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Review Article

A REVIEW OF ANTIHYPERLIPIDAEMIC MEDICINAL PLANTS USED IN AYURVEDA

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ABSTRACT

Hyperlipidaemia is considered a significant modifiable risk factor for Cardiovascular Diseases (CVD). The risk of cardiovascular events is approximately three times higher in comparison to individuals with normal lipid profile. Current practice of hyperlipidaemia management includes lifestyle modifications, exercise, dietary changes and drug therapy with statins. However, statins are expensive and having several limitations including adverse effects. Hence there has been a long demand for evidence based alternative medicines which can improve lipid profile. It is also one of the thrust areas of WHO to find out economical, safe and effective solutions for non-communicable diseases (NCD) based on traditional medical systems. Ayurveda is the oldest scientific traditional system of medicine practiced in India. It offers a variety of plant based medicines for the management of hyperlipidaemia. The current review is aimed at finding potential medicinal plants for effective management of hyperlipidaemia/dyslipidaemia based on the results of experimental and clinical studies.

INTRODUCTION

Both hyperlipidaemia and dyslipidaemia (high LDL, VLDL, Triglycerides and low HDL) are positively linked with several cardiovascular diseases (CVD). This condition is one among the most important risk factors of CVD. The association of high blood cholesterol or disproportionate balance between good and bad cholesterol with increased CVD risk has been proven beyond doubt through various research findings in last few decades. Though statins are frequently recommended to treat dyslipidaemia and hyperlipidaemia, still they have their own limitations. Statins also have serious side effects like myalgia, rhabdomyolysis, altered LFT, increased risk of diabetes etc. [1] Hence there has been a continuous search for the alternative of statins in alternative systems of medicine. Ayurveda seems to have a huge potential in this therapeutic segment.

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Lipids can be best correlated with "*Meda Dhatu*" as described in Ayurveda. Like all other *Dhatus, Meda dhatu* should also be there in proper quantity and quality in a healthy human body. Functionally *Meda dhatu* can be of two types: 1. *Bahya Meda* (body fat) and 2. *Abhyantara Meda* (cholesterol and triglycerides). Inappropriate or excess *Abhyantara meda dhatu* can be logically compared to hyperlipidemia. As per Ayurvedic pathogenesis, such conditions like hyperlipidaemia or dyslipidaemia is caused due to *Santarpana* which literally means over nutrition or defective nutrition. In principle drugs which reverse this condition and opposite in action (i.e., *Apatarpana*) should be used to treat hyperlipidaemia. Many herbs exhibit such properties and are effectively used by Ayurvedic practitioners.

MATERIAL AND METHODS

Search Strategy

Electronic database Google Scholar was used for the purpose of searching. The key words used for searching was "hyperlipidaemia, experimental, clinical study, medicinal plants mentioned in Ayurveda". Research publications published during the period 2000-2022 were considered. Other criteria used were as follows:

1. The medicinal plant must be mentioned in the Brihatrayee (the great trio of literatures by Charak, Sushrut and Vagbhat) in the context of *Medoroga*.
2. The clinical studies must be closely relevant to Indian population.

Review Strategy

Using the above criteria 19 research publications were selected for review. A total of 11 medicinal plants that satisfied the criteria were reviewed. The medicinal plants were mainly reviewed for their potential effect to improve lipid profile in either animal or clinical model. Classical description as mentioned in Ayurvedic literature and findings based on research were considered.

***Guggulu* (*Commiphora mukul*)**

Guggulu belongs to the family Burseraceae. It is a very popular and useful herb having *Tridosha shamak* property. In Ayurvedic medicine it is used to treat several diseases. History revealed that *Guggulu* has got profound mention in *Vedas, Samhitas, Nighantus* and in *Rasa Shastra* texts [2,3,4,5]. There are several *Guggulu* preparations mentioned in various texts which are used in different diseases like *Medoroga, Vata vyadhi, Prameha, Kushtha, Gulma, Ashmari, Mutra krichhra, Pandu, Amavata, Krimi roga, Upadmsha, Dushta vrana* etc.

Two stereoisomers E and Z - guggulsterone have been identified as the bioactive principles. In a double-blind, randomised, placebo controlled trial including 43 women and men, aged between 27-70, with moderate hyperlipidemia, the total cholesterol level was reduced by 11.7%, the low density lipoprotein cholesterol (LDL) reduced by 12.5%, triglycerides reduced by 12.0%, and the total cholesterol/high density lipoprotein (HDL) ratio by 11.1%. [6]

Another randomised placebo controlled study on 61 individuals was conducted for 24 weeks. After 12 weeks of diet control, half of the individuals received placebo and other half received *Guggulu* at 100mg daily dose. After 12 weeks of *Guggulu* therapy, the total cholesterol level decreased by 11.7%, low-density lipoprotein level by 12.7%, triglyceride by 12%, and cholesterol-high-density lipoprotein ratio 11.1% in individuals who received *Guggulu*, which was significant in comparison to placebo group [7].

In a double-blind multicentric study conducted on 228 individuals indicated similar effect of *Guggulu* with that of clofibrate. This multicentric, double-blind, crossover study was completed in 125 patients with *Guggulu* and in 108 patients with clofibrate. *Guggulu* was absolutely safe in terms of side effects except few minor GI upset symptoms not severe enough to stop the trial drug. Whereas two patients in the clofibrate group had flu-like syndrome and opted to go out of the study. In this clinical trial, patients consumed *Suddha Guggulu* in a dose of 500mg three times per day for 12 weeks. The results were encouraging. A significant reduction in serum triglycerides (22.6%) and serum cholesterol (23.6%) was seen in 70 to 80% of patients who consumed *Guggulu*. The average reduction in serum triglycerides and cholesterol was 16.8% and 11%, respectively, in patients who consumed with clofibrate. In this study, clofibrate was more effective on hypertriglyceridemia; whereas, hyper-cholesterolemic patients responded better to *Guggulu* therapy. Clofibrate had no effect on HDL. Whereas HDL was found to be increased in 60% of cases who received *Guggulu*. A significant reduction in LDL cholesterol was observed with both drugs. In toxicity studies *Guggulu* was found to be safe and did not produce any harmful effect on vital organs like kidney, liver, heart, brain etc.[8]

Garlic (***Allium sativum***)

Garlic (*Allium sativum*) is a species of the family Amaryllidaceae. Culinary uses are very similar to that of onions. It is used as a seasoning agent in India and most parts of the world. China is world's largest producer of garlic. It has a reasonably long history of human use. Especially in Ayurveda and other traditional and folk systems of medicine, garlic has found a very important place and multifaceted uses. Garlic contains active principles like allicin, alliin, ajoene, diallyl sulfides, and S-allylcysteine (SAC), as well as enzymes, saponins and flavonoids. It is having numerous medicinal properties like anti-cancer, cardioprotective, anti-hyperglycemic, antimicrobial, anti-hyperlipidaemic, antihypertensive, antioxidant, and anti-inflammatory. Garlic is used to treat digestive disorders, respiratory disorders like asthma, metabolic disorders like diabetes, cardiovascular diseases, hypercholesterolemia, cold and flu, hypertension, diseases of the joints, skin problems and many more. [9]

In a randomized, placebo controlled clinical study, after using garlic capsules for twelve weeks, it was found that the trial medicine was able to lower total cholesterol and low-density lipoprotein (LDL) significantly in 46 persons with dyslipidaemia where as these parameters were not statistically changed in the placebo group. In this study, the investigators concluded that garlic supplement is able to improve lipid profile of patients with mild to moderate hypercholesterolemia. It is worth mentioning that the subjects were kept on low-fat diet during the study. [10]

Not only hyperlipidaemia, garlic may be effective in inhibiting atherosclerotic plaque formation, which is an important risk factor in the pathogenesis of cardiovascular events. It has been proved in numerous

animal studies that garlic decreases formation of atherosclerotic plaque in experimental models. [11]

In two clinical studies performed on 152 and 200 individuals respectively, it was observed that garlic can significantly decrease formation of atherosclerotic plaques. [12,13] In the second study Pulse wave velocity, elastic vascular resistance, and pressure were used as parameters to evaluate the elastic properties of the aorta. The pulse rate, BP and lipid profile were similar in both trial and control groups. The pulse wave velocity and elastic vascular resistance were lower in the trial group in comparison to the control group. Pulse wave velocity was strongly and positively associated with systolic BP and age. The researchers concluded that long term garlic consumption would preserve the elasticity properties of the arterial wall from age related changes in humans.

***Arjuna* (*Terminalia arjuna*)**

Arjuna (*Terminalia arjuna*) is a tree and belongs to the family Combretaceae. It is a well-known plant for its medicinal values. On *Doshic* principle, it can pacify *Kapha* and *Pitta*. In Ayurvedic literature it is described as "*Hrudya*" i.e., beneficial for the heart and cardio vascular system. Maharshi Charak has categorized *Arjuna* under *Udarda Prashaman Mahakashaya*, a group of herbal drugs effective against allergic skin conditions. It is also having other medicinal effects like *Vranahara* (wound healing, *Bhagna sandhanakara* (heals fracture), *Raktapitta hara* (effective in bleeding disorders). The bark is mainly used for medicinal properties. Polyphenols, tannins, flavonoids, saponins, triterpenoids, saponins, sterols and different minerals are the major constituents *Arjuna*. Many amino acids like tryptophan, tyrosine, histidine and cysteine are also present in *Arjuna*. The bark of *Arjuna* is reach in co-enzyme Q10 which is a potent anti-oxidant and numerous health benefits. Therapeutically it is used to treat heart disease (as a cardio tonic), fractures, in ischemic conditions of the heart as it improves blood circulation to cardiac muscles, cirrhosis of liver, hypertension, dyslipidaemia etc.

The anti-hyperlipdaemic effect was proved in an animal study using hamster rodents. First of all, the hamsters were fed with fructose reach high fat diet for 10 days. It produced significant dyslipidaemia and hyperglycaemia in the animals with increase in total cholesterol, LDL, triglycerides and glucose. Then extract was produced from *Arjuna* bark powder using petroleum ether, solvent ether and alcohol and administered in a dose of 250mg/kg body weight to the hamsters with dyslipidaemia. This intervention produced significant reduction in total cholesterol, LDL and triglyceride. Not only that, *Arjuna* also revered the hyperglycaemic state of the animals. In brief *Arjuna* it can be concluded that, *Arjuna* is beneficial in treatment of altered lipid and sugar metabolism. [14]

In another open, prospective, randomized and controlled clinical study, *Arjun* was found more effective in comparison to standard Rosuvastatin therapy. Both the trial and control group had 30 patients each. The trial group was given capsules of *Arjun* bark powder (500mg) twice daily and the control group was given tablets of Rosuvastatin 10mg OD for 12 weeks. Both the drugs were able to reduce total cholesterol and LDL significantly. But *Arjun* was found more effective in reducing both these parameters with lesser adverse effects. *Arjun* was also found to be safe and better tolerated by the patients.[15]

Pushkarmool* (*Inula racemosa)

Pushkarmool has been mentioned in many Ayurvedic literatures for its health benefits. It belongs to the family of Asteraceae and found in the belt of Western Himalayas. Roots are the parts mainly used for medicinal purpose. Various phytochemicals have been isolated from *Pushkarmool* such as: alantolactone, isoalantolactone, inunolide (germacranolide), dihydroisoalantolactone, β-sitosterol, D-mannitol, dihydroxinunolide, neoalantalactone, inunolide, sesquiterpene lactone, and alantodiene. It has been assigned pharmacological properties like analgesic, anti-hyperlipidaemic, anti-oxidant, anti-bacterial, anti-fungal, anti-allergic, anti-inflammatory etc. It is therapeutically used to treat hyperlipidaemia, allergy, diabetes, cardiac problems, asthma etc.

The anti-hyperlipidaemic and anti-oxidant was proved in an animal experiment using rat model. Rats were fed with cholesterol and saturated fat rich diet for 28 days to produce induced hyperlipidaemia. It significantly increased the levels of total cholesterol, LDL triglycerides and decreased level of HDL. The liver enzymes (SGOT & SGPT) were also elevated. Then the rats were administered Inula racemosa root extract orally and the results were compared with standard drug Atorvastatin (10mg/kg body weight). The trial drug i.e., Inula racemosa was found to reduce the levels of total cholesterol, LDL, triglycerides and increased the level of HDL. It also significantly reduced the levels of elevated liver enzymes. Apart from anti-hyperlipidemic activity, it also showed significant anti-oxidant activity by reducing oxidative stress markers.[16]

In another multi group clinical study conducted at IMS, BHU, *Pushkarmool* capsules were found effective in treating dyslipidaemia and metabolic syndrome. *Pushakarmool* capsules were given in a dose of 500mg BD after food with warm water for three

consecutive months. The results showed that the trial drug was effective in reducing total cholesterol, LDL, triglycerides and increasing HDL level in patients of metabolic syndrome. It also improved BMI. [17]

***Haldi* (*Curcuma longa*)**

Haldi is a very popular spice across the world. It belongs to the family Zingiberaceae. Apart from the culinary usage, a lot of medicinal uses are mentioned in traditional systems of medicine. In Ayurvedic literature *Haldi* is accredited with profound medicinal values and subsequent uses. It is *Tridosha shamak* (means it can balance *Vata, Pitta & Kapha*). It is having *Ushna virya* and *Rukshya guna*. It is having properties like *Prameha hara* (in fact it is said to be the best drug to treat *Prameha*.) *Haridra prameha haranam*, *Kusthaghna* (effective in skin disorders), *Vishanrut* (anti-toxic), *Vrana ropak* (wound healer), *Kandughna* (anti-pruritic), *Krimighna* (anthelminthic), *Varnya* (improves complexion), hepatoprotective, anti-oxidant etc. It is used to treat *Kushtha* (skin diseases), all types of *Prameha, Pinasa* (chronic allergic rhinitis), *Vrana*, *Yakrut dosha* (disorder of the liver), *Medoroga* (diseases due to defective lipid metabolism), *Guda roga* (anorecta diseases), *Sotha* (oedema), *Pandu* (anaemia), *Krimiroga* (helminthiasis) and to improve skin complexion.

In a cell line study, curcumin, the active principle of *Haldi* was found to up-regulate LDL receptor expression. This finding is suggestive of the fact that *Haldi* (to be precise curcumin) can be a potential pharmacological agent for the treatment of dyslipidaemia. [18]

***Methi* (*Trigonella foenum*-graecum)**

Fenugreek belongs to the family Fabaceae. The name "*Methika*" or "*Methi*" is derived from the root word "*Medha*". It means which improves intellect. It is *Vatahara*, *Kaphahara* and *Raktapitta prakopoka*. It is bitter in taste. It improves appetite (*Aruchighna*) and strengthens digestive fire (*Deepana*). In Ayurvedic classics, it is mentioned for the treatment of *Jwara* (fever), *Agnimandya, Aruchi, Adhmana, Medoroag, Madhumeha* etc. It also improves breast milk secretion and provides strength to the female body after delivery.

In a clinical study involving 60 patients of Type – 2 diabetes with dyslipidaemia, 25grams of fenugreek seed powder per day was added to their food for 24 weeks. This not only lowered blood glucose level but also improved the lipid profile. The total cholesterol, Triglycerides, LDL and VLDL levels were reduced and HDL level was increased with statistical significance.[19,20]. Since most of the diabetics also present with typical dyslipidaemia, fenugreek can be a good choice in those patients.

***Shatavari* (*Asparagus racemosus*)**

Shatavari (*Asparagus racemosus*) belongs to the family Liliaceae. It is having *Madhura*, *Tikta rasa, Guru guna* and *Sheeta veerya*. It is said to have pacifying action on all the *Tridoshas*. It offers therapeutic benefits like *Hrudya* (cardio tonic), *Vrishya* (aphrodisiac), *Vajikara* (improves vigour and vitality), *Medhya* (improves memory and intelligence), *Rasayana* (antioxidant and rejuvenating), *Shukrala* (improves spermatogenesis) and *Stanyakara* (galactogogue). It is used to treat *Shukra dosha, Grahani, Arsha* (piles), *Bandhyatwa* (female infertility), *Khalitya* (alopecia), *Hridrog* (cardiac ailments), *Gulma, Atisara* (diarrhoea), *Shopha* (oedema) and *Akshi roga* (diseases of the eye).

An experimental animal study was conducted to evaluate the antioxidant and anti-hyperlipidaemic activity of *Shatavari*. Hyperlipidemia was first produced in the animals by mixing 0.75% of Cholesterol and 1.5% of bile salt in normal diet. Then the animals were treated by adding *Shatavari* root powder at 5% and 10% dose level in their normal diet. Plasma lipid profile and hepatic lipid profile were measured at the baseline and at the end of treatment by standard methods. Analysis of the results was done by using appropriate statistical method. This treatment significantly declined the plasma and hepatic lipid profile by increasing faecal cholesterol excretion. [21]

***Adrak* (*Zingiber officinale*)**

Adrak (Ginger) belongs to the family Zingiberaceae. It is a very popular herb in home remedies and traditional medicine. Lots of medicinal properties have been assigned in the credit of ginger. It is having *Katu rasa* (pungent taste), *Ushna veerya* and *Madhura veepaka*. It mainly pacifies *Kapha and Vata*. Ginger has pharmacological actions like *Deepana* (improves digestion), *Ruchikara* (improves appetite), *Hrudya* (cardio tonic), *Swasha Kasha hara* (useful in respiratory diseases like cough and asthma), *Vamihara* (anti-emetic), *Hikkahara* (relieves hiccups) etc.

It is used in the treatment of digestive disorders, respiratory disorders, diseases of throat, *Pandu*, *Shleepada* (filariasis), *Amavata* (rheumatoid arthritis) etc.

In an experimental study on wistar rats, the anti-diabetic and anti-hyperlipidaemic effect of ginger was proved. First hyperglycaemia was induced in the animals using single peritoneal injection of streptozotocin (50mg/kg body weight). This resulted in significant hyperglycaemia as well as dyslipidaemia in the experimental animals in comparison to control animals. Then the animals were treated with oral administration of free and bound polyphenolic extract of ginger in a dose of 500mg/kg body weight for 42

days. Significant reduction in blood glucose level, total cholesterol, LDL, VLDL and triglycerides was observed at the end of treatment. Apart from these, HDL level was found to be elevated. The results of the study are suggestive that Ginger can be a good option for treatment of diabetics with dyslipidaemia. [22]

Pippali (*Piper longum*)

Pippali is a well-known and extremely popular herb in folk and traditional medicine including Ayurveda. It is randomly used as a single herb and in combination with other herbs and minerals in Ayurvedic practice. It is one of the ingredients of "*Trikatu*" (a combination of *Sunthi, Pippali* and *Kali mirch*). It belongs to the family Piperaceae. Dry fruits of *Pippali* are mainly used in therapy.

It is having *Katu rasa, Madhura veepak, Snigdha guna* and *Anushna veerya. Doshik* actions are *Vata Sleshma hara* (pacifies *Vata* and *Kapha*) and *Pitta prakopaka* (aggravates *Pitta*).

Different therapeutic actions of *Pippali* are *Vrushya* (aphrodisiac), *Deepaneeya* (improves digestion), *Rasayan* (anti-ageing and antioxidant), *Rechak* (laxative) etc.

It is therapeutically used for the treatment of *Jwara* (fever), *Kushtha* (skin diseases), *Shwasha* (asthma), *Kasha* (cough), *Prameha, Gulma, Medoroga* (defective fat metabolism) etc.

The anti-hyperlipidaemic effect of *Pippali* was proved in two different experimental models (one acute and one chronic) of hyperlipidaemia. In acute model hyperlipidemia was induced by single intraperitoneal injection of triton WR-1339 in a dose of 400mg/kg body weight. In chronic model hyperlipidaemia was induced by feeding cholesterol rich high fat diet to the animals. Then the hyperlipidaemic rats were treated with *Pippali* fruit extract in a dose of 500mg/kg body weight for 15 days. It was observed that the treatment with *Pippali* fruit extract resulted in significant decrease in total cholesterol, phospholipids and triglycerides in both the models. Guggulipid developed by Central Drug Research Institute, Lucknow, was used as the standard drug. The results of the trial drug (*Piper longum* fruit extract) were comparable to the standard drug Guggulipid. [23]

Amlaki (*Emblica officinalis*)

Amla is another much popular herbal drug in Ayurveda. It is one of the ingredients of "*Triphala*" (combination of three fruits).

It belongs to the family Euphorbiaceae. It is having five *Rasas* except *Lavana* (salty) out of *Shadrasa*. It is also having *Seeta guna* and *Madhura veepaka*. It pacifies all the three *Doshas* (*Tridoshahara*) but mainly *Kapha* and *Pitta*.

Plenty of pharmacological actions have been assigned to *Amla* like: *Vrushya* (aphrodisiac), *Vayasthapana* (best ever anti-aging drug), *Chakshyushya* (good for the eyes), *Raasayana* (anti-oxidant), *Hrudya* (cardiac tonic) etc.

It is used to treat *Prameha, Kushtha* (skin diseases), *Jwara* (fever), *Daha* (burning sensation), *Hrudroga* (cardiac diseases), hair fall, *Amlapitta* (GERD), *Pandu* (anaemia), *Raktapitta* etc.

In clinical study was conducted by Tiwari et al to evaluate the effect of *Amlaki Rasayan* (an Ayurvedic formulation made out of *Amla*) on biological systems. *Amlaki Rasayan* was administered in its original form for 28 days to individuals with hypercholesterolemia and normal individuals within the age group of 35–55 years. It was observed that it significantly lowered total cholesterol, other lipoproteins like LDL and VLDL. But it had no effect on triglycerides. However, after 2 weeks of discontinuing the medicine the above parameters again came back to the original baseline value in hypercholesteraemic individuals. [24]

Kanchnar (*Bauhinia variegata*)

Kanchnar is mentioned in most Ayurvedic *Samhitas* and *Nighantus* for its multiple therapeutic properties. It belongs to the family Fabaceae.

It is having *Kashaya rasa, Laghu* and *Rukshya guna, Katu Veepak, Sheeta Veerya* and pacifies *Kapha* and *Pitta*. It can induce emesis (*Vamonopaga* as per Charak Samhita), *Krimighna* (anthelmintic), *Kushthaghna* (useful in skin diseases), *Grahi* (improves intestinal absorption) etc.

It is used by Ayurvedic practitioners mainly to treat (*Galaganda*) goitre and lymphadenopathy. It is also useful in treating *Arbuda* (tumors), *Krumi roga* (helminthiasis), *Kushtha* (skin disorders), *Guda bhramsa* (prolapse rectum), *Vrana* (ulcers) etc.

The anti-oxidant and anti-hyperlipidaemic activity was evaluated in an experimental study using albino rats. Hyperlipidaemia was induced by using Triton WR-1339 (iso-octyl polyoxyethylene phenol) in intraperitoneal route. Then the animals were treated with ethanolic and aqueous extracts of the stem bark and root of *B. variegata* Linn. Significant antioxidant and free radical scavenging activity were observed which was comparable to standard antioxidants. Significant reduction in total cholesterol, LDL, VLDL and triglyceride was also observed. HDL level was found to be increased significantly. In this study, the anti-hyperlipidaemic activity can be partly explained by the antioxidant activity of *Kanchnar*. [25]

CONCLUSION

Hyperlipidaemia and its potential complications including increased CVD risk has been emerging as a global challenge. Though statins are

already in use as first line therapy in such conditions still there are many unanswered questions. In this scenario, it is imperative to find out alternatives which should be economical, safe and effective. Medicinal plants can be used to treat hyperlipidaemia along with required dietary and life style modifications. From the available data it is clear that many Ayurvedic herbs have shown good results in improving lipid profile in both experimental and clinical studies. Most of the plants also exhibit potential anti-oxidant property. More importantly none of them were found to be having any serious adverse effects during the study. Hence medicinal plants mentioned in Ayurveda for the management of *Medoroga* can be a promising option for the management of hyperlipidaemia or dyslipidaemia. Their synergistic combinations can be further studied in this regard.

REFERENCES

1. Ramkumar S, Raghunath A, Raghunath S. Statin Therapy: Review of Safety and Potential Side Effects. Acta Cardiol Sin. 2016 Nov; 32(6): 631-639. doi: 10.6515/acs20160611a. PMID: 27899849; PMCID: PMC5126440.
2. Charaka Samhita of Agnivesa, Part-1, revised by Charaka and Dridhabala, elaborated by Pt. Kashinatha Shastry and Dr Gorakha Natha Chaturvedi, Chaukhambha Bharati Academy, Varanasi, 2005.
3. Sushruta Samhita of Maharshi-Sushruta Part-1, edited with Ayurveda-Tattva Sandipika, commentary by Kaviraja, Ambikadutta Shastri, Chaukhambha Sanskrit Sansthan, Varanasi, 2007; 143.
4. Astanga Samgraha of Shrimad Vruddha Vagbhata, commentary by Dr. Ravi Dutt Tripathi, Chaukhamba Sanskrit Pratishthan, Delhi; 322.
5. Sarangadhara Samhita, Acharya Sarangadhara, translated by K.R. Srikantamurty, Published by Chaukhamba Orientalia, Varanasi, 4th Edition – 2001.
6. Champe PC, Harvey RA, Ferrier DR. (2005). Cholesterol and Steroid Metabolism. In: Lippincott's Illustrated Review Biochemistry. 3rd ed., Lippincott Williams & Wilkins, Philadelphia. 217- 242.
7. Singh RB, Niaz MA, Ghosh S. Hypolipidemic and antioxidant effects of Commiphora mukul as an adjunct to dietary therapy in patients with hypercholesterolemia. Cardiovasc Drugs Ther. 1994; 8: 659-664.
8. Nityanand S, Srivastava JS, Asthana OP. Clinical trials with gugulipid. A new hypolipidaemic agent. J Assoc Physicians India. 1989; 37: 323-328.
9. Shirzad H, Taji F, Rafieian-Kopaei M. Correlation between antioxidant activity of garlic extracts and WEHI-164 fibrosarcoma tumor growth in BALB/c mice. J Med Food. 2011; 14: 969-974.
10. Kannar D, Wattanapenpaiboon N, Savige GS. Hypocholesterolemic effect of an enteric-coated garlic supplement. J Am Coll Nutr. 2001; 20: 225-231.
11. The Lipid Research Clinics Coronary Primary Prevention Trial results. I. Reduction in incidence of coronary heart disease. JAMA. 1984; 251: 351-364
12. Koscielny J, Klussendorf D, Latza R. The antiatherosclerotic effect of Allium sativum. Atherosclerosis. 1999; 144: 237-249.
13. Breithaupt-Grogler K, Ling M, Boudoulas H. Protective effect of chronic garlic intake on elastic properties of aorta in the elderly, Circulation. 1997; 96: 2649-2655.
14. Saxena, R.; Puri, A.; Khanna, A.K.; Bhatia, G.; Chander, R.; Rastogi, A.K., antidyslipidemic activity of Terminalia arjuna in high fat diet fed hamster. 2nd World Congress on "Biotecnological Development of Herbal Medicines" NBRI, Lukhnow, UP, India, P.41 February 20-22, 2003 (Eng).
15. Prakash, V., Sehgal, V. kumar, Bajaj, V. K., & Singh, H. (2016). To Compare the Effects of Terminalia Arjuna with Rosuvastatin on Total Cholesterol and Low Density Lipoprotein Cholesterol. International Journal of Medical and Dental Sciences, 1056 – 1066. https://doi.org/10.19056/ijmdsjssmes/2016/v5i1/83576
16. Dalu, Damayanthi; Ganesh, Y; Alagrsamy, V. Evaluation of antihyperlipidemic and Antioxidant Activity of Inula Racemosa Roots; Advances in Pharmacology and Toxicology; Jalgaon Vol. 18, Iss. 2, (Aug 2017): 25-42.
17. Singh J and Pandey A.K „Clinical evaluation of puskarmula (Inula racemosa) capsule in the patients of metabolic syndrome IJMPS, April 2014; 4(2): 09-20.
18. Dou X, Fan C, Wo L, Yan J, Qian Y, Wo X. Curcumin up-regulates LDL receptor expression via the sterol regulatory element pathway in HepG2 cells. Planta Med. 2008 Sep; 74(11): 1374-9. doi: 10.1055/s-2008-1081316. Epub 2008 Aug 14. PMID: 18704882.
19. Sharma RD, Sarkar A, Hazra DK, et al.Toxicological evaluation of fenugreek seeds: along term feeding experiment in diabetic patients. Phytother Res 1996; 10:519-520.28.
20. Sharma RD, Sarkar DK, Hazra B, et al. Hypolipidaemic effect of fenugreek seeds: a chronic

study in non-insulin dependent diabetic patients. Phytother Res 1996; 10: 332-334.

21. Visavadiya NP, Narasimhacharya AR. Hypolipidemic and antioxidant activities of Asparagus racemosus in hypercholesteremic rats. Indian Journal of Pharmacology. 2005 Nov 1; 37(6): 376.
22. Mutiu I Kazeem, Musbau A Akanji, Musa T Yakubu, Anofi OT Ashafa, Antiglycation and Hypolipidemic Effects of Polyphenols from Zingiber officinale Roscoe (Zingiberaceae) in Streptozotocin-Induced Diabetic Rats; Trop J Pharm Res; January 2015; 14 (1): 55-61
23. Verma P, Rathore B, Kumar V, Singh RK and Mahdi AA: Hypolipidemic activity of Piper longum in experimental hyperlipidemia. Int J Pharm Sci Res 2017; 8(8): 3385-90.doi: 10.13040/IJPSR.0975-8232. 8(8). 3385-90.
24. Tewari A, Sen SP, Guru LV. The effect of amlaki rasayana on biological system, J. Res. Indian Med. 1968; 2: 189.
25. Rajani GP, Ashok P. In vitro antioxidant and anti-hyperlipidemic activities of Bauhinia variegata Linn. Indian J Pharmacol. 2009 Oct; 41(5): 227-32. doi: 10.4103/0253-7613.58513. PMID: 20177495; PMCID: PMC2812783.

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