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ANTICOAGULANT AND FIBRINOLYTIC EFFECTS OF AQUEOUS EXTRACT OF ALAI MUMIYO IN DOGS

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Abstract
The present study evaluated the effect of an aqueous extract of *Alai mumiyo* on blood coagulation parameters in dogs. Ten healthy adult dogs (12–18 kg) received *Alai mumiyo* orally at a dose of 50 mg/kg body weight. Blood samples were collected before administration, and at 30 and 60 minutes after treatment, to assess coagulation indices. Administration of *Alai mumiyo* produced a marked prolongation of blood clotting time, plasma recalcification time, and thrombin time, along with a significant increase in plasma tolerance to heparin. Fibrinogen levels showed a slight, non-significant decrease, while fibrinolytic activity increased moderately. No changes were observed in total plasma protein concentration. These results indicate that *Alai mumiyo* exerts a clear anticoagulant effect, possibly by modulating both coagulation and fibrinolytic pathways. The findings suggest potential therapeutic value of *Alai mumiyo* as a natural anticoagulant or antithrombotic agent.
Keywords: *Alai mumiyo*, coagulation, anticoagulant activity, thrombin time, plasma recalcification, fibrinolysis, heparin tolerance, dogs, natural product, haemostasis

Introduction

Traditional medicine (TM) represents an extensive and diverse body of empirical knowledge, skills, and healing practices developed and transmitted across generations within various cultural contexts. Grounded in cultural traditions, observation, and experiential wisdom, TM is employed not only for maintaining general health but also for preventing, diagnosing, and managing a wide range of physical and psychological ailments (1). In recent decades, scientific and clinical interest in TM has expanded considerably, leading to growing research efforts aimed at isolating, characterizing, and validating the bioactive constituents of medicinal plants and natural products used in traditional therapies. Many of these investigations have revealed significant pharmacological and preventive potential, supporting the relevance of TM in modern integrative healthcare systems (2).

Traditional medicine encompasses several well-established regional systems, including Traditional Persian Medicine (TPM), Traditional Arabic Medicine, Traditional Chinese Medicine (TCM), and Ayurveda the ancient medical science of India (3). Among the natural substances utilized in these traditions, *Mumijo* also widely known as *Shilajit* (Hindi), *Silajatu* (Bengali), *Rock Juice* (Tibetan), *Conqueror of Mountains* (Sanskrit), *Hajarul-Musa* (Arabic), *Moomiaii* (Persian), *Myemu* (Russian), and *Mumie* (German) holds a distinctive position. This resinous, pale to dark-brown exudate, often referred to as “mineral pitch” or “mineral wax,” has been valued for more than three millennia for its rejuvenating, restorative, and adaptogenic effects (4).

The origin of *Mumijo* has been explained through three major hypotheses biological, geological, and bio-mineralogical. The biological theory proposes that it forms through gradual

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microbial decomposition of plant and animal matter under specific environmental and physicochemical conditions. The geological theory attributes its genesis to long-term mineralization processes within mountain strata, whereas the bio-mineralogical model integrates both views, suggesting that organic precursors interact with mineral matrices to produce the final complex substance. Factors such as local flora, soil and rock composition, altitude, temperature, and humidity play key roles in shaping the final chemical composition and biological properties of *Mumijo* (7).

Despite regional variations, *Mumijo* typically comprises 60–80% organic matter and 20–40% inorganic minerals, enriched with trace elements such as Fe, Ca, Cu, Zn, Mg, Mn, Mo, and P (8). These diverse constituents are believed to contribute collectively to its broad pharmacological activity.

Historically, *Mumijo* has been highly esteemed in Persian medical literature. In the 10th century, Ahvazi's *Kamāl as-Sanā'a* recommended it for ailments such as headaches, hemoptysis, and asthma. Avicenna, in *The Canon of Medicine*, described *Mumijo* as a potent restorative agent beneficial for strengthening the brain, enhancing fertility, and treating various systemic disorders. Later, in the 12th century, Jurjani's *Zakhire Khwārizmshāhi* detailed its therapeutic use for inflammation, ulcers, and urinary tract and prostate diseases (5).

In traditional practice, *Mumijo* has been administered in diverse forms and dosages for a wide range of conditions, including urinary disorders, jaundice, gallstones, gastrointestinal disturbances, splenic enlargement, epilepsy, allergic and neurological conditions, chronic bronchitis, tuberculosis, eczema, anemia, and diabetes (9). However, the potential for fungal contamination and the presence of mycotoxins remain critical challenges to ensuring its safety and standardization (10).

Traditional healers and contemporary researchers alike attribute to *Mumijo* a broad spectrum of pharmacological properties, including aphrodisiac, antioxidant, anti-inflammatory, and rejuvenating actions. It has also been used in musculoskeletal conditions such as arthritis, fractures, and spondylitis, and for promoting wound healing, tissue regeneration, and metabolic balance (7). Modern chemical analyses have revealed that its bioactivity largely arises from the presence of fulvic and humic acids, dibenzo-α-pyrones, and trace minerals, which exhibit potent antioxidant, anti-inflammatory, immunomodulatory, and antimutagenic effects (8).

Experimental studies have further demonstrated that *Mumijo* can reduce blood glucose levels, improve lipid profiles, stimulate nucleic acid and protein synthesis, enhance mineral transport to bone and muscle tissues, and promote diuresis and natriuresis (4, 11, 12). Collectively, these traditional insights and experimental findings indicate that *Mumijo* is a complex natural product with multifaceted biological activities and significant promise as a source of novel pharmacologically active compounds for modern drug development.

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Materials and Methods.

The study was conducted on 10 clinically healthy adult dogs (n = 10) of both sexes, weighing 12–18 kg. All animals were maintained under standard vivarium conditions with free access to water and a balanced diet. The experimental protocol was approved by the Institutional Animal Ethics Committee and complied with international principles of humane animal treatment. The animals received an aqueous extract of *Alai mumiyo* orally at a dose of 50 mg/kg body weight. Blood samples were collected from the cephalic vein at three time points: before administration (baseline), 30 minutes after administration, and 60 minutes after administration. Venous blood was drawn into tubes containing 3.8% sodium citrate (9:1 ratio). The samples were centrifuged at 3000 rpm for 15 minutes to obtain platelet-poor plasma, which was used for coagulation tests.

Data are presented as mean ± standard error of the mean (SEM). Differences between time points were evaluated using Student's *t*-test. Differences were considered statistically significant at $p < 0.05$.

Results

Oral administration of *Alai mumiyo* (50 mg/kg) in dogs produced significant changes in coagulation parameters (Table 1).

Blood clotting time increased sharply from 286 ± 19 s to 900 s at both 30 and 60 min ($p < 0.01$). Plasma recalcification time and thrombin time also rose significantly ($p < 0.05$), indicating delayed coagulation. Plasma tolerance to heparin increased from 246 ± 34 s to 456 ± 57 s, suggesting enhanced anticoagulant activity.

Fibrinogen levels showed a slight, non-significant decrease, while Factor V and Factor VII + X activities changed minimally. Fibrinolytic activity increased moderately, and total plasma protein remained stable, indicating no systemic effect.

Table 1. *Effect of Alai Mumiyo Extract at a Dose of 50 mg/kg on Some Blood Coagulation Parameters in Dogs (n = 10)* (time in seconds unless otherwise stated)

Parameter	Baseline	After 30 min	After 60 min
Blood clotting time	286±19	↑900	↑900
Plasma recalcification time	61±6,3	108±12	107±10
Plasma tolerance to heparin	246±34	395±42	456±57
Thrombin time	11±1,0	26±3,8	26±4,8
Factor V activity	13±0,6	14±0,7	14±0,7
Factor VII + X activity	27±251	32±1,4	33±2,3
Fibrinogen (mg %)	255±29	233±20	245±25
Fibrinolytic activity (min)	123±23	135±17	142±17
Total protein (g %)	8.6±0,6	8.60.4	8.6±0,4

Statistically significant differences ($p < 0.05$) compared with baseline values.

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Discussion

The results demonstrate that oral administration of *Alai mumiyo* extract in a dose of 50 mg/kg exerts a pronounced **anticoagulant effect** in dogs. The consistent prolongation of clotting, recalcification, and thrombin times, accompanied by increased fibrinolytic activity, suggests that the extract acts both on the **coagulation** and **fibrinolytic systems.**

The prolongation of thrombin time indicates possible inhibition of fibrin polymerization or direct interference with thrombin activity. The observed enhancement of plasma tolerance to heparin may reflect potentiation of the **antithrombin-heparin complex** or an increase in endogenous heparinoids. Together, these effects point to a systemic shift toward **hypocoagulation.**

The mild decrease in fibrinogen concentration and the activation of fibrinolysis further support this hypothesis, indicating a stimulation of clot degradation processes. Similar properties have been reported for biologically active substances derived from natural mineral–organic complexes such as mumiyo, which contain humic acids, trace elements, and bioactive peptides capable of influencing enzyme systems.

Overall, the findings suggest that *Alai mumiyo* possesses both **anticoagulant** and **fibrinolytic** activities. These effects may underlie its traditional use as a regulator of circulatory and metabolic functions. Further studies involving larger sample sizes, prolonged exposure, and isolation of active fractions are required to elucidate the precise mechanisms and potential therapeutic applications of this natural preparation.

Conclusion

The findings of this study demonstrate that oral administration of aqueous extract of *Alai mumiyo* (50 mg/kg) in dogs produces a pronounced anticoagulant effect. The extract significantly prolonged blood clotting, thrombin, and plasma recalcification times, increased plasma tolerance to heparin, and slightly enhanced fibrinolytic activity without altering total plasma protein levels. These results suggest that *Alai mumiyo* modulates both coagulation and fibrinolytic pathways, indicating its potential as a natural anticoagulant or antithrombotic agent. Further studies are needed to isolate the active components and elucidate the underlying mechanisms of action.

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