



Received on 29 August 2014; received in revised form, 09 September 2014; accepted, 29 September 2014; published 01 October 2014

VERSATILE PHARMACOLOGICAL ACTION AND COMPOUND FORMULATION OF KUNDUR IN UNANI MEDICINE: A REVIEW

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Keywords:

Boswellia serrata Roxb.,
Kundur, Luban, Unani Medicine

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ABSTRACT: Oleo-gum resin of *Boswellia serrata* Roxb. is described in Unani medicine in the name of Kundur. It is commonly known as luban which belongs to the family Burseraceae. *Boswellia*, or frankincense, harkens back to ancient India and Egypt. Frankincense was one of the four components in the medicinal “Balsam of Jerusalem” from the Franciscan Monastery and, as noted in the Papyrus Ebers, Circa 1500 BC, had applications in Egypt for mummification, cremation, and the treatment of skin wounds. The gum is popularly used in Unani Medicine for the last numerous centuries in curing various ailments, especially osteoarthritis, rheumatoid arthritis, wound healing, hemorrhoids, dysentery, dyspepsia, lung diseases, skin disease bronchitis, asthma, cough, cardiovascular diseases mouth sores, vaginal discharges, etc. Kundur is an ingredient in some Unani formulations viz: Majoon Kundur, Majoon Murawwah-ul-Arwah, Majuoon Masikul Baul, etc. for the treatment of amraze kulliyya (renal disorders). Many clinical studies have done on anti-cancer activity, anti-asthmatic activity, anti-arthritic activity, crohn's disease, cerebral edema, osteoarthrosis, and ulcerative colitis, etc. This review reveals that the relationship between the traditional uses proven by current researches and besides, other novelty is also tinted, which are not reported in traditional texts.

INTRODUCTION: Kundur is a medium to a large sized deciduous tree, up to 18 meters in height and 2.4 meters in girth. This is generally found in the arid forest from Punjab to West Bengal, and in peninsular India. The tree is frequent at the bottom of Western Himalayas, in Rajasthan, Gujarat, Maharashtra, Madhya Pradesh Orissa, Bihar, and Andhra Pradesh.

The large forest of this plant scattered in the Khandesh and Nagpur - Wardha area of Maharashtra, and Khandwa-Nimar area of Madhya Pradesh, and Adilabad in Andhra Pradesh.

The suitable environment for the tree is dry, hot and rocky hills, mainly volcanic traps. Leaves are imparipinnate, 30-45 cm long; leaflets 2.6- 6.3 cm to 1.2-3.0 cm, ovate or ovate-lanceolate. Flowering occurs during January to April when the tree is almost leafless. These are small racemes and white. The tree, on the injury, exudes an oleo gum resin. This is the only non-coniferous source of turpentine and rosin in India. It is secreted from cortex is transparent, fragrant, golden yellow, and solidifies

	<p>QUICK RESPONSE CODE</p>
	<p>DOI: 10.13040/IJPSR.0975-8232.IJP.1(10).627-31</p>
<p>Article can be accessed online on: www.ijpjournal.com</p>	
<p>DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.1(10).627-31</p>	

to brownish yellow tears and crust, varying from pea size to walnut size. It is stored in a specially made bamboo basket and converted into different grades of material according to flavor, color, shape, and size¹. It burns readily with an agreeable odor, and is chiefly used as incense. Very young or very old tree do not exude any oleo-gum-resin. To obtain the oleo-gum-resin trees are tapped by shaving off a thin band of bark about 20 cm wide and 30 cm long or high, at the height of 15 cm from the base of the tree. Tapping should start from November and should be stopped before the monsoon^{2,3,4}.

It has been used by Hindus, Babylonians, Persians, Romans, Chinese, Greeks and the people of old American civilization primarily for embalming and for its incense in cultural functions⁵. It burns with a clear, steady flame and diffuses an agreeable odor. Its therapeutic properties are also widely recognized, mainly for the treatment of warm (inflammatory conditions), sartin (cancerous diseases), quruhe khabisa (non-healing ulcer), amaze jild (skin disease), amraze dam (blood disease)³. In spite of its historical, religious, cultural and medicinal significance, *Boswellia* has not been systematically studied, and gaps still exist between our knowledge of the traditional uses of the resin and the scientific data available⁶. Most drugs prescribed by the practitioners of the traditional system of medicine are in the form of crude extracts wherein the identity of the constituents is not known well because of the availability of several grades of the drug⁷.

These Drugs Generally Have Four Grades:

- ◆ **Superfine grade:** Translucent, light yellow, free from bark and impurities.
- ◆ **Quality I:** it is brownish yellow, less translucent and free from bark and impurities.
- ◆ **Quality II:** it is brownish, semi-translucent and may have some impurities.
- ◆ **Quality III:** it is dark brown, opaque and with impurities².

Therefore, the need of identification of the active principles, the study of their pharmacology, toxicity, and standardization of methods of extraction, etc. are an essential requirement for the

consistency in biological activity as well as the active constituents. The research work carried out on the gum resin for the development of new anti-inflammatory, and the anti-arthritic drug is a small step towards this direction. A brief history of some of the work done in chemistry and pharmacology has been relieved⁷.

Taxonomical Classification:³

Kingdom:	Planate
Order:	Sapindales
Family:	Burseraceae
Genus:	<i>Boswellia</i>
Species:	<i>serrata</i>

Vernacular Names: Kundur (Unani, Arabic); Luban (Arabic); Indian frankincense tree (English); Indian olibanum tree; Kundur, Luban (Hindi); Salai (Hindi); Parangisambrani (Tamil); Phirangisambrani; Parang, Sambrani, Anduga, Kondagugi, Tmu (Telugu); Kundur (Persian); kundur (Urdu); Ashwamuthri, Kunduru (Sanskrit); Shallaki, Chitta, Gugula, Dhupa adimar, Chilakdhupa, Tallaki, Maddi (Kannada)^{3,4}.

Chemistry of Oleo-Gum Resin: There are several class of naturally occurring compounds one of them is terpenoids. It is mostly obtained from the plant, but it could be obtained from other sources. Terpenoids are volatile and give fragrance to plants or their parts like flowers leaves etc. They usually occur in the leaves and fruits of higher plants, conifers, citrus, and eucalyptus⁸. Oleo-gum resin is a complex mixture of terpenoids and sugars. A chemical constituent of *B. serrata* may be divided into three groups which are as⁷.

Classification of Terpenoids: Terpenoids are the plant origin hydrocarbon has the general formula (C₅H₈)_n. Some carbon atoms present in the structure are the basis of their classification.

Essential Oil or Lower Terpenoids: Fresh oleo gum resin yields up to 10-16% of volatile oil by steam distillation. Identified monoterpenes in oils are α - thujene, α - pinene, β - pinene, δ - limonene, ρ - cymene, cadinine, geraniol, elemol, terpineol, methyl chavicol and phellandrene^{3,4,7,9}.

Higher terpenoids. A major portion of oleo gum resin is higher terpenoids (25-35%). There are some studies have been done on the chemistry of

higher terpenoids. Boswellic acid is the first higher terpenoids isolated by Tschirch *et al.*, in 1892. After its isolation a number of other compounds isolated which are as- α amyirin, β amyirin, 11- keto- α -boswellic acid, methyl chavicol, acetyl- 11- keto- α -boswellic acid 3- hydroxyl urs 9, 11- dien-24- oic acid, 3-acetoxy urs 9, 3- α -acetytirucall-8, 24- dien-21-oic acid, 3-ketotirucall-8, 3 β -hydroxy tirucall-8, β -boswellic acid, 2'-3'-dihydroxy urs-12-ene-24-oic acid, urs-12- ene-3'-24- diol^{2, 3, 4, 6, 7, 10, 11}.

Carbohydrates: Oleo gum resin of *Boswellia serrata* contains 45-60% carbohydrates. After hydrolysis, it produces arabinose, galactose, xylose, and mannose^{2, 6, 7, 12, 13}.

Pharmacological Activity: There are a number of compounds found in *B. serrata* like mixtures of terpenes (Resins), a mixture of polysaccharides (Gums) and essential oil. Pentacyclic triterpenes are the chief component of resin has boswellic acid as an active functional group. Pentose and hexose sugars are the parts of gum have oxidizing and digestive enzymes. Monoterpenes, diterpenes, and sesquiterpenes are the chief component of essential oil.

The four principal boswellic acids (pentacyclic triterpene acids) present in Kundur are β -boswellic acid (BA), acetyl- β -boswellic acid (ABA), 11-keto- β -boswellic acid (KBA), and 3-O-acetyl-11-keto- β -boswellic acid (AKBA), which have been shown to be accountable for the inhibition of pro-inflammatory enzymes. AKBA is the important inhibitor of an enzyme 5-lipoxygenase, which is responsible for inflammation. AKBA bind to 5-lipoxygenases in a calcium-dependent and reversible manner, and acts as a non-redox type, noncompetitive inhibitor¹⁴.

Leukotrienes (LTs) are intercellular signaling molecules that induce a variety of reaction. They are best known as potent promoters of inflammation^{14, 15}. Many inflammatory diseases caused by leukotrienes like inflammatory bowel disease, asthma, colitis, rheumatism, arthritis, and psoriasis. It has been shown that Kundur has leukotrienes inhibitor activity by blocking the synthesis of leukotriene^{14, 16, 17}. Alcoholic extracts of *Boswellia serrata* inhibited 6- keto- PGF_{1 α}

formation; stabilize the activity of mast cell. Polymorphonuclear neutrophils (PMNs) release human lymphocyte elastase (HLE) which is responsible for creating different diseases like chronic bronchitis, cystic fibrosis, acute respiratory distress syndrome, glomerulonephritis, and rheumatic arthritis. Studies show that AKBA reduces the activity of human lymphocyte elastase. Free radicals formation in human body induces tissue damage which causes disease like rheumatoid arthritis. AKBA inhibits it^{17, 18}.

Preclinical and Clinical Studies:

Immunomodulator Activity: It is reported that kundur extract exhibit anti-anaphylactic and mast cell stabilizing or inhibiting mast cell degranulation activity *in-vitro* and *in-vivo* method¹⁹. Another study reported that boswellic acids inhibit graft rejection to the same degree as the maximum dose of steroids²⁰.

Anti-diabetic Activity: *B. serrata* is one of the active constituents of one herbal formulation which has been reported to showing significant anti-diabetic activity in streptozocin-induced diabetic rats²¹. Ahangarpour *et al.*, reported that *B. serrata* gum resin in an amount of 900 mg daily for 6 weeks was orally administered (as three 300 mg doses) to diabetic subjects are found to be significant²².

Anti-Cancer Activity: It is reported that triterpenoids and boswellic acids of kundur exhibit anticancer activity in different types of cancer like prostate cancer, skin cancer, brain tumor, and blood cancer²³. Acetyl-keto- β -boswellic acid induces apoptosis through a death receptor 5-mediated pathway in prostate cancer cells²⁴. A Randomized, Placebo-Controlled, Double-Blind Pilot Trial in 44 patients of irradiated brain tumor, 22 patients received kundur, and 22 patient received placebo, at the dose of 4200 mg/day orally. It was found that significantly reduced cerebral edema in test drug group²⁵.

Anti-Arthritic Activity: Kimmatkar *et al.*, reported that when A Randomized, Double-Blind Placebo Controlled Crossover Clinical study was done it was found a significant effect in knee osteoarthritis patients for 64 days duration when kundur has given orally²⁶. Another Randomized,

Prospective, Open-Label, Comparative Clinical Trial reported by Sontakke *et al.*, in 66 patients of knee osteoarthritis for 180 days demonstrated that the efficacy, safety, and tolerability of kundur showed highly significant with durability in compare to valdecoxib²⁷.

Anti-Dementic Activity: Zakaria Rhazi (850-923 A.D) in his medical treatise Al-Havi Fit Tib part-1, described use of kundur for Nisyan (Dementia)²⁸. A preclinical study reported that in rat models during gestation period when an aqueous extract of *B. serrata* given orally it exhibited that there is a significant increase in the power of learning at the post-learning stage, short-term memory, and long-term memory in their births²⁹.

It is reported that when hypothyroidism was by methimazole in adult male Wistar rats, it leads to a significant decline in learning and memory but when kundur used for their treat it was found that enhancing memory and learning functions³⁰. A study done by Yassin *et al.*, revealed that the treatment of Alzheimer's disease induced rats with aqueous infusions of *B. serrata* at the dose of 45 and 90 mg/kg/day for 12 successive weeks significantly ameliorates the neurodegenerative characteristics in rats³¹.

Anti-Ulcer Activity: It is reported that petroleum ether and aqueous extracts of the bark of kundur revealed significant antiulcer activity in aspirin-induced Albino rats model at the dose of 250 mg/kg body wt.³²

Unani Compound Formulations: Majoon Nisyan, Majoon Halila, Dawa-ul-Kibrit, Mufarreh Kabir, Habbe Suzak, Habbe Sarah, Habbe Mi'a, Roghane Kalan, Sunune Supari, Marhame Rusul, Marhame zardie Biazae Murgh, Majoon Kundur, Majoon Masekul Baul, Sufoof Masikul Baul, Jawarish-e-Hazim Jawarish-e-Kundur, Dawa-e-Salasal Baul.³³

CONCLUSION: Kundur is a naturally safe and effective medicament, described by Unani Scholars in their treaties for diverse purposes *viz.*; *Quruhe Khabisa* (non-healing ulcer), *Wajaul Mafasil* (osteo arthritis), *Taqteerul baul* (Urinary retention), *Sartan* (cancer), *Nisyan* (dementia), *Ziabetus* (diabetes). Extensive studies are needed for a right approach in finding a possible new complementary or alter-

native therapy to control, cure, or prevent of above diseases.

ACKNOWLEDGEMENT: The authors gratefully acknowledge the support afforded by co-authors and staff of library of N.I.U.M, Bangalore in providing the appropriate material for the preparation of this review article.

CONFLICT OF INTEREST: Nil

FUNDING: Nil

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How to cite this article:

Ahmed S, Alam MA, Shahabuddin M, Khan MI and Ali H: Versatile pharmacological action and compound formulation of kundur in Unani medicine: a review. *Int J Pharmacognosy* 2014; 1(10): 627-31. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.1\(10\).627-31](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.1(10).627-31).

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