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EFFECT OF LOTUS SEED POWDER SUPPLEMENTATION ON THE ANTHROPOMETRIC MEASUREMENTS AND SERUM LIPID PROFILE IN POSTMENOPAUSAL WOMEN WITH HYPERCHOLESTEROLEMIA

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ABSTRACT

Background: Social inequality, poverty and inequitable access to resources, including health care, result in a high burden of non – communicable disease (NCDs) among women worldwide. **Objective:** To determine the effect of lotus seed powder supplementation on the Body Mass Index (BMI), waist circumference and serum lipid profile (SLP) in postmenopausal women with hypercholesterolemia. **Method:** Thirty postmenopausal women (45 – 60 years) with a serum total cholesterol (TC) level between 200 – 239 mg/dl (borderline-high) were selected and equally divided (n=15) into two groups, that is, Group I (Control group without supplementation but with diet counseling) and Group II (Test group with supplementation and diet counseling) for the study The subjects in Group II were instructed to consume 6 grams of the lotus seed powder dissolved in 200 ml of water, half an hour before bed time every day for a period of 60 days. **Results:** Statistically significant reductions were seen in the anthropometric measurements of the subjects in the test group after the supplementation period .Reductions were observed in all the lipid parameters (except HDL – C) in the test group compared to increments observed in the control group. The HDL – C showed a mild increment in the test group, whereas, a significant reduction was observed in the control group. Statistically significant higher percentage reductions were observed in the BMI and waist circumference of the subjects in Group II by 1.9% and 1.7% respectively compared to statistically significant increment of 1.7% in the BMI of the subjects in Group I. Regarding the SLP - TC, LDL, Very Low Density Lipoprotein (VLDL), Serum TG, TC: HDL ratio and TG: HDL ratio reduced by

3.0%, 4.1%, 7.7%, 7.6%, 6.2% and 10.7% respectively in Group II compared to increments by 3.5%, 7.9%, 0.4%, 0.6%, 9% and 7.3% respectively in Group I. **Conclusion:** Lotus seed powder supplementation can be advocated as an effective hypolipidemic agent for combating dyslipidemia, which is independently responsible for increased CHD mortality among Indian women.

KEYWORDS: Lotus seed powder, Coronary Heart Disease, Dyslipidemia, Cardiovascular disease.

INTRODUCTION

Overweight and obesity are linked to more deaths worldwide than underweight. The risk of non - communicable diseases (NCDs) increases with increase in BMI and has affected nearly 38 million people worldwide. Cardiovascular disease (CVD) accounts for 17.5 million deaths annually, one- third of death among women around the world and half of all deaths in women over 50 years old in developing countries, followed by Cancers (8.2million), respiratory diseases (4 million) and diabetes (1.5 million).[1,2,3] Coronary heart disease (CHD) is the largest contributor to CVD morbidity and mortality in both men and women. Although women tend to live longer than men, they are often in poor health.[2,4]

Hypercholesterolemia, which is characterized by very high levels of cholesterol in blood, has direct proportionate relationship with atherosclerosis and ischemic heart disease (IHD) and it is estimated that by the year 2020, CVD, mainly atherosclerosis, will become the leading cause of total global disease burden.[5,6] Population studies conducted as part of the Asia-Pacific Cohort Studies Collaboration (APCSC) suggested that for each 1 mmol/L higher than usual cholesterol level, the risk of coronary death was approximately 35%.[7] CVD has been gaining importance in India recently because of increased incidence of the disease becoming the first among five causes of deaths in Indian population.[8] It is predicted that Asian Indian ethnicity would account to 40 – 50 per cent of global CVD burden within the next 10 – 15 years.[9] The presence of Asian Indian Phenotype in South Asians has led to their excessive vulnerability to diabetes and premature CHD.[10] In order to prevent CVD and its associated complications which is the leading cause of death and disability in the world, it is of paramount importance to determine an effective hypolipidemic agent to combat the disease burden.

Nelumbo nucifera commonly known as lotus is a rhizomatous aquatic perennial plant belonging to family Nelumbonaceae.[11] Lotus seeds ("kamal gatta") are sold as vegetables in Indian markets and are used as a valuable functional food ingredient in large number of traditional Chinese and Japanese pastries and desserts.[12,13] Many nutrients and bioactive substances, such as phospholipids, proteins, vitamins, sugar, essential minerals, alkaloids and flavonoids are constituent of the seed.[14,15] β – Sitosterol of lotus seeds have sedative and cardioprotective effects.[16] The seeds or their extracts have been reported to exhibit anti-proliferative, anti-fibrosis, anti-depressant, anti-inflammation, astringent, hepato-protective and free radical scavenging, anti- obesity and hypolipidemic effects, anti-inflammatory, immunomodulatory and anti-viral activities.[17,18,19,20,21,22,23]

The purpose of the present investigation is to determine the effect of lotus seed powder supplementation on the Body Mass Index (BMI), waist circumference and serum lipid profile in women with hypercholesterolemia and to compare the same with that of a control group without supplementation.

MATERIALS AND METHODS

The study was designed to investigate the effect of lotus seed powder supplementation on the anthropometric measurements and serum lipid profile in postmenopausal women with hypercholesterolemia. It was a pre – test, post – test, experimental design. The subjects for the study were selected from in and around Mogappair, Chennai and Sindhu Sadan Association, Egmore, Chennai based on a purposive sampling technique. Thirty postmenopausal women in the age group of 45 – 60 years with a serum total cholesterol level between 200 – 239 mg/dl (borderline – high) were included in the study and they were equally divided (n=15) into 2 groups, that is, control group (Group I) and the test group (Group II).

Commercially available lotus seeds were powdered, weighed to an accuracy of 6 grams and supplemented for 60 days to the test group, whereas, the control group did not receive any supplementation. Both the control as well as the test group received dietary counseling before the start of the study/supplementation period.

The subjects were briefed about the significance of the study and were interviewed individually to elicit personal and dietary information. The BMI of the subjects were calculated and the waist circumference was measured before and after the

study/supplementation period. The subjects in the test group were instructed to consume 6 g (1 sachet) of the lotus seed powder dissolved in 200 ml of water, half an hour before bed time every day. The sachet (6g) containing the powder was given to the subjects in an interval of 15 days (15 sachets) for a period of 60 days, while the control group did not receive any supplementation and were instructed to consume their normal diet with restriction of carbohydrate and fat. Subjects from the test and control groups were requested to come in a 12 hour fasting state at the clinical laboratory on Day 1 and Day 61 of the study/ supplementation period for analysis of the serum lipid profile comprising of total cholesterol (TC), low density lipoprotein cholesterol (LDL – C), high density lipoprotein cholesterol (HDL – C), very low density lipoprotein cholesterol (VLDL – C), triglyceride (TG), TC: HDL and TG: HDL ratios. The details obtained from the interview schedule were subjected to descriptive analysis and information regarding BMI, waist circumference and serum lipid profile were subjected to inferential statistical analysis.

RESULTS AND DISCUSSION

Sedentary lifestyle which is an independent cardiovascular risk factor was reported by majority of the subjects in group II than group I. A major proportion of the subjects in Group I (66.6%) belonged to high income category, whereas, 53.3% of the subjects in Group II belonged to the middle income category. Nearly 33.3% of the subjects in the test groups were graduates, whereas, none of the subjects in the control group were graduates and an illiteracy rate of 26.6% was observed in the control group. Lack of physical activity was reported by 86.6% of the subjects in the control group and 40% of the subjects in the test group It was further observed that majority of the subjects from the control group were overweight, whereas, 40% of the subjects from the test group were obese.

Family history of diabetes, CVD, hypertension, hypothyroidism, hypercholesterolemia and kidney disease was reported by the subjects in both the groups which may be the secondary cause for dyslipidemia in these subjects. A strong family history of hypertension and diabetis mellitus was reported by 73.3 per cent and 60 per cent of the subjects in group I, respectively, whereas, an equal percentage distribution (66.6%) in group II reported a family history of both diabetes and hypertension. A family history of hypercholesterolemia was reported by a higher percentage of subjects in the control group (53.3%) compared to that of the test group (46.6%).

Regarding the dietary habits, majority of the subjects (>85%) in both the groups were non-vegetarians. Milk and curd was consumed daily by all the subjects in both the groups. Majority of the subjects in both the groups did not consume saturated fats like vanaspathi, ghee, butter and dalda. Refined oil like sunflower oil ,which is high in PUFA was consumed by majority of the subjects in the test group, whereas, palm oil which is high in saturated fatty acids and linked with increased coronary risk was consumed by subjects in the control group (53.3%) and were advised to reduce its consumption gradually. Weekly consumption of high calorie foods like sweets, cakes, biscuits, samosas, bajji, bonda and cutlets was reported by the subjects in both the groups. None of the subjects were on any hypocholesterolemic drugs or supplementation like vitamin E or C which have a cardio protective effect.

BMI and waist circumference of the subjects in Group I and Group II

The mean BMI of the hypercholesterolemic women in Group I and Group II is presented in table 1 and represented graphically in fig. 1

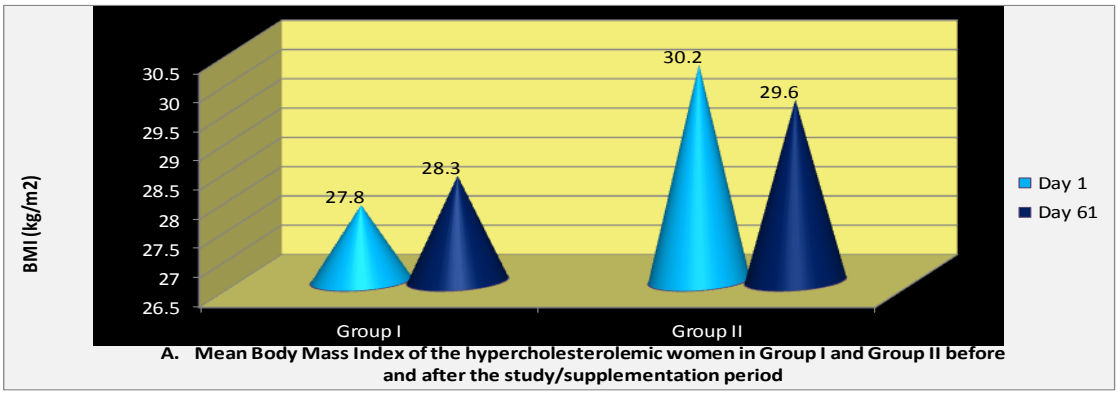
Table 1: Mean BMI and waist circumference of the hypercholesterolemic women in the control and test group before and after the study/supplementation period.

Parameter	Group I (n=15) Mean±S.D		Level of significance
	Day 1	Day 61	
BMI (kg/m2)	27.8 ± 3.0	28.3 ± 3.1	P<0.01
Waist circumference (cms)	94.8 ± 8.6	94.8 ± 8.7	NS
	Group II (n = 15)		
BMI (kg/m2)	30.2 ± 4.8	29.6 ± 4.8	P<0.001
Waist circumference (cms)	99.8 ± 9.5	98.4 ± 9.6	P<0.01

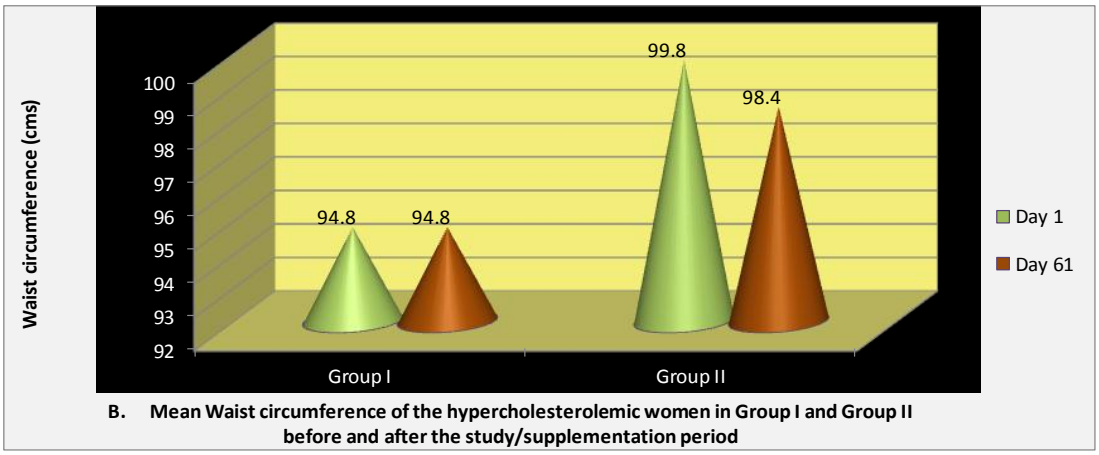
NS – Not Significant

It can be inferred that there was a statistically significant increment in the BMI (28.3 ± 3.1 kg/m2) of the subjects in Group I compared to the baseline mean value of 27.8 ± 3.0 kg/m2 after 60 days of the study period. Waist circumference which serves as a better predictor for CHD than BMI remained unchanged (94.8 ± 8.7 cms) after 60 days of the study period.

Significant reductions were seen in the mean BMI (29.6 ± 4.8 kg/m2) and mean waist circumference (98.4 ± 9.6 cms) of the subjects in Group II after the supplementation period. Despite the reduction in the values of BMI and waist circumference, it still remained above the normal cut-off value which indicates the need for a longer supplementation period.



A. Mean Body Mass Index of the hypercholesterolemic women in Group I and Group II before and after the study/supplementation period



B. Mean Waist circumference of the hypercholesterolemic women in Group I and Group II before and after the study/supplementation period

Fig. 1: Anthropometric measurements of the hypercholesterolemic women A) BMI B) Waist Circumference.

Serum Lipid Profile of the subjects in Group I

The mean serum lipid parameters of the hypercholestrolemic women in Group I before and after the study period is presented in **table 2** and represented graphically in **fig. 2**

Table 2: Mean serum lipid profile of the hypercholesterolemic women in Group I before and after the study period.

Parameter (mg/dl)	Day 1 Mean ± S.D	Day 61 Mean ± S.D	Level of significance
Total cholesterol	222.5 ± 11.1	230.3 ± 22.0	NS
HDL – C	49.7 ± 3.4	46.8 ± 4.1	p<0.01
LDL – C	130.8 ± 24.0	141.2 ± 19.6	NS
VLDL – C	42.0 ± 18.4	42.2 ± 14.6	NS
Triglyceride	210.2 ± 92.3	211.6 ± 73.1	NS
TC: HDL – C ratio	4.4 ± 0.3	4.8 ± 0.5	NS
TG: HDL – C ratio	4.1 ± 1.6	4.4 ± 1.5	NS

NS – Not Significant

The percentage increments in the serum lipid parameters after 60 days of the study period were as follows: Serum TC increased by 3.5%, LDL – C by 7.9%, VLDL – C by 0.4%, TG

by 0.6%, TC: HDL – C ratio by 9.0% and TG: HDL – C ratio by 7.3%. The HDL – C levels decreased significantly by 5.8% after the study period. Increments were seen in all the lipid parameters (except HDL – C) after 60 days of the study period, but it was not significant. Increase in the lipid parameters is directly proportional to the likelihood of developing CHD. Hence, it is necessary to control the lipid parameters with effective intervention in order to prevent or delay the onset of CHD. Dyslipidemia is characterized by elevated LDL – C and decreased HDL – C and is an established risk factor for the development and progression of CAD.[24] For every 10 per cent reduction in HDL, the risk for CAD increases by 13 per cent.[25]

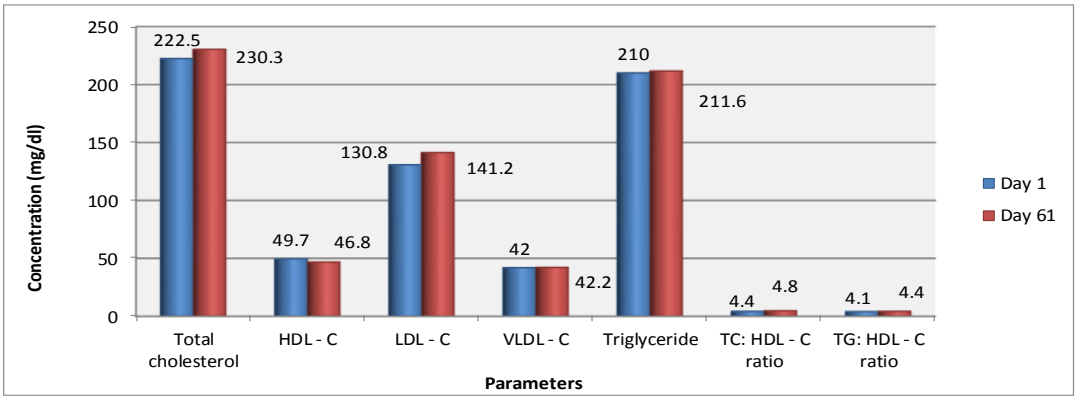


Fig. 2: Mean serum lipid profile of the hypercholesterolemic women in Group I before and after the study period.

Serum lipid profile of the subjects in Group II

The mean serum lipid parameters of the hypercholesterolemic women in Group II (with lotus seed powder supplementation) before and after 60 days of the supplementation period is presented in **table 3** and represented graphically in **fig.3.**

Table 3: Mean serum lipid profile of the hypercholesterolemic women in Group II before and after the supplementation period.

Parameter (mg/dl)	Day 1 Mean ± S.D	Day 61 Mean ± S.D	Level of significance
Total cholesterol	222.8 ± 12.0	216.2 ± 28.6	NS
HDL – C	45.4 ± 1.9	47.0 ± 3.2	NS
LDL – C	151.7 ± 18.2	145.4 ± 22.7	NS
VLDL – C	25.7 ± 13.8	23.7 ± 7.7	NS
Triglyceride	128.8 ± 69.2	118.9 ± 38.2	NS
TC: HDL – C ratio	4.8 ± 0.3	4.5 ± 0.5	NS
TG: HDL – C ratio	2.8 ± 1.4	2.5 ± 0.8	NS

NS – Not Significant

The percentage reductions in the serum lipid parameters after the supplementation period were as follows: Serum TC decreased by 3.0%, LDL – C by 4.1%, VLDL – C by 7.7%, TG by 7.6%, TC: HDL – C ratio by 6.2% and TG: HDL – C ratio by 10.7%. A mild increment was observed in the HDL – C level (3.5%) after the supplementation period, but the increment was not statistically significant. An increment in HDL – C by 10mg/dl leads to reduced risk of CAD by 2 – 3 per cent.[26] From the above findings, it can be deduced that the lotus seed powder supplementation has exerted a favorable hypolipidemic effect in these hypercholesterolemic women, thereby delaying the onset of developing CHD.

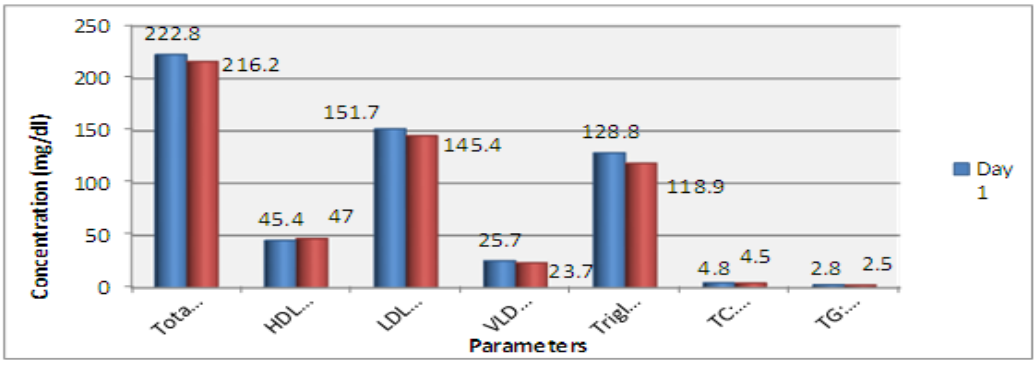


Fig. 3: Mean serum lipid profile of the hypercholesterolemic women in Group II before and after the supplementation period.

CONCLUSION

The results of the study have clearly brought to light the hypolipidemic effect of lotus seed powder supplementation in women with hypercholesterolemia. Thus, it can be concluded from the findings of this study that lotus seed powder supplementation can be advocated as an effective hypolipidemic agent for combating dyslipidemia, which is independently responsible for the increased incidence of CHD mortality among Indian women. Further investigations can be conducted with increased dosage and duration to bring about statistically significant reductions and to study the effect of its withdrawal on the various lipid parameters.

REFERENCES

1. World Health Organization Non communicable disease Fact sheet. WHO Media Centre. Geneva, 2015.
2. World Health Organization. The World Health Report: Reducing Risks, Promoting Healthy Life. Geneva, 2002.

3. World Health Organization report Cardio vascular disease, Fact sheet, N°317. Geneva, 2015.
4. Ford ES and Capewell S. Coronary heart disease mortality among young adults in the US from 1980 through 2002: concealed leveling of mortality rates. J Am Coll Cardiol, 2007; 50(22): 2128-32.
5. National Cholesterol Education Program [NCEP] Expert panel on Detection, Evaluation and Treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA, 2001; 285(19): 2486 – 97.
6. Mohan H. Textbook of pathology. 6th Ed., New Delhi; Jaypee Brothers Medical Publishers (P) Ltd: 2010; pp 393.
7. Zhang X, Wu J, Zhang B. Xuesaitong injection as one adjuvant treatment of acute cerebral infarction: A systematic review and meta-analysis. BMC complementary and alternative medicine, 2015; 15(1): 1.
8. Gupta R, Guptha S, Sharma KK, Gupta A, Deedwania, P. Regional variations in cardiovascular risk factors in India India heart watch World J Cardiol, 2012; 4(4): 112-20.
9. Gaziano TA, Reddy KS, Paccaud F, Horton S, Chaturvedi V. Cardiovascular Disease. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB (eds). Disease Control Priorities in Developing Countries. 2nd ed., New York; Oxford University Press: 2006; pp 645-62.
10. Enas EA, Chacko V, Senthilkumar A, Puthumana N, Mohan V. Elevated lipoprotein (a)—A genetic risk factor for premature vascular disease in people with and without standard risk factors: A review. Dis Mon, 2006; 52(1): 5-50.
11. Laongsri W, Trisonthi, C, Balsley H. Management and use of Nelumbo nucifera Gaertn. in Thai wetlands. Wetlands Ecol Manage, 2009; 17(4): 279 – 89.
12. Moro CF, Yonekura M, Kouzuma Y, Agrawal GK, Rakwal R. Lotus– A source of food and medicine: current status and future perspectives in context of the seed proteomics. International Journal of Life Sciences, 2013; 7(1): 1 – 5.
13. Ling ZQ, Xie BJ, Yang EL. Isolation, characterization, and determination of antioxidative activity of oligomeric procyanidins from the seedpod of Nelumbo nucifera Gaertn. Journal of Agricultural and Food Chemistry, 2005; 53(7): 2441 – 45.
14. Rai S, Wahile A, Mukherjee K, Saha BP, Mukherjee PK. Antioxidant activity of Nelumbo nucifera (sacred lotus) seeds. J Ethnopharmacol, 2006; 104(3): 322 – 327.
15. Chen Y, Fan G, Wu H, Wu Y, Mitchell A. Separation, identification and rapid determination of liensine, isoliensinine and neferine from embryo of the seed of Nelumbo

nucifera Gaertn. by liquid chromatography coupled to diode array detector and tandem mass spectrometry. Journal of pharmaceutical and biomedical analysis, 2007; 43(1): 99 – 104.

16. You JS, Lee YJ, Kim KS, Kim SH, Chang KJ. Anti-obesity and hypolipidaemic effects of Nelumbo nucifera seed ethanol extract in human pre-adipocytes. Journal of the Science of Food and Agriculture, 2013; 94(3): 568 – 75.
17. Yu J, Hu, WS. Effects of neferine on platelet aggregation. Acta Pharm Sin, 1997; 32(1): 1 – 4.
18. Xiao JH, Zhang JH, Chen HL, Feng XL, Wang JL. Inhibitory effects of isoliensinine on bleomycin-induced pulmonary fibrosis. Planta Med, 2005; 71(3): 225 – 30.
19. Bi Y, Yang G, Li H, Zhang G, Guo Z. Characterization of the chemical composition of lotus plumule oil. Journal of Agricultural and Food Chemistry, 2006; 54(20): 7672 – 77.
20. Mukherjee D, Khatua TN, Venkatesh P, Saha BP, Mukherjee PK. Immunomodulatory potential of rhizome and seed extracts of Nelumbo nucifera Gaertn. J Ethnopharmacol, 2010; 128(2): 490-94.
21. Kashiwada Y, Aoshima A, Ikeshiro Y, Chen YP, Furukawa H, Itoigawa M, Lee KH. Anti-HIV benzylisoquinoline alkaloids and flavonoids from the leaves of Nelumbo nucifera and structure–activity correlations with related alkaloids. Bioorg Med Chem, 2005; 13(2): 443 – 48.
22. Kuo YC, Lin YL, Liu CP, Tsai WJ. Herpes simplex virus type 1 propagation in HeLa cells interrupted by Nelumbo nucifera. J Biomed Sci, 2005; 12(6): 1021-34.
23. Lin JY, Wu AR., Liu CJ, Lai YS. Suppressive Effects of Lotus Plumule (Nelumbo nucifera Geartn) Supplementation on LPS-Induced Systemic Inflammation. Journal of Food and Drug Analysis, 2006; 14(3): 273 – 78.
24. Arca M, Montali A, Valiante S, Campagna F, Pigna G, Paoletti V, Gaudio C. Usefulness of atherogenic dyslipidemia for predicting cardiovascular risk in patients with angiographically defined coronary artery disease. Am J Cardiol, 2007; 100(10): 1511-16.
25. Després JP, Lemieux I, Dagenais G R, Cantin B, Lamarche B. HDL-cholesterol as a marker of coronary heart disease risk: The Quebec cardiovascular study. Atherosclerosis, 2000; 153(2): 263-272.
26. Mahdy AK, Wonnerth A, Huber K, Wojta, J. Cardiovascular disease risk reduction by raising HDL cholesterol–current therapies and future opportunities. Br J pharmacol, 2012; 167(6): 1177-94.