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REVIEW ARTICLE

IMPORTANCE OF HERBAL ANTI-HYPERLIPIDEMICS IN CARDIAC DISORDERS AND HYPERGLYCAEMIA: REVIEW AT A GLANCE

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ABSTRACT:

In recent years, herbal remedies have evolved with enormous impending of alleviate. Herbal medicine progress against the non-communicable disease like diabetes is one of the propel area of research in the field of worldwide medicine. Hyperlipidemia is a disorder of lipid metabolism manifested by increase of plasma concentrations of the assortment of lipid and lipoprotein fractions. Hyperlipidemia has been one of the maximum risk factors contributing to the occurrence and relentlessness of coronary heart diseases. HMG Co A reductase is a key enzyme involving in rate limiting step of cholesterol biosynthesis. Conservative anti-hyperlipidemic drugs have restricted efficacies and vital side effects, so that alternative lipid lowering agents are required. This review explains the plants possessing significant anti-hyperlipidemic activity with their botanical name, family, part used, extract used and inducing agent of hyperlipidemia

Keywords: Herbal sources, Coronary heart diseases, Anti-hyperlipidemic activity, HMG Co A reductase

INTRODUCTION:

The lipid metabolism is regulated in many different ways. Enzymes are major regulators of lipid metabolism. 3-Hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase is one of the enzymes involved in cholesterol biosynthesis[1]. Hyperlipidemia and Hyper-cholesterolemia are not only secondary metabolic dysregulations associated with diabetes but also represent increased risk factors for development of diabetes[2]. Hyperlipidemia is a highly predictive risk factor for atherosclerosis coronary artery disease and cerebral vascular disease[3]. There is a general consensus that these metabolic disorders share hyperinsulinemia and insulin resistance as a common link leading to both micro- and macro-angiopathies[4]. Generally after a prolonged "silent" period atherogenesis may become clinically significant. The fatty streak and thickening of intima in blood vessels represent the initial lesion of atherosclerosis[5]. Evidence from studies both in animals and humans indicates that progression can be slowed if elevated serum concentration of the atherogenic lipoprotein and triglycerides are reduced, which in turn prevents coronary heart disease[6]. Natural medicines have been used empirically to lower the cholesterol levels[7]. However, the risk of hyperlipidemia would be reduced by consumption of flavonoids and their glycosides, supported by abundant studies[8]. Phytosterols and natural antioxidants have also been shown to be effective in reducing lipid profiles and also mitigate peroxidative modification of lipoproteins and atherosclerosis[9]. In recent years, the development of lipid lowering drug or formulation from natural source has gained importance[10]. A large number of medicinal plants have been tested and found to contain active principles with curative properties against hyperlipidemic[11]. This paper deals with the study of indigenous herbs viewing prospective for dealing of hyperlipidemic activity.

Table 1: List of herbal sources possessing anti-hyperlipidemic activity

S. No.	Plant Name	Family	Part Used	Extract Used	Inducing Agent
1.	*Asparagus racemosus*[12]	Liliaceae	Entire plant	Ethanolic	Streptozotocin
2.	*Aegle marmelos*[13]	Rutaceae	Leaves	Aqueous	Streptozotocin
3.	*Alstonia scholaris* Linn[14]	Apocynaceae	Bark	Aqueous	Streptozotocin
4.	*Abelmoschus esculentus*[15]	Malvaceae	Peel, seed	Powder	Streptozotocin
5.	*Artocarpus heterophyllus*[16]	Moraceae	Leaves	Ethylacetate	Streptozotocin
6.	*Bauhinia purpurea*[17]	Fabaceae	Unripe pods and leaves	Ethanol	Cholesterol 2%, sodium cholate 1% and coconut oil 2%
7.	*Bauhinia variegata* Linn[18]	Ceasalpiniaceae	Stem bark, roots	Aqueous and ethanolic	In vitro
8.	*Bruguiera cylindrinca* (L)[19]	Rhizophoraceae	Stem, Leaves	Ethanol aqueous	Triton and cholesterol fed
9.	*Bryonia laciniosa* Linn[20].	Cucurbitaceae	Seeds	Ethanolic	Streptozotocin
10.	*Bersama engleriana*[21]	Melianthaceae	Leaves	Aqueous and methanolic	Streptozotocin/nicotinamide
11.	*Boerhaavia diffusa*[22]	Nyctaginaceae	Roots	Ethanolic	Streptozotocin
12.	*Carica papaya* Linn[23].	Caricaceae	Leaves	Aqueous	Alloxan

13.	*Cinnamomum tamala* Nees[24]	Lauraceae	Leaves	Aqueous and ethanolic	Cholesterol (100g), cholic acid(50g) in 1 liter of coconut oil supplemented with egg
14.	*Cynara scolymus*[25]	Asteraceae	Leaves	Aqueous	Streptozotocin
15.	*Carissa carandas*[26]	Apocynaceae	Leaves	Aqueous:ethanolic	Egg yolk
16.	*Casuarina equisetifolia*[27]	Casuarinaceae	Bark	Ethanolic	Streptozotocin
17.	*Cleome droseriloia*[28]	Rubiaceae	Herb	Aqueous	Streptozotocin
18.	*Cassia auriculata*[29]	Fabaceae	Flower	Ethanolic	Triton WR 1339
19.	*Clitoria ternatea* Linn[30]	Fabaceae	Leaves, flower	Aqueous	Alloxan
20.	*Chloris barbata*[31]	Poaceae	Leaves	Methanol	Streptozotocin
21.	*Cinnamomum verum*[32]	Lauraceae	Bark	Aqueous	Alloxan
22.	*Caesalpinia bonduc* L[33]	Fabaceae	Seeds	Hydro-methanolic	Streptozotocin
23.	*Cucumis melo* Linn[34]	Cucurbitaceae	Fruit peel	Chloroform, methanolic, aqueous	Triton-100
24.	*Dodonaea viscose*[35]	Sapindaceae	Leaves	Aqueous, methanol	Alloxan
25.	*Dillenia indica*[36]	Dilleniaceae	Leaves	Methanolic	Streptozotocin
26.	*Eryngium carlinae*[37]	Apiaceae	Aerial part	Ethanolic	Streptozotocin
27.	*Eugenia jambolana*[38]	Myrtaceae	Pulp, seeds	Ethanolic	Streptozotocin
28.	*Euphorbia hirta*[39]	Euphorbiaceae	Leaves	Ethanolic	Streptozotocin
29.	*Erythrina indica*[40]	Fabaceae	Leaves	Aqueous	High fat diet
30.	*Gmelina arborea*[41]	Verbenaceae	Leaves	Ethanolic	Streptozotocin
31.	*Gymnema sylvestre* R. Br[42].	Asclepiadaceae	Leaves	Hydroalcoholic	2% Cholesterol, 1% sodium cholate and 2% coconut oil
32.	*Helicteres isora* L[43].	Sterculaceae	Fruit	Ethanol	Streptozotocin
33.	*Hibiscus cannabinus* L[44].	Malvaceae	Leaves	Hydroalcoholic	Cholesterol, cholic acid, casein,choline, sucrose
34.	*Holarrhena antidysenterica* L[45]	Apocynaceae	Bark	Methanolic	Alloxan
35.	*Hypericum perforatum* L[46].	Hypericaceae	Whole plant	Hydroalcoholic	Fructose
36.	*Hibiscus platanifolius* Linn[47]	Malvaceae	Leaves	Ethanolic	Alloxan
37.	*Lagenaria siceraria*[48]	Cucurbitaceae	Fruit	Juice	Atherogenic diet
38.	*Mimosa pudica*[49]	Mimosaceae	Whole plant	Ethanolic	Butter
39.	*Mangifera indica* L[50]	Anacardiaceae	Leaves	Aqueous	High cholesterol diet
40.	*Morus indica*[51]	Moraceae	Leaves	Ethanolic	Alloxan
41.	*Momordica charantia*[52]	Cucurbitaceae	Fruit	Methanolic	Alloxan
42.	*Mirabilis jalapa* L[53].	Nyctaginaceae	Roots	Ethanolic	Streptozotocin
43.	*Moringa oleifera*[54]	Moringaceae	Leaves	Aqueous	Alloxan
44.	*Musa paradisiaca*[55]	Musaceae	Roots	Methanol	Streptozotocin
45.	*Nerium oleander* Linn[56].	Apocynaceae	Flower	Hydroethanolic	Triton WR 1339
46.	*Nyctanthes arbortristis* Linn[57]	Nyctanthaceae	Roots	Ethanolic	Streptozotocin
47.	*Ocimium gratissimum*[58]	Lamiceae	Leaves	Aqueous	Alloxan
48.	*Phyllanthus rheedii*[59]	Euphorbiaceae	Whole plant	Ethanolic	Streptozotocin
49.	*Peucedanum pastinacifolium*[60]	Apiaceae	Aerial part	Hydroalcoholic	Streptozotocin
50.	*Portulaca oleracea* Linn[61]	Portulacaceae	Leaves	Ethanolic	Dexamethasone
51.	*Picrorhiza kurroa* Royle ex Benth[62]	Scrophulariaceae	Roots	Alcoholic, chloroform and aqueous	Triton wr-1339
52.	*Piper longum*[63]	Piperaceae	Roots	Aqueous	Streptozotocin
53.	*Prosopis cineraria*[64]	Fabaceae	Bark	Ethanolic	Alloxan

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54.	*Pedalium murex* L[65]	Pedaliaceae	Fruit	Ethanolic	High fat diet
55.	*Pithecellobium dulce*[66]	Leguminosae	Leaves	Aqueous	Triton Wr-1339
56.	*Rhododendron arboreum*[67]	Ericacea	Flower	Juice	1%w/w cholesterol
57.	*Rhinacanthus nasutus*[68]	Acanthaceae	Leaves	Methanolic	Streptozotocin
58.	*Rauwolfia serpentina*[69]	Apocynaceae	Roots	Methanolic	Alloxan
59.	*Sida cordifolia* Linn[70].	Malvaceae	Roots	Aqueous	Triton WR-1339
60.	*Sphaeranthus indicus*[71]	Asteraceae	Flower head	Alcoholic	Atherogenic diet
61.	*Suaeda maritima* L[72]	Chenopodiaceae	Aerial part	Aqueous, alcoholic	Triton
62.	*Sapindus emarginatus*[73]	Sapindaceae	Pericarp	Methanolic	Triton WR-1339
63.	*Silybum marianum* (L.) Gaertner[74]	Asteraceae	Seeds	n-Hexane, ethylacetate	1 g cholesterol and 3 g corn oil in96 g of food.
64.	*Salacia chinensis*[75]	Hippocrateaceae	Roots	Pet. ether, chloroform, ethanol and aqueous	Triton- and atherogenic diet
65.	*Sesbania grandiflora*[76]	Fabaceae	Leaves	Aqueous	Triton wr-1339
66.	*Saussurae lappa*[77]	Asteraceae	Roots	Ethanolic	High cholesterol fed diet
67.	*Sphaeranthus indicus* Linn[78].	Compositae	Roots	Ethanolic	Streptozotocin
68.	*Urtica dioica*[79]	Urticaceae	Leaves	Ethanolic, aqueous	Alloxan
69.	*Uraria crinita*[80]	Leguminosae	Whole plant	Aqueous	Streptozotocin
70.	*Terminalia paniculata*[81]	Combretaceae	Bark	Aqueous	Streptozotocin
71.	*Tagetes erecta*[82]	Compositae	Whole plant	Hydroalcoholic	Cholesterol
72.	*Terminalia pallida*[83]	Combretaceae	Fruit	Ethanolic	High cholesterol fed diet
73.	*Tecoma stans*[84]	Bignoniaceae	Flower	Methanol	Atherogenic Diet
74.	*Trichilia connaroides*[85]	Meliaceae	Leaves	Chloroform, methanolic	High fat diet
75.	*Trianthema portulacastrum* Linn[86]	Aizoaceae	Whole plant	Methanolic	Alloxan

DESCRIPTION OF PLANTS:

Aegle marmelos[13]

The lipid lowering property of an aqueous extract of *Aegle marmelos* leaves on streptozotocin (STZ) induced diabetic rats. The lipid profiles such as serum total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), high density lipoprotein (HDL), and very low density lipoprotein (VLDL) were studied. Extracts were administered orally at increasing dose levels of 250mg, 350mg, 450mg/kg body wt., to STZ induced diabetic rats. The levels of TC, TG, LDL, HDL, and VLDL were found to be reduced significantly when compared to that of diabetic control rats. These suggest that *A. marmelos* may be useful in the therapy and management of hyperlipidemia by reducing lipid levels.

Bauhinia purpurea[17]

The ethanol extract of unripe pods and leaves of *Bauhinia purpurea* was evaluated for antihyperlipidemic activity in cholesterol high fat diet (CHFD) induced hyperlipidemia. Changes in body weight and the analysis of serum lipids were carried out at the end of the study. There was a marked decrease in body weight, total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels. Also there was a significant increase in high density lipoprotein levels after the treatment with *Bauhinia purpurea* extracts. Ethanol extract of leaves showed a marked effect over body weight reduction and also had a significant effect on the lipoprotein profile. There is a lowered atherogenic index, TC: HDL-c and LDL: HDL-c ratios in the extract treated groups. The present work indicated that *Bauhinia purpurea* extracts significantly suppressed the CHFD induced hyperlipidemia in rats, suggesting the antihyperlipidemic and antiatherogenic potential of the extracts.

Boerhaavia diffusa[22]

Ethanolic extract of roots of *Boerhaavia diffusa* was administered to streptozotocin induced rats. Glibenclamide was used as a standard drug. Blood glucose levels were determined after oral administration of a dose of *B. diffusa* (400 mg/kg b. wt) in diabetic groups. The ethanolic extract of *B. diffusa* was found to reduce blood sugar in streptozotocin induced diabetic rats. Reduction in blood sugar could be seen from 7th day after continuous administration of the extract. The effect of extracts of *B. diffusa* on serum lipid profile like Total cholesterol, triglycerides, low density, very low density and high density lipoprotein were also measured in the diabetic and non-diabetic rats. There was significant reduction in Total cholesterol, LDL cholesterol, VLDL cholesterol and improvement in HDL cholesterol in diabetic rats. These results indicated that *B. diffusa* possesses a hypoglycemic and antihyperlipidemic effect.

Carica papaya Linn[23]

The antihyperglycemic and hypolipidemic activity of aqueous extract of leaves of *Carica papaya* Linn. (AECPL) in alloxan-induced diabetic albino rats. Diabetes was induced in albino rats by administration of alloxan monohydrate (120 mg/kg, i.p.). Blood samples were analyzed for blood glucose on day 0, 1, 7, 14, 21 and lipid profile on day 21. The AECPL showed significant reduction in blood glucose level and serum lipid profile

levels with 400 mg/kg body weight in alloxan-induced diabetic rats as compared with the control. It is concluded that AECPL is effective in controlling blood glucose levels and in improving lipid profile in diabetic rats.

***Cinnamomum tamala* Nees**[24]

The hypolipidemic effect of *Cinnamomum tamala* Nees leaves extracts in high cholesterol diet induced hyperlipidemia. 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 prevent the rise in serum levels of total cholesterol, triglyceride, LDL-C,VLDL-C and Atherogenic index whereas significant increases in the level of HDL-C.

Carissa carandas[26]

The lipid lowering activity of aqueous: ethanol (1:1) extract of *Carissa carandas* in Egg yolk induced hyperlipidemic rats. A highly significant increase in the weight of group ***C*** (High cholesterol diet) rats was observed when compared with control group ***N***. The extract caused a significant reduction in body weight, Cholesterol, Triglycerides, HDL and LDL in hyperlipidemic rats. Histopathological changes induced by high cholesterol diet were also significantly reduced by the extract. The activity of ethanol and water extract of *C. carandas* was comparable to that of atorvastatin.

Casuarina equisetifolia[27]

The anti diabetic - activity potential of *Casuarina equisetifolia* leaves against streptozotocin (STZ) induced experimental rats. Ethanolic extract of bark of *C. equisetifolia* (EECE) was administered to streptozotocin induced rats. Glibenclamide was used as a standard drug. Blood glucose levels were determined after oral administration of a dose of *C. equisetifolia* (400 mg/kg b. wt) in diabetic groups. Blood glucose levels were determined on 0, 7th, 14th and 21st day after oral administration of ethanolic extracts of *C. equisetifolia* (400 mg/kg). An ethanolic extract of *C. equisetifolia* was found to reduce blood sugar in streptozotocin induced diabetic rats. Reduction in blood sugar could be seen from 7th day after continuous administration of the extract. The effect of extracts of *C. equisetifolia* on serum lipid profile like Total cholesterol, triglycerides, low density, very low density and high density lipoprotein were also measured in the diabetic and non diabetic rats. There was significant reduction in Total cholesterol, LDL cholesterol, VLDL cholesterol and improvement in HDL cholesterol in diabetic rats. These results indicated that *C. equisetifolia* possesses a hypoglycemic and antihyperlipidemic effect.

Chloris barbata[31]

The in vivo anti-diabetic and anti-hyperlipidemic activities of methanolic extract *Chloris barbata* (MECB) leaves in normal, glucose-loaded hyperglycemic and streptozotocin (STZ) induced diabetic rats. MECB (100, 200 and 400 mg/kg) was administered to STZ (40 mg/kg, i.p) induced diabetic rats for 28 days. The three doses of MECB showed a significant decrease in blood glucose and significant increase in plasma insulin and liver glycogen levels in treated diabetic rats. MECB showed anti-hyperlipidemic activity as evidenced by significant decrease in serum TC, TG, LDL-C, VLDL-C levels and significant increase in HDL-C level in treated diabetic rats. MECB also restored the altered plasma enzymes such as SGOT, SGPT and ALP, total protein, liver glycogen levels to near normal. The effect of MECB was comparable to the standard drug glibenclamide. Results of this experimental study indicated that MECB possessed anti-diabetic and anti-hyperlipidemic activities.

***Cucumis melo* Linn**[34]

Anti-hyperlipidemic activity of *Cucumis melo* fruit peel extract in triton induced hyperlipidemia in rats. Chloroform, Methanolic and aqueous extracts of were administered to the triton induced hyperlipidemic rats for 7 days to study antihyperlipidemic acivity. The results concluded that CMFP methanolic extract (500 mg/kg) have definite antihyperlipidemic activity in Triton X-100 induced hyperlipidemia model and which is equipotent activity when compared with Atorvastatin treated group.

Dillenia indica[36]

The present study was carried out to evaluate antidiabetic and antihyperlipidemic effects of *Dillenia indica* methanolic leaves extracts in streptozotocin induced diabetic Wistar rats by administering graded oral doses (250 and 500 mg/kg body weight) for 21 days. The extract showed significant antidiabetic activity. Furthermore, the decreased body weight of rats was significantly improved after extract treatments. Daily oral treatment with the extract for 21 days to diabetic rats, also resulted in significant reduction in serum cholesterol, triglycerides and serum transaminase levels but HDL-cholesterol level was found to be improved as compared to the diabetic control group.

Eryngium carlinae[37]

The effect of chronic administration of ethanolic extract of *Eryngium carlinae* on glucose, creatinine, uric acid, total cholesterol, and triglycerides levels in serum of streptozotocin- (STZ-) induced diabetic rats. Triglycerides, total cholesterol, and uric acid levels increased in serum from diabetic rats. The administration of *E. carlinae* extract reduced the levels of creatinine, uric acid, total cholesterol, and triglycerides. Thus administration of *E. carlinae* is able to reduce hyperlipidemia related to the cardiovascular risk in diabetes mellitus.

Erythrina indica[40]

The antihyperlipidemic activity of aqueous extract of *Erythrina indica* leaf, an indigenous plant used in ayurvedic medicine in india. Administration of Aqueous extract of *E. indica* leaf at two dose level 200mg/kg and 300mg/kg for 30 days resulted in the reduction in total cholestral, triglycerides, low density lipoprotein level and significant increase in high density lipoprotein level in the high fat diet which indual hyperlipidemia in rats. The results are compared to that of standard drug, simvastatin 5mg/kg. The study supports the earlier claims of the plant in obesity.

Gmelina arborea[41]

The antihyperlipidemic effects of ethanolic leaf extract of *Gmelina arborea* in male wistar albino rats at a dose of

150 mg/kg of body weight and standard drug glibenclamide at the dose of 100µg/kg given to the animal models. The extract exhibited significant hypoglycemic activity in animal models when compared with a standard antidiabetic drug Glibenclamide. The hypoglycemia produced by the extract may be due to increased uptake of glucose at tissue level and or increase in pancreatic β-cell function or due to inhibition of intestinal glucose absorption of glucose. The lipid profile such as TC, TG and LDL levels were significantly increased in diabetic control animals where as HDL levels were decreased when compared to the control rats. The ethanolic extract of *G. arborea* produced significant antihyperglycemic activity in STZ induced diabetic rat which is comparable to that the Glibenclamide

***Gymnema sylvestre* R. Br[42]**

Hyperlipidemia was induced in rats by giving high cholesterol diet (2% cholesterol, 1% sodium cholate and 2% coconut oil) for seven days in standard rat chow diet. The hydroalcoholic extract of *G. sylvestre* R. Br. leaves (200 mg kg^{-1} b.wt.) was orally administered once a day to rats fed with a high cholesterol diet for seven days. High cholesterol fed diet rats exhibited significant increase in total serum cholesterol, triglycerides, low density lipoproteins, very low density lipoprotein and significant decrease in high density lipoproteins. Treatment with hydroalcoholic extract of *Gymnema sylvestre* R. Br. leaves significantly decreased total serum cholesterol, triglycerides, low density lipoproteins, very low density lipoprotein and increased the high density lipoproteins in hyperlipidemic rats and was comparable with that of standard atorvastatin. Hence significant antihyperlipidemic activity of hydroalcholic extract of *Gymnema sylvestre* R. Br. leaves.

***Hibiscus cannabinus* L[44]**

The activity was assessed by estimation of serum lipid profile viz. total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), high density lipoprotein cholesterol (HDL-C), stress (TBARS) and liver histopathological studies of control and drug-treated animals. The extract exhibited a strong dose dependent antihyperlipidemic activity and at dose level 400mg/kg p.o. the extract showed a significant decrease in the levels of serum TC, TG, LDL-C, VLDL-C and TBARS. The extract markedly prevented the liver microvesicular steatosis in hyperlipidemic rats. The study demonstrated that the extract exhibits a potent lipid lowering activity in diet induced hyperlipidemia which account for some of the medical claims attributed to this plant.

***Hypericum perforatum* L[46]**

Hypericum is tested for hypolipidemic activity in normal rats, antiobesity activity in high-fat-diet induced obese rats, and fructose-fed rats. *Hypericum* was orally administered as suspension in 0.3% carboxymethyl cellulose at the doses of 100 and 200 mg/kg body weight for 15 consecutive days. *Hypericum* significantly lowered total cholesterol and low-density cholesterol in normal rats. *Hypericum* significantly inhibited weight gain in high-fat-fed rats. In fructose-fed rats, *Hypericum* normalised the dyslipidemia induced by fructose feeding and improved the insulin sensitivity. Taken together, *Hypericum* could be the antidepressant therapy of choice for patients suffering from comorbid diabetes and obesity.

***Lagenaria siceraria*[48]**

The effect of juice of the fresh fruits of *Lagenaria siceraria* on the blood cholesterol level of atherogenic diet rats was evaluated. The study was undertaken to assess body weight, total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL) and very low density lipoprotein (VLDL). They were significantly lower in the juice extract treated groups compared to the control group. The study showed that juice of the fresh fruits of *L. siceraria* have the potential to cause a blood cholesterol lowering effect. The serum biochemistry changes may suggest that the juice extract has a tonic effect on the kidneys and the liver and these organs play central role in drug metabolism. Absence of significant lesion in the kidney, liver and testes may indicate that the plant is safe for medicinal use.

***Mimosa pudica*[49]**

The hypolipidemic activity of *Mimosa pudica* extract was studied on high fat diet induced models of hyperlipidemia in rats. Hyperlipidemia in experimental rats evidenced by an enhancement in the levels of Cholesterols, Triglycerides, LDL and VLDL. Ehanol extract showed significant hypolipidemic effect by lowering the serum levels of biochemical parameters such as significant reduction in the level of serum Cholesterol, TG, LDL, VLDL and increase in HDL level which was similar to the standard drug Lovastatin.

***Moringa oleifera*[54]**

The effect of aqueous leaf extract of *Moringa oleifera* on plasma glucose level, total cholesterol level, triglycerides (TG), high-density lipoprotein (HDL) and low-density lipoprotein (LDL) in male albino rats. Diabetes was induced by 100 mg/kg of alloxan monohydrate. The control and the diabetic groups received distilled water while the diabetic treated group was administered 400 mg/kg body weight of aqueous leaf extract of *M. oleifera* for 28 days. At the end of the experiment, plasma glucose level, cholesterol, Triglycerides (TG), High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL) were determined in all the experimental animals after 12 hours fast. The result showed significant increases in plasma cholesterol, TG and LDL level of the diabetic control group when compared with the normal control group while there were no significant differences in the *M. oleifera* -treated diabetic group and the normal control group. The HDL however was not different in all the three groups. Oral administration of aqueous leaf extract of *M. oleifera* may reduce the plasma lipid imbalances associated with diabetes mellitus.

***Ocimium gratissimum*[58]**

The effect of chronic administration of aqueous leaf extract of *Ocimium gratissimum* on total cholesterol level, triglycerides (TG), high-density lipoprotein (HDL) and low-density lipoprotein (LDL) in male albino rats. At the end of the experiment, plasma glucose level, cholesterol, TG, HDL and LDL were determined in all the experimental animals after 12 h fast. The result showed

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significant increases in plasma cholesterol, TG and LDL level of the diabetic group when compared with the control group while there were no significant differences in the OG-treated diabetic group and the control group. The HDL however was not different in all the three groups. It was then concluded that oral administration of aqueous leaf extract of *O. gratissimum* may reduce the plasma lipid imbalances associated with diabetes mellitus.

Picrorhiza kurroa Royle ex Benth[62]

The alcoholic,chloroform and aqueous root extracts of *Picrorhiza kurroa* Royle ex Benth were screened for its antihyperlipidemic activity in Triton wr-1339 induced albino rats. Atorlip-20 was used as reference standard. The results showed significant decrease in triglyceride and cholesterol level when compared with the hypolipemic groups by using different dose: low (50mg/kg), high (200mg/kg) and standard Atorlip-20(4mg/kg bw) and by treating for 7 hr and 24 hr.

Pedalium murex L[65]

The anti hyperlipidemic potential of the ethanolic extract from the fruits of *Pedalium murex* at doses of 200 and 400 mg/kg/p.o. in high fat diet fed rats. Biochemical parameters like serum total cholesterol (TC), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), very low density lipoprotein (VLDL) and triglycerides (TG) levels were measured and compared with animals concurrently treated with reference standards Gemfibrozil and Atorvastatin. The ethanolic extract showed a significant decrease in triglycerides, LDL, VLDL, cholesterol and a significant increase in HDL levels at the tested doses.

Pithecellobium dulce[66]

Pithecellobium dulce (PD) was study on anti-hyperlipidemic activity of aqueous extract of leaves of PD against triton induced hyperlipidemia in rats. PD administered at a dose of 200µg/kg (p.o) to the triton induced hyperlipidemic rats. PD has shown a significant decrease in the levels of serum cholesterol, phospholipids, triglyceride, LDL, VLDL and significant increase in the level of serum HDL. Aqueous extract fraction decreased serum level of total cholesterol, LDL and increased the serum HDL cholesterol level.

Sapindus emarginatus[73]

Sapindus emarginatus (SE) was study for antihyperlipidemic activity of methanol extract of pericarps of SE against Triton induced hyperlipidemia in rats. SE was administered at a dose of 100 and 200mg/kg (p.o) to Triton induced hyperlipidemic rats. Fenofibrate was used as reference standard. SE 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%.

Sida cordifolia Linn[70]

The study was to evaluate antioxidant and antihyperlipidemic activity of an aqueous extract of root of *Sida cordifolia Linn.* (SCAE) against Triton WR-1339 and High fat diet (HFD) induced hyperlipidemia in experimental animal. Effect of simultaneous administration of SCAE in different doses (200 & 400 mg/kg) by oral route was estimated in Triton WR-1339 and HFD induced hyperlipidemic animals by estimating serum lipid levels of cholesterol (TC), Triglycerides (TG), Low density lipoproteins (LDL), High density lipoprotein (HDL) and Very low density lipoprotein (VLDL) and atherogenic index. Whereas antioxidant activity was carried out by estimating serum levels oxidative marker Superoxide dismutase (SOD) and Catalase (CAT). It was revealed that the aqueous extract of *Sida cordifolia p*ossesses significant hyperlipidemic activity in acute as well as chronic hyperlipidemic models in the company of promising antioxidant activity. So, it was concluded that aqueous extract of *Sida cordifolia p*ossesses potential antioxidant and antihyperlipidemic activity in experimental animals.

CONCLUSION:

Indian plant varieties have proved the worth of the herbs in plummeting the blood sugar level. Hyperlipidemia is a predictable problem of Diabetes mellitus categorized by elevated levels of cholesterol, triglycerides and phospholipids and changes in lipoprotein composition in other hand these changes are also associated with cardiac diseases. . This article gives an overview of some conventionally used medicinal plants which have significant anti-hyperlipidemic property and may be useful as anticipatory agents in some ailments like cardiac disorders and hyperglycaemia. By this review, it can be concluded that in the core of the nature there are so many plants which possess potent anti-hyperlipidemic property and many more are still to be explored.

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