

# The Ameliorative Role of Potential Herbal Plants for Managing Cholesterol

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## ABSTRACT

Hyperlipidemia is a severe medical condition characterized by the increased level of plasma lipids leading to the risk factors associated with different types of cardiovascular diseases. Atherosclerosis is a deposition of cholesterol along the wall of arteries causing them narrow. Hypercholesterolemia and hypertriglyceridemia are the major cause of atherosclerosis. The main etiology of elevated level of cholesterol in blood is high intake of diet including saturated fats. Hypercholesterolemia is a condition of high cholesterol

in the body. Hypertriglyceridemia is a condition of elevated level of triglycerides which is the common form of fat. This review assessed the lowering of cholesterol by herbal medicinal plants. These herbs may establish the effective control on the level of cholesterol.

**Keywords:** Hypercholesterolemia, Atherosclerosis, Cholesterol

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## INTRODUCTION

The various parts of herbal plants viz. roots, stems, leaves, barks, flowers, fruits, etc. are the equipments of herbal plants as these diverse plant materials consist of biologically active compounds having various therapeutic effects. These biologically active compounds present in herbal plants are exploited with different methods in various conventional medicines for many treatments. Thus, treatment with herbal plants is as old as mankind itself (Adler AJ and Holub BJ, 1997). There are lots of herbal plants which are highly beneficial for decreasing cholesterol in the body. Basically, cholesterol is a waxy substance found in blood and cells of the body. Normally cholesterol are present in foods but also synthesized in the body (Antonio J, *et al.*, 1999). Liver is responsible for the formation of cholesterol and it may also get from several fatty foods (Antonio J, *et al.*, 1999; Dev S, 1997). Cholesterol may help all organs to work properly and it can also build up hormones, digestive fluids, vitamin D etc. but when the amount of cholesterol increases then it may be fatal (Adler AJ and Holub BJ, 1997; Dev S, 1997). In 2016, approx. 32% of deaths occurred worldwide due to hypercholesterolemia (Antonio J, *et al.*, 1999).

The excess level of cholesterol may accumulate on the walls of arteries making them narrow and leading to the disturbance in the flow of blood (Dev S, 1997). If the enough blood could not reach the muscle of heart then various problems may occur in the body (Dev S, 1997; Gaur SP, *et al.*, 1997). Generally, the level of cholesterol may increases due to inheritance, alcohol, obesity, stress, poor diet (Gaur SP, *et al.*, 1997). High cholesterol in the blood may leads to several heart diseases (Gujral ML, *et al.*, 1962). It is very interesting as well as stimulating to treat cholesterol with several herbs and from spices (Jain AP, 1980). There are various medicinal plants, herbs and spices which may be used to lose fat and lower the level of cholesterol in the blood (Gaur SP, *et al.*, 1997; Gujral ML, *et al.*, 1962). The body requires cholesterol to function properly (Gujral ML, *et al.*, 1962; Jain AP, 1980). Liver produces various substances in the body. The genetic inheritance plays a vital role in producing the quantity of cholesterol in the body (Dev S, 1997; Gaur SP, *et al.*, 1997; Jain AP, 1980). When the cholesterol attached to proteins, then this combination of bundle is known as lipoprotein which is carried in the whole body through blood (Kotiyal JP, *et al.*, 1979). Lipoproteins are classified

as HDL (High Density Lipoprotein), LDL (Low Density Lipoprotein), IDL (Intermediate Density Lipoprotein), VLDL (Very-Low-Density Lipoprotein) and ULDL (Ultra-Low Density Lipoprotein) (Jain AP, 1980; Kotiyal JP, *et al.*, 1979). LDL and HDL are highly responsible for the diseases caused by cholesterol. LDL (Low Density Lipoprotein) is bad and unhealthy cholesterol (Gelfand JM, *et al.*, 2005). The high level of LDL cholesterol for a long time may damage the arteries and may cause several problems like heart disease, stroke, etc. (Reinbach HC, *et al.*, 2010). The deposition of cholesterol may narrow and block the arteries causing plaques which may decrease the supply of blood. It may also cause some other complications like-chest pain, heart attack, stroke etc. It is responsible for the formation of plaque by depositing waxy and fatty substance along the wall of arteries whereas HDL (High Density Lipoprotein) is good and healthy cholesterol (McCarty DJ, *et al.*, 1994). HDL removes bad cholesterol and prevents the wall of arteries from the deposition of cholesterol (Mori A, *et al.*, 2006). HDL may act as an anti-oxidant and prevent the attack of free radical on LDL as it becomes harmful when they are attacked by free radicals. It is responsible for eliminating excess amount of cholesterol from the body. The level of HDL may protect the body from heart diseases. Cholesterol is a major risk factor for cardiovascular diseases and it may leads to death (Leung FW, 2012). The deposition of cholesterol along the wall of arteries and making them narrow is a process known as atherosclerosis. The high level of cholesterol may cause atherosclerosis (Mózsik G, 2014). The major causes of atherosclerosis are hypercholesterolemia and hypertriglyceridemia. Atherosclerosis is also the major cause of Ischemic Heart Disease (IHD) (Zollman TM, *et al.*, 2000).

## LITERATURE REVIEW

Triglycerides are the most common type of fat stored in the fat cells of the body (Madihi Y, *et al.*, 2013). These are formed in the body by eating fatty foods, butter, oils etc. Whenever body needs energy these stored triglycerides may releases from the fat cells (Brand N, 1990). Liver and pancreas are highly affected when the level of triglycerides increased in the body. It may also create problems like obesity, blood pressure, heart diseases, coronary artery disease, diabetes etc.

It is very difficult to manage the level of cholesterol without using medications (Englisch W, *et al.*, 2000). Various studies have found

that statin drugs may be used to lower LDL or bad cholesterol (Radhakrishnamurthy B, *et al.*, 1982). In last few decades, several herbal products became very popular for managing the level of cholesterol (Colodny LR, *et al.*, 2001). The use of medicinal herb for treating cholesterol is fairly a new, young and still developing research. In today's society, people are searching for natural ways to lower the level of cholesterol. It is beneficial and safe to use medicinal herbal treatment.

Several common herbs used to lower the level of cholesterol and related diseases (Table 1):

**Table 1: List of Medicinal plants with potential hypocholesterolemic activity**

Scientific name	Common name
<i>Allium sativum</i>	Garlic
<i>Curcuma longa</i>	Turmeric
<i>Glycyrrhiza glabra</i>	Liquorice
<i>Zingiber officinale</i>	Ginger
<i>Commiphora wightii</i>	Guggal
<i>Capsicum annuum</i>	Capsicum, Cayenne
<i>Medicago sativa</i>	Alfalfa
<i>Trigonella foenum-graecum</i>	Fenugreek
<i>Cynara scolymus</i>	Artichoke
<i>Plantago ovata</i>	Psyllium
<i>Ferula assa-foetida</i>	Asafoetida
<i>Amorphophallus konjac</i>	Konjac
<i>Ocimum basilicum</i>	Basil
<i>Cinnamomum verum</i>	Cinnamon
<i>Linum usitatissimum</i>	Flaxseeds
<i>Crataegus</i>	Hawthorn
<i>Apium graveolens</i>	Celery seeds
<i>Uncaria tomentosa</i>	Cat's claw
<i>Salvia rosmarinus</i>	Rosemary
<i>Emblica officinalis</i>	Amla

#### ***Allium sativum* (Garlic)**

It is the best herb for lowering the level of cholesterol (Shirzad H, *et al.*, 2011). It also improves the blood circulation (Kemper KJ, 1999). Several studies have proven that if it is consumed daily then it may consistently drop down the level of cholesterol. Garlic may also treat blood clotting as it may cause heart attack and stroke which is sometime fatal (Mitra A, *et al.*, 2006). Garlic may be used as a blood thinner and also regulates blood pressure (Gouni-Berthold I and Berthold HK, 2002). Garlic contains Alliin which increases systolic pressure and decreases blood pressure. It is important for hypercholesterolemia. Garlic may produce nitric oxide which is beneficial for vasodilatation.

#### ***Curcuma longa* (Turmeric)**

Atherosclerosis may be treated by the extract of turmeric (Head KA, 2004). The accumulation of lipid may be suppressed by curcumin in blood (Cas-

tano G, *et al.*, 2005). The roots greatly reduced the level of cholesterol (Castano G, *et al.*, 2002).

#### ***Glycyrrhiza glabra* (Liquorice)**

It is an outstanding effective herb for treating cholesterol as it contains flavonoids which are known to be effective for lowering the level of cholesterol (Ayodhya S, *et al.*, 2010). Licorice also contain glabridin which is the active ingredient used to delay the oxidation of LDL (Mahran GH, *et al.*, 1973).

#### ***Zingiber officinale* (Ginger)**

These have the capability of lowering the level of cholesterol (Buddrus J, *et al.*, 1985). Adding ginger in meal and daily consumption of ginger tea may decrease the overall level of cholesterol (Bhattarai NK, 1992). So, it is beneficial to have daily ginger in the meal as it may minimize the cholesterol and improve the cardiac system (Venkataraghavan S and Sundareesan TP, 1981).

#### ***Commiphora wightii* (Guggal)**

It is a substance obtained from the mukul myrrh tree (Keshri G, *et al.*, 1999). Guggal is mostly used in Ayurvedic medicine as a stabilizer for cholesterol in the blood (Mihaylova B, *et al.*, 2012). Liver may secrete the large amount of cholesterol in blood which is protected by Guggal (Bang CN, *et al.*, 2015).

#### ***Capsicum annuum* (Capsicum)**

It may lower the level of LDL cholesterol which decreases the harmful risk of heart diseases and stroke (Baigent C, *et al.*, 2010). It also increases the metabolic activity of the body which burns more fat (Shihabudeen MS, *et al.*, 2011). Capsicum may have a suppressant property for appetite which decreases few pounds of the body (Jayaprakasha GK, *et al.*, 2007). It also has antioxidant property that may kill free radicals, responsible for increasing the level of cholesterol. It may also lower the high blood pressure (Jenkins DJ, *et al.*, 1997).

#### ***Medicago sativa* (Alfalfa)**

It is a rich source of various nutrients and beneficial for decreasing the level of cholesterol (Bierenbaum ML, *et al.*, 1993). The active constituent of Alfalfa is saponin which inhibits the absorption and formation of cholesterol (Cunnane SC, *et al.*, 1993). Alfalfa reduces the level of LDL without effecting HDL cholesterol. Several studies have proven that daily 30 grams of Alfalfa thrice a day decreases 20% of LDL cholesterol (Koletzko B, *et al.*, 1998). Its seeds, sprouts as well as leaves are beneficial in preventing hairloss, Asthma, Kidney stone, diabetes etc (Lees RS and Lees AM, 1996). Alfalfa may reduce the absorption of cholesterol and plaque formation but high dose may damage the red blood cells (Heinemann T, *et al.*, 1986).

#### ***Trigonella foenum-graecum* (Fenugreek)**

It is a versatile medicinal herb having properties like improving digestion, reducing LDL and triglyceride, increasing HDL, lowering blood sugar level due to the presence of active constituents like flavonoids and phenolic compounds (Schwartzkopff W and Jantke HJ, 1978).

#### ***Policosanol***

It is obtained from the sugarcane and may be used to lower the cholesterol level (Sahebkar A, 2014).

#### ***Cynara scolymus* (Artichoke)**

It plays an important role in controlling hypercholesterolemia by elevating HDL and reducing LDL level (Shin SK, *et al.*, 2011). Its leaves may contain fiber which inhibits the absorption of cholesterol and manage the total cholesterol levels (Goel A, *et al.*, 2008). The extracts of leaves are beneficial in managing the synthesis and lowering the level of cholesterol (Ali SS, *et al.*, 2008). Cynarine are the chemical compound obtained from Artichokes

which elevates the production of bile in liver and improves the activity of gall bladder by which the flow of bile also increases and these both increase the cholesterol excretion (Frishman WH, *et al.*, 2004).

#### ***Plantago ovata (Psyllium)***

These are beneficial medicinal herbs treating digestive as well as gastrointestinal problems (Ali BH, *et al.*, 2008). New research studies have shown that these are also important for managing the level of cholesterol (Fuhrman B, *et al.*, 2000). Psyllium may stimulate the bile acid production as well as cholesterol conversion into bile acids (Bordia A, *et al.*, 1997). Psyllium has high fiber content which may control the level of cholesterol by circulating less amount of cholesterol in the blood stream (Jung EA, *et al.*, 1999). LDL soluble fiber may reduce the level of LDL cholesterol by less absorbing the cholesterol in the intestine and these soluble fibres may also bind with cholesterol for excretion (Sharma SR, 1996). Soluble fibers are found as dietary supplements such as:

- Legumes
- Apples and berries
- Carrots etc. (Suneetha WJ and Krishnakantha TP, 2005)

The 5 percent of LDL cholesterol may be reduced by consuming 10 gram of soluble fiber per day (Ramadan MF, *et al.*, 2008). A healthy diet is the best way to decrease the risk of various heart diseases and to reduce the level of cholesterol naturally and diseased free body (Chen LL and Liu J, 2002). In pregnancy herbal products should be consumed after consulting the physician (Ding W and Zhou Y, 1999).

#### ***Ferula assa-foetida (Asafoetida)***

It prevents the formation of extra cholesterol and plaque formation in the blood vessels (Chen QY, 2007). It is a natural blood thinner and effective against asthma, acidity, expectorant etc. (Sterne JA, *et al.*, 2001).

#### ***Capsicum annuum (Cayenne)***

Cayenne pepper may have various advantages as they prevent plaque formation and blood clotting formations. It helps in smooth blood flow and good for arteries (Fang Q, 1997).

#### ***Amorphophallus konjac (Konjac)***

Glucmannan is a chemical compound present in Konjac treats LDL and Triglycerides. They may also affect the blood sugar and body weight (Zhou ZL and Liu CH, 1999).

#### ***Ocimum basilicum (Basil)***

The seeds of Basil are very effective for high blood pressure. These are consumed with other recipes, soups etc. (Zheng JR and Wang B, 2004). These are rich in antioxidants. They may be used for targeting metabolic stress and lowering bad cholesterol while increasing good cholesterol (Zhang ML, 2006).

#### ***Cinnamomum verum (Cinnamon)***

It is a very important medicinal spice that may act against cholesterol and diabetes (Ye YX, 2007). It can be consumed with honey as both together reduce the cholesterol level (Yue YA, 2006).

#### ***Linum usitatissimum (Flaxseeds)***

It improves the condition of atherosclerosis, cardiac diseases and decreases the level of serum cholesterol in the body (Yang RE, *et al.*, 2005).

#### ***Crataegus (Hawthorn)***

It keeps the heart healthy. It improves the movement of blood in vessels and reduces clotting (Zhang JS, 2002).

#### ***Apium graveolens (Celery seeds)***

Its juice is beneficial for lowering the blood pressure (Xin XY and Riu SP,

1999).

#### ***Uncaria tomentosa (Cat's claw)***

It is beneficial for hypertension and improves cardiac system (Tang JM, 1994).

#### ***Salvia rosmarinus (Rosemary)***

It helps in reducing the level of bad cholesterol and prevents heart disease (Ma Q, *et al.*, 2007).

#### ***Emblica officinalis (Amla)***

The cholesterol absorption may be restricted by amla and leads to favourable change in lipid profile. Amla consist of vitamin C and flavonoids in high amount due to which it possesses hypocholesterolemic effect in the body.

#### ***Barbados aloe (Aloe vera)***

It has been successfully established the deleterious effect of high cholesterol level in the blood and thus may be used for cardiovascular diseases.

Sterols and stanols of plants are the naturally occurring substances that may be used in orange juice and also as a dietary supplement (Abdollahi M and Afshar-Imani B, 2003). They inhibit the absorption of cholesterol and helps in reducing cholesterol (Mohammad A, *et al.*, 2004).

### **CONCLUSION**

Hypertriglyceridemia is a condition of elevated level of triglycerides which is the common form of fat. This review assessed the lowering of cholesterol by herbal medicinal plants. These herbs may establish the effective control on the level of cholesterol. These herbal medicinal plants are the natural remedies as they have safety profiles and potential hypocholesterolemic activity. All these herbal medicinal plants are most effective, acceptable and safe for the treatment of hypercholesterolemia.

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