Bangl. J. Vet. Med. (2005). 3 (1): 79–81

EFFECTS OF DIFFERENT EDIBLE OILS ON GROWTH PERFORMANCE, DIFFERENT ORGAN WEIGHT AND SERUM TRANSAMINASES IN RATS

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ABSTRACT

The effects of different edible oils on body weight gain, different organ weight and serum transaminases were studied on 25, one-month old Long Evans male rats during the period from 3 April to 28 May 2003. The rats were randomly assigned to one of five equal groups ($n = 5$) as A, B, C, D and E of which group A was considered as control and fed with rat pellets (ICDDR, B) and others were supplemented with oils as soybean (group B), palm (group C), coconut (group D) and mustard (group E) at a concentration of 7.5% with pellets for 8 weeks. The results revealed significant ($p < 0.001$) increase in weight gain of the nonsupplemented rats (control). The mean heart weight of the nonsupplemented rats (control) was significantly ($p < 0.05$) higher than those of the treated groups. The mean liver weight of nonsupplemented, coconut and mustard oils treated rats were significantly ($p < 0.05$) higher than those of soybean and palm oil treated groups. The mean kidney weight of the mustard oil treated rats was significantly ($p < 0.05$) lower than those of other treated and control groups. No significant differences ($p < 0.05$) were observed among the groups in respect to SGOT and SGPT activities.

Key words: Edible oil, rat, body weight, organ weight, serum transaminases

INTRODUCTION

Edible oils play an important role in human nutrition as a high energy component. Despite improvement of taste each gram of oil or fat supplies 9 KCal energy which is the double the quantity of energy as is provided by protein or carbohydrate. They act as carrier for fat-soluble vitamins (A, D, E and K) in the body. Fat and oils are also the source of essential fatty acids. Fat and oils which contain more unsaturated fatty acids are particularly susceptible to oxidation. The intake of food containing oxidized lipid increase the concentration of secondary peroxidation products in the liver. Metabolism of these components ultimately affects the activity of different lipogenic enzymes and causes various types of liver injury (Slater, 1972)

Dietary fats and oils chiefly composed of fatty acids and cholesterol. Large amount of cholesterol partially inhibit endogenous cholesterol synthesis but result in a net increase in serum cholesterol concentrations because of suppression of synthesis of LDL- receptor. Current recommendations are to limit dietary fat and cholesterol consumption to 30% or less of total calories and 300 mg or less per day respectively (Baron and Browner, 1998). The presence of cholesterol, saturated fatty acids (Wood *et al*., 1966) in fats and oils increase the risk of coronary heart diseases by increasing the blood cholesterol (Lichtenstein, 1998). The aim of the experiment is to study the effects of different edible oils (soybean, palm, coconut and mustard) on growth performance as well as on enzyme systems especially Serum Glutamate Oxaloacetic Transaminase (SGOT) and Serum Glutamate Pyruvate Transaminase (SGPT) in rats.

MATERIALS AND METHODS

A total of 25, one month aged Long Evans male rats purchased from ICDDR, B was used in this experiment for the period from 3 April to 28 May 2003. The rats were randomly assigned to one of five equal groups ($n = 5$) and numbered them as A, B, C, D and E. Group A was considered as control and fed with rat pellet. Others were treated with soybean oil (group B), palm oil (group C), coconut oil (group D) and mustard oil (group E) at a concentration of 7.5% with rat pellet for 8 weeks.

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Body weight

Body weight of each rat was taken before treatment and then weekly until the last day of experiment using an electrical balance.

Body weight gain = Mean final weight (g) – Mean initial weight (g)

$$\% \text{ body weight gain} = \frac{\text{Mean final weight (g)} - \text{Mean initial weight (g)}}{\text{Mean initial weight}} \times 100$$

At the end of experimental period the rats were starved overnight. A series of sterile test tubes were taken for collection of blood. Sequential anaesthesia was done with 3-4% halothane using self adopted technique and the blood was collected by incising the abdominal aorta after opening the abdominal cavity. The selected organs (heart, liver and kidney) collected by tissue forceps and weighed after removing the unwanted tissues. The blood containing tubes were placed in slanting position at room temperature for 6 hours. The tubes were then incubated overnight in the refrigerator (4^0C). The sera samples were separated and centrifuged to get rid of unwanted blood cells where necessary. Sera were kept at -20^0C until analysis for enzymes. Analysis of enzymes (Serum Glutamate Oxaloacetate Transaminase - SGOT and Serum Glutamate Pyruvate Transaminase - SGPT) was performed in a quickest possible time using Humalyzer 2000 (Human type, Germany).

Statistical Analysis

A randomized complete block design (RCBD) with multiple observations per cell was applied. An analysis of variance (ANOVA) was done for testing the significance of the difference among the mean body weight gains of the experimental rats under the different treatments (Ali, 1973). A comparison of the organ weights in the different treatment groups of the experimental rats was made by performing Duncan's Multiple Range Test (DMRT). Enzyme systems in the different treatment groups were also compared by DMRT (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Body weight gain per week per rat group weights of organ and values of transaminases in different treatments are shown in Table 1. From the Table, it could be inferred that there existed a significant ($p < 0.001$) difference among the treatment groups regarding mean body weight gain. The result revealed that the significant ($p < 0.001$) body weight gain was achieved by the control group. Each of the treated groups exerted a reduced growth performance as compared with the control. Body weight gain was found to be the highest in control (25.64 ± 5.31 g) followed by soybean oil (22.23 ± 6.66 g), coconut (22.14 ± 6.99 g), palm (21.93 ± 6.22 g) and mustard oil treated group (20.35 ± 8.48 g). The replacement of protein source in commercial broiler ration with soybean meal caused significantly higher weight gain, showed better feed conversion, higher dressing percentage with better carcass composition and lower mortality (Ali *et al.*, 1993). In contrast to the present finding Li *et al.* (1996) reported that soybean oil supplementation increased the body weight gain in geese. The present findings also differ from the findings of Islam *et al.* (2002) who reported that the broiler fed 2% soybean oil had significant weight gain.

Table1. Effects of some edible oils on body weight gain, different organs weight and serum transaminases in rats

Groups	Body weight gain per week (Mean ± SD)	Organ weights (g) (Mean ± SD)			Enzyme values (U / L)	
		Heart	Liver	Kidney	SGOT	SGPT
A (Control)	25.64 ± 5.31**	$1.00 \pm 0.12_a$	$8.86 \pm 0.66_a$	$0.79 \pm 0.10_a$	447.88 ± 146.68	156.10 ± 75.21
B (Soybean oil)	22.23 ± 6.66	$0.72 \pm 0.08_c$	$7.66 \pm 0.96_{bc}$	$0.74 \pm 0.11_{ab}$	584.10 ± 30.75	220.97 ± 15.92
C (Palm oil)	21.93 ± 6.22	$0.76 \pm 0.15_c$	$7.28 \pm 0.62_c$	$0.70 \pm 0.19_{ab}$	471.83 ± 214.75	348.80 ± 199.97
D (Coconut oil)	22.14 ± 6.99	$0.96 \pm 0.15_{ab}$	$8.60 \pm 0.70_{ab}$	$0.82 \pm 0.22_a$	290.67 ± 137.51	259.90 ± 199.08
E (Mustard oil)	20.35 ± 8.48	$0.80 \pm 0.16_{bc}$	$8.84 \pm 1.09_a$	$0.57 \pm 0.08_b$	506.57 ± 272.24	247.00 ± 277.05

** Indicates significant at $p < 0.001$, Mean values with different letters in the parentheses differ significantly at $p < 0.05$ in same column.

The results obtained from the Duncan's Multiple Range Test (DMRT) showed that the mean heart weight of group A (1.00 ± 0.12 g) was significantly ($p < 0.05$) higher than that of others except group D (0.96 ± 0.15 g) and groups B, C and E differ insignificantly ($p > 0.05$). The mean liver weight of the groups A, D and E were significantly ($p < 0.05$) higher than that of B and C. The mean kidney weight of group E was significantly lower ($p < 0.05$) than that of other treatment groups. The liver weights of present experiment in soybean oil and palm oil fed groups are inconsistent to that of Gaiva *et al.* (2001) but their findings of increased liver weight was similar to coconut oil and mustard oil treated rats of present experiment.

The values of SGOT and SGPT activities indices the heart and liver function. The result indicates that none of the possible comparisons of the treatments exhibited any significant ($p < 0.05$) difference regarding SGOT and SGPT. The present values of SGPT and SGOT are consistent with those of Naheed *et al.* (1999) who reported no change in the enzyme system after lipid supplementation to Juvenile Albino rats.

SGOT is distributed widely in various organs such as the heart and skeletal muscles as well as liver whereas SGPT exists mainly in the liver. The low SGOT level in coconut oil fed group indicates apparently less muscular damage especially in heart muscle. Nageswari *et al.* (1999) observed a maximum increase in SGOT in male Albino Sprague Dewley rats indicative of myocardial damage in the coconut oil group rich in polyunsaturated fatty acid. A relatively high SGPT level in palm oil fed group indicates the possible hepatic damage as was reported by Rashid *et al.* (1999) who studied the effects of dietary cooked fats and oils on blood lipids. The above situation may be explained by the fact that coconut oil contains less unsaturated fatty acid compared to palm oil and this unsaturated fatty acid on thermal deterioration produces harmful secondary peroxidation products which cause the liver necrosis and thereby the value of SGPT is increased. The present findings indicate that edible oils have no effect in increasing body weight and changes in transaminase activity but have little effect on organ weight in rats.

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