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# Effects of Different Edible Oils on Hemato-Biochemical Profiles in Rats

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**Abstract:** A total of 25. one month old Long Evan male rats were studied to observe the effects of different edible oils on hemato-biochemical profiles. They were randomly assigned to one of five equal groups (n= 5) as A, B, C, D and E. Group. A was considered as control fed with rat feed (ICDDR'B) and others were supplemented 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 feed for 8 weeks. TEC was increased significantly ($P<0.05$) in group D as compared to control. The Hb concentration increased significantly ($P<0.05$) in group B and highly significantly ($P<0.01$) in group C and E. The PCV increased significantly ($P<0.05$) in group C as compared to control. ESR differed insignificantly ($P>0.05$) among treatment groups compared to control. TLC differed insignificantly ($P>0.05$) in group B,C,D but varied significantly ($P<0.05$) in group E to that of control. The total serum cholesterol differed insignificantly ($P>0.05$) in the treatment groups. Triglycerides concentration of group E differed significantly ($P<0.05$) but insignificantly in group B,C and D to that of control. There was no significant ($P>0.05$) difference of HDL-cholesterol in treatment groups with the control. The LDL- cholesterol values were below detection level in all rats. The results suggest that edible oils have little effect in rat haematobiochemical parameters. Further research should be carried with long duration before making any comments

**Key words :** Edible oil, rat, hemato-biochemical profiles

## Introduction

As high energy component of food, edible oils are important for calorie requirement. Food rich in fats and oils are responsible for various cardiovascular and liver diseases. The presence of cholesterol, saturated fatty acids (Wood *et al.*, 1996) and trans fatty acids (Anon, 1997) in fats 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 LDL- cholesterol (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 hypercholesterolemic (Beveridge *et al.*, 1995 ).

Ingestion of saturated fats increase serum cholesterol level as compared to the consumption of unsaturated oils ( Ramesha *et al.*, 1980) but others (Triscari *et al.*, 1978; Ide *et al.*, 1978) reported the opposite. The hematological and biochemical constituents of blood are relatively constant. Variations occur due to age, sex, breed, climate, geographical location, nutritional status, season and status of the individual (Dukes, 1955). Any physical abnormalities or pathology is first reflected in the blood and body fluid. Haematobiochemistry permits the study of specific pathological alteration of certain blood constituents.The fatty acids profiles of the diet are reflected in the fatty acid pattern of plasma lipoproteins. Increasing the linolenate in the diet will increase the linolenate level of lipoprotein types and thereby the polyunsaturated: saturated (P:S) ratio. The endogenous triglycerides bound to very low-density lipoprotein (VLDL) is progressively removed from circulation by lipolysis. LDL delivers cholesterol to the tissue by lipolysis. The high-density lipoprotein (HDL) cholesterol in blood acts as reverse transport mediators accepting cholesterol from peripheral cells like arterial walls and taking to the liver, it is protective against ischemic heart diseases (Laurence and Bennett, 1992). Limited information is available on the haematological profiles in rats The present paper describe the effects of edible oils on hematological (TEC, Hb, ESR, PCV, TLC and DLC) and biochemical (total serum cholesterol, triglyceride, HDL and LDL-cholesterol) parameters.

## Materials and Methods

A total of 25, month-old male rats (Long Evans) were used in this experiment. The rats were randomly assigned to one of five equal groups (n=5) and numbered as group A, B, C, D and E. Group A was considered 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. Blood samples were collected at the end of experiment The rats were kept fasting overnight and then anaesthesized with halothane. After opening the abdominal cavity, blood was collected from abdominal aorta and serum was prepared separately for lipid profiles. The hematological studies were performed within two hours of blood collection. TEC, Hb concentration, PCV, ESR, and TLC were determined as per technique described by Lamberg and Rothstein (1977). Serum lipid profiles (Total cholesterol, Triglyceride, HDL and LDL-cholesterol) were analysed colorimetrically using Humalyzer 2000 (Human

type, Germany) according to Trinder and Ann (1969).
Mean values of both the hematological and biochemical parameters in the different treatments groups were analyzed in accordance with Dunnett's test procedure (Steel and Torrie, 1980).

## Results and Discussion

The hematological parameters presented in Table 1 revealed that TEC, Hb, PCV and TLC differed significantly ($P<0.05$) in the treatment groups D, B, and E respectively from the control. The treatment groups C and E showed a highly significant ($P<0.01$) difference in Hb concentration with the control. No significant ($P>0.05$) differences are observed in ESR values among the groups.
Hematological parameters of present experiment is partially similar to Islam *et al.* (2002) and Aleotor *et al.* (1991) who reported that values of TEC and PCV differ significantly ($P<0.05$) among the different treated groups of broiler chickens.
The effect on biochemical parameters by oils presented in Table 2. depicted that total serum cholesterol and high-density lipoprotein values differ insignificantly ($P>0.05$) in all treatment groups compared to the control. The present finding is partially similar to Hassan (1988). who reported that palm oil doesn't increase blood cholesterol in man and Zhibin *et al.,* (1997) also reported that coconut and soybean oils decrease total serum cholesterol. In contrast, Chio *et al.,* (1993) also reported that palm oil and soybean oil increase the values of total serum cholesterol. The total serum cholesterol of present finding is higher than those reported by Koh (1987). Mean triglyceride concentration varies among the groups but only significantly ($P<0.01$) with group E compared to control. The result is dissimilar to that of Fernandez *et al.*,(1996)

Table 1: Comparison of the hematological values of experimental rats by Dunnett's test procedure

| Hematological values | Mean ± SE in the different treatment groups | | | | |
|---|---|---|---|---|---|
| | Group A (control) | Group B | Group C | Group D | Group E |
| TEC (million/mm$^3$) | 5.02±0.28 | 5.55±0.23 | 4.96±0.23 | 5.93±0.18* | 5.54±0.18 |
| Hb (g%) | 7.25±0.25 | 8.30±0.20* | 9.17±0.20** | 8.00±0.16 | 8.60±0.16** |
| PCV (%) | 32.50±3.76 | 43.00±3.07 | 46.00±3.07 | 39.00±3.38 | 40.40±3.38 |
| ESR (mm in 1st hr.) | 0.50±0.57 | 0.50±0.46 | 0.33±0.46 | 0.00±0.36 | 1.40±0.36 |
| TLC (Thousand/mm$^3$) | 6.05±0.29 | 5.67±0.24 | 5.92±0.24 | 6.97±0.18 | 7.22±0.18* |

*and ** indicate significant mean difference from control at the level 5% and 1% respectively. Blank (-) mean results failure due to technical faults

Table 2: Comparison of Biochemical parameters of the experimental Rats by Dunnett's Test procedure

| Biochemical parameters | Mean ± SE in the treatment groups | | | | |
|---|---|---|---|---|---|
| | Group A (control) | Group B | Group C | Group D | Group E |
| TSC (mg/dl) | 84.00±4.79 | 79.97±4.79 | 87.67±4.79 | 88.10±4.79 | 81.03±4.79 |
| Triglycerides (mg/dl) | 93.43±12.41 | 100.83±12.41 | 75.27±12.41 | 115.13±12.41 | 171.23±12.41** |
| HDL (mg/dl) | 74.87±4.68 | 70.20±4.68 | 78.53±4.68 | 70.00±4.68 | 71.20±4.68 |
| LDL (mg/dl) | | Below detection level | | | |

**indicates significant ($P<0.01$) mean difference from control

The HDL values differed insignificantly ($P>0.05$) in the treatment groups compared with the control which is partially similar to Zhibin *et al.* (1997) but is dissimilar to Leplaix *et al.* (1996), Islam *et al.* (2002) and Koh (1987) LDL values of the experimental rats were below the detection level. Almedigen *et al.* (1995) who observed a significantly reduction in LDL on the partial hydrogenated soybean oil diet in young man. Piliang *et al.* (1996), Leplaix *et al.* (1996) and Koh (1987) stated that soybean oil had the greatest hypolipaemic effects.

## References

Aletor, V.A., F. A. O. Laseinde and O. Orgnyemi, 1991. Equiprotein replacement of fish meal with soybean meal in the diets for broiler chicken, Poultry, 17: 38.

Almendingen, K., O. Jordal, P. Kierult, B. Sandstad and J. T. Pedersen, 1995. Effects partially hydrogenated fish oil, partially hydrogenated soybean oil and butter on serum lipoprotein in men. Journal of lipid Res., 36: 1370-1384.

Anonymous, 1997. Trans in margarines are worse than butter. *Nutrition briefs.* MPOPC, 2:1.

Baron, B. R. and W. S. Browner, 1998. Lipid abnormalities, In: Current Medical Diagnosis and Treatment. 37th edn., Prentice Hall, New Jersey, 1138-1149.

Beveridge, J. M. R., W. F. Cornell, First brook and M. S. Dewolfe, 1995. The effects of certain vegetable and animal fats on the plasma lipids of humans. J. Nutr., 56:311.

Chio, Y. S., C. Ahn, H. I. Rhee, M. Choe, C. H. Kim, J. D. Kim, S. Y. Lee and M. Sugano. 1993. Comparative effects of dietary palm oil perilla oil and soybean oil on lipid profiles in differently aged rats fed on hypercholesterolemic diets. Bio-science Biotechnology and Biochemistry, 57:65-68.

Dukes, H. H., 1955. The physiology of domestic animals. 7th edition. Bailleric tindal and Co. London 96-98.

Fernadez, S., C. Gonzlez, F. Diaz, A. M. Fneyo, J. M. Gutierrez and A. M. Patterson, 1996. Long term effects in two generations of enriched soybean oil and olive oil diets on some cardiovascular and biochemical parameters in male rats. International Journal for vitamin and Nutrition Res., 66: 343-399.

Hassan, A. H., 1988. Palm oil and Health. Planter. 64:752, 505-519.

Ide, T., Okamatsu, H. and Sugano, M. 1978. Regulation of dietary fat on 3-hydroxy-3 methylaglutaryl coenzyme A reductase in rat liver. J. Nutr., 108: 601.

Islam, K., N. Ahmad, S. Majumder, R. Islam and M. A. Barek, 2002. Effect of Dietary Supplementation of Soybean Oil on Body Weight and Certain Haemato-Biochemical Parameters in Broiler Birds. Bangladesh Vet. J., 36: 15-17.

Koh, E. T., 1987. Comparison of hypolipemic effects of corn oil, sesame oil and soybean oil in rats. Nutrition Reports International, 36: 903-917.

Lamberg, S. L. and R. Rothstein, 1977. Laboratory manual of Hematology and Urinalysis. Avi publishing company, Inc. Westport Connecticut, U.S.A.

Laurence, D. R. and P. N. Bennett, 1992. Clinical Pharmacology. 7th edition. Produced by Longman Singapore Publisher Ltd. pp: 453.

Leplaix, C. L., D. Bauchart, D. Durand, P. M. Lapland and M. J. Chapman, 1996. Plasma lipoproteins in preruminant calves fed diets containing tallow or soybean oil with and without cholesterol. Journal of Dairy Sci., 79: 1267-1277.

Lichtenstein, A. H., 1998. Trans fatty acid and blood lipid levels, LP(A), Parameters of cholesterol metabolism, and Hemostatic Factors. Journal of Nutritional Biochemistry, 9: 244-248.

Piliang, W. G., S. Djojosoebagio and A. Suprayogi, 1996. Soybean hull and its effect on altherosclerosis in non-human primates. Biochemical and Environmental Sci., 9: 137-143.

Ramesha, C. S., R. Paul and J. Ganguly, 1980. Effect of dietary unsaturated oils on the Biosynthesis of cholesterol and on biliary and fecal excretion of cholesterol and bile acids in Rats. J. Nutr., 110: 2149-2158.

Sinha, S. and R. Rahman, 1995. Cholesterol lowering effect of hilsa fish oil in female rats. Bangladesh J. Biochemistry, 1: 9-15.

Steel, R. G. D. and J. H. Torrie, 1980. Principles and procedures of statistics : A Biometrical approach. 2nd edition. McGraw Hill, New York, USA. pp: 188-190.

Sugano, M. T., T. Ishida and T. Ide, 1986. Effects of various poly-unsaturated fatty acids on blood cholesterol and Eicosanoids in Rats. Agricultural and Biological chemistry, 50: 2335-2340.

Trinder, P. and Ann., 1969. Clinical Biochemistry, 6: 24-27

Triscari, J., J. G. Hamilton and A. C. Sullivan, 1978. Comparative effects of saturated and unsaturated lipids on hepatic lipogenesis and cholesterogenesis in vivo in the meal-fed rats. J. Nutr., 108: 815.

Wood, P. D. S., R. Shioda and K. Kinsell, 1966. Dietary regulation of cholesterol metabolism. Lancet. 17: 604-607.

Zhibin, L. U., S. Hendrich, Shen, Nuo, P. J. White, L. R. Cok and N. Shen, 1997. Low linolenate and commerical soybean oils diminishes serum HDL cholesterol in young free living adult females. Journal of the American college of Nutr., 16: 562-569.