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Research Paper

A Review on Anti-Hypercholesterolemic Plants

Chemistry

KEYWORDS :

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ABSTRACT

Plants arerootages of medicine throughout the worldsince time immemorial. The demand for plant-based formulations to treat various ailments is ever increasing as plant based products have less or no untoward effects. Using plants for treatinghypercholesterolemic patients is an ancient practice. Hypercholesterolemia is the key risk factor for atherosclerosis and related cardiovasculardiseasesin humans all around the world. The review is an attempt to compile commonly available plant based anti-hypercholesterolemic studies. However, further sophisticated studies with clinical trialsshould be conducted to illuminate proper treatment modalities against hypercholesterolemia.

Introduction

Hyperlipidemia (hypercholesteremia) is a complex group of disorders as a result of high level of lipids in the blood which includes cholesterol, cholesterol esters, phospholipids, and triglycerides. Lipids are carried in the blood as *'lipoproteins'*. The disease refers to raised levels of lipids and cholesterol in the blood, or due to different disorders of lipoprotein metabolism (dyslipidemia) in the body. Enhanced plasma cholesterol concentration in hypercholesterolemic patients is the key reason for arthrosclerosis (Kumar *et al.*, 2007). The relationship between hypercholesterolemia and atherosclerosis was well reported by many researchers across the world (Stone *et al.*, 1994; Fletcher *et al.*, 2005). Very high levels of lipids or triglycerides can cause yellowish nodules of fat in the skin beneath eyes, elbows and knees, and in tendons (xanthomas). Pain, liver, spleen or pancreas gibbosity or whitish rings around the eye's iris can also take place in some people.

The causes of hyperlipidemia are familial combined hypercholesterolemia, familial hypertriglyceridemia, other diseases like diabetes mellitus, hypothyroidism, Cushing's syndrome, dysproteinemias and renal failure. Life style implying excessive alcohol intake, lack of exercise, smoking and other factors such as age, stress and postmenopause also are contributing factors.

The uses of medicinal plants in medical care are time tested and still the mainstay of treatment across the world (Miranda and Hanazaki, 2008; Chowdhury and Koike, 2010). Adverse consequences connected with the use of modern therapeutic drugs necessitate the need to find other alternative preludes for effective management of hypercholesterolemia. The population is increasingly turning to plant-based complementary and alternative medicines to treat hypercholesterolemia due to fewer side effects and cost effectiveness. Tralatitious medicinal plants having antilipidaemic activity are useful source for the development of novel hypolipidaemic agents or dietary additives to existing therapies. The present review is an attempt to compile anti- hypercholesteremic activity of some commonly used medicinal plants.

About 2000 plants listed in traditional (herbal/alternative) systems of medicine are decreed against hyperlipidemia which provides complete relief for people suffering from hypercholesterolemia. Plants produce incredible motley of metabolites such as isoflavones, phytosterols, saponins, fiber, polyphenols, flavonoids and ascorbic acid which have potential to treat hyperlipidemia.

Sl. No.	Plant	Effects
1.	*Achyrathus aspera* Amaranthaceae	Lowered total serum cholesterol (TC) and phospholipid (PL), triglyceride (TG) and total lipid (TL) levels in triton-induced hyperlipidemic rats (Khanna *et al.*, 1992; Shibeshi *et al.*, 2006)
2.	Aegle marmelos Rutaceae	Antihyperlipidemic and Lipid lowering effects in rats (Vijaya *et al.*, 2009; Das *et al.*, 2012)
3.	*Allium sativum* Alliaceae	Suppressed LDL oxidation and hypocholesteromic (Lau, 2006; Al-Numair, 2009)
4.	*Amomum subulatum* Zingiberaceae	Lipid lowering and antiatherosclarotic (Joshi & Joshi, 2007; Bairwa, 2011)
5.	*Coriandrum sativum* Apiaceae	showed significant increase in hydroxy methyl glutaryl CoA (HMG-CoA) reductase and plasma lecithin cholesterol acyl transferase (LCAT) activity in hypercholesterolemic rats and enhanced degradation of cholesterol to faecal bile acids and neutral sterols (Dhanapakiam *et al.*, 2008)
6.	Cyperus rotundus Cyperaceae	Lipid Lowering (Chandratre *et al.*, 2011)
7.	*Emblica officinalis* Euphorbiaceae	prevents LDL oxidation and decrease synthesis of cholesterol and enhanced reverse cholesterol transport by elevating HDL-C level (Antony *et al.*, 2006)
8.	*Garcinia cambogia* Guttifera	showed dose-dependent decrease in the plasma level of very-low-density lipoprotein and a dose-dependent increase of chylomicrons in adult male rats (Kayode *et al.*, 2007)
9.	*Gymnema sylvestre* Asclepiadaceae	reduced the elevated serum triglyceride (TG), total cholesterol (TC), very low-density lipoprotein (VLDL)-and low-density lipoprotein (LDL)-cholesterol in a dose-dependent manner in rats (Anupam & Malay, 1987)
10.	*Hemidesmus indicus* Asclepiadaceae	showed significant reduction of lipid levels in serum of rats (Bopanna *et al.*, 1997)
11.	*Momordica charantia* Cucurbitaceae	Oral administration of fruit extract at (150 mg/kg & 300 mg/kg) to old obese rats showed significant reduction in total cholesterol, triglyceride and HDL-CH, LDL-CH and VLDL-CH levels in serum samples (Huang *et al.*, 2008)
12.	*Moringa oleifera* Moringaceae	decrease in high fat diet induced serum cholesterol in rats (Ghasi *et al.*, 2000)
13.	*Ocimum sanctum* Labiateae	Antihyperlipidemic (Suanarunsawat *et al.*, 2010)

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14.	*Piper nigrum* Piperaceae	Piperine supplementation significantly reduced the levels of plasma total cholesterol, low density lipoprotein (LDL), very low-density lipoprotein (VLDL) and the activity of 3-hydroxy 3-methyl glutaryl oenzymeA(HMG CoA) reductase in the liver, heart and aorta in rats (Vijayakumar and Nalini, 2005)
15.	*Rhinacanthus nasutus* Acanthaceae	Antihyperlipidaemic (Desu & Saileela, 2013)
16.	*Ruta graveolens* Rutaceae	Antihyperlipidemic (Ahmed *et al*., 2010)
17.	*Semecarpus anacardium* Anacardiaceae	Decreased serum LDL-C and very low density lipoprotein cholesterol (VLDL-C) levels on 60 days of treatment in rabbits (Sharma *et al*., 1995)
18.	*Terminalia arjuna* Combretaceae	Hypolipidemic (Gupta *et al*., 2001)

Table 1: Common plants with proven antihyperlipidemic effects

Several evidences are available, pointing the positive effects of many natural product components that can be utilized for the treatment of hyperlipidemia. Sabrin *et al*, (2013) reported that polyphenols like apigenin, genistein and catechins as well as saponins, sterols, stanols, polyunsaturated fatty acids, mucilage and carbohydrates are good examples of agents found to exhibit potent hypocholesterolemic activities. Table 1 summarizes the list of commonly available plants with proven antihyperlipidemic effects.

Recent researches witnessed an overwhelming rise in reports indicating that botanical dietary supplementations can improve cardiovascular health and associated diseases (Mahmood *et al*., 2010). The hypolipidaemic activity of numerous plants/ plant products was assessed and corroborated not only in animal models but also in human beings. Increased intake of viscous soluble dietary fibers as well as plant sterols and stanols has considerable lipid lowering effects. Cereals and, to a lesser degree, pseudocereals meet the major dietary requirements in proteins, antioxidants, and minerals and are an important part of diet of hypercholesterolemic patients (Gorinstein *et al*., 2002). The effects of various phytochemicals in hypocholesterolemic activity are given in Table 2.

Phytochemicals	Mode of action
Phenolics	Inhibit the oxidation of lipids, fats and proteins by donation of a phenolic hydrogen atom to free radicals
Flavanoids	Decrease of 3-hydroxy-3-methylglutaryl coenzyme A and decrease in apo B secretion in hepatocytes
Tocopherols	Scavenging lipid peroxyl radical through hydrogen ion transfer
Tannins	Enhance the synthesis of nitric oxide and relax vascular segments precontracted with nonepinephrin
Anthocyanin	Prevent oxidation of low density lipoproteins and turn off genes involved with proliferation, inflammation and angiogenesis
Ascorbic acid	Ability of scavenging free radicals and inhibition of lipid peroxidation and preserves membrane against peroxidation by increasing tocopherol activity
Carotinoids	Strong antioxidant effect for damage of free radicals and it has beneficial effect on lipid oxidation

Table 2: Phytochemicals and their mechanism of action against hypercholesterolemia (Joshi & Jain, 2014)

Conclusion

Tralatitious medicinal plants having antilipidaemic attributes are useful sources for the development of new oral hypolipidaemic agents or simple dietary auxiliaries to existing treatment modalities. The effects of the potential plants may retard the disease development and related ramifications. However, more detailed investigations are the need of the hour to appraise the mechanism of action of medicinal plants with hypolipidaemic effects.

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