



Anti-obesity and hypolipidemic activity of siddha drugs: A review

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ABSTRACT

Obesity has reached epidemic proportions globally with more than one million adults overweight and at least 300 million of them are clinically obese. It poses a major risk for diseases like type 2 diabetes mellitus, hypertension, coronary heart diseases, stroke, obstructive sleep apnea, asthma, orthopedic disorders and certain forms of cancer. Siddha medicine is one of the oldest Indian systems of medicine which is believed to be originated more than 10,000 years ago. It takes human and nature as a part of closed system. In siddha, obesity has been dealt by various siddhas regarding its causes, signs and symptoms. Siddha being a medical science constitutes both preventive aspects as well as treatment aspects. This article reviews about the siddha medicinal herbs possessing hypolipidemic and anti-obesity property.

Keywords: Obesity, Hyperlipidemia, Siddha Medicine, Medicinal herbs.

INTRODUCTION

Obesity is a complex condition with serious social and psychological dimensions affecting all age and socio economic groups. The health consequences range from increased premature death to serious chronic conditions that reduce the overall quality of life. (WHO) Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a adverse effect on health leading to reduced life expectancy and an increased health problem. Presence of fat tissue is essential as natural energy reserve in our body. But excess fat tissue result in obesity and cause health disorder. India is currently experiencing rapid epidemiological transition. Under nutrition due to poverty is being replaced by obesity associated with affluence.

In Siddha system of medicine obesity is referred as **Athithoola Rogam** which is caused by aggravation of **Kabha** humor. The characteristic feature (GUNAM) of Kabha is heavy, dense, slow, sticky, wet, and cold. Agni plays a vital role in the digestion and metabolism. Excessive intake of Kabha diet results in agni mantham which leads to formation of seetham in the stomach. In athithoola rogam there is excess of Oon and kolluppu thathu which ultimately causes excess accumulation of fat in the breast, buttocks, thighs and abdomen.

Various treatment modalities have been mentioned in our Siddha literatures. Management of Obesity remains challenging till date. The selected drugs are safe, economical, easily available, easy to administer and can be used for longer duration. These drugs have strong literary evidence and scientific evidences.

WITHANIA SOMNIFERA- ASWAGANDHA:

Application in Siddha: Take dried root powder of *Withania somnifera* with boiled gruel to reduce weight.[1]

Pharmacological Study: *Withania somnifera* (WS) root powder decreases total lipids, cholesterol and triglycerides in hypercholesterolemic animals. On the other hand, significantly increased plasma HDL-cholesterol levels, HMG-co-A reductase activity and bileacid content of liver. Significant increase in urine sodium, urine volume, significant decrease in serum cholesterol, triglycerides, LDL and VLDL cholesterol were observed indicating that root of WS is a potential source of hypoglycemic, diuretic and hypocholesterolemic agents[2].

TERMINALIA CHEBULA-KADUKKAI:

Application in Siddha: The powder of *Terminalia chebula* (skin of kadukkai) was mixed with, *Terminalia bellerica* (thantrikai skin), *Phyllanthus emblica* (nellimulli), *Zingiber officinale* (dry

ginger), *Piper longum* (thipilli), rock salt (Inthuppu) powders in equal ratio and take 1 or 2 pinches of this mixture with gingelly oil twice daily. The body weight decreases within 6 months.[3]

Pharmacological Study: Treatment with Haritaki (*Terminalia chebula*) produced a significant decrease in the serum level of lipids in atherogenic diet induced hyperlipidemia in rats. Haritaki contains alkaloids, phytosterol, saponins, tannins, ellagic acid, gallic acid, chebulinic acid, chebulagic acid and corilagin. High amount of saponins, phytosterols, chebulinic acid and corilagin present in Haritaki is responsible for the hypolipidemic effect.[4]

ERYTHRINA VARIEGATA-MULL MURUNGAI:

Application in Siddha: 3 teaspoonful of leaf juice of *Erythrina stricta* (mull murungai ilaicharu) should be taken in the morning to reduce body weight.[5]

Pharmacological Study: *Erythrina variegata* (EV) of 1.39% w/w yielded β -sitosterol, oleanolic acid and β -sitosterol glycoside on column chromatographic processing. Serum lipid levels of the experimented animals shows a statistically significant rise in total cholesterol (TC 229%), low density lipoprotein (LDL 890%) and the atherosclerosis index (AI 254%) in animals compared to normal controls. EV administration reduced TC (33%), triglycerides (TGL 39%) and LDL level remain unaltered demonstrating its marginal hypolipidemic influence. Body weight changes of the experimentation 12% increase in group II, 8% increase in EV treated group III and 11.5% increase in group IV against 10% increase for normal control.[6]

AZIMA TETRACANTHA-SANGAN:

Application in Siddha: The body weight is reduced by taking the dried powder of root bark of *Azima tetracantha* along with ghee or honey[7]

Pharmacological Study: Friedelin isolated from *Azima tetracantha* showed protective action on high fat diet induced hyperlipidemic rats, as it significantly increased the serum HDL-cholesterol levels. Friedelin also lowers triglyceride level and this effect might be related to increase in the endothelium bound lipoprotein lipase which hydrolyses the triglycerides into fatty acids.[8]

SOLANUM NIGRUM-MANITHAKKALI:

Application in Siddha: Fried dry fruit of *Solanum nigrum* and ghee is given with rice to maintain the body structure.[9]

Pharmacological Study: *Solanum nigrum* fruit extract (SNFE) restored the lipid level to near normal indicating the efficacy of *Solanum nigrum* showing anti-hyperlipidemic activity. *Solanum nigrum* glycoprotein possess hypolipidemic activity in normal mice. The possible reason for the lowering of cholesterol level in that the HMG-co-A reductase activity may last through phosphorylation of cAMP dependent protein kinase (pkA), which is activated by *Solanum nigrum* glycoprotein therefore we speculate that SNFE modulates the lipid abnormalities by inhibiting the activity of hepatic HMG-co A reductase thus bringing the lipid levels to normal.[10]

BOERHAVIA DIFFUSA-MOOKIRATAI:

Application in Siddha: Green leaves of *Boerhavia diffusa* have blood purifier action and should be taken regularly to reduce body weight.[11]

Pharmacological Study: Recent investigations have revealed the efficacy of *Boerhavia diffusa* as an antioxidant and hypolipidemic effect by analysing all parameters in plasma lipoprotein lipids, total cholesterol (TC), Triglycerides (TGL), VLDL-c, LDL-c, WDL-c, (MDA) malondialdehyde and in-vitro oxidizability of LDL[12]

BAUHINIA PURPUREA-MANTHARAI:

Application in Siddha: Decoction of *Bauhinia purpurea* root cures peptic ulcer diseases. On having regularly it decreases body weight[13]

Pharmacological Study: The antihyperlipidemic activity may be due to the presence of polyphenolic compounds flavanoids, tannins and proanthocyanidines in the ethanolic extracts, which reduce oxidation of LDL-c. This needs to be studied further by assay of oxidised LDL. The ethanol extract of leaves have significant weight reduction property than unripe pods extract which was comparable to that of atrovastatin. Ethanol extract of leaves also had a marked effect on antihyperlipidemic activity[14]

AEGLE MARMELOS-VILVAM:

Application in Siddha: Decoction of root or root bark of *Aegle marmelos* should be taken to reduce weight[15]

Pharmacological Study: The levels of serum total cholesterol, triglycerides, LDL and VLDL were significantly reduced in the aqueous extract of *Aegle marmelos* treated diabetic animals. This might be due to the reduced hepatic triglyceride synthesis and or reduced lipolysis that might be due to the increase in serum insulin levels in the plant extract treated animals. The high-density lipoprotein (HDL) was significantly ($p < 0.001$) increased in the

plant extract treated animals indicating a reversed atherogenic risk[16]

CASSIA ITALICA-NILAVARAI:

Application in Siddha: Verukadi alavu leaf powder of *Cassia italica* should be taken with honey twice daily to reduce weight and with bitter gourd leaf juice to gain weight [17].

Pharmacological Study: The aqueous and ethanolic extract of *Cassia italica* leaves have lipid lowering effect as evidenced by their remarkable improvement due to diabetes, its specific effect on HDL cholesterol has additional advantage in checking coronary risks[18]

ECLIPTA PROSTRATA-KARISALAI:

Application in Siddha: 5 gram of leaf powder of *Eclipta prostrata* should be taken with water in the morning to reduce weight [19]

Pharmacological Study: The aqueous extract of *Eclipta prostrata* contains alkaloids, phytosterols, flavanoids, saponins, tannins, sugars, gums and mucilages. The high amount of saponins and phytosterols present in *Eclipta prostrata* may be responsible for the hypolipidemic effect. It has been proved that the level of total serum cholesterol, triglyceride and total protein which are actually raised in atherogenic diet can be lowered significantly with the aqueous extract of *Eclipta prostrata*[20]

MACROTYLOMA UNIFLORUM-HORSE GRAM:

Application in Siddha: 2 tablespoon of horse gram powder should be taken with sugar and hot milk twice daily to reduce the body weight and gain strength[21]

Pharmacological Study: Oral administration of *Macrotyloma uniflorum* at doses 200 and 400 mg/kg to obese diabetic rats for 4 weeks significantly ($p < 0.05$) decreased the elevated serum levels of TC and TG when compared with control rats. Serum analysis revealed that male rats fed on cholesterol for 6 weeks had a significant decrease in high density lipoprotein (HDL-c) increase in LDL-c and VLDL when compared with negative control group[22]

MORINGA OLIFERA-MURUNGAI:

Application in Siddha: Prepare rasam from the immature pods of *Moringa olifera* and have regularly. It reduces bad cholesterol in the body and it is used best for gall stones[23]

Pharmacological Study: The *Moringa olifera* plant has a wealth of naturally occurring nutrients along with vitamins, minerals, protein and also contains essential amino acids, chlorophyll, omega-3 oils and other important poly nutrients. This

vegetable tree is known to contain 15 times the potassium in banana, 17 times the calcium in milk, 4 times the vitamin A found in carrot, 25 times the iron in spinach and one half times the vitamin C in oranges. By consuming ozone the nutrients present in the *Moringa* naturally gets absorbed by our body. Daily intake of ozone *moringa* will provide the antioxidant daily which in turn keeps the body healthy and preventing the adverse effect caused due to fat deposition [24]

TRITICUM AESTIVUM- WHEAT:

Application in Siddha: Boiled gruel of *Triticum aestivum* should be taken with honey to reduce body weight[25]

Pharmacological Study: Ethanolic extract of *Triticum aestivum* sprout (TAE) is administered for 6 weeks significantly decreased the body weight, serum total cholesterol (TC) and LDL-cholesterol level in high fat diet fed mice. TAE treatment reduced lipid accumulation in epididymal white adipose tissue (EWAT) and liver. Moreover TC and lipid levels were decreased by TAE treatment in liver. Serum leptin and adiponectin concentrations were reduced by TAE treatment. TAE treated mice showed decreases in peroxisome proliferator activated receptor Y (PPAR) and fatty acid synthase expression in EWAT. Furthermore, TAE administration elevated levels of PPAR α -protein in the liver of HFD-induced obese mice. These results suggest that TAE supplementation might be beneficial for the treatment and prevention of obesity and related diseases [26]

TRIBULUS TERRESTRIS-NERUNJIL:

Application in Siddha: Powder of *Tribulus terrestris*, *Hygrophilla auriculata* (Neermulli), *Pimpinella anisum* (Sombu), *Coriandrum sativum* (Kothamalli) in equal ratio should be taken. The decoction of this powder with milk and sugar twice daily instead of having coffee to reduce body weight[27]

Pharmacological Study: The preventive and therapeutic effects of saponins from *Tribulus terrestris* L. on diet induced hyperlipidemia in mice have been studied. It showed that in preventive experiment the saponin could significantly low the levels of serum TC ($p < 0.05$), LDL-c ($p < 0.01$), liver TC ($p < 0.05$), TG ($p < 0.05$) and increase the activities of superoxide dismutase (SOD) in liver. The therapeutic experiment showed that the saponin could significantly reduce the contents of serum total cholesterol ($p < 0.05$) and liver TC[28]

RICINUS COMMUNIS-CASTOR:

Application in Siddha: Half tumbler of soaked water of *Ricinus communis* root should be taken to

reduce belly fat. Salt deposits down on boiling the soaked water. Having 2 pinches of this salt with boiled gruel gradually reduces the body weight[27]

Pharmacological study: The observed significant increase ($p < 0.05$) in the level of serum TC ,TG , LDL , coronary heart disease risk ratio and a significant decrease ($p < 0.05$) in the level of HDL in the serum of cadmium treated rats as compared to normal control is an evidence of hyperlipidemia. *Ricinus communis* leaf extract demonstrated hypolipidemic activity as it significantly reduced triglyceride , cholesterol , LDL , coronary heart disease risk ratio and increased HDL in rats serum presenting the herb as a candidate drug in the treatment of hyperlipidemia and cardiovascular diseases. The hypolipidemic and blood boosting activities of the leaf can be ascribed to its phytochemical constituents which are tannins, phlobatannins, flavanoids, steroids, terpenoids, saponins and cardiac glycosides[29]

CISSUS QUADRANGULARIS – PIRANDAI:

Application in Siddha: 1 teaspoon of *Cissus quadrangularis*, rock salt powder and lemon juice (5 lemons) and dry it. Take ½ teaspoon of this mixture with food or water after food to reduce body weight. It also cures low back pain especially for ladies[27]

Pharmacological Study: Combination of *Cissus quadrangularis* (CQ) and *Irvingia gabonensis* (IG) had a synergistic effect on the reduction of total cholesterol, LDL-cholesterol and fasting blood. Glucose compared to CQ only, thus creating a better anti – antherogenic agent. The efficacy of CQ has been linked to its content of various steroidal principles , a novel flavanoid (3-0-alpha-L-rhamnopyranosylkaempferol) and stibene (3-(4-hydroxybenzylidene)-2-(2,5 – dihydroxy phenyl)-1-(4- hydroxyphenyl)indane-4,6-diol) as well as four known structurally related flavanoids and on stilbene. These components has the ability to inhibit certain enzymes like alpha amylase , glucosidase and lipase. IG seeds, on the other hand, have been shown to have hypocholesterolemic, hypoglycemic, anti - amylase, anti- lipase and anti-oxidant properties [30]

ZIZIPHUS MAURITIANA – ILANTHAI:

Application in Siddha: Leaf paste of *Ziziphus mauritiana* was made gruel and that kadhuneer was taken to reduce lower abdomen fat[27]

Pharmacological Study: The aqueous extract and the non-polysaccharide fraction of the aqueous extract of *Ziziphus mauritiana* were found to exhibit significant anti-hyperglycemic effect and hypoglycemic activities. Treatment of diabetic rats with petroleum ether extract, aqueous extract and non - polysaccharide fraction of this plant restored the elevated biochemical parameters glucose , urea,

creatinine, serum cholesterol, serum triglyceride, HDL, LDL, haemoglobin and glycosylated haemoglobin significantly to the near normal level[31]

HYGROPHILLA AURICULATA-NEERMULLI:

Application in Siddha: The root powder of *Hygrophilla auriculata* was taken with honey to reduce body weight[32]

Pharmacological Study: Triglycerides and cholesterol level in serum were found to be significantly increased in DOX induced MI rats when compared to control rats. Serum triglycerides and cholesterol levels plays important role in cardiovascular functions. Result indicates that pre-treatment with different fractions of *Hygrophilla auriculata* methanolic extracts at doses 100,200 mg /kg showed decrease in serum triglycerides and cholesterol level. It was observed that as compare to other fraction n-butanol fraction of both the plant methanolic extract at dose level 100 mg/kg shows significant decrease ($p < 0.05$) in serum triglycerides and cholesterol level as compare to DOX treated group which indicate protective potential of n-butanol fraction[33]

RAPHNUS SATIVUS – RADISH:

Application in Siddha: Taking the tuber of *Raphnus sativus* regularly reduces body weight[34]

Pharmacological Study: *Raphnus sativus* is one of the medicinal plant that prevent injuries to the colon in high fat diet rats. Some reports show that *Raphnus sativus* can decrease the plasma cholesterol, triglyceride and phospholipid in normal rats. It seems that *Raphnus sativus* increases the lipid metabolism and lowers the lipid plasma by increasing the activity of lipoprotein lipase. Black radish juice is shown to increase anti-oxidant enzymes, resulting in a significant improvement of hyperlipidemia. This extract has anti-oxidant properties and decrease free radicals. Therefore, perhaps the use of *Raphnus sativus* in those who have hyperlipidemia leads to reduction of free radicals. In conclusion it seems that *Raphnus sativus* decreases plasma triglyceride but it has no role in controlling glucose and cholesterol[35]

EMBELIA RIBES – VAIVILANGAM:

Application in Siddha: Kondavai vilangam kollum, Kothumbai sakalathi, Vindathil vennai kukil, Vengaiyum kodiaveli, Kandidum kadukkai logam, Karpoora silaiyum thenum, Andiyae yavacha rantha, Nathithoola haranga lamae[36]

Pharmacological study: In the present study, elevated levels of homocysteine, LDH, TC, TG, LDL-c and VLDL-c in serum and LPO in brain homogenates were reduced significantly ($p < 0.01$) after treatment with aqueous extract of *Embelia*

ribes. Further there was decrease in the atherogenic index values suggesting antihyperhomocysteinemic and antihyperlipidemic potential of *Embelia ribes*. Further, the levels of HDL-c in serum and GSH in brain homogenates were increased significantly ($p < 0.01$) thereby, enhancing the endogenous antioxidant levels. And also, the result of test drug were comparable to folic acid, a standard positive control [37]

CONCLUSION:

Athithoolarogam (obesity) as discussed earlier is known to be caused by aggravation of Kabha thathu which in turn causes accumulation of Oon and Kozhupu udal thathu in various body parts

such as thighs, buttocks, chest, abdomen etc. This condition can be treated by using medicinal plants having bitter, astringent and pungent tastes which directly acts on kabha thathu. Herbs mentioned in the article such as *Withania*, *erytherina*, *azima*, *boerhavia*, *aegle*, *cassia*, *eclipta*, *ricinus*, *embelia*, *moringa* has bitter taste where as *macrotyloma*, *zizyphus*, *tribulus*, has astringent taste. *Cissus* and *hygrophilla* has pungent taste. Antiobesity property of herbs which are discussed in this article are mentioned elaborately in ancient siddha literatures. Further their antiobesity effects have been scientifically validated based on the phytochemicals present in them. This article can be used as a platform for conducting clinical trials.

ANTIOBESITY AND HYPOLIPIDEMIC DRUGS

1. WITHANIA SOMNIFERA - Aswagandha

Used Part : Root



2. TERMINALIA CHEBULA - Kadukkai

Used part: FRUIT SKIN.



3. ERYTHRINA VARIEGATA - Mull murungai

Used part: LEAF EXTRACT



4.AZIMA TETRACANTHA

Used part: ROOT BARK



5.SOLANUM NIGRUM-Manithakkali:

Used part: DRY FRUIT.



6.BOERHAVIA DIFFUSA-Mookirattai:

Used part : GREEN LEAF.



7.BAUHINIA PURPUREA-Mantharai:

Used part: Root



8.AEGLE MARMELOS-Vilvam:

Used part: ROOT/BARK



9.CASSIA ITALICA-Nilavarai:

Used part: LEAF



10.ECLIPTA PROSTRATA-Karisalai

Used part: LEAF



11.MACROTYLOMA UNIFLORUM-Horse gram

Used part: SEEDS.



12.MORINGA OLIFERA-Murungai

Used part: IMMATURE POD



13.TRITICUM AESTIVUM-Wheat:

Used part: SPROUT



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14.TRIBULUS TERRESTRIS-Nerunjil:

Used part-DRIED NUTLETS



15. RICINUS COMMUNIS-Castor

Used part-Root



16. CISSUS QUADRANGULARIS-Pirandai:

Used part- Leaf



17. ZIZIPHUS MAURINTIANA-Illanthai:

Used part: LEAF



18.HYGROPHILLA AURICULATA-Neermulli

Used part: ROOT.



19.RAPHNUS SATIVUS-Radish:

Used part: ROOT TUBER



20.EMBELIA RIBES-Vaivilangam

Used part:SEEDS



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