased but statistically not significant. In conclusion, using palm oil can be useful for prevent of cardiovascular disease.

Key words: Palm oil, triglyceride, cholesterol, lipoprotein

Introduction

Palm oil (PO) obtained from a tropical plant Elaeis Guineensis is rich in monounsaturated fatty acids, antioxidant and vitamins and is widely used as oil in diet in many parts of the world. PO has been reported to have beneficial effects in oxidative stress association and arterial thrombosis and hypertension (Edem, 2002; Narang, 2004). The studies showed that PO with an unsaturated -to- saturated fatty acid ratio close to one and rich in antioxidants vitamins, reduce oxidative stress-induced hypertension in normal rats (Bayorh *et al*., 2005; Edem, 2002). According to study in china red palm oil is a good source of carotenoids and it can significantly increase plasma concentration of alpha-carotene, beta- carotene, lycopen and alpha - tocopherol (Zhang *et al*., 2003). Several studies have reported the effect of palm olein; palmitic acid content approximately (38%) incorporation into the diet on blood cholesterol concentration and on the development of atherosclerosis (van Jaarsveld and Benade, 2002). Although saturated fatty acids have long known to have harmful effects on cholesterol and emerged from recent research on this matter (Bosch *et al*., 2002), some of the compositions of palm oil such as palm olein caused that lipoproteins of blood have had less changes. This matter is important factor in reduction of cardiovascular disease (C.V.D) (Ebong *et al*., 1999; Niyongabo *et al*., 1999). Several studies have showed, every increasing of unsaturated -to- saturated fatty acid ratio could be decreased thrombosis. This ratio in PO is 25% (Sundram *et al*., 1990). The effect of PO on lipids and haemostatic factors showed hamsters fed the three PO preparations had lower plasma total cholesterol (c) and non HDL-c and higher HDL-c concentrations while accumulating less aortic cholesterol concentrations compared to hamsters fed coconut oil (Scholtz *et al*., 2004). In another study, the result showed there was no difference in the mean change of LDL molecular weight within the high- fat diet (HFD) and moderate- fat diet (MFD). It is concluded that PO is no different from (HFD and MFD) or so (MFD) in its cholestrolemic effect in non-human primates (van Jaarsveld and Benade, 2002; van Jaarsveld *et al*., 2000). Anyway, the results of different studies are contrary and PO used as cooking oil for processing in different kinds of foods and ordinary diets in the world. According to above mentions, the aim of this study was to determine the effect of PO with diet on serum lipid indices and fecal fat rats.

Materials and Methods

It was experienced on eight male rats (Balthazar), 30 days old as case and control groups. After acclimatization, rats were divided in two groups. The mean of weight in case and control groups were 149.7±709 and 149±1306 g, respectively. All of the rats were in the stainless steel cage at 30-35°C. In control group, rats were fed with normal diet (stock) and case group were fed with 12% commercial palm oil. Protein contents of food was analyzed using kejldal method and fat by sukselet, ash and moisture by oven assay (Horwitz, 2000). Samples of the rats fecal were collected and analyzed for two times per day. At the end of experiment (60 days) the feeding of rats was stopped and after 12 hr fasting the rats become anesthetized by chloroform and 5 ml of blood heart was taken. The serum levels of cholesterol, triglyceride, HDL-c and

Table 1: Characteristics of diet intake in case and control groups.

	Groups	
	Case	Control
Ash (%)	9	8
Carbohydrate (%)	56.3	62.5
Protein (%)	15.4	17.5
Fat (%)	12	4
Moisture (%)	14.4	8
Energy (%)	395	356

LDL-c assayed by commercial kit using Auto analyzer (RA-1000). The carcasses of rats were homogenized in the mixer and the amount of carbohydrate, protein, fat, ash, moisture was determined as described before.

Statistical analysis: All data expressed as the mean±SD. Analyze of variance, t-test, regression correlation were performed using SPSS 10 software. P<0.05 was considered to be significant.

Results

As shown in Table 1 the findings showed that there was significant differences (P<0.05) in amount of fat in two diets (stock and experimental diet). The weight gain increasing in case and control group was 125 and 120 g, respectively, although the difference was not significant (P>0.05). However, energy intake in case was more than control group (4329 vs. 3930 Kcal), but statistically no significant (P>0.05).

The amount of moisture, fat and ash of fecal samples in rats were measured at second and eight weeks. The results showed that only in fat, there was significant difference (P<0.05) between two groups (Table 2).

In Table 3 the levels of serum cholesterol, triglyceride, LDL-C and HDL-C are showed, the levels of cholesterol and HDL-c were statistically significant (P<0.05) between two groups.

At the end of study, carcasses of the rats were analyzed. As shown in Table 4, the levels of fat in case was more than control group (P<0.05) while, the other indices were no significant (P>0.05).

Discussion

In the present study, a significant increase in levels of cholesterol, HDL-c and HDL/LDL-c were observed upon treatment with palm oil. It is shown that palm oil in medium and high fat diet didn't effect on the blood cholesterol (van Jaarsveld *et al.*, 2000). Although Palm oil-based diets induce a higher blood cholesterol level than do corn and other oils, the consumption of palm oil causes the endogenous cholesterol level to drop (Edem, 2002). However, the effect of palmitic acid on plasma cholesterol appears to depend on the cholesterol content of the diet. It has been reported that PO contains approximately 4% palmitic acid (Scorza *et al.,* 1999). Hyperlipidmia might be due to decrease catabolism than increase synthesize of triglyceride (Ebong *et al.*, 1999; Tan *et al.,* 1991). According to other studies HDL_{-C} an LDL_{-C} are important for assessment (Farombi and Britton, 1999; Scorza *et al.*, 1999). Serum concentration of total cholesterol, triglyceride, HDL, apolipoprotein B of Chinese male adults showed no significant changes in Red palm oil (RPO) group during the study (Zhang *et al.*, 2003). All four diets palm, palm and soy bean, palm olein and soy bean, palmstearin and soybean oils had similar influence on total cholesterol, LDL, HDL/VLDL and triglyceride and there were no significant differences in serum lipids concentrations due to feeding palm or the others one (Edionwe and Kies, 2001). The results showed that the levels of triglyceride and trend of weight increasing in

Table 2: The mean of analysis in rat's focal in second and eight weeks * p<0.05

Time	second week			Eight week		
groups	Moisture (%)	Fat (%)	Ash (%)	Moisture (%)	Fat (%)	Ash (%)
Case	8.2	16.2*	15.8	10.4	8.7*	15
Control	8	4	21	6	2.2	18

Table 3: The levels of cholesterol, triglyceride, HDL-c, LDL-c an HDL-c/LDL-c in blood serum at the end of study *p<0.05

Groups	Cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL-C (mg/dl)	LDL-C (mg/dl)	HDL-c/LDL-c
Case	102±20.2	31±10.2	71±18.2*	10±5.8	7.1±3.1*
Control	77±8.1	32±9.4	42±3.2	26±9.5	1.6±0.34

Table 4: The levels of ash, protein ,fat and moisture in rats carcasses at the end of study.* p<0.05

Groups	Ash (%)	Protein (%)	Fat (%)	Moisture (%)
Case	61.7±1.0	23±1.0	11.4±1.2*	3.5±0.28
Control	63.6±0.28	21.6±0.28	3.1±0.26	3.7±0.29

case and control groups were the same, whereas the levels of lipoproteins was changed. The study in weaning rats after a feeding period of 36 days with Crude and Refined Palm Oil (CPO and RPO) on the lipid and lipoproteins constants of plasma showed, the rats fed the CPO diet had lower total cholesterol, LDL_{-C} $VLDL_{-C}$ and apo B and higher HDL_{-C} LDL_{-C} and apo A1/ apoB and higher HDL_{-C}/LDL_{-C} and apo A1/apo B ratios (Niyongabo *et al.*, 1999). It is mention to the diet of the case group have had less fiber than control groups, but it had more fat than other one that can be caused more energy intakes in rats. Any way using of palm oil as supplementary feeding programme is accepted (Sarojini *et al.*, 1999). It can be reduction cholesterol biosynthesis, platelet aggregation and blood pressure (Edionwe and Kies, 2001). Reduction of fat excretion in case group eight week to second week observed. It seems that rats gradually increase adaptation with the amount of fat diet, although there was significant difference between amount of lipid in carcasses and fecal of rats in two groups ($p<0.05$). Comparison of palm and mixtures of refined palm and soybean oils showed fecal fat excretion was higher (1.81,1.80 g/d) with palm and soybean and palmstearin and soybean oils and lower (1,78,1.42 g/d) with palm and palm olein and soybean diets (Edionwe and Kies, 2001).

In conclusion, our results showed that palm oil increase the levels of HDL-c and ratio of HDL-c/LDL-c significantly. We suggest that using palm oil can decreases the risk of cardiovascular disease.

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