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EXPERIMENTAL EVALUATION OF THE SPECIFIC ACTIVITY OF *ASTRAGALUS KRAUSEANUS* PLANT EXTRACT

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Abstract. This study evaluates the anti-inflammatory activity of *Astragalus krauseanus* extract under experimental conditions. White rats were treated orally with the extract at doses of 50, 100, and 200 mg/kg for 7 days. Acute inflammation was induced using acetic acid–induced peritonitis and formalin-induced edema models. Anti-inflammatory activity was assessed based on exudate volume and paw edema. The results showed that the extract reduced the exudative phase of inflammation by 31–43% at all tested doses. In the formalin-induced edema model, anti-inflammatory effects ranged from 43.0% to 62.2%. At some doses, the efficacy of the extract was comparable to or higher than that of ketoprofen. These findings indicate that *Astragalus krauseanus* extract exhibits significant anti-inflammatory activity and may be considered a promising biologically active substance for further pharmacological studies.

Introduction. Inflammation is a protective response of the organism to harmful factors and proceeds through the stages of alteration, exudation, and proliferation. Although the main function of this process is the restoration of damaged tissues, its prolonged course may lead to the development of various diseases. Currently, inflammation is considered a key

pathogenetic factor in many pathological processes, including cardiovascular, metabolic, and autoimmune diseases. Therefore, the search for effective agents aimed at controlling and reducing the inflammatory process remains highly relevant. Despite the widespread use of non-steroidal anti-inflammatory drugs, their side effects have increased the need to study biologically active compounds derived from natural sources. In this regard, the investigation of the anti-inflammatory properties of medicinal plants represents an important scientific direction.

Literature Review. *Astragalus* L. is a genus of plants belonging to the Fabaceae family, comprising 2,000–3,000 species and more than 250 taxonomic groups worldwide [1]. The medicinal properties of *Astragalus* species are associated with their chemical composition, and more than 200 compounds have been identified in several *Astragalus* species to date. According to modern chemical analyses, the main classes of these compounds are polysaccharides, saponins, and flavonoids, which represent the primary biologically active constituents of *Astragalus* species [2]. The aqueous extract of *Astragalus* has been reported to alleviate memory impairment and neurodegenerative conditions, which may be associated with an increase in the number of M-cholinergic receptors in the cerebral hemispheres [3]. These compounds exhibit a wide range of pharmacological activities, including antimicrobial, anti-inflammatory, anticancer, and insecticidal effects [4, 5]. Astragaloside compounds present in several *Astragalus* species have been shown to possess acetylcholinesterase inhibitory activity [6]. Phenolic and flavonoid compounds, which are also present in the plant, play an important role in preventing various diseases due to their antioxidant properties [7]. In the present study, for the first time in Uzbekistan, the specific activity of the extract of *Astragalus krauseanus* was experimentally evaluated in laboratory animals.

Materials and Methods. The study object consisted of different doses of *Astragalus krauseanus* plant extract and white rats with a body weight of 200–220 g. The extract was administered orally once daily for 7 days at doses of 50, 100, and 200 mg/kg. After the administration period, acute exudative inflammation was induced using 1% acetic acid to model experimental peritonitis [9]. The experiments were carried out by dividing the white rats into four groups:

Control group: Animals received distilled water corresponding to body weight during the experimental period. At the end of the experiment, experimental peritonitis was induced by intraperitoneal injection of 1 ml of 1% acetic acid per 100 g of body weight.

Experimental group 1: Animals received *Astragalus krauseanus* extract at a dose of 50 mg/kg orally once daily for 7 days. At the end of the treatment period, experimental peritonitis was induced by intraperitoneal injection of 1 ml of 1% acetic acid per 100 g of body weight.

Experimental group 2: Animals received *Astragalus krauseanus* extract at a dose of 100 mg/kg orally once daily for 7 days, followed by induction of experimental peritonitis using 1% acetic acid as described above.

Experimental group 3: Animals received *Astragalus krauseanus* extract at a dose of 200 mg/kg orally once daily for 7 days, followed by induction of experimental peritonitis using 1% acetic acid as described above.

After the experiments, euthanasia was performed under ether anesthesia.

Results and Discussion. Anti-inflammatory activity. It is well known that most diseases in the organism are based on inflammatory processes. The inflammatory response consists of three main phases: alteration, exudation, and proliferation. The expansion of the inflammatory area in damaged tissues is mainly associated with the intensification of the exudative phase. For this purpose, *Astragalus krauseanus* plant extract was administered orally at doses of 50, 100, and 200 mg/kg for 7 days. Acute exudative inflammation was then induced by intraperitoneal injection of 1% acetic acid at a dose of 1 mL per 100 g of body weight. After 3 hours, laparotomy was performed, and the peritoneal fluid (exudate) was collected. The anti-inflammatory activity was evaluated based on the volume of the collected exudate. The obtained results are presented in Table 1.

Table 1.

Evaluation of the effect of *Astragalus krauseanus* extract on the exudative phase of inflammation (n=6).

Groups / Indicator	Control	50 mg/kg	100 mg/kg	200 mg/kg
Exudate volume, 100 g/ml	2.13±0.39	1.23±0.09*	1.49±0.17*	1.36±0,12*

Note: *P≤0.05 compared to the control group.

Thus, all tested doses of *Astragalus krauseanus* extract demonstrated a significant effect on the exudative phase of inflammation, showing anti-inflammatory activity of 43%, 31%, and 36%, respectively, compared to the control group.

Formalin-induced inflammation model. According to the current International Classification of Diseases, there are more than 23,000 diagnoses in modern medicine, the majority of which are based on inflammatory processes. In the course of various diseases, anti-inflammatory drugs are widely used within complex therapeutic approaches to prevent disease progression. These agents play an important role in slowing down or suppressing disease development by affecting the main stages of inflammation, including alteration, proliferation, and exudation. In this study, an acute inflammation model was induced using formalin to produce edema, and the anti-edematous activity of *Astragalus krauseanus* extract was evaluated at doses of 50, 100, and 200 mg/kg administered orally. The degree of edema was measured using an oncometric method based on changes in the paw volume of experimental animals. Paw volume was recorded before administration of the phlogistic agent and 180 minutes after injection. The evaluation criteria for the anti-inflammatory effect included the absence of increase in paw volume and reduction of the inflammatory process. The obtained results were compared with a reference drug (Table 2).

Table 2

Evaluation of the anti-inflammatory activity of *Astragalus krauseanus* extract in the formalin-induced edema model

Groups	Dose (mg/kg)	Mean paw volume		Increase in paw volume compared to the baseline		Anti-inflammatory effect (%)
		Normal	3 h after formalin	ml	%	
Control (2% formalin, 0.1 mL)	-	0.85	1.48	0.63	74.1	-
Extract	50	0.84	1.14*	0.30*	35.7*	51.8*
	100	0.82	1.05*	0.23*	28.0*	62.2*
	200	0.90	1.28*	0.38*	42.2*	43.0*
Ketoprofen	5.0	0.86	1.24*	0.38*	44.2*	40.4*
	10.0	0.88	1.16*	0.28*	31.8*	57.1*

Note: *$P \leq 0.05$ compared to the control group.

Based on the obtained results, it can be concluded that the anti-inflammatory activity of *Astragalus krauseanus* extract at doses of 50, 100, and 200 mg/kg was 51.8%, 62.2%, and 43.0%, respectively, compared to the control group. It was also confirmed that the anti-inflammatory effect of the studied extract was not inferior to that of the reference drug ketoprofen at doses of 5.0 and 10.0 mg/kg, and in some cases was higher by 10–15%.

Conclusion. Based on the conducted experiments, studies on specific anti-inflammatory activity using formalin-induced edema and acetic acid-induced experimental peritonitis models demonstrated that all tested doses of the extract exhibited anti-inflammatory effects. It was also established that the activity of the extract was comparable to that of the reference drug ketoprofen. The observed anti-inflammatory activity of the investigated substance suggests its potential for future application in medical practice.

References

1. Al-Snafi, A.E. Chemical constituents and pharmacological effects of Astragalus hamosus and Astragalus tribuloides grown in Iraq. Asian J. Pharm. Sci. 2015, 5, 321–328.

2. Liu, Y.X.; Song, X.M.; Dan, L.W.; Tang, J.M.; Jiang, Y.; Deng, C.; Zhang, D.D.; Li, Y.Z.; Wang, W. Astragali Radix: Comprehensive review of its botany, phytochemistry, pharmacology and clinical application. Arch. Pharm. Res. 2024, 47, 165–218.

3. Shi R, He L, Hu Y, Yi N, Weng S, Cao Y (2001). The regulatory action of Radix Astragali on M-cholinergic receptor of the brain of senile rats. J Tradit Chin Med, 21:232-235.

4. Agatonovic-Kustrin S, Morton DW. The current and potential therapeutic uses of parthenolide. 1st ed. Stud Nat Prod Chem. Elsevier B.V. 2018;58: 61–91

5. Dong M, Li J, Yang D, Li M, Wei J. Biosynthesis and pharmacological activities of flavonoids, triterpene saponins and polysaccharides derived from *Astragalus membranaceus*. Molecules. 2023;28:5018. https://doi.org/10.3390/molecules28135018.

6. Salehzadeh, A., Mirjalili, M.H., Tavan, M. *et al.* Phytochemical profiling and acetylcholinesterase inhibitory activity of fifteen Iranian *Astragalus* species: towards new sources of astragalosides. *Chem. Biol. Technol. Agric.* **12**, 167 (2025). https://doi.org/10.1186/s40538-025-00888-7

7. Sevim Colak, Nazan Comlekcioglu, Ashabil Aygan, Yusuf Ziya Kocabas, Ugur Comlekcioglu. Phytochemical properties and bioactive potential of various *Astragalus* spp. from Turkey. Food Bioscience Volume 64, February 2025, 105901

8. Доклинические исследования лекарственных средств. Методические рекомендации под редакцией члена-корреспондента АМН Украины А.В. Стефанова. Киев 2002. 357 с.

9. Миронов А.Н. Руководство по проведению доклинических исследований лекарственных средств. Часть первая. – М.: Гриф и К, 2012. – 944 с.

10. Стрелков Р.Б. Статистические таблицы для ускоренной количественной оценки фармакологического эффекта. Фармакология в токсикологии, 1986. № 4. с.100-104.