

REVIEW ARTICLE**MEDICINAL OLEOGUM RESIN – GUGGULU A REVIEW****E. SUKUMAR and K. BALAKRISHNA**

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ABSTRACT: A detailed review on Guggulu, covering its botanical, Chemical Pharmacological and Ayurvedic aspects, is presented here.

Guggulu is an oleogum resin (Oleoresin) that exudes spontaneously as a result of injury from the bark of *Commiphora wightii* Bhandari (Syn : *Commiphora mukul* Hook. ex Stocks or *Balsamodendron mukul* Hook. ex Stocks) which is a weird tree of the arid zones of Central India and Deccan Plateau.

This tree belongs to the family Burseraceae and is exceedingly sluggish in growth, crooked, twiggy and thorny reaching 3 metres in height and practically lacking foliage except during the moist season (Fig. 1). But the trunk and the branches are always of a grey metallic sheen with horizontally peeling off papery cork. The flowers are minute amidst the few serrate 1 to 3 foliate leaves that are rarely exceeding 2 cms across and along.

The local people who collect the gum resin make incisions on the trunk and major branches during February – April period. The gum slowly exudes and gradually hardens in tears and frequently drips on the ground. The process is complete in a week or so. Then fresh gashes have to be inflicted to further bleed the tree. It has been noted that several trees are killed every year by

avaricious hacking. As a result the commodity is progressively dwindling in supply leading to ingenious adulteration by admixture with other gums obtained from wild trees like Karaya (*Sterculia urens* Roxb.) and Moringa (*Moringa oledifera* Lam.)

The freshly exuded gum is syrupy and is golden yellow in colour. In the due course it hardens and becomes yellowish blue green but remains sticky. This colour is aptly described by the synonym 'Mahisaksi' which in Sanskrit means, 'buffalo eye'. Guggulu is a mixture of gum, resin and essential oil and hence it is better termed 'Oleogum – resin'.

Chemical Studies

A detailed chemical study of guggulu revealed that it is a complex mixture of steroids, diterpenoids, aliphatic esters, carbohydrates, amino acids and variety of inorganic compounds. Besides known sesamin and cholesterol, Sukh Dev et al have isolated Z – guggulsterone, E-guggulsterone, 16 β – hydroxyprogesterone

and three new sterols viz. guggulsterols I, II & III (1) Fig. (2).

Later workers have isolated two more new sterols guggulsterol – IV and guggulsterol – V (2) (Fig. 3).

Besides a new alcohol viz. mukulol (3), four steroids too have been isolated from guggulu (4). (Fig. 4).

General Pharmacology

The oleogum resin has been put to medicinal use in Ayurveda for a variety of ailments as shown by its being specifically spoken of by Caraka and Susruta in their treatises. According to them the drug is useful in the following conditions, viz. heart diseases, obesity, tumours, urinary infections and calculi, ascites, piles, fistula, worms, skin diseases, vitiligo, arthritis and rheumatism, swellings, malignant ulcers, and pains. However, guggulu is currently reported for its efficacy as an excellent antiarthritic, antireumatic, antiphlogistic and hypolipaeamic. When a plethora of synthetic drugs are in current use for these ailments the extensive employment of guggulu by the indigenous as well as modern medical practitioners confirms the utility of the drug particularly in combating corpulence.

Anti – inflammatory Activity

Pharmacological studies have shown that the oleoresin is a highly potent anti inflammatory agent as compared to hydrocortisone and butazolidin against

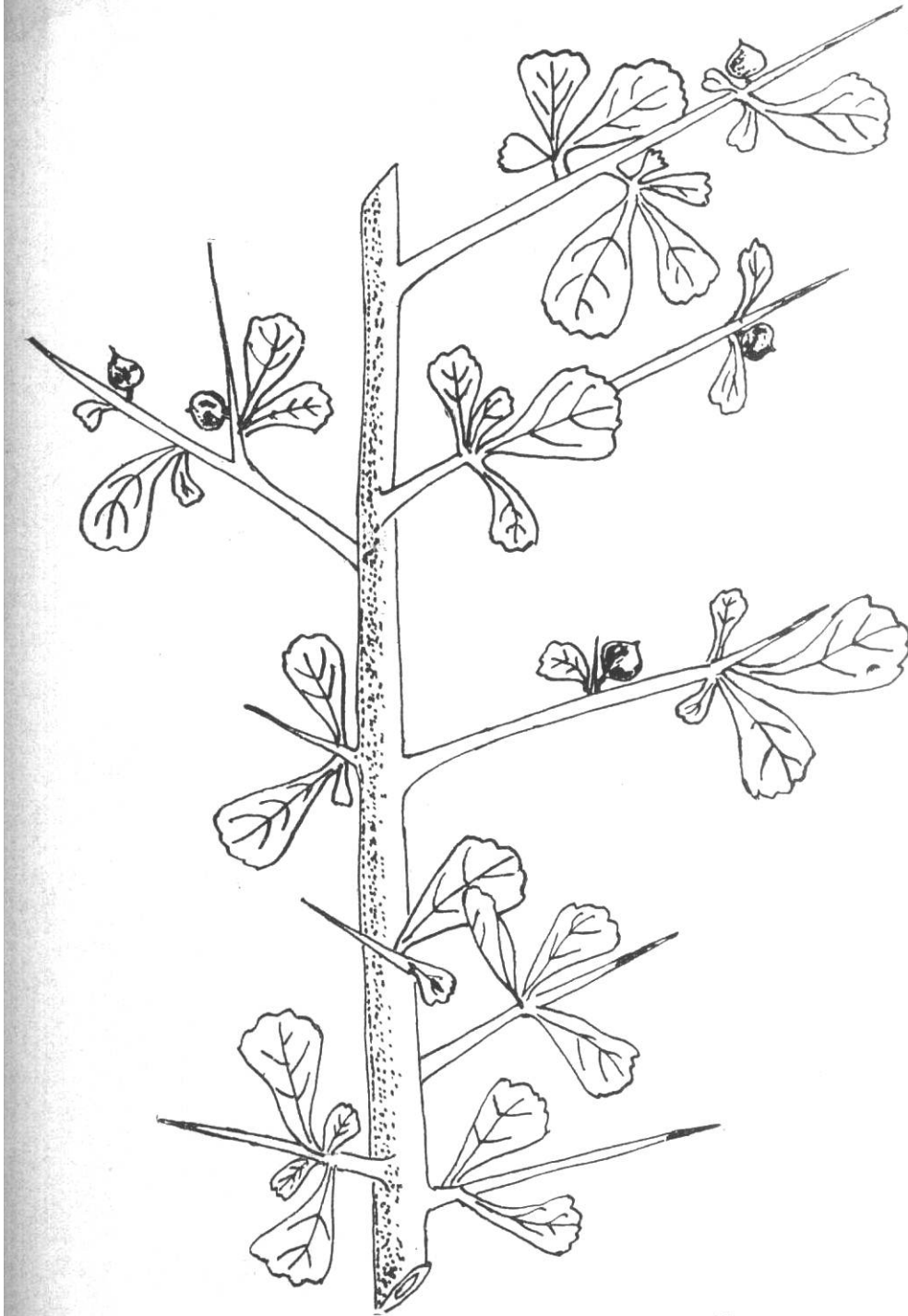
Brownlee's formaldehyde induced arthritis in albino rats (5). The acidic fraction of the oleo resin was active one whereas the non – acidic and the solid fractions were inactive. The activity of the acidic portion was present even in the adrenalectomised animals (6).

The steroidal fraction from the petroleum ether extract of the guggulu showed significant effect on the primary as well as the secondary inflammation induced by Freund's adjuvant. It was more effective than hydrocortisone in reducing the severity of secondary lesions. Its antiphlogistic effect was comparable to that of hydrocortisoneacetate (7).

The aqueous extract of guggulu suppressed acute rat paw oedema induced by carragenin. It was active in granuloma pouch test also. In adjuvant arthritis this extract suppressed the secondary lesions very effectively without having any significant action on the Primary Phase. Side effects such as gastric ulceration, loss of weight and mortality were negligible in animals treated with betamethasone (8).

In Freund's adjuvant arthritis the lipid extract (250 mg/kg) produced activity comparable to pheybutazone. However, in the dosage used it caused significant morbidity and mortality (9). Petroleum ether extract showed significant inhibition of joint swelling in experimental rabbits. Fraction – A of gum guggulu showed anti – inflammatory activity in human beings at a dose level of 500 mg / kg / day (10).

FIG. 1.



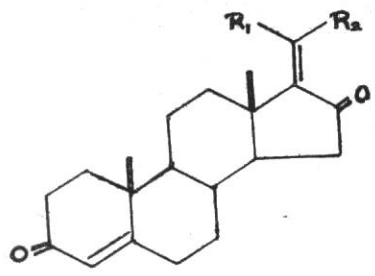
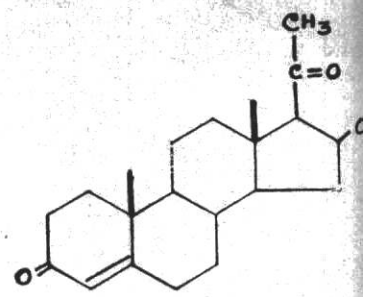
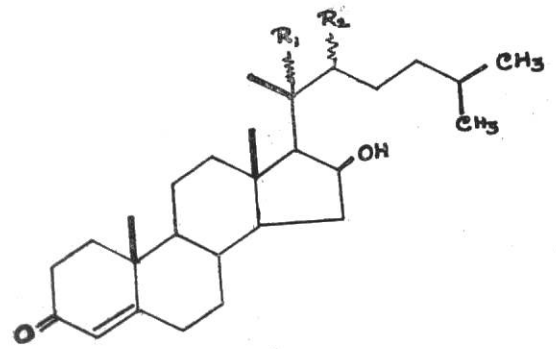


FIG. 2 & 3

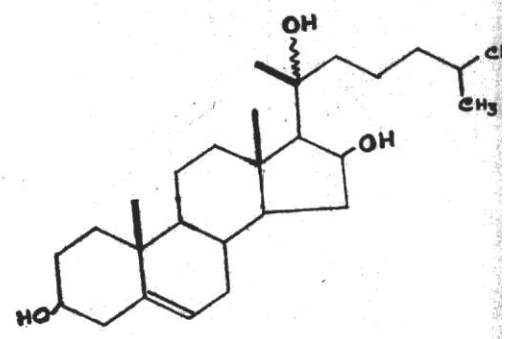
$R_1=H, R_2=CH_3$: Z-guggulsterone
 $R_1=CH_3, R_2=H$: E-guggulsterone



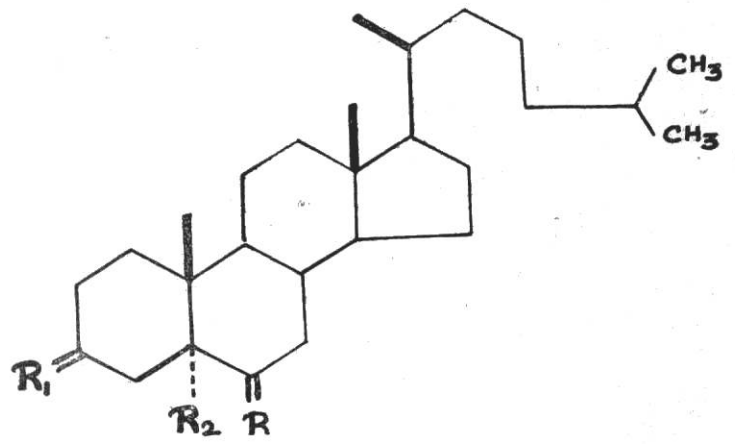
16β-hydroxyprogesterone



$R_1=R_2=\xi OH$: guggulsterol I
 $R_1=\beta OH, R_2=H$: guggulsterol III



Guggulsterol II



$R_1=R_3=O, R_2=OH$: Guggulsterol IV
 $R_1=\beta OH, H; R_2=OH; R_3=\beta OAc, H$: Guggulsterol V

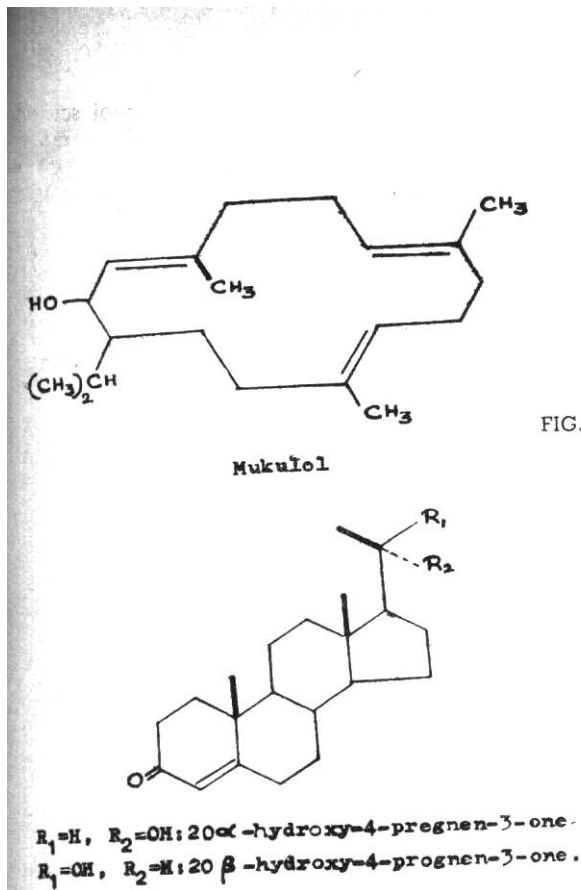
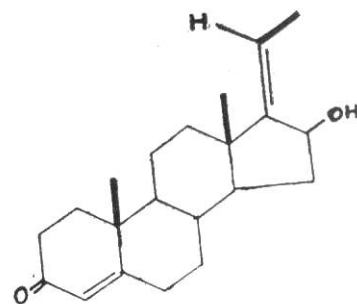
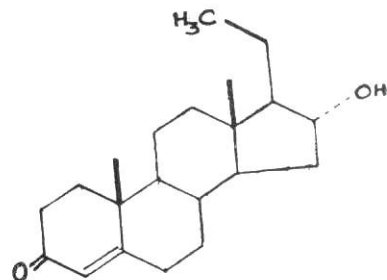


FIG. 4



16 β -hydroxy-4,17,(20)-
Z-pregnadiene-3-one



16 α -hydroxy-4-pregnen-3-one

The fraction - A of guggulu was compared with phenylbutazone and brufen (11) and the whole drug with a nonsteroidal anti-inflammatory agent indomethacin and a steroidal drug dexamethazone (12). It was found that guggulu has clinically demonstrable anti-inflammatory activity.

Anti - arthritic Activity.

Suddha guggulu administered to 30 patients of rheumatoid arthritis showed complete remission (66.66%) major to minor (23.33% - 10%) improvement besides anti-inflammatory and analgesic properties (13). Composite drugs with Simhanada guggulu (14) and Vyosadi guggulu (15) were also

found to be effective in the treatment of rheumatoid arthritis.

Guggulu in combination with septalin is more effective and has no side effects (16). In combination with *Nirgundi* (*Vitex negundo*) it was found to be useful in sciatica (17); with *Bhallataka* (*Semecarpus anacandium*) and *Gowrakh* (*Dalbergia lanceolaria*) it was effective in the treatment of osteoarthritis and sciatica (18).

Hypocholesterolemic Activity

Crude guggulu was found to possess highly encouraging hypolipaeamic activity in rabbits (919). The oleogum resin not only lowered

the serum cholesterol in hypercholesterolemic rabbits but also protected the animals against hypercholesterolemia induced by hydrogenated vegetable oil and cholesterol. It was useful also in cholesterol induced atherosclerosis. It reduced the body weight of the experimental animals (20).

Crude guggulu and its alcohol soluble fractions caused significant fall in serum cholesterol and serum turbidity with a concomitant increase in the coagulation time and prothrombin time (21, 22). In Indian domestic pigs the alcohol extract lowered serum cholesterol, β – lipoprotein and its cholesterol content and significantly altered the α – β lipoprotein ration (23).

Studies carried out on monkeys fed on cholesterol diet indicated that fraction – A of the petroleum ether extracts could effectively lower serum total lipids, cholesterol, phospholipids and triglyceries. The hypolipaeamic activity in this case was comparable to that of Atromid – S (24).

Fraction A and a steroidal fraction present in guggulu also showed significant hypolipaeamic activity in cholesterol fed chicks (25, 26). Alcoholic extract and a pure steroid isolated from it reduced serum cholesterol level in normal and triton induced hyperlipidemic rats and cholesterol fed hyperlipidemic rabbits (27).

Clinical studies on patients of hypercholesterolemia associated with obesity, ischaemic heart diseases, hypertension, diabetes, etc. showed a fall in total serum cholesterol and serum lipiphosphorous when treated with guggulu. The body weight of the obese ones declined significantly (28). Other clinical studies showed that the lowering of serum triglycerides was found most encouraging in

case of gum guggulu in comparison to all the drugs known so far (29).

In a long term clinical study it was found that fraction A of guggulu in cases of hyperlipoproteinaemia reduced triglycerides by 36.5% whereas the drug clofibrate brought a reduction of 33.3%. Serum cholesterol was reduced by 26.2% with fraction – A treatment when 31.5% was the result with clofibrate. Fraction – A enhanced the rate of excretion of cholesterol and also reduced its synthesis (30).

Spontaneous hypercholesterolemia and hyperglyceridemia were induced in male gerbils with stock diet alone. Fraction A showed maximum activity after 24 weeks. But the activity against atherosclerosis could not be studied as no spontaneous atherosclerosis was developed during the period of 48 weeks (31).

A ketosteroid ($C_{21}H_{30}O_3$) from the gum was studied against endogeneous hypercholesterolemia and hyperlipidemia induced by oral administration of neomercazole and cholesterol in chicks. In this study neomercazole induced thyroid cell proliferation was prevented by the ketosteroid. This showed that the drug influences the lipid metabolism by activating the thyroid.

Gupta et al (23) studied the effect of fraction A on the estrogen induced hyperlipidemia in white leghorn male chicks. The drug showed effective hypolipidemic activity in 2 weeks and it also antagonized the hypertrophy of the liver and showed thyrogenic activity.

A systematic double blind clinical trial on 40 obese patients was carried out with crude guggulu and its petroleum ether fraction A. Serum cholesterol was

significantly reduced without affecting the body weight (34). Similar studies were done by Kotiyal et al (35) and Baldwa et al (36). The latter team found that the hypolipidemic activity was more than that of garlic (37).

In the treatment of coronary – heart diseases

The fraction A and the steroidal component derived from it were studied in experimental myocardial infarction in rats produced by isoprenaline. The results show that guggulu is one of a few drugs which is effective in both hyperlipidemia and myocardial necrosis (38).

The effect of the gum guggulu on serum cholesterol, fibrinolytic activity and platelet adhesive index in healthy patients and in patients of coronary artery disease was studied. The fibrinolytic activity increased (40% and 30%) while platelet adhesive index showed fall (19% and 16%) at the end of 15 days (39).

Purified steroidal fraction of guggulu showed a marked inhibition of ADP, adrenaline and serotonin induced platelet aggregation. Their inhibiting effect was comparable to that of clofibrate (40). Later investigations also confirmed this activity of the drug (41).

Upadhyaya et al (42) studied the effect of guggulu on patients with coronary insufficiency and obesity. At the end of three months the drug showed 27.8% reduction in serum cholesterol and 32.7% reduction of serum triglyceride. Subjective improvement had been observed in precordial pain and dyspnea and the T wave had been corrected.

Clinical trials have shown that the drug is useful in the management of hemiplegia

which is also an atherosclerotic disorder (43).

Anti – fertility activity

Guggulu caused a reduction in the weight of rat uterus, ovaries and cervix with a concomitant increase in their glycogen and sialic acid levels thereby showing that it might be useful as an antifertility agent (44).

Analgesic activity

Myostal, a composite drug containing guggulu, Simhanada guggulu, abhraka bhasma, Vaca, Rasna, Goksura, Sankha bhasma was tried in 50 puerperal primiparous patients. The drug was effective in reducing pain during puerperium without affecting involution in mother or physiology of the new born (45).

In infective hepatitis

Biliarin, a compound drug containing guggulu, triphala, katuki, punarnava, mandua (reduced iron) and nux vomica was tried in 50 cases of liver disorders in children. The drug showed good effects in infective hepatitis (46). Earlier the antagonizing property of guggulu on the liver hypertrophy has been established (33).

Aphrodisiac activity

Because of *ushna – teekshna* properties, guggulu stimulates sexual ardour; acts as emmanogogue. Being *snigddha – picchila* it acts as an aphrodisiac (47).

Thyrogenic activity

In *vitro* studies on thyrogenic effect of guggulu on mice suggested that the drug may be used for the management of hypothyroidism in addition to the associated

disorders like hypercholesterolaemia, hyperlipidaemia and atherosclerosis (48).

Uses in Ayurveda

In Ayurvedam guggulu enters into the preparation of several compound medicines most of which are named with suffix 'guggulu' (Table – I).

The verse 44 of chapter V of Cikitsasthana of Susruta Samhita details the areas for intensive studies. It runs thus: Guggulu is light, aromatic, penetrating into the minutes parts of the body, sharp, warmth generating in potency, pungent in taste and digestion, laxative, lubricating and whole some to the heart. New (fresh) guggulu is an aphrodisiac and anabolic. Old guggulu is anti-fat and reduces corpulency. Due to sharpness and warming nature it reduces *Vayu* and *Kapha*. Because of its laxative nature it flushes out the waste products from all tissues and systems. Its aroma removes bad odours. Its subtle essence awakens the appetizing factors.

Methods of administration according to Ayurveda

Guggulu should be taken in the mornings with Triphala decoction, Berberies decoction, bitter-gourd diction or cow's urine, warm milk and water. The person should take boiled rice with milk, soup or meat extract after some time. Diseases such as an internal tumours, urinary tract ailments, ascites, piles, fistula, helminthiasis, skin diseases, aversion to food, vitiligo, sinus, pains, swellings, malignant ulcers and sores

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reliably yield to it, if used for a month. It destroys deranged *vata* from the tissues and systems, bones and joints just as a thunder bolt destroys trees.

In the treatment with guggulu no acute or chronic toxicity was found (26). Mild gastrointestinal upsets may be present in some cases (34). Microscopic examination of the liver, kidney and heart of the chicks treated with guggulu indicated no toxic effects. Kidney irritation, abdominal discomforts and pruritus with slight oedema had been reported (937). But it is quite harmless and can be taken for a long time (49).

Conclusion

While recent researchers have focused attention on the anti-inflammatory activity and hypolipaeic activity of guggulu comparatively less work has been done relating to other properties of the drug enumerated in Ayurveda. Pharmacological and clinical studies to evaluate the efficacy of the drug in conditions mentioned in Ayurvedic texts with references to its particular modes of actions will open up avenues of its being put to better and even newer applications.

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