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Some Herbs for Management of Disorders of Lipid Metabolism

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Abstract

Ayurveda is the oldest scientific system of medicine. It considers that root cause of all types of disorders is vitiation of *agni*. If *agni* is in its natural form, person is healthy and otherwise diseased. Therapeutic agents used in this system are mainly from herbal origin. Various herbs have been indicated for the treatment of *medoroga* i.e. the disorders of lipid metabolism. *Trigonella foenum-graecum* (Fabaceae) and *Cyperus rotundus* (Cyperaceae) are very common herbs used for the treatment of various diseased conditions and have the potential to cure disorders of lipid metabolism.

Keywords: Ayurveda; Agni; Disorders of lipid metabolism; *Trigonella foenum-graecum; Cyperus rotundus*.

Introduction

Ayurveda is the oldest codified system of medicine being practiced in Indian subcontinent since time immemorial. It is based on the theory of similarity between man and universe.[1]. *Agni* has been considered the basic factor for the proper digestion of ingested food and its assimilation in the body. *Mandagni* (diminished power of digestion) is considered to be the basic factor responsible for all the disorders and diseases. Thirteen types of *Agni* (digestive factors) in their normal states have been considered to play their role in the proper nourishment and built-up of body tissues.[2] All the seven *dhatus* viz. *Ras, Rakta, Mamsa, Meda, Asthi, Majja* and *Shukra* are nourished from previous *dhatu* by the action of *Dhatwagni.[3]* If this factor, responsible for nourishment of *Dhatu* is deficient in action, it results in the formation of *Ama* (improperly digested poor quality *dhatu*) which is *guru* and *picchila* (heavy and slimy) and tends to stangnate the proper flow of body fluids.[4] *Medoroga* results from the vitiated digestive power responsible for the formation of *medodhatu*. *Medodhatu* thus produced in the body is of low quality and tends to block the body channels (*dhamani, shira and shrotasa*) resulting in the impairment in the flow of body fluids which ultimately results in various disorders of vascular system.[5] It is a well accepted fact that high level of cholesterol is not always harmful to the body, even persons with high cholesterol levels lead a good quality life because cholesterol is an important biological molecule involved in various biological reactions in the body and must for the proper functioning of human physiology. [6] Here the concept of *Amamedodhatu* (low quality cholesterol/lipids) and *Pakvamedodhatu* (properly digested high quality cholesterol/lipids) comes in force which was stressed upon by Acharya Charaka.[7]

Thus it may be concluded that *medoroga* is the result of *mandagni (Medodhatwagnimandya*) due to various etiological factors which are similar to those responsible for causation of *prameha*.[8,9] Various herbal remedies, simple and poly herbal formulations are in practice for the management of *medoroga* and resulting clinical conditions like hyperlipidemia, atherosclerosis etc. Some of the important

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herbs are being reviewed here.

Trigonella Foenum-graecum Linn. (Family: Fabeaceae)

Sanskrit-Methika, Hindi-Methi, English-Fenugreek

Morphology

Methi consists of seeds of *Trigonella foenum-graecum* Linn. (Family: Fabeaceae), an aromatic, 30-60 cm. tall, annual herb, cultivated throughout the country. Two types are known a dwarf type is used for culinary purposes and tall type is used for fodder. The seeds are aromatic, bitter, carminative, tonic and a galactogogue.[10]

Phytochemistry

Alkaloids, sapogenins and mucilage are major constituents. The seeds are rich source of dietary fiber with 45-60 percent total carbohydrates, mostly soluble fiber present as mucilage, 20-30 percent protein and 10 percent of fixed oil. Several steroidal saponins are present in seeds. The bitter taste of the seeds is because of the presence of furostanol saponins. Also present or sterols, flavonoids, alkaloids such as trigonelline, 0.015 percent of an essential oil,[11] and amino acids including the novel insulin secreting amino acids 4-hydroxyisoleucine.[12]

Pharmacotherapeutics

1. *Classical Pharmacology: Rasa – Tikta, Guna – Snigdha, Virya – Usna, Vipaka – Katu, Karma – Dipana, Kaphahara, Rucya, Vatahara*.[13]
2. *Pre-Clinical Pharmacology:* Fenugreek seeds have been shown to reduce lipid levels in a number of experimental animals such as dogs, rats and rabbits. There was significant reduction of serum cholesterol levels ($p<0.00005$) in both normal (42%) and hypercholesterolemic (58%) rats feeding with diet of 50 percent *Trigonella foenum-graecum* seeds.[14] The saponin fraction that interacts with the bile salts has been shown to reduce cholesterol levels in rats[15] Ethanol extract contains hypoholesterolemic constituents likes saponins, which led to a 18-26 percent reduction in plasma cholesterol in rats.[16] In dogs the lipid extract had no effect on cholesterol levels, but the fiber rich (53.9%) and saponin containing (4.8%) defatted portion showed significant reduction of cholesterol level in normal and in hypercholesterolemic dogs.[17] A principle isolated extracts showed hypoglycemic, hypocholesterolemic and hypotriacylglycerolemic activities in hyperlipidemic rabbits.[18]

Classical Uses

1. *Indigestion: Methika, candrasura, kalajaji* and *yavani* - These four constitute *caturbijja* (four seeds). Its powder alleviates vatavyadhi, indigestion, colic, flatulence, pain in flanks and lumbago.[19]
2. *Puerperal Disorders:* It is one of the ingredients in *pancajiraka paka*.[20]

Part Used: Seeds.

Dose: Powder-3-5 gm.[20]

Clinical Studies

In an open exploratory trial 10 hyperlipidemic patients were given isocaloric diets with or without the addition of 100 gram of de-bitterized fenugreek powder for 20 days. Patients receiving a diet with added fenugreek showed significant reduction in total serum cholesterol, LDL, VLDL cholesterol, and tiglyceride level. HDL cholesterol did not change but ratios with respect to total cholesterol and LDL and VLDL showed a favorable change.[21] In patients with mild to moderate hypercholesterolemia[22], fenugreek seeds were able to reduce cholesterol levels. In another open trial, 20 hypercholesterolemic patients, aged 50-65 years, were given germinated fenugreek seeds

powder in packets of 12.5 gram and 18 gram to incorporate daily one packet into any food of their choice for one month. It was found that fasting blood levels taken one day before the start of trial and after the treatment period of one month showed significant reduction of total cholesterol and LDL levels at the 18 gram dose level, although there was a hypolipidemic effect at both levels. Germination was found to bring about definite changes in the soluble fiber content of the seeds.[23]

In a single blind trial with placebo control, 18 hypercholesterolemic patients were divided into three groups and were given 50 gram packets of defatted deodorized fenugreek seed powder, 50 gram placebo powder, or 25 gram placebo powder plus 25 gram FG powder to be taken orally before lunch and dinner for 20 days. Lipid profiles were checked with fasting blood samples on 0, 10, and 20 days. Significant changes in total cholesterol, triglycerides, and VLDL levels were seen in both the fenugreek groups as compared to placebo.[24]

Drug Safety

In clinical trials, generally no side effects have been reported at lower dosage levels of 15-25 gm seeds[25,26], however with 100 gm of fenugreek some patients complained of diarrhea and flatulence[27]; few patients had GI disturbances even at 25 gm.[28,29] There was no toxic effects on liver or kidneys and blood parameters in a long term clinical trial on diabetic patients.[30]

Cyperus Rotundus Linn. (Family: Cyperaceae)

Sanskrit: *Mustaka, Varida*; Hindi: *Motha, Nagarmotha*; English: Nut Grass

Morphology

Musta consists of dried rhizome of *Cyperus rotundus* Linn.(Cyperaceae) occurring throughout the country, common in waste grounds, gardens and road sides, up to an elevation of 1800 metre.[31]

Phytochemistry

Several chemical compounds have been isolated from world's worst weed *C. rotundus[32]* and some of these chemicals possess medicinal properties and are used in Latin America, China, India and elsewhere. [33-35] Various preparations of *C. rotundus* have been used for centuries in perfumes, spices and traditional medicines in India, China, Arab and Africa. It is also an important ingredient of anti-aging Ayurvedic neutraceutical Chyavanprash.[35] Different phytochemical studies on *C.rotundus* revealed the presence of alkaloids, flavonoids, tannins, starch, glycosides, furochromones, monoterpenes, sesquiterpenes, sitosterol, fatty oil containing a neutral waxy substance, glycerol.[36,37,38-39] The major compounds isolated from essential oil and the extracts of *C. rotundus* rhizome are Alpha-cyperone, Alpha-rotunol, Beta-cyperone, Beta-pinene, Beta-rotunol, Beta-selinene, Calcium, Camphene, Copaene, Cyperene, Cyperenone, Cyperol, Cyperolone, Cyperotundone, D-copadiene, D-epoxyguaiene, D-fructose, D-glucose, Flavonoids, Gamma-cymene, Isocyperol, Isokobusone, Kobusone, Limonene, Linoleic-acid, Linolenic-acid, Magnesium, Manganese, C. rotunduskone, Myristic-acid, Oleanolic-acid, Oleanolic-acid-3-o-neohesperidoside, Oleic-acid, P-cymol, Patchoulenone, Pectin, Polyphenols, Rotundene, Rotundenol, Rotundone, Selinatriene, Sitosterol, Stearic-acid, Sugeonol, Sugetriol.[40-43] *C. rotundus* contains an essential oil that provides characteristic odour and taste of the herb, comprised of mostly sesquiterpene hydrocarbons, epoxides, ketones, monoterpenes and aliphatic alcohols. [42-43]

Classical Pharmacology

Rasa - Katu, tikta, kasaya; Guna –Laghu, Ruksha; Virya –Sita; Vipaka –Katu; Karma – Sothahara, Dipana, Grahi, Krimighana, Pachana, Vishagahana, Pittakaphahara, Sthoulyahara, Trishnanigrahana, Tvakadosahara, Jvaraghna. [31]

Pre-Clinical Pharmacology

Cyperus rotundus Linn. preperations (powder in fine suspension, aqueous and alcoholic extracts) exhibited a lipolytic action and mobilized fat from the adipose tissue in rats, thus helping to reduce the obesity.[44] It was also demonstrated that administration of 45 or 220 mg/kg/day of its tubers hexane extract for 60 days in Zucker rats induced a significant reduction in weight gain without affecting food consumption or inducing toxicity. *In vitro*, the extracts was able to stimulate lipolysis in 3T3-F442 adipocytes suggesting that this medicinal plants contains activators of â adrenoreceptors (AR). The binding assay performed on the rat â-3 AR isoform, known to induce thermogenesis, demonstrated that tubers extract can consistently and effectively bind through this receptor. These data suggest that the effect on weight gain exerted by the tubers extract may be meditated, at least partially, through the activation of â-3AR.[45]

In another study administration of *C. rotundus* extract restored the age associated change in serum lipids (total cholesterol, LDL cholesterol, DL cholesterol, triglycerides and VLDL triglyceride level) to the level of young control rats. In young rats, treatment of *C. rotundus* significantly increased HDL cholesterol level.[46]

Pharmacology

Scientific studies based on clinical and pharmacological data have shown that it is a good remedy for indigestion in the light of constituents present in it, for example, there are many enzymes for carbohydrates and minerals which act as catalyst for various biochemical reactions and helps indigestion. It is also useful for dietary management of psychotic diseases and metabolic disorders. [47]

Classical Uses

1. *Sthoulya (Obesity): lekhaneeya mahakashaya[48]* and *lekhan basti[49]* are indicated for the treatment of *sthoulya*.
2. *Agnimandhya/Atisar*: A. water processed with *Vacha* and *Musta[50]*, Decoction of *musta* alone mixed with honey [51], *Musta* rhizomes (twenty in number) should be boiled in milk with 3 times water and reduced to milk[52] are indicated.

Clinical Studies

A pilot study carried out on 30 obese people treated with the powdered tuber of *C. rotundus* for 90 days, showed reduction in weight along with a decrease in serum cholesterol and triglycerides.[53]

Conclusion

Hyperlipidaemia and obesity are among the most common life style disorders resulting from faulty life style, changing food habits and many other factors associated with so called modernization. Presently, chemically synthesized drugs are used to combat the situation. It is a well known fact that these synthetic drugs adversely affect the overall physiological processes of biological systems. Therefore it is advisable to manage these situations with the use of natural medicines. Both the drugs discussed above are abundantly available and can be effectively used for the management of challenging situations like obesity and hyperlipidaemia.

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