

REVIEW; CHEMICAL CHARACTERISTICS AND THERAPEUTIC POTENTIAL OF ASPHALTUM PUNJABIANUM (SHILAJIT)

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Summary: Asphaltum is produced by the decomposition of plants on rock's surface; the secretions of plants i.e. latex, gums and resins. An unprocessed asphaltum may contain fulvic acid, humic acid, amino acid, essential fatty acids, gums proteins, waxes, steroids, and vitamins. It also contains plenty of calcium and trace amounts of aluminum, magnesium, potassium, and iron, *etc.* Asphaltum has so many therapeutic applications because of its two major and primary compounds i.e. fulvic acid and dibenzo- α -pyrones. It has been used for the treatment of many diseases like diabetes, jaundice, anemia, urinary diseases, tuberculosis, asthma, jaundice, gall bladder disease, enlarge spleen, renal calculi, digestive troubles, dyspepsia, neurological disease, dysmenorrhea, menorrhoea genitor urinary disease, tuberculosis, leprosy eczema, anemia, chronic bronchitis, asthma, fracture of bones and in various other treatments. Asphaltum is an effective antiulcer agent, memory and learning enhancing and possess anti-oxidant property, cardiac stimulating activity, hypolipidimic activity and active against kidney problems. It is also used to reduce the aging effects in humans.

Keywords: asphaltum, shilajit, therapeutic

INTRODUCTION

Asphaltum (or shilajit) is a natural multicomponent mineral which was originated in India and used in Siddha and Ayurveda systems of medicine [1]. It is commonly exuded from mountain rocks mainly found in Russia, Tibet, Himalayan ranges, Norway, Bhutan, Nepal, Afghanistan, China and Pakistan [2-4]. Asphaltum was formed in centuries through the natural decomposition of certain plants under the action of microorganisms [5]. In different traditional literatures, it has been reported as a folk medicine [6]. The physiological properties of Asphaltum may vary depending upon their geographical origin. It has been used as medicine from old times. There is hardly a curable disease which cannot be controlled with aid of asphaltum; in fact, it is Panacea in Oriental medicine [7].

Asphaltum contains triterpenes, sterols, aromatic carboxylic acids, 3,4-benzocoumarinsfulvic acid, humic acid and dibenzopyrones [8]. It contains 80-85% humus and various organic compounds derived from fossils which remained compressed under layer of rocks for hundreds of years at a high temperature and pressure conditions [9]. Asphaltum has antiulcer, memory and learning enhancing potential, antidiabetic effect, anti-oxidant property, cardiac stimulating activity, hypolipidemic activity and is useful against kidney problems and anti-aging problems [5, 10]. It is also used for the treatment of jaundice, gall bladder disease, enlarged spleen, renal calculi, digestive troubles, dyspepsia, neurological disease, dysmenorrhea, menorrhoea genitor urinary disease, tuberculosis, leprosy eczema, anemia, chronic bronchitis, asthma, fracture of bones and in various other treatments [2, 11]. Asphaltum has been used to reduce the aging effects in human and it is produced by the decomposition of plants commonly *Euphorbia royleana* and *Trifolium repens*. Some other plants like *Barbula*, *Fissidens*, *Minium* and *Thuidium*, *Marchantia* and *Stephen recella-Anthoceros* also contributes in the formation of asphaltum [2, 9, 12]. Aqueous solution of Asphaltum contains organic substances especially fulvic acid (FA). FA has much medicinal potential [9, 13].

According to literature [14, 15], 80% of earth inhabitants depend upon traditional medicines (TM) for their health care, which involves medicines of plant, mineral and animal origin for therapeutic purposes. Currently, the research on plant based medicines is growing worldwide [16-20] but the remaining two components of TM (medicines based upon minerals and animals) are almost neglected [1]. Current studies are focused on the chemical characteristics and therapeutic potential of shilajit which has a specific mineral nature.

ORIGIN OF ASPHALTUM PUNJABIANUM

There are different thoughts regarding to the origin of Asphaltum, It was originally thought that plant fossils or substance of mixed plant and animal origin

were decomposed in rocks of mountains [21] under the action of high temperature and pressure and converted in asphaltum which can be directly exuded from the upper layer of rocks [2].

NAMES FOR ASPHALTUM IN DIFFERENT REGIONS

Traditional names were given to the Asphaltum because of its primary importance and characteristic features at different places. Some of traditional names for Asphaltum are displayed in table 1 [2, 22-24].

TABLE 1. Traditional names for *Asphaltum*

LANGUAGE	NAMES OR SYNONYMS
Latin	<i>Asphaltum Punjabanum</i>
Russian	Myemu and mumie
Persian	Momia-i-Faqrul-yahud
Arabic	Hajar-ul-musa
English	Asphalt, mineral pitch, Jew pitch, Bitumen
German	Mumie, Salhumin
Gujarati	Silajita
Bengali	Silajatu, Shilajit
Tamil	Peragym, Uerangyum, kalmatam
Hindi	Shilajit, Ral-yahudi

CLASSIFICATION OF ASPHALTUM

There are two major types of Asphaltum as described follows:

Semi hard: It is brownish black to dark greasy resin with a distinct coniferous smell and bitter taste [9, 25].

White Asphaltum: White Asphaltum with camphor odor [1, 9].

The semi hard type Asphaltum can be further divided into four sub-classes on the basis of dominance of metal ore found in them [23].

- **Gold ore Asphaltum:** It is red in color and used for the treatment of hemorrhoids.
- **Silver ore Asphaltum:** It is white in color and used in the treatment of phlegm humor associated with heat like allergic rhinitis.
- **Copper ore Asphaltum:** It is blue in color and it is used to maintain balance in phlegm humor like asthma.
- **Iron ore Asphaltum:** It is dull in color and it is useful for the treatment of pain syndrome, hypertension, diabetes.

CHEMICAL COMPOSITION

About 60-80 % of organic matter and 20-40 % mineral content are present in Asphaltum. The unprocessed material may contain fulvic acid, humic acids, amino acids, essential fatty acids, gums, proteins, waxes, steroids and vitamins. It also contains plenty of mineral elements in it such as calcium, magnesium, potassium, *etc* [2].

A typical processed Asphaltum may contain fulvic acid and equivalents, 0.3-0.4% dibenzo- α -pyrones (DBP's), 10-30% DBP chromoproteins (DCP's) and 10-15% mineral products [26].

Some calculated concentrations of different elements and compounds in Asphaltum are reported as in table 2.

TABLE 2. Concentrations of some elements and compounds in Asphaltum

ELEMENT/ COMPOUNDS	AMOUNT (% W/W)
Calcium	24.06044%
Aluminum	0.0966%
Magnesium	0.366%
Iron	3.124%
Alotin	1.23%

MEDICINAL DRUGS CONTAINING ASPHALTUM

Asphaltum has become an important constituent of different medicines and finds so many therapeutic applications due to its anti-oxidant, antiviral, anti-diabetic properties [1]. Table 3 shows some important shilajit based medicinal drugs used for the treatment of specific diseases.

TABLE 3. Shilajit based medicinal drugs used for the treatment of diseases

S. NO.	NAME OF MEDICINE	DISEASES	COMPANY/ MANUFACTURING INDUSTRY
1	Tablet Abana (Heart Care)	Hypertension and Cardio-protection	Himalaya Drug Company, Bangalore, India
2	Capsule Shilajit	Natural energy enhancer and aphrodisiac	Dabur International Limited, KBC Harrow Exchange 2 Gavton Road Harrow HA1 2XU,UK
3	Capsule mumijo	Asthma, Osteoporosis and Diabetes	ApeironHandels GmbH & Co. KG, Walllenhorst
4	Capsule Shilajit (3% fulvic acid)	Anti-stress, enhances memory and intellectual functions	Renaissance Herbs, California, USA and Dhanvantri Botanicals, Bangalore, India
5	Shilajit Oil	Hypertension	Cinnabarisspagyrics (Herbals), Pune, India
6	Capsule ji Gold	Aphrodisiac	Ban Labs Ltd., Rajkot, India
7	Tablet Prosteez	Benign Prostatic hyperplasia	Charak Pharma Pvt. Ltd. Mumbai, India
8	Tablet Pigmento	Vitiligo	CharakPharma Pvt. Ltd. Mumbai, India
9	Tablet Pallry- wyn Forte	Premature senility or loss of libido in both sexes	Charak Pharma Pvt. Ltd. Mumbai, India
10	Tablet Neo	Nocturnal semen emission and premature ejaculation	Charak Pharma Pvt. Ltd. Mumbai, India
11	Tablet Nefrotec DS	Urolithiasis, diuretic and urinary antiseptic	Himalaya Drug Company, Bangalore, India
12	Tablet Pilex (Vein care)	Heamorrhoids and varicose veins	Himalaya Drug Company, Bangalore, India
13	Tablet Cystone (Uricare)	Urolithiasis, nonspecific urethritis Including dysuria and chronic urinary tract infection	Himalaya Drug Company, Bangalore, India
14	Tablet Lukol	Non-specific leucorrhoea and pelvic inflammatory disease	Himalaya Drug Company, Bangalore, India
15	Capsule Addyzoa	Oligospermia, asthenosper- mia, tetraspermia and ma- nagement of male functional infertility	Charak Pharma Pvt. Ltd. Mumbai, India
16	Tablet Hyponidd	Mild diabetes mellitus and polycystic ovarian syndrome	Charak Pharma Pvt. Ltd. Mumbai, India

THERAPEUTIC POTENTIAL OF ASPHALTUM PUNJBIANUM

Asphaltum extract is medicinally important for different deficiencies, disorders and diseases which are explained below:

Anti-oxidant: A biological molecule may undergo oxidative damage by free radicals [27]. This oxidative damage leads to various disorders like heart diseases, cancer, diabetes, arthritis, aging [28]. Anti-oxidant prevents the oxidative damage. Asphaltum has been used for more than 3,000 years [29]. Fulvic acid extracted from Asphaltum is also used as an ion exchange resin [30].

Anti-Inflammatory: Asphaltum induces anti-inflammatory property against carrageenan induced pedal oedema and can be used in weight of 50 mg/kg [31]. It acts as strong regulator of enzymatic and non-enzymatic activities [32].

Analgesics: Effect of 20-50 mg per kg of Asphaltum was studied in albino mice, it was found to have analgesic property (P, 0.001) in amount of 200mg/kg [32].

Adaptogen to stress: Asphaltum works as stress reducer. Different coniferous plants have property to attenuate the effects of stress [31].

Asphaltum and chronic fatigue syndrome: In the study of modulation of hypothalamus pituitary axis and preservation of mitochondrial function, Asphaltum was shown to reduce the effects of chronic fatigue syndrome [33].

Energy enhancer: Two primary components of Asphaltum i.e. Fulvic acid and dibenzo- α -pyrones (DBP's) act as energy enhancer. Fulvic acid independently Stimulates mitochondrial energy metabolism. DBP also acts as electron as an energy "reservoir" [2, 34].

Antidiabetic: It is reported that Asphaltum is used to reduce the glucose level in blood [31, 35].

Anti-ulcer: Asphaltum is found to possess anti-ulcer genic effects by its ability to decrease gastric acid secretions and peptic output [36]. Asphaltum pretreatment reduces the ulcer by cysteamine in rats and histamine in guinea pigs [35].

Spermatogenic effect: Asphaltum was evaluated in healthy volunteers between 45 to 55 years of age for its effects on male androgenic hormones [37].

Ovogenic effect: Asphaltum induces the ovogenic activity in female rats [38].

Antiviral and antifungal Activity: Shilajit is endowed with immunomodulation, antiviral and antifungal properties. Activity of fungus like *Alternariacajani* can be reduced by using Asphaltum [25, 39].

Immunomodulatory Activity: It was found that white blood activity is enhanced by Asphaltum's extract. Asphaltum is currently available as effective immunomodulator [32].

Learning and memory enhancing: It was reported that Asphaltum helps in memory enhancing and learning in rats Phytotherapy research [40].

Biological Activities: Asphaltum contains fulvic acid, humic substances, which enhance the biological activities like endocrine, brain functions in organisms [36].

CONCLUSIONS

Asphaltum is exuded from rocks at high altitude about 1000 and 5000m. During hot summer the plant present on rocks especially coniferous plants undergo degradation and their secretions i.e. latex, gums, resins, stick on the surface of rocks. This exudation from the rock surface term as Asphaltum. It is also known as Shilajit or salajit. It has so many therapeutic potential because of two major and primary compound i.e. fulvic acid and dibenzo- α -pyrones (DBP's), which are helpful in diagnosis of different diseases. Asphaltum can be used as anti-oxidant, anti-inflammatory, anti-stress, energy enhancer, anti-ulcer, anti-viral, anti-fungal, anti-diabetic and many more. It also contains basic elements such as calcium, magnesium, iron, potassium, selenium, sodium etc. which are very good for body strength and bones. Asphaltum is also helpful for the memory and sharp mind.

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