Effects of Edible Oils on Biochemical Parameters of Blood in Mice

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ABSTRACT

The study was conducted on "Swiss Albino" mice (*Mus musculus*) fed with additional supplementation of rice bran oil, soybean oil and palm oil to observe their effects on biochemical parameters (total serum cholesterol, triglycerides, high density lipoproteins and creatinine). A total of 40 (4-5weeks old) mice were randomly divided into 4 equal groups (n=10) as A, B, C and D. Group A was considered as control, fed only commercial ration and other groups were supplemented with rice bran oil (group B), soybean oil (group C) and palm oil (group D) respectively in addition to commercial ration for 60 days. The serum total cholesterol in oil treated groups differed significantly ($p<0.05$) from control group (95.43 ± 2.16 mg/dl) and was highest in palm oil group (131.468 ± 2.6 mg/dl) among the oil treated groups. The triglycerides in palm oil (172.32 ± 3.09 mg/dl) treated group varied significantly ($p<0.05$) from control (150.79 ± 3.95 mg/dl) and other oil treated groups. The serum creatinine in palm oil (1.15 ± 0.96 mg/dl) treated group also varied significantly ($p<0.05$) from control (0.69 ± 0.04 mg/dl) and other oil treated groups. The high density lipoprotein (HDL) in soybean oil treated group (79.48 ± 5.87) differed significantly ($p<0.05$) from palm oil (63.72 ± 6.81) and control groups (54.47 ± 4.54) but close to rice bran oil group (73.19 ± 3.96). Further investigation is necessary with large number of animals and addition of more parameters like liver function, kidney function which will give more precise information about the effect of these oils.

Key words: Biochemical parameters, Edible oils

INTRODUCTION

Various cardiovascular and liver diseases are the consequence of eating those foods which are rich in fats and oils. Cardiovascular disease is one of the major health problems in the world. It is dramatically increasing in the last 10 years (Yamada *et al.* 1997). The presence of cholesterol, saturated fatty acids (Wood *et al.* 1996) and trans fatty acids (Anon, 1997) in fat and oils increase the risk of coronary heart disease and atherosclerosis by increasing the blood cholesterol (Lichtenstein, 1998). Oils containing unsaturated fatty acids help to decrease the blood cholesterol as well as increase the level of low density lipoporotein (LDL) (Sugano *et al.*1996, Sinha and Rahman, 1995 and Baron and Browner, 1998). Unsaturated fats tend to depress serum cholesterol while saturated fats appear to be hyper cholesterolemic (Beveridge *et al.* 1995). Ingestion of saturated fats increase serum cholesterol level as compared to unsaturated oils (Ramesha *et al.* 1980) but others (Triscari *et al.* 1978, Ide *et al.* 1978) reported the opposite.

Cholesterol is an important metabolic precursor for biosynthesis of steroid hormones. It acts as a special transport agent for unsaturated fatty acids (Orten and Neuhaus, 1970). Triglycerides are used for energy production; therefore two–third to three quarter of all

the energy derived directly by the cells might be supplied with triglycerides (Guyton, 1971). The HDL in blood acts as reverse transport mediators accepting cholesterol from peripheral cells like arterial walls and taking to the liver, thus it is protective against ischemic heart diseases (Laurence and Bennett, 1992). The hematological and biochemical constituents of blood are relatively constant. Variations occur due to age, sex, breed, climate, geographical location, nutritional status, seasons and present status of the individuals (Dukes, 1955). Any physical abnormalities or pathology is first reflected in the blood and body fluid. Hemato-biochemistry permits the study of specific pathological alteration of certain blood constituents. Information about effects of different edible oils (rice bran, soybean and palm oil) with commercial fed on biochemical parameters of blood in mice under Bangladesh condition is scarce. Considering the above ideas, the present study was designed to evaluate the effects of edible oils (rice bran, soybean and palm oil) on biochemical parameters of blood in mice.

MATERIAL AND METHODS

The experiment was conducted in the Department of Physiology, Bangladesh Agricultural University (BAU), Mymensingh-2202 during the period from 28 January to 28 March, 2015.

Experimental animal

Forty Swiss Albino mice *(Mus musculus)* of 4-5 weeks of age and an average body weight of 20-25 gm were used. The mice were randomly divided into 4 equal groups (n=10) as A, B, C and D. Group A was considered control fed on standard broiler pellet (5gm/mouse/day) and fresh drinking water. Group B, group C and group D were fed on standard broiler pellet (25ml in 1000g pellet) enriched with rice bran, soybean and palm oil respectively for a period of 60 days. The mice were acclimatized for 7 days prior to experiment. All groups were housed in compartmentalized rectangular metallic cages (9x11x7cubic inches) wrapped with wire mesh. The cages were kept in well ventilated room at 28.2°C and a relative humidity of 70-80% with natural day light. The experimental laboratory was cleaned and washed at a regular interval. Commercial Broiler pellet (HI-PRO-VITE feed and composition showed in Table 1), rice bran oil, soybean oil and palm oil were purchased from local market and were supplied as group wise. The diet was prepared on daily basis and supplied as 5gm/mice/day and water was supplied *ad libitum* in all groups.

Management practices

The cages were kept on a well-ventilated room. In order to prevent spoilage feeds were kept in poly packed sac. The feed was supplied daily to the mice and fresh drinking water was made available. Mice cages were cleaned regularly and proper hygienic and sanitary measures were also adopted during the experimental period. Feces were removed regularly.

Table 1: Composition of the HI-PRO-VITE feed (Kg/100kg)

Ingredient	(%)
Maize	56.70
Rice polish	16.92
Soybean meal	4.78
Fishmeal	7.14
Limestone	0.50
Common salt	0.25
DCP	0.25
DL-methionine	0.06
Broiler premix	0.05
Metabolized energy(Kcal⁄kg)	3100
Crude protein (%)	18.40
Calcium (%)	0.09
Total phosphorus	0.76
Lysine (%)	0.85
Methionine	0.38
Tryptophan	0.27

Collection of blood

On day 60, blood samples were collected by sacrificing the mice. Abdominal cavity and thoracic cavity were opened and the blood was collected by a syringe directly from the heart and preserved for serum preparation.

Preparation of serum

Sera were prepared for biochemical (serum total cholesterol, triglycerides, high density lipoprotein, serum creatinine) analyses according to standard procedures. Briefly, 2 ml of blood was collected in the sterile glass test tube. The blood containing tubes were placed in a slanting position at room temperature for clotting. Then the tubes were incubated overnight in the refrigerator (4°C). Then serum was collected. The sample was centrifuged at 1000 rpm for 15 minutes to have a more clear serum. The serum samples were separated and stored at -20°C till analysis (Henry, 1979)).

Biochemical parameters

The serum total cholesterol was determined using the procedure described by Trinder (1969). The result was expressed in mg/dl. The triglyceride of blood serum was determined by Biochemistry Humalyzer-3000 (Human type, Germany) according to the technique described by Trinder (1969). The result was expressed in mg/dl. The concentration of serum HDL was estimated with the incubation of supernatant of serum sample and reagent mixture in Reflectron® Humalyzer 3000 (Human type, Germany) and then placing the mixture in the Reflection® against the blank reagent. The result was expressed in mg/dl.

Determination of serum creatinine

Serum creatinine was determined at central lab of Bangladesh Agricultural University by using “Reflotron” pipette (Reflotron® plus) according to the

manufacture specification. The sample material was drawn up (0.3 ml) avoiding the formation of bubbles and applied that as a drop the center of the red application Zone without allowing the pipette tip to touch the Zone. Within 15 seconds, the flap was opened; the strip was placed on the guide and inserted the strip horizontally into the instrument until hearing a click. Closing flap the display "creatinine" confirmed that the rest specific magnetic code has been correctly read into the instrument. The time before the results appeared in displayed in seconds. After particular time, the creatinine concentration displayed in for mg/dl 37ºC, 30ºC depending upon the reference temperature selected. The range of measurement was 5.00-500 mg/dl, (37ºC).

Statistical analysis

The biochemical parameters of mice corresponding to the different levels of rice bran oil, soybean oil and palm oil supplementation are compared and performing by Student T Test (SPSS, 16 versions).

RESULTS AND DISCUSSION

The biological parameters are serum total cholesterol (mg/dl), triglycerides (mg/dl), high density lipoproteins (mg/dl) and serum creatinine (mg/dl), which was effected by provided different types of edible oil.

Serum Total Cholesterol (mg/dl)

The effects of rice bran, soybean and palm oil supplementation with ration on total cholesterol is shown in Table 2. The total cholesterol values increased with addition of rice bran oil (122.36 ± 6.63 mg⁄dl), soybean oil (124.104 ± 13.49 mg⁄dl) and palm oil supplementation (131.468 ± 2.61 mg⁄dl) compared to control (95.43 ± 2.16). The total cholesterol in oil treated groups differ significantly ($p<0.05$) from control group. The highest concentration of total cholesterol was recorded in palm oil treated group but it did not differ among other oil treated groups. The rats fed on diet enriched with soybean oil increased concentration of cholesterol significantly in blood (Fernandez *et al.* 1996). Total cholesterol reductions at significant level in hamsters fed stabilized rice bran diets compared with those fed cellulose control diet (Kahlon *et al.* 1990). Palm oil diet consumption increased a significant level of serum cholesterol in animals (Khairy *et al.* 2014 and Alaam *et al.* 2012).

Triglycerides (mg/dl)

Triglycerides (TG) concentration is presented in Table 2. The TG values increased with addition of rice bran oil (153.83 ± 5.19 mg⁄dl), soybean oil (154.99 ± 6.21 mg⁄dl) and palm oil (172.32 ± 3.09 mg⁄dl) supplemtation compared to control (150.79 ± 3.95 mg/dl). The TG in palm oil treated group differ significantly ($p<0.05$) from other groups. Triglycerides were significantly increased in rat (wistar male) fed with soybean oil (Fernandez *et al.* 1996). In animals, rice bran diet consumption has been reported to result insignificant plasma triglycerides reduction (Kahlon *et al.* 1992 and Shakib *et al.* 2014).

Table 2: Effects of additional supplementation of rice bran, soybean and palm oil on biochemical parameters (mean ± SE) in different mice groups

Biochemical Parameters	Mean±SE				P-value
	Group A (control)	Group B (rice bran oil)	Group C (soybean oil)	Group D (palm oil)	
Cholesterol(mg/dl)	95.43±2.16^{a}	122.36±6.63^{b}	124.104±13.49^{b}	131.468±2.6^{b}	0.05
Triglycerides(mg/dl)	150.79±3.95^{a}	153.83±5.19^{a}	154.99 ± 6.21^{a}	172.32±3.09^{c}	
HDL (mg/dl)	54.47±4.54^{a}	73.19±3.96^{b}	79.48±5.87^{b}	63.72±6.81^{c}	
Serum creatinine (mg/dl)	0.69±0.04^{a}	0.84±0.37^{b}	0.83±0.08^{b}	1.15±0.96^{c}	

Values with different superscript letter in same row differ significantly ($p<0.05$).

High density lipoproteins (mg/dl)

High density lipoproteins (HDL) concentration is presented in Table 2. The HDL values increased with addition of rice bran oil (73.19 ± 3.96 mg/dl), soybean (79.48 ± 5.87 mg/dl) and palm oil (63.72 ± 6.81 mg/dl) supplementation compared to control (54.47 ± 4.54 mg/dl). The HDL in soybean oil treated group differ significantly ($p<0.05$) from palm oil group and control group but close to rice bran oil group. This result agreement with earlier report by Leplaix (Leplaix *et al.,* 1996) who showed that dietary soybean oil induced an increased concentration of HDL. The result is also closely similar to Koh's and verma's (Koh, 1987 and verma *et al*. 1995) result.

Serum creatinine (mg/dl)

The serum creatinine value of different groups of mice is presented in Table 2. The serum creatinine values increased with addition of rice bran (0.84 ± 0.37 mg/dl), soybean oil (0.83 ± 0.08 mg/dl) and palm oil (1.15 ± 0.96 mg/dl) supplementation compared to control (0.69 ± 0.04 mg/dl). The serum creatinine in palm oil treated group differ significantly ($p<0.05$) from other groups. Though the highest concentration of creatinine was recorded in palm oil treated group and differs from other oil treated group B and C but their values were close to each other. When fed with palm oil diet serum creatinine level increased in blood (Alaam *et al.* 2012).

CONCLUSION

Our findings suggested that supplementation of rice bran and soybean oil improved the lipid profile as decreased serum total cholesterol, triglycerides and serum creatinine and increased high density lipoprotein values. Whereas palm oil altered lipid profile as increased serum total cholesterol, triglyceride, and serum creatinine and decreased HDL.

CONFLICT OF INTEREST

None of the authors has any financial or personal relationships that could inappropriately influence or bias the contents of paper.

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