Progressive Agriculture 28 (1): 36-41, 2017 **ISSN: 1017 - 8139**

Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

Effect of sunflower oil supplementation in feed on body weight and hematobiochemical parameters in mice

Basak A, Banu LA, Ahmad N, Rafiq K[1]*

Department of Physiology, [1]Department of Pharmacology, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

Abstract

Sunflower oil contain high concentrations of essential polyunsaturated fat with antioxidant vitamin E. The study was carried out on Swiss Albino healthy mice to evaluate the effects of additional supplementation of sunflower oil in feed on body weight, hematological parameters (total erythrocyte count and hemoglobin concentration) and biochemical parameters (total serum cholesterol, triglycerides, high density lipoproteins, low density lipoprotein and serum creatine). A total of 20, three-weeks old mice were randomly divided into two equal groups (n=10) as A and B. Group A was considered as control (standard poultry pellet) and group B was supplemented with sunflower oil (5 mL/kg feed) respectively in addition to standard poultry pellet for 50 days. At the end of experimental trial, the mice were sacrificed for analysis of hemato-biochemical parameters. Body weight was significantly *(P*<0.05) higher in sunflower oil supplemented group compared to control. The total erythrocyte count and hemoglobin concentration were increased significantly (*P*<0.05) in group B compared to control group A. The total serum cholesterol, HDL and LDL values increased significantly *(P*<0.05) whereas the triglycerides concentration decreased significantly *(P*<0.05) in sunflower oil treated group compared to control group. On the other hand serum creatinine value showed non-significant trend to increase (*P*<0.2). These results suggest that sunflower oil may have beneficial effects to maintain healthy life style. Although further studies are needed to find out the molecular mechanism and its toxicological aspect if any.

Key words: Sunflower oil, dietary supplement, hematobiochemical parameters, mice

 *Corresponding Author: krafiq73@yahoo.com

Introduction

Sunflower oil is the non-volatile oil compressed from sunflower (*Helianthus annuus*) seeds. Sunflower oil is commonly used in food as frying oil, and in cosmetic formulations as an emollient. The world's largest sunflower oil producers now are Russia, Ukraine and Argentina. One of the primary reasons for the growing popularity of sunflower oil is its impressive fatty acid content and has oleic acid (omega-9) and linoleic acid (omega-6) which are the predominant monounsaturated and polyunsaturated fats (Skorić *et al*. 2008). These fatty acids reduce the LDL cholesterol and total cholesterol, decreasing the chances of coronary artery diseases (Chowdhury *et al*. 2007). Phytosterols have been found in high amounts (270-289 mg/100gm) in sunflower oil which are efficient in reducing cholesterol, increasing immunity and reducing the risk of colon cancer (Phillips *et al*. 2005).

Sunflower oil is mainly a triglyceride (Thomas, 2002). It also contains sterols, squalene and other aliphatic hydrocarbons. Omega-6 fatty acids are typically

considered "bad" cholesterol, they are still essential in the body. Some people apply sunflower oil directly to the skin for poorly healing wounds, skin injuries, psoriasis, arthritis and as a massage oil. Sunflower oil is an excellent source of vitamin E/tocopherol which neutralizes free radicals, scavenge them and prevent oxidative damage to cellular and molecular components exhibiting anti inflammatory, cardio protective and antitumour action. Due to anti inflammatory action of tocopherols, sunflower oil seem to have a promising role to play in chronic inflammatory conditions like bronchial asthma, osteoarthritis and rheumatoid arthritis (Singh *et al.* 2005). It has also important impact of vitamin E on cardiovascular system makes sunflower seed oil beneficial in reducing atherosclerosis and hence complications like coronary artery disease and stroke (Dutta, 2003).

Sunflower oil possess antioxidant value 0.153, antioxidant activity 72.9, oxidation rate ratio 0.271 and antioxidant activity coefficient 279.7 which has no statistically significant correlation with total phenolic extracts (Velioglu *et al.* 1998). Due to its antioxidant action, it has been found to decrease the risk of prostate cancer (Vogt *et al*. 2003).

Sunflower oil provides a rather significant source of zinc, a mineral which helps boost the immune system. Folate in sunflower oil facilitates the formation of RNA, DNA and haemoglobin. Tryptophan and choline present in sunflower oil is useful in reducing stress, anxiety and depression and memory enhancement. Sunflower seed oil provides an extra option in treatment of atopic dermatitis where therapeutic agents increase relipidization and inhibit inflammation are conventionally used (Lopez and Torres, 2006).

There are two major groups of lypoproteins like low density lipoprotein (LDL) which contain high concentration triglycerides and low concentration of protein. Another lipoprotein is high density lipoproteins (HDL) which contain low concentration triglycerides and high concentration of protein.

Triglycerides are used for energy production, therefore, two-third to three quarters of all the energy derived directly by the cells might be supplied with triglycerides (Guyton, 1971). The endogenous triglycerides which synthesized by the liver and carries as bound to very low density lipoproteins (VLDL) is progressively removed from circulation by lipolysis which is enhanced by lipoprotein lipase enzyme attached to capillary endothelium of certain tissue. LDL delivery cholesterol to the tissue by this above process (Laurence and Bennett, 1992). The LDL cholesterol fraction increases in severe diabetes mellitus, atherosclerosis etc. Hence determination of concentration of LDL and HDL lipoproteins are of diagnostic importance.

Use of sunflower oil in our daily life can provide us much of the recommended level of phenolic anti-oxidants, minerals, vitamins and proteins. Multidimensional role of sunflower oil in health promotion and disease prevention necessitates their use in our diets to assure healthy living. Therefore, the present study was undertaken to estimate the effects of sunflower oil on body weight, haematological parameters (total erythrocyte countand hemoglobin concentration) and lipid profiles i.e. triglyceride, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) and serum creatinine in mice.

Materials and Methods

The experiment was conducted in the Department of Physiology, Bangladesh Agricultural University (BAU), Mymensingh over a period of January to May 2016, to study the effects of sunflower oil on hemato-biochemical parameters in mice.

Experimental mice: The mice were purchased from Department of Pharmacy, Jahangirnagar University, Savar, Dhaka and adapted for 10 days in order to acclimatize them with the new environment. All mice were housed in a compartmentalized square wooden cages 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 and light.

Experimental design: A total of 20, the male Swiss Albino mice having three weeks of age were used in this experiment. The mice were randomly divided into two equal groups (n=10 in each group). Group A was considered Control and fed with standard poultry pellet only and Group B was fed with sunflower oil (5 mL/kg feed) in poultry pellet. All groups were supplied with standard poultry pellet and fresh drinking water *adlibitum*. The several parameters measured that includes body weight, hematological and biochemical tests. The mice were sacrificed to collect blood sample for hematological study and biochemical parameters such as the lipid profile i.e. triglyceride, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) and serum creatinine. Blood was collected directly from the heart of the mice using general anaesthesia.

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 and fresh drinking water were supplied daily to the mice. Mice cages were cleaned regularly and proper hygienic and sanitary measures were also allowed during the experimental period.

Measurement of body weight: The body weight of each mice was measured with the help of electric balance at 7 days interval up to the end of the experiment.

Collection of blood: The mice were placed inside the air tight container one by one containing cotton soaked with chloroform. After anesthetized they were taken out from the container for blood collection. The abdominal cavity and thoracic cavity were opened surgically and blood was collected directly from the heart with the sterile syringe and needle. About 1 mL of blood from the syringe was taken in the test tube containing anticoagulant (3.8% Sodium citrate solution) for hematological studies. The remaining amount of blood of syringe was used for collection of serum.

Preparation of serum: Two mL of blood was collected in the sterile glass test tube. 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°C). The serum samples were separated and centrifuged at 1500 at rpm for 15 minutes to get rid of unwanted blood cells if necessary. Serum samples were stored at -20°C for biochemical analysis.

Biochemical analysis: The serum biochemical parameters like the lipid profile i.e. triglyceride, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL), serum creatinine were performed using auto analyzer in the Central Laboratory of Bangladesh Agricultural University, Mymensingh.

Statistical analysis: The data were calculated and analyzed using statistical SPSS program. The study was expressed as Mean ±SE. The data were analysed using "student *t*" test and $P<0.05$ or less was considered as statistically significant. (SPSS., Chicago, IL, U/L).

Results and Discussion

Effects on body weight gain*:* The total body weights was increased significantly ($P<0.05$) in the treatment groups compared to control group (Table 1). The present finding is similar with Yanovich (1986) who reported that soybean oil, sunflower and maize oil when added to the broiler chickens diet, increased body weight gain and improved the efficiency of feed utilization and carcass quality. The increase in body weight gain resembles to that of Ali *et al.* (1993) who reported that the replacement of protein sources in commercial broiler ration with soybean meal resulting significantly higher weight gain.

Table 1. Effects of feeding sunflower oil on total body weight in mice (n = 10)

Parameters	Mean ± SE		*P*-Value
	Control group (A)	Sunflower oil (B)	
Body weight gain(gm)	24.45±0.283	25.43±0.254	0.0196

Effect on hematological parameters*:* The Total Erythrocyte Count (TEC) recorded in sunflower oil group was 8.04 ± 0.229 million/mm^3 and control group was 6.63 ± 0.213 million/mm^3. The sunflower oil treated group differ significantly (P<0.05) from that of control group (Figure 1). The present finding is dissimilar with Ahmed *et al*. (1994) who reported that TEC is not affected by dietary treatment with protein in Japanese quails. The result of total erythrocyte count is partially similar to Aletor *et al.* (1991) who reported that of TEC differ significantly among the different treated groups in broiler chickens.

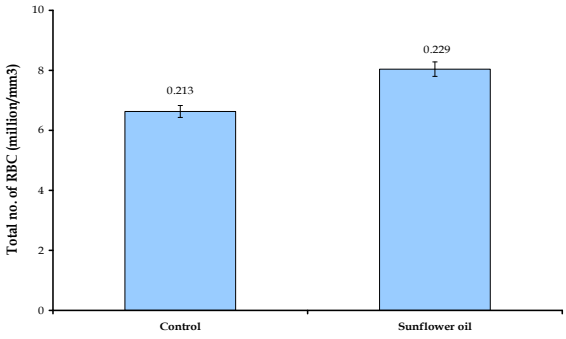

Figure 1. RBC concentration (Mean ± SE) of mice after supplementation of sunflower oil (n = 5). The superscript value above bar indicates standard error (SE).

Hemoglobin concentration in different groups of mice is presented in Figure 2. The hemoglobin concentration was recorded in sunflower oil treated group was 8.15 ± 0.354 g% and control group was 6.91 ± 0.281 gm%. The sunflower oil treated group differ significantly (P<0.05) from that of control group. The present finding is dissimilar with Ahmed *et al.*(1994) who reported that hemoglobin concentration of Japanese quails affected by dietary treatment with protein.

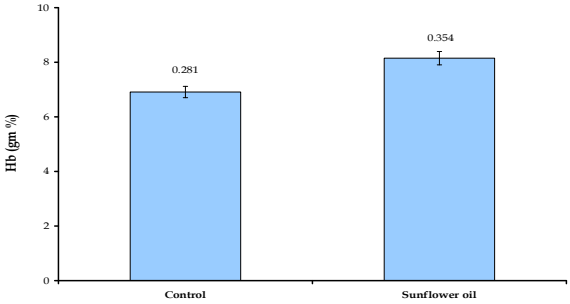

Figure 2. Hb concentration (Mean ± SE) of mice after supplementation of sunflower oil (n = 5). The superscript value above bar indicates standard error (SE).

Effect on biochemical parameters*:* The effects of sunflower oil supplementation with ration on total cholesterol are shown in Table 2. The sunflower oil treated group significantly (P<0.05) differ from that of control group. The present finding similar with Fernandez *et al.*(1996) who reported that concentration of cholesterol increased significantly in Wister rats fed on diet enriched with soybean oil but dissimilar with the findings of Kamei *et al.* (1995) who observed decreased plasma cholesterol in rats fed with hydrogenated soybean oil.

The total triglyceride was decreased significantly (P<0.05) in the treated group compared to control (Table 2). The result is similar with Yıldırım *et al*. (2014) who reported that triglyceride was decreased in in Wister rats fed on diet enriched with sunflower oil and cocoa butter groups as compared to control but the result dissimilar with Nocolosie and Wilson (1997) and Newman *et al.* (1992). They observed that triglycerides were significantly (P<0.05) lower in chicks fed on full fat rice bran and soybean diets.

The high density lipoproteins (HDL) value of different groups of mice is presented in Table 2. The total HDL was increased significantly (P<0.05) in the

treated group compared to control. This result is similar with Lepaix *et al.* (1996) who reported that high density lipoprotein was inccreased significantly in preruminant male calves fed on diet enriched with soybean oil. The result is also supported by Koh (1987), Verma *et al*. (1995).

Table 2. Effects of feeding sunflower oil on serum biochemical parameters in mice (n = 5)

Parameters	Mean ± SE		*P*-Value
	Control group (A)	Sunflower oil (B)	
Cholesterol (mg/dL)	189.60±9.19	197.15±4.91	0.1396
HDL-cholesterol (mg/dL)	41.32±0.85	43.17±1.10	0.0455
Triglycerides (mg/dL)	190.17±10.55	111.20±4.99	0.0028
LDL-cholesterol (mg/dL)	110.26±6.70	135.60±2.73	0.0472
Serum Creatinine (mg/dL)	1.33±0.006	1.37±0.008	0.2010

The low density lipoproteins (HDL) value of different groups of mice is presented in Table 2. The total LDL was increased significantly (P<0.05) in the treated group compared to control group. The present finding is dissimilar with Yıldırım *et al*. (2014) who reported that low density lipoprotein was decreased significantly in Wister rats fed on diet enriched with sunflower oil. The result is dissimilar with Nocolosie and Wilson (1997) who reported that hamsters fed on soybean protein concentrate had significant reduction of LDL cholesterol.

Serum creatinine value of different groups of mice is presented in Table 2. Serum creatinine level has no significant difference (P=0.20) among the groups. This data indicate that sunflower oil supplementation in healthy mice have no adverse effects on renal function. Although previously Yıldırım *et al*. (2014) reported that serum creatinine level was decreased significantly in Wister rats fed on diet enriched with cocoa butter.

Conclusions

The present study suggested that sunflower oil supplementation have significant beneficial effect on hemato-biochemical parameters in mice. For the establishment of beneficiary effect of such oil, further study is necessary to observe any adverse effect in relation to histopathology and biochemistry before making any definite conclusion regarding the beneficial effect in mice as well as human being

References

Ahmed MK, Barque AR, Nawaz H, Siddique RH (1994). Effect of varying energy and protein levels on the hematology of Japanese quails. Pakistan Veterinary Journal. 14: 200-202.

Aletor VA, Laseinde FAO, Ogunyemi O (1991). Equiprotein replacement of fishmeal with soybean meal in the diets for broiler chickens. Poultry Abstract. 17(2): 38.

Ali A, Azim A, Zahid S, Rasool Z, Rehman KU (1993). Comparative performances of broiler chicks on commercial and corn-soybean meal based rations. Asian-Australian Journal ofAnimal Science. 6(1): 115-122.

Chowdhury K, Banu LA, Khan S, Latif A (2007). "Studies on the Fatty Acid Composition of Edible Oil". Bangladesh Journal of Science Industrial Research. 42(3): 311-316.

Dutta A (2003). Vitamin E and its role in the prevention of atherosclerosis and carcinogenesis: a review. Journal of the American College Nutrition. 22(4):258-68.

Fernandez S, Gonzlez C, Diaz F, Fueyo A.M, Gutierrez JM, Patterson AM (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 Research. 66(4): 343-399.

Guyton AC (1971). Text Book of Medical Physiology, 4th Edition, W.B Saunders Company. pp. 801-802.

Kamei M, Ohagaki S, Kanbe T, Shimizu M, Morita S, Niiya L, Matsui YI, Otani S (1995). *Highly* hydrogenated dietary soybean oil modifies the responses to polychlorinated biphenyls in rats lipids. *31(11): 1151-1156.*

Koh ET (1987).Comparison of hypolipemic effects of corn oil, sesame oil and soybean oil in rats. Nutrition Reports International. 36(4): 903-917.

Laurence SL, Bennett PN (1992). Clinical Pharmacology. 7th Edition. Produced by Longman Singapore Publisher (Ltd.) pp. 453.

Leplaix CL, Bauchart D, Durand D, Laplaud PM, Chapman MJ (1996). Plasma lipoproteins in preruminant calves fed diets containing tallow or soybean oil with and without cholesterol. Journal of Dairy Science. 79(7): 1267-1277.

Lopez PG, Torres MT (2006). Indications for sunflower oil concentrate in the treatment of atopic dermatitis. Revista Alergia Mexico. 53(6):217-25.

Newman RK, Betschart AA, Newman CW, Hofer PJ (1992). Effect of full fat or defatted race bran on serum *Poultry Abstract.* 19(8): 246.

Nicolosie RJ, Wilson TA (1997). The anti-atherogenic effect of dietary Soybean protein concentrate in hamsters. Nutrition Research. 17(9): 1457-1467.

Phillips KM, Ruggio DM, Ashraf KM (2005)." Phytosterol composition of nuts and seeds commonly consumed in the United States". Journal of Agricultural Food and Chemistry. 53(24):9436-45.

Singh U, Devaraj S, Jialal I (2005). Vitamin E, oxidative stress, and inflammation. Annual Review Nutrition. 25:151-74.

Skorić D, Jocić S, Sakac Z, Lecić N (2008)."Genetic possibilities for altering sunflower oil quality to obtain novel oils". Canadian Journal of Physiol Pharmacol. 86 (4): 215–21.

Thomas A (2002). "Fats and Fatty Oils". Ullmann's Encyclopedia of Industrial Chemistry. Weinheim: Wiley-VCH.

Velioglu YS, Mazza G, Gao L, Oomah BD (1998). Antioxidant Activity and Total Phenolics in Selected Fruits, Vegetables, and Grain Products. Journal of Agricultural Food and Chemistry. 46: 4113-4117.

Verma ND, Panda JN, Singh KB, Shrivastar (1995). Effect of feeding cholesterol and fat on serum cholesterol on Japanese quail. Indian Journal of Poultry Science. 30: 218-223.

Vogt TM, Ziegler RG, Graubard BI, Swanson CA, Greenberg RS, Schoenberg JB (2003). Serum selenium and risk of prostate cancer in U.S. blacks and whites. Intertional Journal of Cancer. 103(5):664-70.

Yanovich VG (1986). Fat supplements in diets for animals. Poultry Abstract. 14(9): 2233.

Yıldırım E, Çınar M, Yalçınkaya I, Ekici H, Atmaca N, Güncüm E (2014).Effect of Cocoa Butter and Sunflower Oil Supplementation on Performance, Immunoglobulin, and Antioxidant Vitamin Status of Rats.Biomed Research Intertional. 2014; 2014: 606575.