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Research Article

PHYTOCHEMICAL, PHARMACODYNAMIC AND PHARMACOTHERAPEUTIC ACTIONS OF *DASANGA GUGGULU*. AN AYURVEDIC HYPOLIPIDEMIC FORMULATION - A REVIEW

Jayasinghe JMGSL[1*], Kulatunga RDH[2], Rathnapala DUS[3]

[1]MD (Ayu) scholar, Institute of Indigenous Medicine, University of Colombo. Rajagiriya, Sri Lanka
[2]MD(Ay.), PhD (Kayachikitsa), Senior lecturer, Department of Kayacikitsa, Institute of Indigenous Medicine, University of Colombo, Sri Lanka
[3]MBBS(col), MD(col) (Medicine), National Hospital of Sri Lanka, Colombo, Sri Lanka

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*Corresponding Author: **Jayasinghe J M G S L, MD (Ayu) scholar,**
Institute of Indigenous Medicine,University of Colombo. Rajagiriya, Sri Lanka. Medical Officer at Welagedara Ayurvedic Hospital, Kurunegalla, North Western Province, Sri Lanka. Mobile: +94726551711

ABSTRACT

Hyperlipidemia is one of the greatest health issue in the world which has become a huge burden for health sector in globally. Elevated concentrations of any or all the lipids in the plasma, including hypertriglyceridemia, hypercholesterolemia, is called Hyperlipidemia. In Ayurvedic view point hyperlipidemia can be correlated with Medo Roga, which has been defined as an accumulation of excessive and abnormal quantity of Medo Dhatu along with Mansa Dhatu, resulting increased body size and the pendulous appearance in buttock, belly, and the breast. For thousands of years Dasanga Guggulu has been used as one of the best remedy among hundreds of successful hypolipidemic medications. The object of this study was to identify phytochemical, pharmacodynamics and pharmacotherapeutic actions of Dasanga Guggulu.Authentic Ayurvedic texts, various scientific books, journals, and internet have been reviewed to collect the data. It is found that main Doshsa and Dushyas of Medo Roga are Kapha Vata and, Medha while Dasanga Guggulu has the properties of Kapha Vata Shamaka and Medo hara therapeutic actions which are originated by *Katu* ,Thikta, Kashaya Rasas, Lughu, Ruksha Gunas and Katu Vipaka and Ushna Veeryas. Concluding the literary survey, that can be emphasized the drug –Dasanga Guggulu is highly effective on Medo Roga which reduces hyperlipidemia and obesity.

Keywords: Medo Roga, Dasanga Guggulu, health issues, Rasa, Guna,Veerya, Vipaka.

INTRODUCTION

Hyperlipidaemia, one of major health issue, is being developed globally in this century. It is defined as elevated concentrations of any or all the lipids in the plasma, including hypertriglyceridemia, hypercholesterolemia etc[1]. Less physical activities, sedentary life style and mental stress are negatively influenced on increasing serum lipids level. Due to modernization of the society people can't get rid of instant lifestyle pattern, therefore billions of people are prone to have hyperlipidemia or suffering from hyperlipidemia all over the world. It is a huge burden for health sector to come across an effective and less side effective drug for this ailment. Even though there are number of synthetic drugs available in the market, they have considerable side effects such as headache, difficulty in sleeping, flushing of the skin, muscle aches, drowsiness, memory loss etc. So there is a great demand for less side effective natural remedies as preventive as well as curative aspect for hyperlipidemia. Ayueveda; the most prehistoric natural medicinal method in the world has mentioned about this disease under the topic of Medo Roga and Athisthaulya. Its causative factors, pathogenesis and treatment methods were described elaborately in Ayurvedic authentic literature. These treatments have been practiced over thousands years in India, Sri Lanka and several southern Asian countries effectively. The formulation of Dasanga Guggulu is mentioned in a classical text of Ayurveda –Bhava Prakasha under the Staulya Roga Adkaraya[2]. This formulation is specially prescribed for Sthaulya Roga and for diseases which are produced by Medas, Kapha, Ama, and Vata[3] . The Sthaulya means increased bulkiness and heaviness of the body due to accumulation of excessive Kapha Dosha, Medo Dhatu and Ama Visha due to over nutrient. Over nutritious diseases are called as Ati Santarpaniya Janya Roga in Ayurveda and the best remedy for Santarpana is Apatarpana (emaciate the body)[4]. This study has been focused to review data regarding phytochemical, pharmacodinamic, and pharmaco thetapeutic actions of Dasanga Guggulu and to identify the possible mode

of action of the drug against increased lipids. Dasanga Guggulu has been identified as one of the best remedy for hyperlipidemia with the efficacy of emaciation due to properties of its ingredients. By its name Dasanga Guggulu contains ten ingredients, namely Viyosha, Agni, Tripala, Musta, Vidanga and Guggulu. Viyosha means a group of drugs that contains medicinal parts of three herbs i.e Shunti, Maricha,Kana. A very famous group of drugs in Ayurveda; Tripala contains three fruits of Haritaki, Vibhithaki, Amalaki. Other ingredients are Agni, Musta,Vidanga and an aromatic resin –Guggulu.

Ingredients of Dasanga Guggulu

"Vyoshagni Tripala Musta Vidanga Guggulnsamam Khadan sarvan jayet vyadin medashleshmama vatajan" [5]

Table 1: Ingredients of *Dasanga Guggulu*

Sanskrit name	English name	Botanical name	Part of use
1.Shunti	Ginger	*Zyngiber officinale*	rhizomes
2.Maricha	Black pepper	*Pipper nigrum*	Dried fruit
3.Kana	Long pepper	*Piper longum*	Dried fruit
4.Chithraka	Ceylon lead wart	*Plumbago zeylanica*	roots
5.Haritaki	Chebulic myrobalan	*Terminalia chebula*	Dried fruit
6.Vibhithaki	Bastard myrobalan	*Terminalia balarica*	Dried fruit
7.Amalaki	Indian goose berry	*Emblica officinalis Gaertn*	Dried fruit
8. Mustha	Brown nut sedge	*Cyperus rotundus*	rhizomes
9.Vidanga	False black pepper	*Emblica ribes*	Dried fruit
10. Gugul	Mukul	*Commiphora wightii*	Aromatic resin

Figure 1: Ingredients of Dasanda Guggulu

MATERIALS AND METHODS

Information of phyto chemical, pharmaco dynamics, pharmaco therapeutic, and pharmacological actions of *Dasanga Guggulu* have been gathered from Authentic Ayurvedic texts; *Charaka Samhitha, Susruta Samhitha, Ashtanga Hrada Samhita, Dhanvantarai Nigandu, Bhava Prakash*, latest texts books of Botany, the Ayurvedic pharmacopeia of Sri Lanka, the Ayurvedic pharmacopeia of India and previous advanced research articles relating with Ayurveda. The traditional knowledge of Ayurvedic practitioners and laymen were helpful to identify the therapeutic effects of ingredients of Dasanga Guggulu. In spite of that the drug has been prepared at the Ayurvedic Teaching Hospital in Borella, Sri Lanka and tested its therapeutic effect clinically to identify the efficacy on hyperlipidemia.

Table 2: weights of ingredients of Dasanga Guggulu before and after purification

Raw material	Wt (g) before purifying	Wt(g) after purifying
1. Rhizomes of *Zyngiber officinale*	1250	920
2. Dried fruits of *Pipper nigrum*	1250	950
3.Dried fruits of *Piper longum*	1250	925
4. Roots of *Plumbago zeylanica*	1250	1000
5.Dried fruits of *Terminalia chebula*	1250	973
6.Dried fruits of *Terminalia balarica*	1250	975
7.Dried fruits of *Emblica officinalis Gaerin*	1250	1050
8.Rhizomes of *Cyperus rotundus*	1250	990
9.Dried fruits of *Emblica ribes*	1250	1050
10.Resin of *Commiphora mukul*	1250	920

Preparation method of Dasanga Guggulu

Equal part of each ingredient were taken for drug preparation and submitted to the board of drug authentication at Bandaranayaka Memorial Ayurvedic Research Institute for identification and approval of the drugs. In the preparation procedure ,all ingredients were cleanse by pure water and dried initially. *Commiphora mukul was* purified by Tripala Kashaya as mentioned in Ancient text book of Rasa Tarangani[6] and .*Plumbago zeylanica* was purified by Churnodaka(Allum) as mentioned in The Ayurvedic Formulary of India[7]. Weights reducing of all ingredients were noticed as mentioned below.

From each raw material, 920g were taken and mixed together except Guggul. Those were grinded till them became a fine powder with using grinding apparatus. Before grinding the weight of the whole ingredients was 8280g and after 7650g.Amount of weight reducing was 630g due to vaporize and spread over the grinding machine. Weight of 920 g of Guggulu has been dissolved well in prepared *Tripala Kwata* and other powdered ingredients were added. Then the mixture was boiled till it become a thick paste and prepared 250 mg weight of each Vati by using pill making machine.

Figure 2: Prepared Dasanga Guggulu

Clinical study

Clinical study was approved by the ethical review committee of Institute of Indigenous medicine, University of Colombo. Group of 30 patients who fulfilled inclusion criteria was selected and the experimental drug was distributed among them in every two week clinic visits for three months period. The patients were instructed to administrate 1 g of Dasanga Guggulu three times a day after meal with lukewarm water. The therapeutic efficacy on hyperlipidemia was tested with using lipid profile and clinical signs mentioned in *Madhava Nidana* before and after the treatment. Toxicity of the drug was tested by examining kidney functions (serum creatinine, blood urea) and liver functions (SGOT, SGPT) before and after the treatment.

RESULTS AND DISCUSSION

Chemicals derived from plants as secondary metabolic are called photochemical. Many of these provide protection against insect attacks and plant disease. They also exhibit a number of protective functions for human beings[8]. In this review, ingredients of Dasanga Guggulu exhibit having following photochemical.

Phytochemicals in Dasanga Guggulu

Phytochemical constituents of Dasanga Guggulu is mentioned in table 3.

Pharmaco dynamic activities of Dasanga Guggulu

The final action and effect of the drug inside the body is called Pharmaco dynamic action and it can be described using with five types of properties containing in the drug according to the Ayurvedic view point. They are Rasa, Guna, Veerya, Vipaka and Prabhava namely. Rasa which presents in six types (Madura, Amla, Lavana, Katu ,Tikta, Kashaya) gives a taste to the drug and help to increase or decrease the three Doshic condition (Vata,pitta, and Kapha) in the body. Gunas are bind with the action of the drug and they are 20 in

number. The energetic of the drug is called Veerya. There are two types of Veeryas in a drug ;Ushna or Sheeta. Ushna Veerya substances are hot by itself while a Sheeta Veerya substances are cool by itself. Vipaka means the taste, which is produced at the post digestive process. It is of three types; Madhura, Amla ,and Katu Vipaka. Prabhava is a special characteristic in a drug which cannot explain by its other properties. Mostly this action is contrary to its Rasa, Guna, Veerya, and Vipaka.

Table 3: Phytochemical constituents of Dasanga Guggulu

Ingredients	Phytochemicals
1. *Zyngiber officinale*	Alkaloids, saponins, tannins, flavonoids, terpenoids,glycosides and absence of steroids[9]
2.*Piper nigrum*	glycosides,alkaloids, tannins, phenolics[10]
3.*Piper longum*	alkaloids, tannins, flavonoids[11]
4. *Terminalia chebula*	alkaloids, flavonoids, saponin, phenolic compounds, steroids, carboxylic acid, tannin and glycoside[12].
5. *Terminalia bellirica (Gaertn.) Roxb*	Gallic acid, tannin chebulin, chebulinic acid, chebulagic acid, stearic acid, oleicacid, linoleic acid, arachidic acid, behenic acid[13].
6. *Emblica officinalis Gaertn*	Gallic acid, tannic acid, tannin, glucose, Ellagic acids, Quercetin, Chebulinic and Chebulagic acids. 2 major alkaloids (phyllantidine and phyllantine[14].
7. *Plumbago zeylanica*	Terpenoid, tannin, alkaloids and flavonoid[15]
8. *Cyperus rotundus Linn*	Steroids, phenolic compounds, flavonoids, glycosides, saponins, triterpenoids, alkaloids, tannins[16]
9. *Emblica ribes*	Benzoquinones, alkaloids, tannin, essential oil[17]
10. *Commiphora mukul*	Essential oil, gum, resin, steroids[18]

Table 4: Pharmacodynamics of Dasanga Guggulu

Ingredients	Rasa	Guna	Veerya	Vipaka
1. *Zyngiber officinale*	Katu	Laghu, Snigdha	Ushna	Madhura
2.*Piper nigrum*	Katu	Lagu, Thekshna Ruksha	Ushna	Katu
3.*Piper longum*	Katu	Lagu, Thekshna Ruksha	Ushna	
4. *Terminalia chebula*	Madhura, Amla, Katu, Tikta, Kahaya	Lagu,Ruksha	Ushna	Madhura
5.*Terminalia bellirica (Gaertn.) Roxb*	Kashaya	Lagu, Ruksha	Ushna	Madhura
6. *Emblica officinalis Gaertn*	Madhura, Amla, Katu, Tikta, Kashaya	Lagu, Ruksha	Sita	Madhura
7. *Plumbago zeylanica*	Katu	Lagu, Ruksha Thikshana	Ushna	Katu
8. *Cyperus rotundus Linn*	Katu, Tiktha, Kashaya	Laghu,Ruksha	Sita	Katu
9. *Emblica ribes*	Katu, Tikta,	Laghu, Ruksha, Tikshna	Ushna	Katu
10. *Commiphora mukul*	Katu, Tikta, Kashaya	Laghu, Sara, Vishada	Ushna	Katu

Pharmacotherapeutic action of Dasanga Guggulu

The most important aspect in patients' care is pharmacotherapeutics or therapeutic action of the drug. According to Ayurvedic view point it has been described in several ways. There are over 50 pharmaco therapeutics which Caraka and Susruta Acharya have explained relating drug effect over the diseases (*Dosha –Bhaisajja Prabhava*))[19] .When considering therapeutic measures of the ingredients of the Dasanga Guggulu it can clearly be seen the ability of decreasing *Medas* and *Kapha Dosha* in the body. Most of the ingredients of Dasanga Guggulu have the abilities of Vata Kapha Shamaka(decreasing Vata and Kapha Dosha), Lekhaniya(scraping out unnecessary things from vessels) , Deepana(digestive stimulant), Pachana(digestive), Raktha Shodaka(blood purifying) and Anulomana(purgation stimulant) actions. These procedures respond against the vitiated Doshas and Dhatus in the body which helps to destroy the disease.

Table 5: Pharmacotherapeutics of *Dasanga Guggulu*

Ingredients	Therapeutic actions
1. *Zyngiber officinale*	Anulomana,Deepana,Hrdya,Pachana,Vata kapha paha,Asmadosahara[20]
2.*Piper nigrum*	Deepana,Pachana,Jvaranashaka,Vata-pitta shamaka,Nadibalya,Vishagna,Svasa,Kasa Nashaka, Shirovirechana, Chadana, Shoshashana[21]
3.*Piper longum*	Vata kapha shamaka,Medhya,Deepana,Vata Anulomana,Sheeta Prashamana,Yakrid Uttejaka,Pleeha Vriddhikara,Raktavardhaka,Raktashodaka,Kasa Svasa hara,Hikkanigrahana,Shirovirechana,Mutrala,Jvaragna, Rasayana[22]
4. *Terminalia chebula*	Tridoshahara,Shotahara,Vedana,Stapana,Vranashodana,Vranaropana,Balya,Medya,Deepana, Pachana,Mridurechana,kaphagna,Hridya,Rasayana,Mutrala,Kushtagna,Jvaragna[23]
5.*Terminalia bellirica*	Tridoshahara,Shotahara,Vedanastapana,Raktastambhaka,Deepana,Anulomana,Krimighna,

(Gaertn.) Roxb	Kaphagna,Vajikara,jvaraghna,Chakshushya[24]
6. *Emblica officinalis Gaertn*	Tridoshahara,Dahaprashamana,Chakshushya,Keshya,medya,Shakthivardhaka,Rochana,Deepana, Anulomana,Amlanashaka, Yakrit uththejaka, Hridya,Shonitasthapana, Kaphagna, Garbhasthapana, Mutrala, Kushtagna, Pramehagna, Jwaragna, Rasayana[25].
7. *Plumbago zeylanica*	Lekhana,Visphotana,Deepana,Pachana,Arshogna,Triptigna,Shulaprashamana[26]
8. *Cyperus rotundus Linn*	Kapha pitta shamaka, Deepana, Pachana,Grahi,Trishna Nigrahana,krimigna,Kaphagna,Stanya Shodana,Jvaragna,Balya, Medya,Atisara,Rakta vikara,Aruchi nashaka[27]
9. *Emblica ribes*	Deepana,Pachana,Udarakrimigna,anulomana,Shirivirechana,Nadi Balya,Mutrala,Kushtagna[28]
10. *Commiphora mukul*	Shotahara,Vedanasthapana,Vranashodhana,Vranaropana,jantugna,Nadivalya,Deepana, Yakrituttejaka,Arshoghna, Raktashodaka,raktakana-vardhaka(RBC &WBC), Kapha nissaraka, Mutrala. Rasayana, Balya, Lekhana[29]

Pharmacological actions of Dasanga Guggulu

Pharmacology refers to the actions of drugs on mechanisms in the body[30]. The drug somehow changes the biochemical activities at the persistence stage of a diseased cell and support to regain normal behavior.

Concentration of the drug is proportionally affected at its site of action .There for the dosage of the drug is very important with referring to the pharmacological actions. In the authentic texts of Ayurveda, *Caraka Samhita* and *Sharangadhara Samhita* ,there are descriptive chapters about the doses of drug. Acharya Sharangadhara mentons environmental factors, collection methods of drug ingredients, age, weight, constitution and digestive capacity of the patient, should take in to account for considering the dose of the drug.

Table 5: Pharmacological actions of Dasanga Guggulu

Ingredients	Pharmacological actions
1 Zyngiber officinale	Antipyretic, analgesic, antiemetic, analgesic, anti arthritic, and anti inflammatory
2.Piper nigrum	Increase digestion and appetite, decrease abdominal pain, stimulant thermal receptors and increase secretion of saliva and gastric mucous, anti microbial effect, influence liver and metabolic functions, insecticide effect, antioxidant,anticonvultion, sedative, antipyretic, antiinflammatory, lipolitic, antiulcer, antibacterial, antifungal
3.Piper longum	antidiabetic antihyperlipidemic, hepatoprotective, neuroprotective, cardioprotective, antibacterial, aphrodiasiac,digestive agent[31].
4Terminalia chebula	antioxidant, antidiabetic, antibacterial, antiviral, antifungal, anticancerous, antiulcer, antimutagenic, wound healing[32]
5.Terminalia bellirica (Gaertn.) Roxb	Antiulcer, antioxidant, Analgesic, antiallergenic, antibronchitic, antipyretic, anti-spasmodic, digestive aid, astringent, anaemia, asthma, bronchitis, tonic, laxative, leprosy, leucoderma, eyedisorders, dyspepsia, diarrhoea, dysentery, intestine inflammation, liver diseases and germicidal, anticough and anti tuberculosis[33]
6.Emblica officinalis Gaertn	Astringent, antioxidant, antidiarrhoeal, antacid, diarrhoea, dyspepsia, cough, indigestion, constipation, piles, jaundice, anaemia, weight loss and cardiac problems. It is beneficial for urinary infection, ulcers, stomach and intestinal inflammation[34]
7.Plumbago zeylanica	anti microbial, antiviral, antioxidant, antifungal, antiallergic, anti hepatotoxic, antidiabetes, antiinflammation, anticancer[35]
8. Cyperus rotundus Linn	Antiinflamatory,antidiabetic, hypocholesterolaemia[36]
9. Emblica ribes	anthelmintic, astringent, carminative, anthelmintic, diuretic, astringent, anti inflammatory, antibacterial and febrifuge[37].
10.Commiphora mukul	Hypolipidemic, anti inflammatory,anti tumour, treatment for nervous disorders, antihyperlipidaemic , treatment for cardiac disorders antihypertension and anti ischaemia, treatment for skin disorders, cancer and urinary disorders[38]

According to view of Ayurveda there are two types of Meda which are called Abaddha Meda and Baddha Meda[39]. Abaddha Meda which is circulates in the body can be considered as lipids (Cholesterol, Triglycerides, LDL,HDL &VLDL).Fats which is not mobile, deposits at various places in the body including subcutaneous tissues and muscles.

Hyperlipidemia occurs when increases circulatory fats and, increased deposited fat causes obesity. Considering above facts Medo Roga can be correlated with hyperlipidemia as well as obesity according to modern medicinal aspects. Doshas and Dushyas which vitiated in Medo Roga**,** are Kapha, Vatha and Meda[40]. The properties of Kapha and Medha are Snigdha Sheeta, Manda, Sth ira, Slakshna and Sandra. Properites of vata are Ruksha Laghu Sheeta Khara and Sukshma. When analyzing the ingredients which are in Dasanga Guggulu, those act against the properties of Kapha Vata and Meda by its Rasa , Guna ,Veerya and Vipaka.

Properties of Ingredients in Dasanga Guggulu

Rasa	Guna	Veerya	Vipaka
Tikta Rasa, Katu Rasa and kashaya	Guru Guna, Lagu guna	Ushna	Katu vipaka, Madura Vipaka, Amla Vipaka

Mode of action of Dasanga guggulu against Medo Roga by its properties

When analyzing the herbs of Dasanga Guggulu it can be indicated the most prominent Rasa is Thikta Rasa followed by Katu Rasa, Kashaya Rasa and Madhura Rasa. Tikta Rasa is said as Lekhaniya and Medo nashaka.It reduces vitiation of *Kapha* and *Medodushti* along with neutralization of *Ama visha* through its *Deepaniya*, *Pachaniya* activities. Katu Rasa is said as having Lekhaniya action. It is opposite to the quality of kapha and Medas. According to Bhava Misra, Kashaya Rasa is said as Kapha Hari. It facilitates for absorption (Shoshana) of liquefied or detoxified *Kapha* and *Medodhatu*. The most prominent Gunas are in the Dasanga Guggulu are Laghu, *Ushna*,Thekshna and *Ruksha Gunas. Laghu guna acts against to Guru Guna which Kapha and Medas have. Ushna Guna is also opposite to Snigdha Guna which is in Kapha Dosha and Medo Dhatu.* . It cleans the obstruction of channels. *Thekshna Guna is against to Manda Guna in Kapha which acts as* Sroto Shodaka. *Ruksha Guna* helps to absorption of liquefied *Kapha and Medodhatu*[41]. *Most prominent Vipaka is Ushna followed by Sheeta Veerya.* Ushna Veerya does Kapha vata Shamaka and help in Amapachaka. *Sheeta Veerya* herbs are Amalaki and mustaka help to increases *Ruksha Guna* (dry) resulting in *Medo Shoshana* (absorption of liquefied fat). Majority of herbs in Dasanga Gugulu are having Katu Vipaka which acts against to Madura Vipaka of Kapha and Meda. Inspite of that herbs which are with Madura Vipaka is opposite to the properties of Vata Dosha, and palliate vitiated Vata.

CONCLUSION

Above mentioned properties of Dasanga Guggulu helps to alleviate Kapha, Vata Doshas and visiated Medo Dhathu in the body. Most of the ingredients have Deepana, Pachana Guna which help to reduce toxic of Ama that has affected to Agni. Lekhaniya Property in this herbs helps to clean the obstructed channels by vitiated Medo Dhatu. As a result of these actions Jataragni gets normalization and reduced Medo Dhatvagni is increased. Finally increased Medo dhatu that has been transported in the blood (hyperlipidemia) as well as deposited Medo Dhathu in subcutaneous tissues (obesity) reduces By Dasanga Guggulu as a holistic processes that gives relief from the Medo Roga. In the clinical research Dasanga guggulu was found to be very well effective in reducing symptoms of Medo Roga like breathlessness, excessive sleep, exhaustion, and bad smell of the body. Symptomatic relief suggest that effectiveness of Dasanga Guggulu is positively significant on Medo Roga.. This poly herbal formulation has also been proved not having any toxic effects on the human subjects.

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