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## Biochemical Study of Mumijo in Uvs province, Mongolia

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**Abstract:** The authors cleared mumijo by extractive and distil methods, defined pure output of natural mumijo and compared difference between these two methods. We defined the amount of dry and extractive substances, raw oil, antioxidant-rutin, vitamin C, fulvic acid, common nitrogen and total protein, content of protein amino acids, and mineral elements in natural mumijo. We exposed 13 protein amino acids in sample of natural mumijo. The content of total irreplaceable amino acids (5) were 26.2%. The authors defined macro and microelements (42) in ash of natural mumijo. In sample of mumijo exposed 10 elements are oxide form, W, Y, Cs, La-rare metal of the earth, and actinoids- Nd, Th, U; lanthanoids-Pr, Sm. The same exposed non-ferrous metal-Cu, Mo; light metal-Al, mixed metal-Pb, Zn. However, the valuable metals-Au, Ag and white gold are not exposed.

**Keywords:** Mumijo, protein amino acids, fulvic acid, mineral elements

### Introduction

Mumijo, also known as *momia* and *shilajit* is a thick, sticky tar-like substance with a colour ranging from white to dark brown, which sometimes found in Caucasus, Altai mountains and Tibet mountain chains. Mumijo is a word of Greece origin. The substance is mentioned in the works of Aristotle and Avicenna as a remedy with antiseptic and general stimulant properties used people in Caucasus. Most scientists agree that people observed wounded animals frequenting caves with mumijo and discovered the substance, similar substances are used for medicinal purposes throughout Tibet (Berun, 10<sup>th</sup> century; Jambaldorj, 1978).

Some scientific research on mumijo has been done in the former USSR, including full-scale clinical trials. Most information on mumijo is known from Russian literature sources.

Mumijo is still unclear whether it has geological or biological origin as it has numerous traces of vitamins and amino acids.

Mumijo is not toxic, at least in reasonable quantities. A mumijo-like substance from Antarctica was found to contain glycerol derivatives and was also believed to have medicinal properties. Mumijo has a wide spectrum of pharmacological activity. A unique plant extract in combination with dozens of minerals: six amino acids, vitamins, A, B, C and P, natural steroids, terpenoids, phospholipids and polyphenol complexes. Mumijo contains trace and micro-elements (cobalt, nickel, copper, zinc, manganese, chromium, iron, sodium, potassium, magnesium, and others) (Shakirov, 1963).

Mongolian researchers were studied about Mumijo at an ancient time. Agvaandondov (1991) translated it as “Khar magic”, “Brown method” and “Historical

ensemble of Mongol khar magic”, our high writer of 18<sup>th</sup> century Lunggregdandar wrote “Jud-shiin habit” work, scientist Ishdanzanvanjil (1868) composed “Jiru-dosil” in Tibetan language. He wrote that mumijo need in prescription of gastric disease. Khaidav (1982) and Ambaga *et al.*, (1989) were had similar explanation. Famous doctor Choijamts (1920) composed about mumijo in his work “Very wonderfully wedding foundation”. Later, Danzan (1995) translated this work, Enkh-Oyun (2008) composed thesis “Mumijo preparation influence on bone callus and some indices of patience for cattle and animals”.

Fulvic acid, one of two classes of natural acidic organic polymer that can be extracted from humus found in soil, sediment or aquatic environments. This name derives from latin fulvus, indicating its yellow colour.

**Fulvic acid** (not to be confused with folic acid) is rapidly being recognized as one of the key elements in many outstanding health and scientific breakthroughs of the 21<sup>st</sup> century. Scientists and doctors throughout the world are beginning to discover fulvic acid and starting to recognize its extraordinary potential. Fulvic acid has always occurred naturally in organic plants and soils. It increases energy, it is a ferocious antioxidant and free radical scavenger, chelates heavy metals and body toxins, removing them from the system (Ponomareva *et al.*, 1969).

## Experimental

**Material and methods.** Mumijo material was collected from “Yoliin shil” of the Umnogovi sum of the Uvs province in September, 17. 2009. Mumijo sample was purified by extraction and distillation methods (MNS 5725:2007). Dry substance was determined by method of weight stability, the raw oil by method soxhlet, extractive substance by method of Pleshkov, total protein by Kjeldahl method, protein amino acid by paper chromatography, vitamin C by titration method 2,6-dichlorinephenolindophenol sodium, rutin was determined by method of Murri, fulvic acid by vacuum evaporate method.

## Results and Discussion

We cleared natural mumijo by extractive and distil methods (Table 1).

**Table 1.** Purely output compared by two methods.

Sample of mumijo	Purified method	Extract of mumijo	Weight of extract (g)	Weight of after clear (g)	Purely output (%)
“Yoliin shil” Umnugovi district of the Uvs province	Extraction	natural	5	2.742	54.8
	distillation	natural	5	1.02	20.4

Purely output compared in between two methods: by extractive method was-54.8%, by distil method was-20.4%. An extractive method was more effective (34.4%) than distilling method. Dry substances of natural mumijo was 95.23%, water 4.77%.

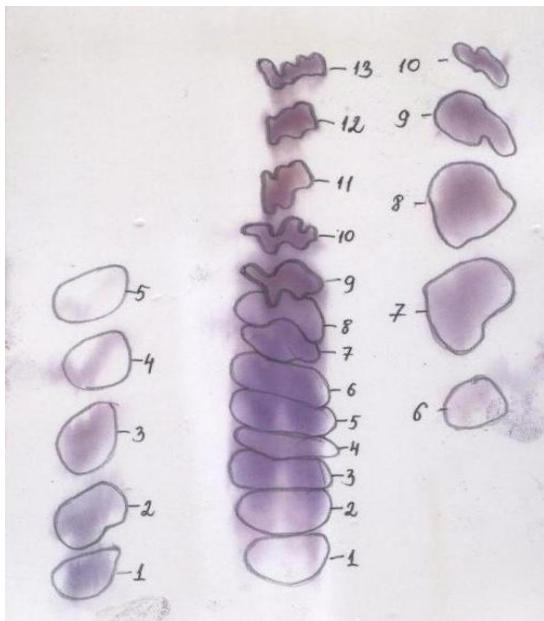
We have determined biochemical components of natural and pure mumijo.

**Table 2.** Some results of biochemical characteristics of natural and pure mumijo.

Mumijo	Dry substance (%)	Extractive substance (%)	Raw oil (%)	Rutin (mg%)	Vitamin C (mg%)	Commonnitrogen (%)	Total protein (%)	Fulvic acid (%)
Natural	95.23	38.73	3.02	0.53	130	2.24	14.0	23
Pure	89.74	21.05	2.53	0.41	121	1.72	10.8	nd

nd-not determined

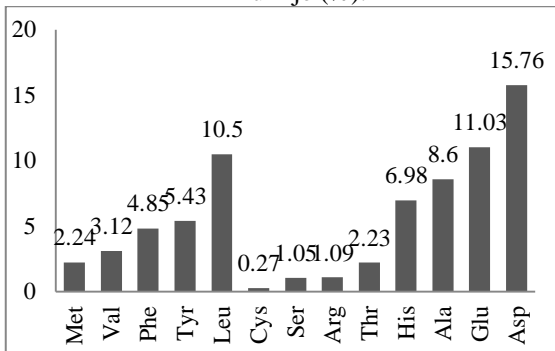
Dry substance of natural mumijo was 95.23% and of pure mumijo was 89.73%, extractive substance of natural mumijo was 38.73%, but of pure mumijo was 21.05%; raw oil of natural mumijo was 3.02%, of pure mumijo was 2.53%; rutin of natural mumijo was 0.53mg% of pure mumijo was 0.41mg%; antioxidant vitamin C of natural mumijo was 130mg%, of pure mumijo was 121mg%; total protein of natural mumijo was 14%, and total protein was more (3.2%) than pure mumijo. The fulvic acid in sample of natural mumijo was 23%.



Standard Uvs province Standard  
**Fig. 1.** Chromatogram of experimental and standard amino acids.

Amino acids in natural mumijo have been determined by paper chromatography. (Fig 2).

**Fig 2.** Content of protein amino acids in natural mumijo (%).



We exposed 13 protein amino acids in sample of dry natural mumijo. The content of essential amino acids (methionine, valine, phenylalanine, tyrosine, and leucine) were 26.2%. The content of replaceable amino acids (cysteine, serine, arginine, threonine, histidine, alanine, glutamic acid, and aspartic acid) were 47.01%. The content of leucine was high (10.5%) more than other essential amino acids. Aspartic acid was high in content (15.76%) than other replaceable amino acids. Content of cysteine was very little (0.27%) than other amino acids.

We have defined content of mineral elements in ash of natural mumijo, where exposed 42 mineral elements. Most elements measured in ppm. But, we calculated it in

percentage. In sample of natural mumijo exposed 10 elements were oxide form.

**Table 3.** Amount of mineral elements in ash of natural mumijo (%).

Elements (oxide form)	Amount
SiO	39.1
TiO <sub>2</sub>	0.37
Al <sub>2</sub> O <sub>3</sub>	9.53
Fe <sub>2</sub> O <sub>3</sub>	3.42
MnO <sub>2</sub>	0.11
MgO	3.98
CaO	15.2
Na <sub>2</sub> O	2.35
K <sub>2</sub> O	11.4
P <sub>2</sub> O <sub>5</sub>	1.8

Elements	amount
As	0.0011
Ba	0.0276
Bi	0.0005
Ce	0.0101
Co	0.0005
Cr	0.0018
Cs	0.0025
Cu	0.0037
Ga	0.0009
Hf	0.00015
La	0.0056
Mo	0.0005
Nb	0.0023
Nd	0.0075
Ni	0.0016
Pb	0.0016
Pr	0.003
Rb	0.0115
Sb	0.004
Sc	0.001
Sm	0.003
Sn	0.002
Sr	0.0356
Ta	0.0006
Th	0.0021
U	0.0005
Y	0.0017
W	0.0027
Y	0.0061
Zn	0.0126
Zr	0.0312
F	0.00005

The amount of silicon oxide was very high (39.1%) than other mineral oxide form. The calcium oxide was 15.2% etc. The non-ferrous metals, Cu 0.0037%, Mo 0.0005%; light metal Al 9.53%; mixed metal, Pb 0.0016%, Zn 0.0126%. The rare metal W was 0.0027%, Y-0.0061%, Cs-0.0025%, La-0.0056%.

### Conclusions

- Purely output of natural mumijo, as compared between two used methods revealed that the extractive method was more effective than distil method.

- Dry substances of natural mumijo was 95.23%. The extractive substance of natural mumijo was 38.73%, and in pure mumijo it was 21.05%. The raw oil of natural mumijo was 3.02%, and in sample of pure mumijo it was 2.53%. Antioxidant vitamin C and rutin of natural mumijo were 130mg%, 0.53mg%. The contents of latter were equal in sample of pure mumijo 121mg%, 0.41mg%. In the sample of natural and pure mumijo we defined total protein. The fulvic acid in sample of natural mumijo was 23%.
- The content of essential amino acids were 5, replaceable amino acids were 8.
- In ash of natural mumijo, we defined 42 mineral elements, of which 10 elements were in oxide form. In ash of natural mumijo exposed some rare metals, non-ferrous metals, light metals, mixed metals, actinoids and lanthanoids.

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