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Botanicals Used for Anti-Hyperlipidemic Activity: A Review



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ABSTRACT

Lipids are very diverse in both their respective structures and functions. Major lipid groups include fats, phospholipids, steroids and waxes. Elevated serum total cholesterol (TC), low-density lipoproteins (LDL), very low-density lipoprotein (VLDL) and decrease high-density lipoprotein (HDL) are the major risk factors for coronary heart diseases and chronic degenerative disease such as atherosclerosis. Medicinal plants have vital role in hypolipidemic activity. Effectiveness, safety, affordability and acceptability of plant derived medicine took advantage for their acceptability. This review enlightens the various botanicals known for their anti hyperlipidemic activity.



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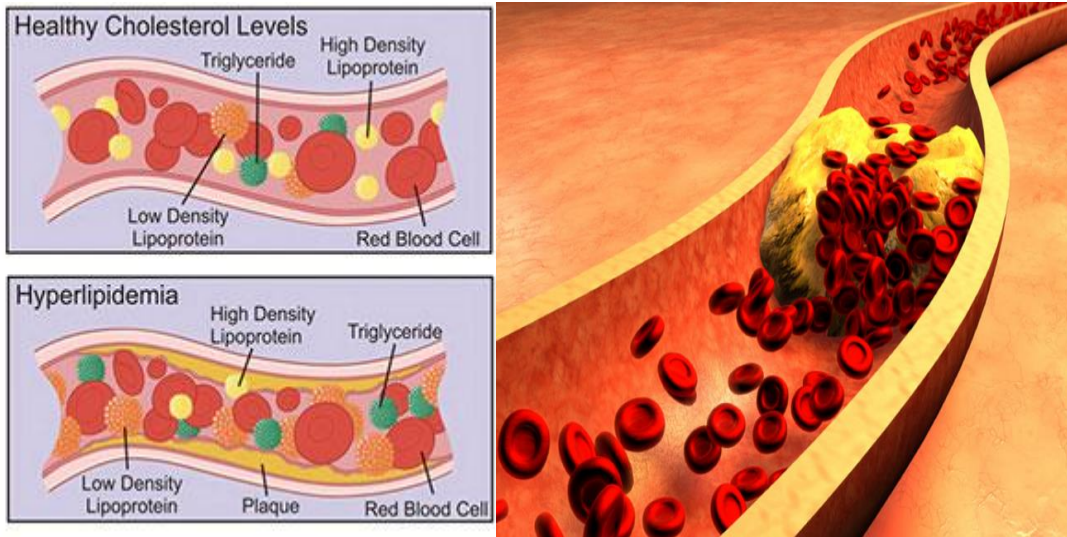
INTRODUCTION

An herbal drug constitutes a major part in all traditional systems of medicine. There are approximately 1250 Indian medicinal plants which are used in formulating therapeutic preparations according to Ayurvedic and other traditional systems of medicine. Plants provide varieties of resources that contribute to the fundamental need of food, clothing and shelter. Among plants of economical importance, Medicinal and Aromatic plants have played vital role in alleviating human sufferings. Plants are utilized as therapeutic agents as since times immemorial in both organized (Ayurveda and Unani) and unorganized (folk, tribal, native) forms. Pharmacological activity of medicinal plants is often known as a result of millennia of trial and error but they have to be carefully investigated if we wish to develop new drug that meet the criteria of modern treatment. Since time immemorial man has used various parts of plants in the treatment and prevention of many ailments. Historically all medicinal preparations were derived from plants, whether in the simple form of plant parts or in the more complex form of crude extracts, mixtures, *etc.* Today a substantial number of drugs are developed from plants which are active against a number of diseases. The majority of these involve the isolation of the active ingredient (chemical compound) found in a particular medicinal plant and its subsequent modification. In the developed countries 25 percent of the medical drugs are based on plants and their derivatives and the use of medicinal plants is well known among the indigenous people in rural areas of many developing countries¹.

Hyperlipidemia

Hyper = Lipid = Fat Emia = Excess A condition of the blood. Hyperlipidemia is excessive amounts of fatty substances in the blood (aka Hyperlipemia).

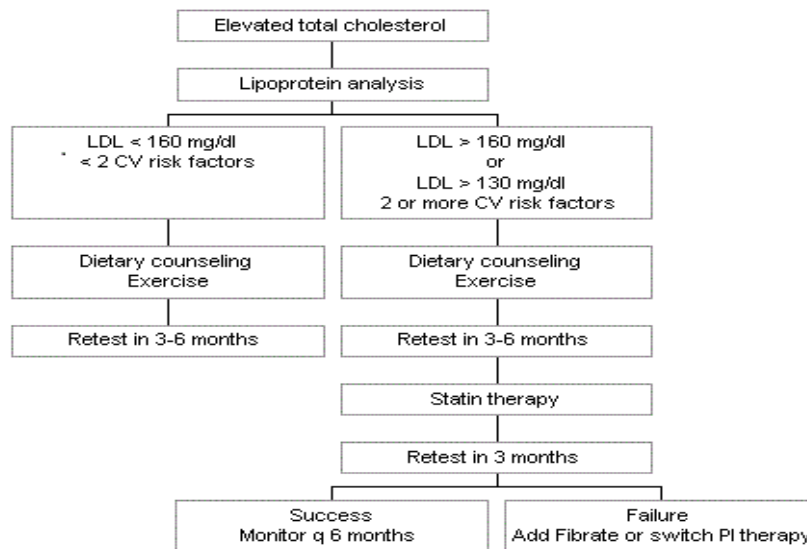
It is a medical condition characterized by an elevation of any or all lipid profile and/or lipoproteins in the blood. It is also called hypercholesterolemia/hyperlipoproteinemia. Although elevated low-density lipoprotein cholesterol (LDL) is thought to be the best indicator of atherosclerosis risk, dyslipidemia (abnormal amount of lipids in the blood) can also describe elevated total cholesterol (TC) or triglycerides (TG), or low levels of high-density lipoprotein cholesterol (HDL)².



Hyperlipidemia

Complications due to hyperlipidemia are Atherosclerosis, Coronary Artery Disease, Stroke, Heart Attack (which can result in death)³.

Management of elevated low-density lipoproteins



Common secondary causes of hypercholesterolemia (specifically, high LDL cholesterol) include hypothyroidism (that is, low thyroid hormone levels), pregnancy, and kidney failure. Common secondary causes of hypertriglyceridemia include diabetes, excess alcohol intake, obesity, and certain prescription medications (such as glucocorticoids and estrogen). Hyperlipidemia, along with diabetes, hypertension (high blood pressure), positive family history, and smoking are all major risk factors for coronary heart disease⁴.

Hyperlipidemia usually has no noticeable symptoms and tends to be discovered during routine examination or evaluation for atherosclerotic cardiovascular disease. However, deposits of cholesterol (known as xanthomas) may form under the skin (especially around the eyes or along the Achilles tendon) in individuals with familial forms of the disorder or in those with very high levels of cholesterol in the blood. Individuals with hypertriglyceridemia may develop numerous pimple-like lesions across their body. Extremely high levels of triglycerides may also result in pancreatitis, a severe inflammation of the pancreas that may be life-threatening⁵.

Plants Reported having Antihyperlipidemic Activity



***Cleome gynandra* (Cleomaceae)**

The studied was carried out for hypolipidemic activity of *Cleome gynandra* L. by *in vivo* animal model. Hyperlipidemia model was induced by administering dexamethasone (10mg/kg, b.wt.,s.c.) in rats with significant imbalance in the serum lipid profiles such as TC, TG, VLDL-C, LDL-C, HDL-C levels along with increase in atherogenic index. Treatment with hydroalcoholic extract of leaves of *Cleome gynandra* L. (200 and 400mg/kg,b.wt.,p.o) has shown significant amelioration of altered serum lipid profile reducing atherogenic index as evidenced by histopathological examinations compared to the standard treatment (atorvastatin, 10mg/kg, b.wt. p.o.)⁶.



***Leucas aspera* (Lamiaceae)**

Antihyperlipidemic activity of the leaves of *L. aspera* by *in vivo* animal model. Hyperlipidemia model can be induced by administered with dexamethasone in rats with significant increase in serum cholesterol and triglyceride (TG) levels along with increase in the atherogenic index. The results revealed that the ethanolic extract of leaves of *L. aspera* Linn. (200 and 400 mg/kg) treatment has shown significant inhibition against dexamethasone-induced hyperlipidemia in rats by maintaining the serum levels of cholesterol, TGs and near to the normal levels⁷.

Deecaraman M. et al in 2010 studied the Antihyperglycemic and antihyperlipidemic effects of extracts of the pulp of *Syzygium cumini* and bark of *Cinnamomum zeylanicum* in streptozotocin-induced diabetic Rats. He finally concluded that the use of a combination of aqueous extracts of pulp of *Syzygium cumini* and bark of *Cinnamomum zeylanicum* for the remedial effects against streptozotocin-induced diabetic state.



***Cinnamomum tamala* (Indian bay leaf) Lauraceae**

The studied was carried out on Indian bay leaves to assess Antihyperlipidemic activity on high cholesterol diet induced hyperlipidemia. The result revealed that the aqueous and

ethanolic extracts of leaves of *Cinnamomum tamala* Nees were administered in doses of 400mg/kg/day p.o. each for 10 days. Simultaneous administration of *Cinnamomum tamala* Nees. leaves extracts significantly ($p < 0.001$) prevent the rise in serum levels of total cholesterol, triglyceride, LDL-C, VLDL-C and atherogenic index whereas significant ($p < 0.01$) increases in the level of HDL-C⁸.



***Bauhinia purpurea* (Fabaceae – Caesalpinioideae)**

The Antihyperlipidemic activity of *Bauhinia purpurea* extracts in hypercholesterolemic albino rats. The outcome of the works showed that the *Bauhinia purpurea* extracts significantly suppressed the CHFD induced hyperlipidemia in rats, suggesting the antihyperlipidemic and antiatherogenic potential of the extracts⁹.



***Ruta graveolens* (Rutaceae)**

Ruta graveolens [L. strong smelling rue], commonly known as **rue**, **common rue** or **herb-of-grace**. Antihyperglycemic, Antihyperlipidemic and antioxidant effects and the probable mechanisms of action of *Ruta graveolens* infusion and rutin in nicotinamide-streptozotocin-induced diabetic rats. He finally resulted that the study suggested both *R. graveolens* and rutin to exhibit antihyperglycemic and antihyperlipidemic properties via their insulinogenic effects, decreasing intestinal glucose and cholesterol absorption, improving peripheral insulin

action, affecting mediators of insulin resistance, enhancing peripheral glucose uptake and decreasing hepatic glucose output in addition to the ameliorating effect on the antioxidant status in this condition¹⁰.



***Peucedanum Pastinacifolium* (Umbelliferae)**

The studied was carried out on Antihyperlipidemic Effect of *Peucedanum Pastinacifolium* Extract In Streptozotocin-Induced Diabetic Rats. He finally resulted that the there were significant ($P < 0.05$) increases in total serum cholesterol, triglyceride and low-density lipoprotein cholesterol (LDL-C) and a decrease in high-density lipoprotein cholesterol (HDL-C) in streptozotocin-induced diabetic rats. Treatment of diabetic rats with PPE over a period of a month returned these levels close to control levels¹¹.



***Sapindus emarginatus* (Sapindaceae)**

The Antihyperlipidemic potential of *Sapindus emarginatus* in Triton WR-1339 induced albino rats. He finally research that the *Sapindus emarginatus* shows a significant decrease in the levels of serum cholesterol, phospholipid, triglyceride, LDL, VLDL and significant increase in the level of serum HDL at the dose of 100 and 200mg/kg (p.o) against Triton

induced hyperlipidemic in rats. Methanol extracts decreased serum level of total cholesterol by 69.72%. On the other hand aqueous extract of SE increased the serum HDL cholesterol level by 24.11%. The reduction of LDL cholesterol level by extract was 30.31%.¹²



***Erythrina indica* (Fabaceae)**

The Antihyperlipidemic Studied was carried on the Leaf Extract of *Erythrina indica* Lam. The result revealed that the administration of aqueous extract of *Erythrina indica* leaf at two dose level 200mg/kg and 300mg/kg for 30 days resulted in the reduction in total cholesterol, triglycerides, low-density lipoprotein level and significant increase in high-density lipoprotein level in the high-fat diet which induce hyperlipidemia in rats.¹³



***Terminalia chebula* (Combretaceae)**

The Anti-hyperlipidemic Activity of Aqueous Extract of *Terminalia chebula* & Gaumutra in High Cholesterol Diet-Fed Rats. He finally concluded that the treatment with *Terminalia chebula* (300mg/kg, p.o) and its combination with Gaumutra (30mg/kg, p.o) showed significant decrease ($p < 0.05$) in serum and tissue serum and tissue cholesterol, LDL-C, VLDL-C, triglyceride, atherogenic index and increase HDL-C levels. Thus *Terminalia*

chebula and its combination with Gaumutra both are effective as an antihyperlipidemic agent¹⁴.



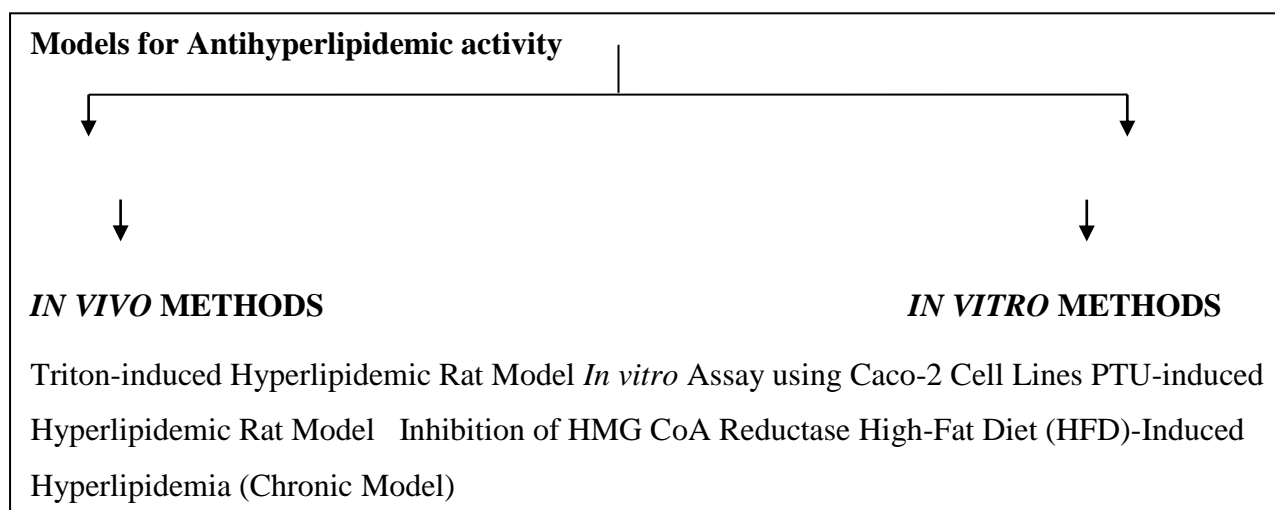
***Premna corymbosa* (Lamiaceae)**

Antihyperlipidemic effect of the ethanolic extract was assessed by the assay of the biochemical parameters like serum triglycerides (STG), serum total cholesterol (STC) and Very low-density lipoprotein cholesterol (VLDL-c). The ethanolic extract, significantly ($p < 0.01$) restored the levels of biochemical parameters as compared to normal.¹⁵

Table 1: The List of some important Botanicals used for lipid-lowering activity

S. No.	Plants	Parts/Extract	Reference
1.	<i>Lagenaria siceraria</i> (Cucurbitaceae)	Juice of The Fresh Fruits	16
2.	<i>Sphaeranthus indicus</i> Linn. (Family-Compositae)	Ethanolic extract of <i>Sphaeranthus indicus</i> root	17
3.	<i>Hibiscus cannabinus</i> (Malvaceae)	Ethanolic extract of <i>Hibiscus cannabinus</i> seeds	18
4.	<i>Phyllanthus amarus</i> and <i>Monstera deliciosa</i>		19
5.	<i>Glycosmis pentaphylla</i>	Ethanolic extract of whole plant	20
6.	<i>Lagenaria siceraria</i> (Cucurbitaceae), commonly known as Lauki (Hindi)	Flavonoidal fraction of <i>Lagenaria siceraria</i>	21
7.	<i>Helicteres isora</i>	Fruit extract	22
8.	<i>Pongamia pinnata</i> (Leguminosae)	Leaf extract	23
9.	Glycine max	Crude methanol seed extract	24
10.	<i>Lens culinaris</i>	Methanolic seed extract	25

Screening models for Antihyperlipidemic activity²⁶



In-Silico Approach towards lowering cholesterol synthesis²⁷.

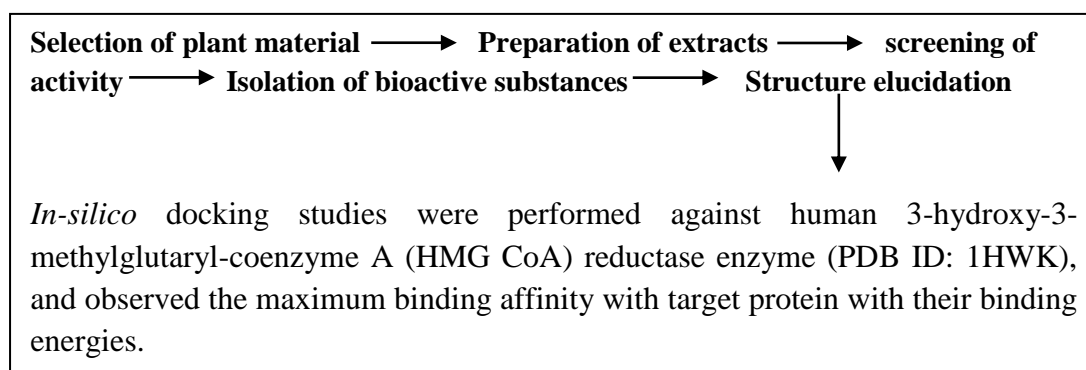




Table 2: Home Remedies Effective Against Lowering Cholesterol Level ²⁸

Herbs	Description	Picture
Garlic	Garlic is made up of amino acids, vitamins, minerals, and organosulfur compounds such as allicin, ajoene, s-allyl cysteine, s-acetylcysteine, and diallyl sulfide.	
Green tea	Green tea has the highest concentration of polyphenols associated with not only lowering LDL Cholesterol but also increasing HDL Cholesterol.	




Coriander seeds	Numerous key vitamins like folic acid, vitamin A and beta-carotene, and most importantly, vitamin C.	
Methi seeds.	Saponins found in fenugreek help remove cholesterol from the body and its fibre helps reduce the synthesis in the liver.	
Fruit of amla	Effective against cholesterol lowering. Rich source of vitamin C.	

Table 3: Natural Bioactive Constituents Effective Against Lowering Cholesterol Level

S. No.	Phyto-constituents	Activity
1.	Polymeric procyanidins (Grapeseed extracts also contain polymeric proanthocyanidins)	It have been shown to increase endothelial nitric oxide synthase to a greater extent than monomers in aortic endothelial cells ²⁹ .
2.	Green tea extracts	Green tea catechins, decrease the solubility of cholesterol in micelles, thereby reducing the intestinal absorption of cholesterol ³⁰ .
3.	Phytosterols	Reduce the intestinal absorption of cholesterol with extent 30-40%. ³¹
4.	Tocotrienol	HMG-CoA reductase inhibitor ³²
5.	Cysteamine (Pantethine's metabolite)	Decrease the hepatic synthesis of cholesterol by inhibiting HMG-Co reductase. ³³

CONCLUSION

Hyperlipidemia is an abnormality of lipid metabolism, characterized by an elevation of total cholesterol, triglyceride, and low-density lipoprotein-cholesterol, and/or a decreasing of high-density lipoprotein cholesterol in circulating levels. Hyperlipidemia is interrelated to obesity and cardiovascular disorder. Hypolipidemic drugs are comprehensively used to prevent such disorders, but have other adverse effects. To overcome this, there is a demand for new compounds for the treatment of hyperlipidemia. The effectiveness of herbal drugs is

significant and they have negligible side effects as compare with synthetic drugs. This review update the botanicals used for Antihyperlipidemic activity and this helps scientific community/researcher to explore their works toward bioactive compounds.

REFERENCES

1. Himesh Son & Akhlesh Kumar Singhai. A Recent update of Botanicals for wound healing activity. IRJP;2012;3(7);1.
2. OnwePE ., Folawiyo MA., Anyigor -Ogah CS., Umahi G., Okorochoa AE and Afoke AO Hyperlipidemia: Etiology and Possible Control. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 14(10); 93-100.
3. Dugdale, D.C. (2010). High blood cholesterol and triglycerides. Retrieved February 16, 2011, from <http://www.nlm.nih.gov/medlineplus/ency/article/000403.htm>.
4. Libby P, Schoenbeck U, Mach F. *et al.* Current concepts in cardiovascular pathology: The role of LDL cholesterol in plaque rupture and stabilization. *Am. J. Med.* 1998;**104**, 18–27.
5. McKenney J.M. New guidelines for managing hypercholesterolemia. 2001;41,**4**:596-607.
6. Mallikarjuna G, Shireesha T, Suma Sree V, Shalini Priyadarshini M, RamuluNaik M, Charitha Y. Evaluation of Hypolipidemic Activity of Cleome gynandra L. against Dexamethasone Induced Hyperlipidemia in Rats. *Int. J. Pharm. Sci. Rev. Res.*, 50(1), 2018; Pages: 47-52.
7. Vijay Kumar, N. Devanna. Antihyperlipidemic Activity of Leaf Extracts of *Leucas aspera* Linn. against Dexamethasone-induced Hyperlipidemia in Rats G. *Asian Journal of Pharmaceutics* • Jul-Sep 2016 (Suppl) • 10 (3) | S408.
8. Varsha Dhulasavant, Shubhangi Shinde, Mangesh Pawar and N.S. Naikwade, Antihyperlipidemic activity of *Cinnamomum tamala* Nees. on high cholesterol diet-induced hyperlipidemia. *International journal of pharmacy & life sciences.* 2(1):Jan., 2011.
9. B.V.S. Lakshmi, N. Neelima, N. Kasthuri, V. Umarani, M. Sudhakar. Antihyperlipidemic activity of *Bauhinia purpurea* extracts in hypercholesterolemic albino rats. /*Int.J. PharmTech Res.*2011,3(3).
10. Osama Mohamed Ahmed1, Adel Abdel Moneim, Ibrahim AbulYazid, Ayman Moawad Mahmoud. Antihyperglycemic, antihyperlipidemic and antioxidant effects and the probable mechanisms of action of *Ruta graveolens* infusion and rutin in nicotinamide-streptozotocin-induced diabetic rats. *DiabetologiaCroatica* 39-1, 2010.
11. Ahmad Movahedian. Antihyperlipidemic Effect of *Peucedanum pastinacifolium* Extract in Streptozotocin-Induced Diabetic Rats. *CLINICS* 2010;65(6):629-33.
12. Srikanth Jeyabalan, Muralidharan Palayan. Antihyperlipidemic activity of *Sapindus emarginatus* in Triton WR-1339 induced albino rats. *Research J. Pharm. and Tech.*2 (2): April.-June.2009,319-323.
13. KamalrajR .Antihyperlipidemic studies on leaf extract of erythrina indica lam. *ijrpc*2011, 1(3).
14. R N Akhand, S Ahmed, A Bhowmik, B Rokeya, M M H Khan and M R Chowdhury. Effects of *Terminalia chebula* fresh fruit extracts in streptozotocin-induced type 2 diabetic model rats. *J. SylhetAgril. Univ.* 1(1):131-137, 2014.
15. Karthikeyan.M, Deepa .M.K. Antihyperlipidemic Activity of *Premna corymbosa* (Burm. f.) Rottl. & Willd. in liver Damaged Wistar Albino Rats. *Journal of Pharmacy Research*;1(1)1. 2008.
16. PankajNainwal, karandhamija, sacchidanandmanitripathi. Study of antihyperlipidemic effect on the juice of the fresh fruits of *Lagenaria siceraria*. *Int J Pharm PharmSci*, Vol 3, Issue1, 8890.
17. S. Ramachandran, K. Asokkumar, M. Uma Maheswari, T. K. Ravi, A. T. Sivashanmugam, S. Saravanan, A. Rajasekaran, and J. Dharman. Investigation of Antidiabetic, Antihyperlipidemic, and *In Vivo* Antioxidant Properties of *Sphaeranthus indicus* Linn. in Type 1 Diabetic Rats: An Identification of Possible Biomarkers. *Evidence-Based Complementary and Alternative Medicine.* 2011,8.
18. Patel Arun Kumar N., Subodh Kumar Singh, Aman Kant, VeeranaGoda. A. Evaluation of hepato protective role of *Hibiscus caabiis* seeds extract agaist alcohol redered hepatotoxicity rats. *Pharmacologyonline* 2: 1160-1168 (2011).

19. Dilshad Noor Lira, Md. Aftab Uddin, Mohi Uddin, Abu SharaShamsurRouf, Assessment of cytotoxic activities of *Phyllanthus amarus* and *Monstera deliciosa*. Journal of Applied Pharmaceutical Science Vol. 4 (07), pp. 110-113, July, 2014.
20. Syed SafiullahGhori, M.A Rizwan Khan, Kaab e Alam, AbidHussainAbrar Evaluation of antihyperlipidemic activity of ethanolic extract of *Glycosmis pentaphylla* in hyperlipidemic Wistar rats. International Journal of Pharma Sciences and Research (IJPSR), 6(2),2015;282.
21. S. S. Agrawal*, D. S. Mohale, B.V. Ghule, A. N. Saoji and P. G. Yeole Studies on the Antihyperlipidemic activity of flavonoidal fraction of *Lagenaria siceraria*. Int. J. Chem. Sci.: 6(2), 2008, 751-760.
22. A. boopathy raja, C. elanchezhiyan, S. Sethupathy, Antihyperlipidemic activity of *Helicteres isora* fruit extract on streptozotocin-induced diabetic male Wistar rats. European Review for Medical and Pharmacological Sciences, 2010; 14: 191-196.
23. M S. Sikarwar, Mrityunjaya B. PATIL. Antihyperlipidemic Activity of *Pongamia pinnata* Leaf Extracts. Turk J Pharm Sci 11(3), 329-338, 2014.
24. UchenduIkenna Kingsley, OnwukweOkechukwu Steven, ChidozieElochukwuAgu, Oliver Chukwuma Orji, Blessing ElukeChekwube, Tochi Faith Nwosu. Anti-hyperlipidemic effect of crude methanolic extracts of Glycine max (soybean) on high cholesterol diet-fed albino rats. J Med Allied Sci 2017 ; 7 (1) : 34 - 40.
25. Kripi Vohra, Vivek Kumar Gupta, Harish Dureja and Vandana Garg. Antihyperlipidemic Activity of Lens *Culinaris medikus* Seeds in Triton WR-1339 Induced Hyperlipidemic Rats. J Pharmacogn Nat Prod 2:117.
26. U. S. Jijith^{1,2}, S. Jayakumari Screening methods for antihyperlipidemic activity: A review. Drug Invention Today; 10(2); 2018;257-259.
27. Muhammad Tahir Aqeel Nisarur-Rahman, Arif-ullah Khan Zaman Ashraf Muhammad LatifHummeraRafique Usman Rasheed. Antihyperlipidemic studies of newly synthesized phenolic derivatives: *in silico* and *in vivo* approaches. Drug Design, Development and Therapy 2018;12 2443–2453.
28. Rupali Datta, Most Effective Home Remedies for Cholesterol.
29. Karim M, *et al.* Effects of cocoa extracts on endothelium-dependent relaxation. J Nutr 130:2105S-2108S, 2000.
30. Maron DJ, *et al.* Cholesterol-lowering effect of the aflavin enriched green tea extract. Arch Intern Med, vol 163, 1;1448-1453, June 2003.
31. Micallef MA and Garg ML. The lipid-lowering effects of phytosterols in (n-3) polyunsaturated fatty acids are synergistic and complementary in hyperlipidemic men and women. J Nutrition 2008;138; 1086-1090.
32. Qureshi AA, *et al.* The structure of an inhibitor of cholesterol biosynthesis isolated from barley. J Bio Chem. 1986, vol.261, No. 23, Aug15, pp 10544-10550.
33. Binaghi P, *et al.* Evaluation of the cholesterol-lowering effectiveness of pantethine in women in perimenopausal age. Minerva Med. 1990 Jun; 81(6):475-9