

Bhutanese *Brag-zun* (mineral pitch): Its uses and scientific findings

Phurpa Wangchuk¹

*In-charge, Research and Development Section, Pharmaceutical and Research Unit,
Institute of Traditional Medicine Services, Thimphu.*

Abstract

Brag-zun is the most sought after medicinal products in Bhutan and also in the Asian countries. It is used in many folkloric and traditional medicines for treating various disorders and is commonly known as the "destroyer of all illnesses". According to *gso-ba-rig-pa*, *Brag-zun* is used for treating fever, ulceration of stomach, liver and kidney diseases, dysentery, gout, rheumatism, boosting the body immune system (as rejuvenators) and for improving the eyesight. In Bhutan, *Brag-zun* is collected from the rocky cliffs in Chukha, Punakha and Paro Dzongkhags and is used for formulating as many as seventeen different traditional medicines. The scientific literature review found that *Brag-zun* has been extensively studied and the findings substantiate most of its ethno-medical claims. However, no study was done on the Bhutanese variety of *Brag-zun*. Therefore, series of studies were carried by the authors mainly to assess its anti-oxidant and anti-microbial activities. These studies found that the Bhutanese variety of *Brag-zun* exhibited the anti-oxidant and the antifungal activities. It was active against *Candida albicans* and *Microporeum gypsum*. Thus, this paper describes the reported scientific findings of *Brag-zun* and the findings of the Bhutanese variety of *Brag-zun*.

Keywords: *Brag-zun*; Ethno-medical uses; Scientific findings; Anti-fungal; Anti-oxidant.

1. Introduction

Brag-zun (Fig.1) is a herbo-mineral drug ejected out of fissures in iron rich rocks, during hot weather. *Brag-zun* is called Silajatu in Sanskrit and Mineral Pitch or Asphaltum/Bitumen in English. Indian calls it Silajita and Pakistanis call it Salajit. In ancient Hindu literature, there are different types of Silajit. They are Iron silajit (blackish-brown variety), Copper silajit (blue variety), Silver silajit (white variety) and Gold silajit (red variety). *Brag-zun* is bitter and pungent in taste and hot in potency. The true Shilajit smells like cow's urine.

Brag-zun is commonly found adjacent to conifer forests especially in the Himalayas, Vindhya and other mountains in India, Nepal, Bhutan, Pakistan and Afghanistan (Zahler, 1998). Inside Bhutan, it is found in the rocky cliffs in Chukha, Punakha and Paro Dzongkhags.



Fig.1: Raw *Brag-zun*

The *Brag-zun* was first discovered by Himalayan villagers observing large white monkeys migrate to the mountains in the warm summer months. The monkeys were seen chewing a semi-

¹ Corresponding address. Email address: phurpaw@yahoo.com

soft substance that flowed from between layers of rock. The villagers attributed the monkey's great strength, longevity and wisdom to this substance. These villagers consumed and reported a broad spectrum of improvements in their health. It seemed to give them more energy, relieve digestive problems, increase sex drive, improve memory and cognition, improve diabetes, reduce allergies, improve the overall health and it seemed to cure all diseases (Hartman, 2002).



**Fig.2: Processed
Brag-zun**

Since then, the *Brag-zun* became popular and today it is widely used in many folkloric and traditional medicines. In Ayurvedic and Unani medicines, *Brag-zun* is used as an aphrodisiac, antiseptic, anodyne, parasiticide, internally alterative, tonic, slightly laxative, disinfectant, expectorant, diuretic, respiratory, stimulant and intestinal antiseptic (Ahmad & Arunachalam, n.a). It is an important ingredient in the Ayurvedic preparations for strengthening immune system of human body (Kokate & Gokhale, 1995).

According to *gso-ba-rig-pa*, the processed *Brag-zun* (Fig.2) is individually used for treating fever, ulceration of stomach, liver and kidney diseases, dysentery, gout, rheumatism, general tonic stimulant for strengthening the body immune system (as rejuvenators) and for strengthening as well as improving the eyesight (Dash, 1987).

Brag-zun is collected in a raw form by the farmers and they sell it to the Pharmaceutical and Research Unit (PRU) at a cost of Nu.395/kg (2009 quoted price). The PRU procured 1000 Kilograms of *Brag-zun* in 2007 (Procurement Record, 2007). The pre-processing of this crude *Brag-zun* is done at PRU. It is dissolved in water and left standing till the soil and other foreign matter settles down. It is decanted and then boiled at 90-100 degree Celsius. It is then concentrated to get the slurry form of processed *Brag-zun* which is then used for making 17 different types of Bhutanese traditional medicines (Tenzin, 2007) in combination with other ingredients as mentioned below.

1. gser-m.dog-5-pa used for treating indigestion and jaundice
2. gser-m.dog-11 used for treating gallstone
3. churu -25 used for treating blood pressure and liver diseases
4. s.kren-'jom-zda-b.sil used for treating gallstone and as anticoagulant
5. klu-b.dud-18 used for treating leprosy, skin diseases and boil
6. gurgum-7-pa used for treating kidney diseases and fever
7. gumphye-d.mar-po used for treating dysentery and gout
8. goyu-28 used for treating gonorrhea and strengthening kidney functions
9. giwam-9-pa used for treating fever and for stopping nose bleeding
10. thangchen-25 used for suppressing high body temperature and for improving appetite
11. rdutsi-5-lum used for treating gout and paralysis
12. spois-d.kar-10-pa used for treating gout and rheumatism
13. brag-zun -9-pa used for treating stomach acidity (ulcer)
14. 'basam-lhalung used for treating kidney diseases

15. gya-kyi-25 used for treating jaundice
16. se-bru-kuen-b.dey used in treating gastritis and promoting digestion and
17. zda-zhel-rdutsi-ma used for treating liver diseases and gastritis

Brag-zun is the most sought after products in Bhutan and in the region. While extensive research has been reported on this product, no specific study was done on the Bhutanese *Brag-zun*. Therefore, a study was conducted on the Bhutanese variety of *Brag-zun* to find its anti-oxidant and anti-microbial activities. In the process, a scientific review was also carried out to find what has been done and reported so far.

This paper thus describes the scientific findings of *Brag-zun* reported in the literatures and also about the findings of the Bhutanese variety of *Brag-zun* in relation to its anti-oxidant and anti-microbial activities.

2. Reported Scientific Findings

2.1 Chemistry of *Brag-zun*

According to the literatures related to Mineralogy, *Brag-zun* is reported to be an oxygenated hydrocarbon of different types with their melting points ranging from 90-1000 degree Celsius. It gives bright flame without fumes when burnt. It is soluble in turpentine. The reported chemical contents of *Brag-zun* are; humic acid, fulvic acid (3-20%), Dibenzo- α -Pyrones (1%) and 4'-Methoxy-6-Carbomethoxybiphenyl (Sahlelian, n.a). These chemical compositions and the pH of *Brag-zun* differed based on their geographical origin (Table 1).

Table 1: Composition and pH of *Brag-zun* by geographical origin (Jamtsho, 2006).

Country	pH of 1% aqueous solution	Relative% composition of low Mw extracts	Fulvic acid% composition	Relative% composition of humic acid constituents
India	6.2	17.9	21.4	19.8
Nepal	7.5	20.0	15.4	11.4
Pakistan	6.8	4.3	15.5	5.6
Russia,	8.2	29.7	19.0	11.5
Bhutan	7.4	pH test at Silpakorn University		

2.2 Pharmacology of *Brag-zun*

Over sixty years of clinical research have shown that *Brag-zun* has positive effects on human health. It increases longevity, improves memory and cognitive ability, reduces allergies and respiratory problems, reduces stress, and relieves digestive troubles. It is anti-inflammatory, antioxidant, and eliminates free radicals. The research works reported in the literatures provides

evidences that *Brag-zun* increases immunity, strength, and endurance, and lives up to its ancient reputation as the "destroyer of weakness" (Hartman, n.a). Extensive proof has been submitted on the healing, anti-aging and restorative properties of *Brag-zun*.

The primary active ingredients in *Brag-zun* are Fulvic Acids, Dibenzo- α -Pyrones, Humins, Humic Acids and trace minerals. Fulvic Acids are small lattice shaped molecules that act as carriers for the Dibenzo- α -Pyrones and trace minerals into the body. The trace minerals act as co-factors for enzymes, as catalyst for energy conversion, as electrolytes for maintaining the electrical balance in bodily fluids, as an oxygen carrier in the body, and as neuro-transmitters (Hartman, 2002). The Dibenzo- α -Pyrones are able to pass the blood brain barrier and act as a powerful antioxidant protecting the brain and nerve tissue from free radical damage. It also inhibits the enzyme acetyl cholinesterase, which breaks down the acetylcholine. Low levels of acetylcholine are associated with Alzheimer disease, poor memory and poor concentration (Hartman, 2002).

Some of the claims are being substantiated by scientific papers published by various journals as mentioned below:

i) *Allergies*

Mast Cell Protecting Effects of Shilajit and Its Constituents. *Phytotherapy Research* Vol. 3, No. 6, 1989 pp249-252.

ii) *Anti-inflammatory*

a) Antiulcerogenic and Anti-inflammatory Studies with Shilajit. *Journal of Ethno pharmacology*, 29 (1990) 95-103; Elsevier Scientific Publishers Ireland Ltd.

b) Anti-Ulcerogenic Activity of Fulvic Acids and 4'-Methoxy-6-Carbomethoxybiphenyl Isolated From Shilajit. *Phytotherapy Research*, Vol. 2, No. 4, 1988 pp187.

iii) *Antioxidant*

a) Effects of Shilajit on Biogenic Free Radicals. *Phytotherapy Research*, Vol. 9, pp 56-59 (1995) by Salil K. Bhattacharya and Ananda P. Sen. Dept. of Pharmacology, Institute of Medical Sciences, Banaras Hindu ; University, Varanasi-221005, India.

b) *Interaction of Shilajit with Biogenic Free Radicals*. Shibnath Ghosal, Soumyn Lata, Yatendran Kumar, Department of Pharmaceutics, Banaras Hindu University, Varanasi-221005, India.

c) Antioxidant Defense by Native and Processed Shilajit-A Comparative Study. *Indian Journal of Chemistry* Vol. 35B, Feb. 1996, pg. 127-132.

iv) *Diabetes*

Shilajit Attenuates Streptozotocin Induced Diabetes Mellitus and Decrease in Pancreatic Islet Superoxide Dismutase Activity in Rats. Salil K. Bhattacharya, Neuropharmacology laboratory, Dept. of Pharmacology, Institute of medical sciences, Banaras Hindu University, Varanasi-221005, India.

v) *General*

a) Chemical Studies on a Nepalese Panacea – Shilajit. *Int. J. Crude Drug Res.* 25 (1987), No. 3, pp. 179-182.

b) Unearthing the Evidence. *Chemistry in Brittan*, March 1997, pp32-34.

c) Effects of Shilajit on the development of tolerance to morphine in mice. *Phyther Res.* 2001 Mar; 15(2):177-179.

- d) Systemic administration of defined extracts from *Withania somnifera* and Shilajit differentially affects cholinergic but not glutamatergic and GABAergic markers in rat brain. *Neurochem Int.* 1997 Feb; 30(2):181-190.
 - e) *Chopra's Indigenous Drugs of India*, Second Edition pg. 457-461; Academic Publishers, Calcutta.
 - f) *Pharmacological Actions of Shilajit*. S.B. Acharya, M.H. Frotan, R.K.Goel, S.K. Tripathi, P.K. Das, Department of Pharmacology, institute of medical sciences, Banaras Hindu University, Varanasi-221005, India.
 - g) Shilajit, A Comparative Study of the Ancient and Modern Scientific Findings. *Indian J. Indg. Med.* April 1995-September 1995 Vol. 17(1).
 - h) The Chemistry of Shilajit Odour. *Indian Journal of Chemistry*, Vol. 34B, January 1995, pp. 40-44.
 - i) Shilajit: Its Origin and Significance. *Indian J. Indg. Med.* (1992), 9 (1&2).
- vi) *Immunity*
- a) *Shilajit Induced Morphometric and Functional Changes in Mouse Peritoneal Macrophages*. Shibnath Ghosal, Dept. of Pharmaceutics, Banaras Hindu University, Varanasi-221005, India.
 - b) Chemistry of Shilajit, an Immunomodulatory Ayurvedic Rasayan. *Pure & Appl. Chem.*, Vol. 62, No. 7, pp. 1285-1288, 1990. Great Brittan.
- vii) *Memory*
- a) *Effects of Shilajit and Its Active Constituents on Learning and Memory in Rats*. S. Ghosal and J. Lal Pharmaceutical Chemistry Research Laboratory, Department of Pharmaceutics, Institute of Technology, Banaras Hindu University, Varanasi-221005, India.
 - b) *Effect of Shilajit on Rat Brain Monoamines*. S. K. Bhatineharyn; Dept. of Pharmacology, Institute of medical sciences, Banaras Hindu University, Varanasi-221005, India.

3. Chemical, anti-oxidant and antifungal studies of Bhutanese *Brag-zun*

The chemical, anti-oxidant and antifungal analysis of Bhutanese *Brag-zun* was carried at the Mahidol University and the Department of Medical Sciences in Thailand. The Bhutanese *Brag-zun* was assessed for the following:

3.1 Chemical analysis

The *Brag-zun* was analysed for the alkaloidal, flavonoid, coumarin, amino acid, triterpene and the essential oil compounds. Different chromatographic conditions were developed for each compound-based investigation. The tests were found negative for essential oil, triterpene and alkaloidal compounds. However, it gave positive test result for flavonoid, coumarin and amino acid compounds. The test result in case of amino acid was too weak and may need further confirmatory test.

For flavonoid test, it gave clearly a positive result as seen in the Thin Layer Chromatography (TLC) Plate (Fig.3).

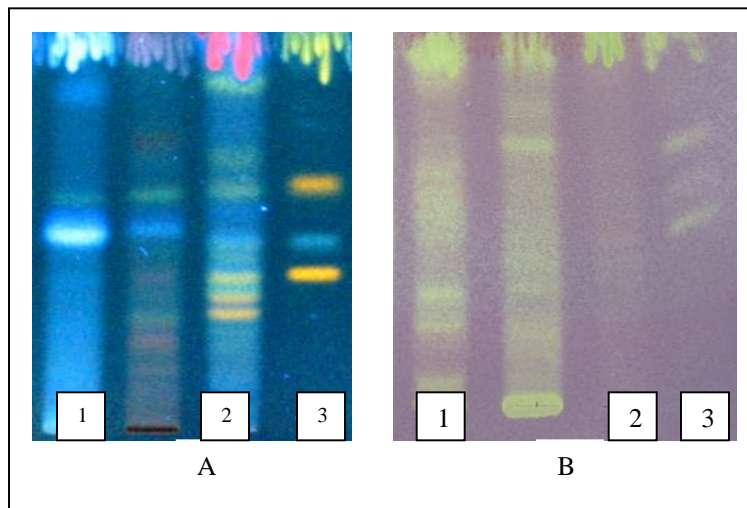


Fig.3: TLC plates for flavonoid

Chromatographic conditions

Stationary phase : TLC plates silica gel 60 F254 (Merk)

Mobile phase : Ethyl acetate: Formic acid: Acetic acid: water
(100 : 11 : 11 : 27)

Sample applied : 5 μ L volumes of test solutions

Sample tracks : Track 1 = *Brag-zun*

: Track 2 = *Tribulus terrestris* (standard)

: Track 3 = Standard (Rutin, Chlorogenic acid, Isoquercitin, Quercitin)

Detections : A = UV 366 nm, after derivatization with natural products reagent/PEG.

: B = DPPH spray reagent and examined in visible light after drying.

(Fig.2)

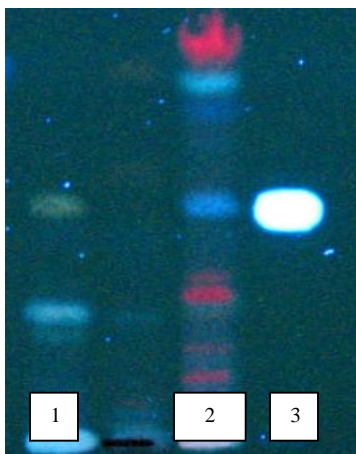


Fig.4: TLC plates for coumarin compounds

Chromatographic conditions

Stationary phase: TLC plates silica gel 60 F254 (Merk)

Mobile phase : Ethyl acetate: Formic acid: Acetic acid: water
(100 : 11 : 11 : 27)

Sample applied: 5 μ L volumes of test solutions

Sample tracks : Track 1 = Brag-zun

: Track 2 = *Tribulus terrestris* (standard)

: Track 3 = Standard (rutin, chlorogenic acid,
isoquercetin, quercetin)

Detections : A = UV 366 nm, after derivatization with
natural products reagent/PEG.

: B = DPPH spray reagent and examined in
visible light after drying.

3.2 Antifungal activity

Samples Received : 19th February 2008.

Date of Analysis : February 20, 22, 27, 29. March 3, 6, 10, 17, 18, 24, 28,
31. April 4, 17, 23. May 3, 12, 20.

Test Sample B : Dark brown viscous liquid.

Objective : To test antifungal activity against dermatophytes.

Sample Preparation : The test samples were dissolved in water (40 mg/ml)
and filtered aseptically.

Test Method 1. : MIC (Minimum Inhibitory Concentration) by broth
microdilution test.

Concentrations tested were 0.625, 1.25, 2.5, 5, 10, 20 mg/ml.

Test Method 2. : MFC (Maximum Fungicidal Concentration) by growing on SDAPlate.
Concentrations tested were 0.625, 1.25, 2.5, 5, 10, 20 mg/ml.

Fungal strains : *Candida albicans* CDCB.385, *Trichophyton mentagrophytes*,
Microsporum gypseum.

Reported Date : 21st May 2008.

Test Results : From the test, it was found that Brag-zun was inactive

against *Candida albicans* and *Trichophyton mentagrophytes*. However, it gave positive test against *Microsporum gypseum* with IC₅₀ value of 0.625 mg/mL (Table 2).

Table 2: Test result of the antifungal activity of Brag-zun.

Analysis	Test Sample	Fungal Strain	Result
13-51-06819	BRAGZHUN Mfd. 5/2/2008 Batch No.261	<i>Candida albicans</i> CDCB.385	Negative for all concentration
		<i>Trichophyton mentagrophytes</i>	Negative for all concentration
		<i>Microsporum gypseum</i>	Positive at 0.625 mg/mL

3.3 Anti-oxidant activity

The *Brag-zun* gave very weak activity with the DPPH determined using the UV Spectrophotometer (Table 3). The TLC was developed and when sprayed with DPPH, it gave positive test for the anti-oxidant activity (Fig. 3, B).

Table 3: DPPH radical scavenging activity of Brag-zun

Sample	DPPH IC ₅₀ (µg/ml)
<i>Brag-zun</i>	405.45
Ascorbic acid (Positive control)	9.70

4. Conclusion and recommendation

Brag-zun has been extensively studied and many of the traditional medical claims are being supported by many scientific paper publications in the journals some of which are highly regarded in the international arena. The Bhutanese variety of *Brag-zun* gave positive tests for its chemical compositions (only major classes of compounds), free radical scavenging activity and antifungal activity. The presence of anti-oxidising agent in *Brag-zun* supports the traditional medical claim of boosting the health and increasing the youthfulness. The antifungal activity substantiates the claims of *Brag-zun* being good for ringworm and wounds.

Science has proven that it is a miracle traditional drug. Therefore, it may be a good choice of herbal drug to keep oneself young and healthy. In general, the Traditional Physicians suggest the users to take more cow's milk during use-period of *Brag-zun*. As it is soluble in milk, its intake helps in proper digestion and assimilation in the body. Spicy and heavy foods are strictly prohibited.

However, some *Brag-zun* that are available in the local market especially those imported ones, may be adulterated with steroids. Therefore, if bought from the local markets, it is cautioned not to exceed its intake for more than 1 week for the fear that the steroids may inflict adverse side effects.

If *Brag-zun* is collected from the rocky cliffs, it is advisable not to over harvest it. This is because it takes minimum 20 years to regenerate. There is need to develop the management plan for this.

Acknowledgements

The contributions of Dr. Omboon Lauratana, Head of Pharmacognosy Department, Mahidol University, Thailand; and Dr. Malee and the staffs of the Department of Medical Sciences in Thailand are appreciated here.

References

Ahmad, R.U.S; Arunachalam, C. *Album of Crude drugs*, Ghaziabad: Pharmacopoeial Laboratory for Indian Medicine, Department of Indian System of Medicine and Homoeopathy, Ministry of Health & Family Welfare. Pp.51.

Dash, V.B. 1987, First ed. *Materia Medica of Indo-Tibetan Medicine*. Delhi, Classics India Publication. pp.197.

Hartman, M. 2002. *Shilajit: Miracle of the Himalayas*.
Website: www.drhartman.com/Shilajit.htm.

Hartman, M., *SHILAJIT: Sacred Soma of the Alchemists*.
Website: www.crucible.org/shilajit.htm.

Jamtsho, Loden. 2006. *Development of Mineral Pitch (Brag-zun) as Semisolid Dosage Form*. Dissertation of Diploma Course, Silpakorn University, Thailand.

Kokate, C.K.P; Gokhale, S.B. 1995, Third ed.. *Pharmacognosy*. Pune, Shri.D.K.Furia, Nirali Prakashan. pp.740-741.

Sahlelian, R. *Shilajit Research Update: Shilajit Extracts*.
Website: www.raysahelian.com/shilajit.html.

Thinlay, Jigme. 2009. *Raw Materials Procurement Report*. Pharmaceutical and Research Unit, Institute of Traditional Medicine Services, Ministry of Health, Thimphu.

Tenzin, Sherub. 2007. Second Edition. *Traditional Medicine Formulary of Bhutan*. Institute of Traditional Medicine Services, Ministry of Health, Thimphu, Bhutan.

Zahler, P.K. 1998. *Origin of the Floristic Components of Salajit*, in *Hamdard Medicus*, H.M. Said, Editor. Bait al-Hikmah at Madinat al-Hikmah: Karachi. pp.6-8.