

## Therapeutic Potentials of “*Shilajit Rasayana*”-A Review

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### ABSTRACT

Shilajit is a rejuvenator ('Rasayana') of traditional Hindu Ayurvedic origin, which clearly has attracted considerable interest in India. Shilajit is a blackish-brown exudation of variable consistency exuding from layers of rocks in many mountain ranges of the world, especially the Himalayas and Hindukush ranges of the Indian subcontinent. Shilajit has been used as a folk medicine for general physical strengthening, anti-aging, blood sugar stabilization, urinary tract rejuvenation, enhanced brain functioning potency, kidney rejuvenation, immune system strengthening, arthritis, hypertension as well as for treating many other conditions. Shilajit (botanical name: Asphaltum), also known as mineral pitch, is a natural exudate oozed from rocks during hot weather. Shilajit is a compact mass of vegetable organic matter, which is composed of a gummy matrix interspersed with vegetable fibers and minerals.

**Keywords:** Shilajit, Rasayana, Exudate.

### INTRODUCTION

Shilajit is a rejuvenator ('Rasayana') of traditional Hindu Ayurvedic origin, which clearly has attracted considerable interest in India. Ayurvedic pharmacology classifies medicinal substances into different groups (e.g. 'Rasayana') according to their actions. Rasayana medicines improve the quality of 'Rasa' (plasma) and thus strengthen or promote the health of all tissues of the body.<sup>[1]</sup> Shilajit is blackish-brown exudation of variable consistency obtained from the steep rocks of different formation found in the Himalayas at altitudes between 1000-1500 m, from Arunachal Pradesh in the East, to Kashmir in the West. Shilajit is also found in other mountain ranges of the world, e.g., Afghanistan (Hinduksh, Badakh-Shan), Australia (Northern Pollock Ranges) and in the former USSR (Tien-Shan, Pair, Caucasus, Ural).<sup>[2-5]</sup> Shilajit has urinous odour and slight bitter, saline, somewhat pungent and astringent taste. The purified substance is nearly completely soluble in water and has an acid reaction.<sup>[2]</sup> Shilajit is not a rock but a complex mixture of organic humic substances and humic nature, plant and microbial metabolites occurring in the rock rhizospheres.<sup>[6-9]</sup> It is also called, Momio in Persian, myemu in Russian and mumie in German.<sup>[2, 6, 43]</sup> Shilajit has been used for thousands of years, in one form or another, under the indigenous systems of medicine such as Ayurveda, Siddha and Unani. It is bitter in taste and its smell resembles pungent

cow's stale urine.<sup>[41-42]</sup> Shilajit, an ancient traditional medicine has been ascribed a number of pharmacological activities and has been used for ages as a rejuvenator and for treating a number of disease conditions.<sup>[10]</sup> Shilajit is one such remedy, which has been in use as a folk medicine for over 3000 years as a rejuvenator and adaptogen.<sup>[11]</sup> Shilajit mainly consists of pale humus (around 80-85 %) and organic compounds derived from vegetation fossils that have been compressed under layers of rocks for hundreds of years and have undergone a high amount of metamorphosis due to the high temperature and pressure conditions prevalent there.<sup>[7, 12-14]</sup>

### Varieties of Shilajit

There are four different varieties of shilajit which have been described in charka samhita, namely savrana, rajat, tamra and lauha shilajit. Savrana shilajit is gold shilajit and is red in colour. Tamra is a copper shilajit and is blue in colour. Rajat is a silver shilajit and is white in colour while the lauha shilajit is an iron-containing shilajit and is brownish-black in colour. Blue and Gold Shilajit are not found commonly and the variety mostly available is the Iron Shilajit which, from the therapeutic point of view, is considered to be active.<sup>[2, 11, 15-16]</sup>

### Origin of Shilajit

There are many scientists who claim that shilajit exuding from a layer of rocks of mountains is basically of vegetative origin.<sup>[2, 17]</sup> Shilajit was variously described as bitumen varying greatly in consistency from a free flowing liquid to hard brittle solid; a mineral resin, a plant fossil exposed by the elevation of the Himalayas, a substance of mixed plant and animal origin and an inorganic material.<sup>[18-19]</sup> Latex bearing plants, namely *Euphorbia royleana* Boiss and

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*Trifolium repens* which occur in the vicinity of the shilajit bearing rocks are thought to be the most likely source of shilajit. [20-21] Other recent research claims that the mosses of species such as *Barbula*, *Fissidenc*, *Minium*, *Thuidium* and species of Liverworts like *Asterella*, *Dumortiera*, *Marchantia*, *Pellia*, *Plagiochasma* and *Stephenrencella-Anthoceros* were present in the vicinity of shilajit-exuding rocks and these bryophytes are responsible for the formation of shilajit. [7, 22]

#### TRADITIONAL USES

In Ayurveda, the term maharasa denotes a group of drugs of mineral origin. Shilajit is an important drug of the ancient Hindu *materia medica* and is extensively used by the Hindu physicians in a variety of diseases. It is said to be efficacious against phthisis, chronic bronchitis and asthma, digestive troubles, sexual and bladder calculi, dropsy, nervous diseases, leprosy, diabetes, and fracture of bones. It is also used in parasitic diseases of the skin and as an antiphlogistic. [2-3]

According to Ayurveda, shilajit arrests the process of aging and produces rejuvenation which is two important aspects of an Ayurvedic rasayana. [19] Shilajit is also used as yogavaha. [16, 31] Shilajit increases efficacy of: *Shoria robusta* (sala), *Bachanania lactifolia* (piala), *Acacia farnesiana* (acacia), *Terminalia tomentosa* (asana), *Catechu nigrum* (catechu), *Terminalia chebula* (myrobelan) and *Sida cordifolia* (bala) in the decoction form. [32]

#### PHYTOCHEMISTRY

Considerable controversy had existed in the reported literature on the nature and chemical constituents of Shilajit. It was reported to contain resins, fatty acids, benzoic and hippuric acids, albuminoids, amino acids and a number of minerals. [2, 20] Extensive chemical studies by Ghosal et.al [3, 20] have indicated the occurrence of oxygenated biphenyls and three oxygenated 3, 4-benzocumarins, several phenolic, amino acid and triterpenes in Shilajit. [13, 23]

Shilajit contains two classes of organic compounds, namely

- (1) Humic substances
- (2) Non-humic organic metabolites

Humic substances are the major organic constituents of Shilajit present in an amount of about 80-85%. The humic substances can be further divided into three fractions

1. Fulvic acids (Fas)
2. Humic acids (Hs)
3. Humins (HMs)

The Fas micropores of Shilajit are occupied by low molecular weight. Bioactive molecules e.g oxygenated dibenzene-alpha-pyrones and their dimeric and oligomeric equivalents. [19, 20, 24], other low molecular weight phenolic entities and Fas of Shilajit act as an efficient carrier of several classes of drug molecules for uninterrupted systemic distribution and absorption. [15-16]

The non-humic substances of Shilajit are low molecular weight compounds of marine fossil, plant, and microbial origin, occurring in and around Shilajit bearing rocks. The remaining non-humic organic masses in Shilajit comprise a mixture of low molecular weight aromatic, aliphatic alicyclic and heterocyclic (N- and S- containing) compounds of particular biological interest are low molecular weight oxygenated dibenzo-alpha-pyrones (DBP) and hydroxy acetophenones (HAPS).

The two oxygenated dibenzo-alpha-pyrones, viz 3-hydroxydibenzo-alpha-pyrone and 3, 8 dihydroxy dibenzo-alpha-pyrone occurred both in the free form in the

micropores of Has and Fas [12] and also in conjugated forms in the humus of Shilajit. [6]

#### GENERAL PHARMACOLOGICAL ACTIVITIES

Shilajit extract have LD<sub>50</sub> 1g/kg. The general pharmacological activities shown by Shilajit are summarized below:

##### Anti-inflammatory

Orally administered Shilajit (50 mg/kg) induced significant anti-inflammatory activity against carrageenan induced pedal oedema. [10]

##### Analgesic

Studies were conducted in albino mice to determine the effect of 50-200 per kg of Shilajit. The analgesic effect of Shilajit pretreatment were studied using the technique of hot wire induced tail-flick response. Shilajit was found to have analgesic activity (p, 0.001) in the dose of 200mg/kg i.p. The effect was significant during the first 60 min. [10]

##### Antidiabetic

Shilajit (50 & 100 mg/kg, p.o) had no discernible per se effect on blood glucose levels in normal rats but attenuated the hyperglycemic response of STZ. [27]

##### Immunomodulatory

Shilajit and its corresponding combined fractions, acted essentially as cell growth factors in both normal and tumour cells by maintaining membrane integrity. Thus, Ayurveda rasayan, Shilajit would be validated as currently available efficacious immunomodulator. [19] It was found that the white blood cell activity was increased by shilajit extract. The observed activity increased as the dose of shilajit extract and time of exposure was increased. [34]

##### Nootropic

Shilajit at a dose of 50 mg/kg, p.o has significant nootropic activity as shown by passive avoidance learning and retention. It was found that processed shilajit and its active constituents (total ethyl acetate fraction and fulvic acids) significantly increased the learning acquisition and memory retention in old albino rats. [29, 44]

##### Anti-anxiety

Shilajit at a dose of 10 mg/kg, p.o has significant anti-anxiety activity as proved by elevated plus-maze test which is comparable to that of diazepam (1 mg/kg, p.o). [29]

##### Anti-ulcer

Shilajit pretreatment at the dose of 100mg/kg orally reduced ulcer index in immobilization and aspirin induced gastric ulcers. In duodenal ulcers also, Shilajit pretreatment significantly reduced the incidence of ulcers induced by cysteamine in rats & histamine in guinea pigs. [23]

##### Antiviral activity

Shilajit is endowed with both immunopotentiating [19, 34-39] and viral load reducing properties [25, 40].

##### Spermatogenic and ovogenic effects

The administration of Shilajit to rats showed a remarkable increase in the number of sperm of the epididymus in male rats and in the number of ovulation induced rats in females. [28]

##### Antifungal activity

Methanolic extract of Shilajit at the concentration of 5000µg/ml was having excellent inhibitory activity against *Alternaria cajani* (95.12 % spore inhibition). [30]

##### Protection of mast cells from degranulation

The effects of fulvic acids, 4-methoxy-6-carbomethoxy biphenyl and 3,8-dihydroxy-pyrone were studied in relation to the degranulation of mast cells against noxious stimuli.

Shilajit and different combination of its constituents provided statistically significant protection to antigen-induced degranulation of sensitized mast cells, markedly invited the antigen-induced spasms of sensitized guinea pig ileum and prevent mast cell disruption induced by compound 48/80. [24]

#### Free radical scavenging and antioxidant effect

Shilajit shown free radical scavenging & antioxidant effect against  $SO_3^-$ , OH radical and paramagnetic nitric oxide (NO) depending on the concentration of Shilajit. [25] The antioxidant effects were concentration dependent. Higher concentrations of processed shilajit provided greater free radical protection. [15, 33]

#### Anti-lipid-peroxidative Activity

The effects of Shilajit on lipid liver homogenate were investigated. It inhibited lipid peroxidation induced by cumene hydroperoxide and PDP/Fe<sup>++</sup> complex in a dose dependent reduced glutathione content and inhibited ongoing lipid peroxidation, induced by these agents immediately after addition to the incubation system. [26]

A number of old ayurvedic texts have mentioned tremendous and a variety of uses of shilajit rasayana as a potential rejuvenator and immunomodulator. Today evidence based studies are needed to establish these facts so that these wonder drugs with multifarious therapeutic activities can be put to human use.

#### REFERENCES

- Govindarajan R, Vijayakumar M, Pushpangadan P. Antioxidant approach to disease management and the role of ‘Rasayana’ herbs of Ayurveda. *Journal of Ethnopharmacology* 2005; 99: 165–178.
- Chopra RN, Handa KL, Kapoor LD. *Indigenous Drugs of India*. Dhar and Sons Pvt. Ltd. Calcutta, 1958; 457-460.
- Ghosal S, Lal J, Singh SK, Kumar Y, Srivastava R. Antitumor activity of fulvic acid and 4'-methoxy-6-carbomethoxybiphenyl isolated from shilajit. *Phytotherapy Res.* (1988a); 2(4):187-191.
- Kong YC, Butt PPH, Ng KH, Cheng KF, Camble RC, Malla SB. Chemical studies on a Nepalese panacea; Shilajit. *Int J Crude Drug Res* 1987; 25: 179–187.
- Srivastava RS, Kumar Y, Singh SK, Ghosal S. Shilajit, its source and active principles. *Proc 16 IUPAC (Chemistry of Natural Products)*. Kyoto Japan. 1988; 524.
- Ghosal S. Shilajit: Its origin and vital significance. In: B. Mukherjee, Editor, *Traditional Medicine*, Oxford – IBH, New Delhi 1993; 308–319.
- Agarwal SP, Khanna R, Karmarkar R, Anwer MK and Khar RK. Shilajit: a review, *Phytotherapy Res.* 2007; (21) 401–405.
- Agarwal SP, Anwer MK, Aqil M. Complexation of furosemide with fulvic acid extracted from Shilajit: a novel approach, *Drug Development and Industrial Pharmacy* 2008; 34: 506–511.
- Agarwal SP, Khanna R, Karmarkar R, Anwer MK, Khar RK. Physico-chemical, spectral and thermal characterization of Shilajit, a humic substance with medicinal properties, *Asian Journal of Chemistry* 2008; 20:209–217.
- Acharya SB, Frotan MH, Goel RK, Tripathi SK, Das PK. Pharmacological actions of Shilajit. *Indian J Exp Biol.* 1988; 26: 775–777.
- Sharma PV. In *Darvyaguna Vijnan*, 4th edn. Chaukhamba Sanskrit Sansthan Varanasi. 1978; 63.
- Ghosal S, Lal J, Singh SK. The core structure of Shilajit humus. *Soil Biol Biochem* 1991a; 23: 673–680.
- Ghosal S, Muruganandam AV, Mukhopadhyay B, Bhattacharya SK. Humus, the epitome of Ayurvedic makshika. *Indian J Chem* 1997; 36B: 596–604
- Ghosal S, Lal J, Ravi K, Yatendra K. Similarities in the core structure of shilajit and soil humus. *Soil Biol Biochem* 1993b; 25: 377–381.
- Ghosal S, Lata S, Kumar Y, Gaur B, Misra N. Interaction of Shilajit with biogenic free radicals. *Indian J Chem.* 1995b; 34b: 596–602.
- Ghosal S, Mukherjee B, Bhattacharya SK. Shilajit – A comparative study of the ancient and the modern scientific findings. *Indian J Indig Med* 1995c; 17: 1–10.
- Shakir N, Salim N, Bhatti MK, Karimullah. Studies on ‘Shilajit’ (Asphalt) Part-I. *Pak J Sci Industr* 1965; Res 28–30.
- Tewari VP, Tewari KC, Joshi P. An interpretation of Ayurvedic findings on Shilajit. *J Res Ind Med.* 1973; 8: 53–58.
- Ghosal S. Chemistry of Shilajit, an immunomodulatory Ayurvedic rasayan. *Pure Appl Chem (IUPAC)* 1990; 62: 1285–1288
- Ghosal S, Reddy JP, Lal VK. Shilajit: Chemical constituents. *J Pharm Sci.* 1976; 65: 772–773.
- Ghosal S, Singh SK, Srivastava RS. Shilajit part 2. Biphenyl metabolites from *Trifolium repen*. *J Chem Res.* 1988b; 196: 165–166.
- Joshi GG, Tewari KC, Pande NK, Pande G. Bryophyte, the source of the origin of Shilajit – a new hypothesis. *B M E B R* 1994; 15: 106–111.
- Goel RK, Banerjee RS, Acharya SB. Antitumor and anti-inflammatory studies with Shilajit. *Journal of Ethnopharmacology*. 1990; 29:95-103
- Ghosal S, Lal J, Singh SK, Dasgupta G, Bhaduri J, Mukhopadhyay M, Bhattacharya SK. Mast cell protecting effects of Shilajit and its constituents. *Phytotherapy Res.* 1989; 3(6): 249-252.
- Ghosal S. Free radical oxidative stress and antioxidative defense. *Phytomedica* 2000; 21(1&2): 1-8.
- Tripathi YB, Shukla S, Chaturvedi S. Antilipidperoxidative property of Shilajit. *Phytotherapy Res.* 1996; 10(3): 269-273.
- Bhattacharya SK. Shilajit attenuates streptozotocin induced diabetes mellitus and decrease in pancreatic islet superoxide dismutase activity in rats. *Phytotherapy Res.* 1995; 9(1): 41-44.
- Jeong- Sook Park, Gee-Young Kim, Kun Han, The spermatogenic and ovogenic effects of chronically administered Shilajit to rats, *Journal of Ethnopharmacology* 2006; 107: 349-353.
- Jaiswal AK, Bhattacharya SK. Effects of Shilajit on memory, anxiety and brain monoamines in rats. *Indian Journal of Pharmacology* 1992; 24: 12-17.
- Shalini et. Al. Antifungal activity screening and HPLC analysis of crude extract from *Tectona grandis*, Shilajit, *Valeriana wallachi*. *Electrical Journal of Environment, Agricultural and Food Chemistry* 2009; 8(4): 218-229.
- Ghosal S, Lal J, Singh SK, Goel RK, Jaiswal AK, Bhattacharya SK. The need for formulation of Shilajit by its isolated active constituents. *Phytother Res.* 1991b; 5: 211–216.
- Khanna R. Novel bioavailability enhancers from natural sources, Thesis (Ph.D.), *Jamia Hamdard (Hamdard University)*, New Delhi. 2005.
- Bhattacharya SK, Sen AP, Ghosal S. Effects of Shilajit on biogenic free radicals. *Phytother Res.* 1995; 9: 56–59.
- Bhaumik S, Chattopadhyay S, Ghosal S. Effects of Shilajit on mouse peritoneal macrophages. *Phytother Res.* 1993; 7: 425–427.
- Ghosal S. Shilajit: Its origin and significance in living matter. *Indian J Indig Med.* 1992a; 9: 1–3.
- Ghosal S. The saga of Shilajit, *Proceedings of 2nd Indo-Korean Symposium on Natural Products*, Seoul Korea, (Plenary lecture). 1992b; 1–12.
- Ghosal S. Standardization of phyto- and herbo-mineral medicines. In *Proceedings of National Symposium on Proprietary and Patented Medicines*. Calcutta, 1998; 22–28.
- Ghosal S, Bhaumik S, Chattopadhyay S. Shilajit induced morphometric and functional changes in mouse peritoneal macrophages. *Phytother Res.* 1995a; 9: 194–198.
- Ghosal S, Mukhopadhyay B, Muruganandam AV. Ayurvedic herbo-mineral vitalizers: Ancient and modern perspectives. *Indian J Indig Med.* 1995d; 17: 1–12.
- Ghosal S. Herbo-Mineral compositions. 2002a; US Patent application No. 20030198695.
- Ghosal S. The aroma principles of gomutra and karpurgandha Shilajit. *Indian J Indig Med* 1994; 11: 11–14.
- Ghosal S, Kawanishi K, Saiki K. Shilajit odour Part 3. The chemistry of shilajit odour. *Indian J Chem* 1995e; 34b: 40–44.
- Ghosal S, Mukhopadhyay B, Bhattacharya SK. Shilajit, a rasayan of Indian traditional medicine. In *Molecular Aspects of Asian Medicines*, Mori A, Satoh T (eds). PJD Publication Ltd: Westbury, NY, 2000; 425–444.
- Ghosal S, Lal J, Jaiswal AK, Bhattacharya SK. Effects of Shilajit and its active constituents on learning and memory in rats. *Phytother Res.* 1993a; 7: 29–34.