



Studying the antihyperlipidaemic basis of ayurvedic formulations – Avipattikara churna and triphala churna

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ABSTRACT

Increased blood lipid profile (hyperlipidaemia) has been described as a significant risk factor, which is majorly responsible for making the coronary heart diseases more severe. Coronary heart disease, stroke, atherosclerosis and hyperlipidaemia are the primary cause of death. The increase in total cholesterol and total low-density lipoprotein (LDL) cholesterol is described for its main risk factor, which is responsible for cardiovascular disease. The anti-hyperlipidemic drugs are used frequently for its lipids lowering potential to protect disorders which are induced by a condition like atherosclerosis. Still, these hypolipidemic agents also have various sorts of adverse events. Many plants and their derivatives and have been tested successfully for their anti-hyperlipidemic role. Almost 70 medicinal plants and more than this have been successfully screened for their significant anti-hyperlipidemic role. The significant increase observed in the use of medicinal plants in metropolitan regions of developed countries in the last decades. There are so many medicinal plants play a crucial role in lowering the blood lipid level. The most important advantage and popularity of traditional medicine system are because of effectiveness, safety, affordability and acceptability. This review focus on the anti-hyperlipidemic role of Avipattikar Churna and Triphala Churna used for the treatment of hyperlipidaemia.



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INTRODUCTION

The lipids are significant biomolecules. Cholesterol is a vital component of the human cell membrane, and they are a major precursor to steroid hormones and bile acids. Even triglycerides play a significant function in transmitting energy from food to body cells. Any excess biomolecule is not ideal for human health; however, (Kanakavalli *et al.*, 2014). Hyperlipidemia has been described as one of the major risk factors which are responsible for the development and severity of coronary heart diseases (Saranakumar *et al.*, 2010). Atherosclerosis risk fac-

tors are affected by hyperlipidemia, hypertension, obesity, elevated coagulation factor

and homocysteine. In that dyslipidemia, the most critical risk factor in the elderly population causes ischemic heart disease (IHD). IHD's fundamental mechanism involves the accumulation of serum lipids in coronary arteries, leading to the reduced blood supply to cardiac muscles. (Talha et al., 2014) Present lipid modulating drugs include fibrates, bile-acid sequestrates, cholesterol absorption inhibitors, nicotinic acid, phytosterols, protein transfer inhibitors to cholesteryl ester, fish oil, and HMG-CoA reductase inhibitors. Clinically, statins were the medicines most widely prescribed for hypercholesterolemia. Statins help minimize plasma concentration of low-density lipoprotein cholesterol (LDLC) and decrease coronary artery disease mortality and morbidity. (Sailesh et al., 2013) Over the ages, spices have been eaten in many cultures. Because of their taste and scent, they were eaten mainly. Nevertheless, recent scientific findings have demonstrated their biological activity beyond their taste and smell. Spices are now known for their anti-thrombotic, anti-atherosclerotic, hypolipidemic, hypotensive, anti-inflammatory, anti-arthritis and platelet aggregation inhibitors activity. Clinical studies have shown that hypercholesterolemia is a significant risk factor for coronary artery disease (CAD) in which low-density lipoprotein (LDL) cholesterol plays a significant role in atherosclerosis and pathogenesis of CAD and other vascular diseases is one of the major reasons for premature death globally and is expected to be one of the leading causes of death in India by 2021. (El-Yamani, 2011) Consumption of prescription medications with side effects such as hyperuricemia, vomiting, nausea, myositis, stomach pain, flushing, dry skin and impaired liver function. Triphala is a typical Ayurvedic herbal remedy consisting of equal parts of three medicinal plants, namely *Terminalia chebula*, *Terminalia bellerica* and *Phyllanthus Emblica*. Triphala is considered a 'tridosic rasayan' with calming and rejuvenating effects in the Charaka Samihita on the three constitutional elements that rule human life, i.e., Vata, Pitta and Kapha. (Sailesh et al., 2013), (Jing et al., 2017) Avipattikar Churna is an Ayurvedic medicine used to treat gastrointestinal complaints. This is helpful for constipation and gastritis treatment. It contains strong medicinal herbs, helps to promote digestive tract functions and relieves the symptoms of certain diseases, and can also be used to treat urinary disorders, including difficulties passing through urine. Combined ingredients of Avipattikar Churna Table 1 and Triphala Churna Table 2

play an essential role in hypolipidemic behaviour. They indicate that the lipid-lowering action is mediated by inhibiting the biosynthesis of hepatic cholesterol and reducing lipid absorption in the intestine. Hyperlipidemia prevalence is in the range of 39 per cent, 51 per cent and 26 per cent respectively globally, developed and developing countries. Overall, cholesterol elevated is estimated to cause 2.6 million deaths (4.5 per cent of the total) and 29.7 million life-adjusted disability years, or 2.0 per cent of overall. (Kanakavalli et al., 2014) Medicinal plants are used for various purposes of the study. More than 15,000 plants for specific pharmacological properties were researched and documented. The pharmacological study observations for various components drug of Triphala Churna and Avipattikar Churna are as following.

MATERIALS AND METHODS

Description of Constituent Ingredients

Cinnamomum Tamala (Patra)

A study was performed to investigate the CTO and Cinnamaldehyde potential on diabetic rats with the oral administration of 100 or 200 mg/kg and 20 mg/kg, respectively, for 28 days to study both acute and chronic anti-hyperglycemic models. The whole activity in study was compared with the Glibenclamide, 0.6 mg/kg, as standard drug and shown to be as effective as standard in reducing the glucose level and beta-cell existing insulin potentiation. (El-Yamani, 2011) Ethanolic extraction of *C. Tamala* leaves display hypoglycemic activity and anti-hyperglycemic. It also corrects blood glucose levels to normal and substantially raises total cholesterol, TG, LDL and VLDL cholesterol levels in diabetic rats, and decreases chances of hyperlipidemia following daily dose. *C. Tamala* leaf extract facilitates the release of insulin from undestroyed β -cells and enhances oral glucose tolerance by increasing insulin availability. (Kumar et al., 2012) Aqueous and ethanolic *Cinnamomum Tamala* leaf extracts. Doses of 400mg / kg / day p.o were administered. Each leaf extract for ten days significantly ($p < 0.001$) prevents a rise in the serum levels of total cholesterol, triglyceride, LDLC, VLDL-C and Atherogenic index whereas substantial ($p < 0.01$) increases in HDL-C. (Kanakavalli et al., 2014) In male Wistar strain albino rats, the anti-hyperlipidemic effect of aqueous extract from the *Cinnamomum Tamala* leaf (CTLE) was evaluated at two graded doses levels viz., bodyweight: 200 and 400 mg/kg. The following two models have been used in rat for anti-hyperlipidemic activity, high fat diet, and hyperlipidemia induced by Tri-

Table 1: Constituent Herbs of Avipattikar Churna

S. No	Ayurveda Name	Hindi Name	Botanical Name	Part Used
1.	Sunthi	Adrak Dry		Rhizome
2.	Marica	Kali Mirch	<i>Piper nigrum</i> Linn.	Fruit
3.	Pippali	Long Pippier	<i>Piper longum</i> L.	Fruit
4.	Haritaki	Haritaki	<i>Terminalia chebula</i> Retz.	Plant (Fr)
5.	Bibhitaka	Bahera	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Plant (Fr)
6.	Amalaki	Amla	<i>Phyllanthus emblica</i> L.	Plant (Fr)
7.	Musta	Nut Grass	<i>Cyperus rotundus</i> (scariosus) R.Br.	Rhizome
8.	Vida(Vida Lavana)	Vida Lavana	Ammonium chloride	Salt
9.	Vidanga	Vidanga	<i>Embelia ribes</i> Burm.f	Fruit
10.	Ela(Suksmaila)	Elaichi	<i>Ellettaria cardmomum</i> (L.)Maton	Fruit (Seed)
11.	Patra (Tej patra)	Tej patra	<i>Cinnamomum tamala</i> Nees & Eberm.	Leaf
12.	Lavanga	Clove	<i>Syzygium aromaticum</i> (L.)Merr	Flower bud
13.	Trivrit	Nishoth Kala	<i>Operculina turpenthum</i> (Linn.)	Root
14.	Sarkara	Gud	<i>Saccharum officinarum</i>	Gud

Table 2: Constituents Herbs of Triphala Churna

S. No	Ayurveda Name	Hindi Name	Botanical Name	Part Used
1.	Pathya (Haritaki)	Haritaki	<i>Terminalia chebula</i> Retz.	Plant (Fr.)
2.	Bibhita (Bibhitaka)	Bahera	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Plant(Fr.)
3.	Dhatri (Amalaki)	Amla	<i>Phyllanthus emblica</i> L.	Plant(Fr.)

ton X-100. The efficacy of CTLE in Triton X100-induced hyperlipidemia was contrasted with standard Atorvastatin (10 mg/kg, p.o.) and in the high-fat diet with Atorvastatin (30 mg/kg, p.o.). The findings show that CTLE has a significant potential for anti-hyperlipidemic by reducing TC, TG, LDL-C and increasing HDL-C. (Saravanakumar *et al.*, 2010) The analysis was examined for the extract of leaves *C. Tamala* with an oral dosage of 100, 200 and 400 mg/kg, given once daily for seven days and with effectiveness compared by lorazepam (1 mg/kg, p.o.), imipramine (10 mg/kg, p.o.). The study showed that the rats treated with CT reported a substantial decrease in plasma triglyceride levels and LDL-C levels. (Singh *et al.*, 2016) Specific doses of *C. tamala* extract was orally administered for 15 d to alloxan-induced diabetic rats and was monitored for

the impact of treatment on blood glucose levels, glycosylated haemoglobin and peroxidation products such as thiobarbituric acid reactive substances and serum lipids. These studies have given proof of *C. tamala* ethanol extract's anti-diabetic, antioxidant and anti-hyperlipidemic activity when orally administered. (Singh *et al.*, 2016)

Cyperus Scariosus (Nutgrass)

The researchers have studied the antioxidant and lipid-lowering function of a *Cyperus scariosus* Linn root hydroalcoholic extract (HCS) on guinea pigs dieting high in cholesterol. Both doses of *Cyperus scariosus* hydroalcoholic extract decreased the serum lipid profile and atherogenic indices ($P < 0.05$). (Singh *et al.*, 2018b) Research to investigate the lipid-lowering and antioxidant function

of a hydroalcoholic extract of *C. scariosus* Linn. root (HCS) in guinea pigs fed with a high cholesterol diet was evaluated. Serum lipid profile (TC, VLDL-C, TG, LDL-C, and HDL-C), serum enzymes (ALT, AST, ALP, LDH, and CK-MB) and atherogenic indices were performed in each group at 0 days and 60 days, respectively. (Kumar et al., 2017) Anti-hyperglycemic activity calculated by the glucose tolerance test in mice showed that a dosage of 400 mg/kg glibenclamide extract was as active as 10 mg/kg. (Chawda et al., 2014)

Elettaria Cardamomum (Suksmaila)

The various study aims to assess the antioxidant role of Cardamom (*Elettaria cardamomum*) on oxidative damage caused by gamma radiation in liver and heart tissues. The analysis was carried out on forty (40) rats categorized into four regular classes. A significant enhance (P=0.05) in the TC, TG, and LDL-C levels correlated with a substantial decrease (P=0.05) in HDL-C was seen in irradiated rat serum. The hyperlipidaemic condition found after irradiation may be due to the blood-stream mobilizing the fats from the adipose tissue. (Venkatasubramanian et al., 2015) A study was done to examine the cardamom extract's anti-hyperlipidemic behaviour for Wistar albino rats being fed a high-fat diet. The present experimental research provides further evidence that a significant anti-hyperlipidemic effect occurred during 30 days of oral administration of cardamom extract. Cardamom powder suspension was tested for efficacy with pioglitazone on dexamethasone-induced dyslipidemia, hyperglycemia in albino rats at a dose of 45 mg/kg orally, and an increase in total cholesterol, triglycerides, and decrease in HDL was observed in the group of dexamethasone, and a substantial reduction in total cholesterol and triglyceride, as well as an increase in HDL. (Darwish et al., 2013) In Wistar rats, the anti-hypercholesterolemic activity of cardamom was tested by inducing eight weeks of hypercholesterolemia with high cholesterol, and dietary treatments with cardamom powder (50g / kg) showed a substantial reduction in total blood cholesterol (31%) and LDL cholesterol (44%) through oral administration and 3% reduction in liver triglycerides. (Bhat et al., 2015)

Embelica Ribes (Vidanga)

The *Embelica ribes* (ethanolic extract) administered orally at the concentration of 200 mg/kg for 20 days reported substantial (p<0.01) reduction in serum total cholesterol and triglycerides, blood glucose levels and increased rates of HDL cholesterol compared with streptozotocin-induced pathogenic diabetic rats (with a dose of 40 mg/kg, IV). (Nagashree

et al., 2017) A study performed for the lipid-reduction of ethanolic extract *E. Ribes* were investigated in streptozotocin-induced diabetes at a dosage of 40 mg/kg in rats for 20 days of oral extract feeding at the dose of 200 mg/kg in diabetic rats, resulting in substantial decreases in blood glucose, total serum cholesterol and triglycerides, and elevated levels of HDL cholesterol compared with pathogenic diabetic rats. (Srinath et al., 2010) [18] Preliminary research on the beneficial effects of *E. ribes* at a dosage of 50 mg/kg for 21 days on lipid metabolism, and oxidative stress in obese rats significantly decreased in TC (22.25%), TG (28.84%), LDL-C (38.43%) and HDL-C (46.93%) respectively.

Operculina Terpentum (Trivrit)

Dosage of *Operculina terpentum* stem methanolic extract 100 mg/kg p.o and methanolic extract of *Operculina terpentum* roots for 21 days were given to regular, glucose-loaded and experimental diabetic rats. The continuous (p<0.05) decrease in fasting blood glucose levels and lipid profile was observed at three h in normal rats and 21 days in treated animals. (Bharat and Neeraj, 2013) The roots of the family Convolvulaceae, *Operculina turpentum*, are useful in treating fatty liver and enhancing liver fat metabolism. Through reducing excessive body fat, it acts successfully against obesity and Serum cholesterol, and triglyceride levels decrease significantly. (Mohammad et al., 2017) A phytochemical studies and pancreatic lipase inhibitory activity was performed in various *Operculina turpentum* leaf extracts at different concentrations of 25, 50, 75, 100µg / ml. Concentration-dependent inhibition of lipase by the different extracts and ethanol showed a median inhibition of 85.24 per cent at 100µg / ml concentration. (Khemchand and Parul, 2016) *Operculina turpentum* root extract was administered orally at 300, 400 mg/kg b.wt at 5 hours after NDMA was administered. NDMA treated mice showed a substantial decrease in the low-density lipoprotein (LDL) concentration in the serum of mice receiving OTE. B.wt: 300mg/ kg. Besides, the level of high-density lipoprotein (HDL) in the serum of mice receiving OTE (400 mg/kg b.wt.) increased. (Zaburuth and Jayshree, 2014)

Phyllanthus Emblica (Amalaki)

Research showed an improved lipid profile by comparing levels of, Triglycerides, HDL, Total Cholesterol, LDL, and index of Atherogenic with Atorvastatin in Albino mice high in fat. [23] Ethanol extracts from *Phyllanthus Emblica* fruits were administered orally at a concentration of 200 mg/kg bodyweight for 45 days, resulting in a substantial decrease in

blood glucose and a significant increase in plasma insulin in diabetic rats, and a significant reduction in TC, VLDL-C, LDL-C, FFA, PL, TG and elevation in HDL-C. (Swetha et al., 2014) A present study indicates that *Phyllanthus emblica* extract at a dosage of 1 gm/kg BW exerts an anti-hyperlipidemic effect comparable to that of simvastatin (1.8 mg/kg B. wt) and has hypolipidemic activity too. (Krishnaven et al., 2010) Blood lipid profile also affected by cinnamon and amla feeding, serum cholesterol, and triglycerides were 84.28 ± 6.19 and 70.27 ± 3.78 (mg/dl) respectively, for healthy rats group (control negative). For group treated with 1.5 per cent amla, the lowest result in serum triglycerides was reported. (Anju and Hiteswar, 2013)

Piper Longum (Pippali) and Piper Nigrum (Marica) LINN.

The *P. longum* L ethanol extract as the significant anti-hyperlipidemic constituents, the fruit yields piperlonguminine, piperonaline, and piperin. They show significant in vivo anti-hyperlipidemic activity, comparable to that of the generic anti-hyperlipidemic drug simvastatin. (El-Tellawy et al., 2016) *Piper longum's* role in diabetic rats induced by streptozotocin (STZ) has been evaluated by the anti-hyperglycemic and anti-hyperlipidemic effects of *P. longum* root aqueous extract (PlrAqe), and their studies envisage the plant extract being capable of controlling hyperlipidemia. (Kumar et al., 2012) Bioassay-guided isolation of the *Piper longum* L and piper nigrum fruit from an ethanol extract. The major anti-hyperlipidemic constituents were piperlonguminine, piperine, and piperonaline. Both demonstrate substantial anti-hyperlipidemic activity in vivo, which is comparable to that of simvastatin, the commercial anti-hyperlipidemic drug. (Md et al., 2019) The antihyperlipidaemic activity of chemically synthesized GBN in rats was first tested and verified in a study. The findings of in vivo antihyperlipidaemic assay showed that there were critical lipid-lowering activities in synthetic GBN. (Jin et al., 2009) In High-fat diet-induced study, obese rats were treated orally with 200 mg/kg b.wt of various extracts as (hexane, ethanol, aqueous, etc.) of PnL at 42 d. The levels of total cholesterol, TGs, PLs, HDL-C, LDL-C, and VLDL-C are recorded in control plasma and liver and HFD-fed rats. A substantial increase in tissue and plasma lipid profiles was observed, which was substantially reduced by oral administration. (Sarnaizul et al., 2013) Therefore, the piperine-induced increase in the receptor-mediated clearance of apoB-containing lipoproteins and decrease in the hepatic apoB production by testosterone may explain the decreased apoB levels. Thus, the administering of piperine

enhances the high-fat-induced changes in hormone profiles and the function of significant apolipoproteins and decreases plasma lipid levels. (Parim et al., 2015), (Vijayakumar and Nalini, 2006)

Saccharum officinarum (Sarkara)

The effect of policosanol (obtained from *Saccharum officinarum*) and Atorvastatin on blood lipid profile and the aggregation of platelet in dyslipidaemia along with type 2 diabetes patients. Policosanol consistently decreased LDL-C by 25.7% after eight weeks of therapy, and total cholesterol (TC) by 18.2%. In effect, atorvastatin 10 mg/day significantly decreased LDL-C by 41.9% and TC by 31.5 per cent. (Vijayakumar and Nalini, 2006) A proportion of polysaccharides from *S. officinarum* on the metabolism of carbohydrate and lipid in normal rats were tested and those diets high in sugar. Feeding with a high sugar diet caused serum glucose elevation and massive accumulation of lipid peroxide in the serum and liver. Combined feeding with the polysaccharide fraction has prevented the production of lipid peroxides. The dosage of the policosanol used in human studies ranged from 2, 40 to 80 mg/day. Some research reported a substantial decrease in plasma cholesterol between 5 weeks and 8 weeks at doses of 5 and 10 mg, respectively. As a standard drug, it was compared with statins, and the result indicated an efficient lipid profile potential but above 80mg/ kg The results of the meta-analysis showed that TC and LDL-C could be lowered and HDL-c increased by sugarcane polycosanol. No significant impacts were observed on TG and body weight. The most potent therapeutic effects of sugarcane policosanol should be achieved with a daily dosage of 5 mg, and lipid-improving effects did not occur in a dosage-dependent manner. (Francini-Pesenti et al., 2008)

Zinger officinale Roscoe (Sunthi)

Protective effect of ginger on blood pressure and on blood lipid profile in rats which is fed on a high-fat diet (HFD) and comparison was made with another natural herbal garlic's preventive effect, which is a studied more and a proven herb against these risk factors. The result was that ginger is an essential herbal remedy against IHD risk factors (hypertension and hyperlipidemia). (Jing et al., 2017) Specific doses of ginger powder (range 13 g) were used in the clinical trials over various periods (range 45 days–12 weeks). The result that has been found was ginger, particularly in diabetic patients, can be considered as a useful ingredient for modifying blood lipids. (Saravanan et al., 2007) The ultimate aim of the study is to investigate the ability of ginger extract (GIN) to modulate the expression and

activity of liver SCD1 under hyperlipidemic conditions, to reduce the accumulation of lipids in the steatotic liver. Results can be a significant help for developing a new strategy to minimize lipid accumulation and oxidative stress in the steatotic liver to enhance its proper functioning. (Sanghal et al., 2012) The research was planned to assess and compare the efficacy of different doses of Ginger decoction with rosuvastatin, fenofibrate and ezetimibe in hyperlipidemic rats on lipid profile, liver function test and MDA level and it reported to have an effective potential. (Arablou and Aryaeian, 2018) Red Ginger Rhizomes Ethanol Extract (RGREE) administered at 100 mg/kg, and 400 mg/kg daily doses have the potential to boost lipid profile including decreasing levels of cholesterol and triglycerides, as well as rising blood plasma levels of HDLs. (Carnuta et al., 2018) Although treatment with methanolic extract of *Zingiber officinale* dried rhizomes resulted in a substantial reduction in fructose-induced lipid-level elevation, body weight, hyperglycemia, and hyperinsulinemia, treatment with *Zingiber officinale* ethyl acetate extract did not bring about any significant improvement in any of the last two parameters. (Dizaye et al., 2019)

Terminalia chebula (Haritaki)

The effect of *Terminalia chebula* fruit ethanolic extract, given orally for 30 days at the concentration of 500mg / kg (Dose-A) & 250mg / kg (Dose-B) and extract showed a substantial decrease in the cholesterol and triglyceride serum levels in hyperlipidemic rats. (Safitri et al., 2016) There is ample evidence that it can be used as an anti-ageing agent for gastrointestinal motility. It also has properties such as Antilithiatic activity, Hypolipidemic activity, Ability-protecting Radio, Antifungal activity, and so forth. (Kadnur and Goyal, 2005) Treatment with *Terminalia chebula* (300mg / kg, p.o) and its combination with Gaumutra (30mg / kg, p.o) showed substantial decreases ($p < 0.05$) in serum and tissue serum and tissue cholesterol, LDL-C, VLDL-C, triglycerides, atherogenic indexes and increased levels of HDL-C. (Choudhary, 2013) An atherogenic diet mediated hyperlipidemic model, rats receiving immature alcoholic extract (IMF), mature fruits (MF), and T fraction soluble in ethyl acetate (immature fruits). Total cholesterol (TC) ($p < 0.05$), total triglyceride (TG) ($p < 0.001$), total protein (TP) ($p < 0.001$), and elevation of high-density lipoprotein cholesterol (HDL-C) ($p < 0.001$) were significantly reduced in *T.chebula* care. (Rathinamoorthy and Thilagavathi, 2014) The anti-hyperlipidemic effect of MeOH bark extract of *T. chebula* in doses of 200, 400 and 600 mg/ kg and fasting glucose levels were measured at doses of 200, 400 and 600 mg/ kg after

treatment with MeOH bark extract of *T. chebula*. The *T. chebula* MeOH bark extracts demonstrated anti-hyperlipidemic activity which is dose-dependent in rats against hyperlipidemia induced by a high-fat diet. (Israni et al., 2010) The *Terminalia chebula* Retz aqueous extract of fruits shows anti-diabetic activity in the rat by using streptozotocin (STZ) induced model and activity compared with tolbutamide, a known drug. The extract's oral effective dose (ED) was found to be 200 mg/kg body weight, resulting in a 55.6% ($p < 0.01$) decrease in the oral glucose tolerance study.

Terminalia bellerica (Bibhitaki)

T. bellerica fruit ethanolic extract 250mg / kg & 500mg / kg body weight was administered p.o., Evaluate the anti-hyperlipidemic response for 20 days. The findings of this study show that *T. bellerica* alcoholic extract (500 mg / Kg) has a substantial decrease in different levels of lipid as well as the elevated physical parameters such as heart weight, body weight ratio, BMI. Orlistat and Atorvastatin are used as standard drugs. (Reddy et al., 2015) , (Murali et al., 2007) In rabbits, cholesterol feeding was experimentally caused by hypercholesterolaemia and atherosclerosis. These hypercholesterolemic rabbits measured the impact of an endogenous drug, *T bellerica*. *T bellerica* decreased lipid concentrations in hypercholesterolemic animals. The drug-treated animals have reported a substantial diminish in liver lipids and heart lipids ($P < 0.05$). (Pragya et al., 2016) *Terminalia bellerica* is the rich source of the existence in plant fruit extracts of β -sitosterol, gallic acid, ellagic acid, galactose, ethyl gallate, chebulagic acid, mannitol, glucose, galactose, fructose and rhamnase, and these constituents had several investigated successful lipid profile potentials. (Ahmad and Mishra, 2017)

Syzygium aromaticum (Lavanga)

The present work was carried out to examine the role of clove bud powder (CBP) on type 2 diabetes rat model, which is induced for 30 days by using high-fat diet along with streptozotocin (35 mg kg⁻¹), and the result revealed the dose-dependent action potential of the *Syzygium aromaticum*. (Shaila et al., 1995) Lipid peroxidation as demonstrated by a rise in the values of TBARS, CD, urea, lipid profiles, AST and ALT as well as a distinct decrease in GSH rates in hyperlipidaemic rats was found to be nullified by co-administration of cloves as these parameters showed a propensity to return to near normalcy. (Singh et al., 2018a) The experiments were carried out after six weeks by using the high-fat diet-fed (control group) and high-fat diet + lycopene (10 mg/kg) (test group). Serum TC, LDL - C and

serum TG levels decreased dramatically, and serum HDL – C and antioxidant SOD increased following the addition of lycopene to a high-fat diet. Hyperlipidaemia was induced in rats over six weeks by oral administration of a high-fat diet. The extract was then given to hyperlipidaemic rats for the next six weeks, at two separate doses of 200mg / kg and 400mg / kg body weight. Atorvastatin was used as a norm of reference. The extract exhibited dose-dependent anti-hyperlipidaemic activity. (Shyamala et al., 2003) The ultimate results of the present study showed that *Eugenia caryophyllus* responsible for anti-hyperlipidemic activity against hyperlipidaemia induced by high-fat diet at (200mg / kg) and high (400mg / kg) dosages. (Mulkalwar et al., 2002; Shyamala et al., 2003; Kadnur and Goyal, 2005) , (Ghai et al., 2015)

CONCLUSIONS

Several potential therapies for hyperlipidaemia are recently being investigated. The current statins and fibrates therapy, which regularly fails to emulate the lipid homeostasis that healthy individuals eventuate. It is widely reported that herbal sources are more useful, having fewer side effects and convenient as far as the administration is concerned. So, the only answers can be explored from the Ayurvedic Polyherbal formulations. In this review, authors are trying to discuss exhaustively the Avipattikar and Triphala churna constituents which have tremendous potential to cure and prevent the problem of hyperlipidaemia.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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