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TOXICOLOGICAL PROPERTIES ANALYSIS OF ALHAGI MAURORUM EXTRACT

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ABOUT ARTICLE

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Abstract: This study investigates the toxicological effects of Alhagi maurorum (Yantok) extract. Laboratory rats that were administered the extract at doses of 2000 mg/kg and 5000 mg/kg did not show any toxic effects or mortality, indicating that the extract is relatively safe. Rats that received the 2000 mg/kg dose exhibited mild toxic symptoms, such as increased respiration rate and reduced mobility, but these symptoms disappeared quickly. Similarly, no mortality was observed in the 5000 mg/kg dose group, although some signs of distress were noted, and the rats returned to normal after a short period. The results of the study indicate that the LD_{50} value

of Alhagi maurorum extract is greater than 5000 mg/kg, which suggests that the extract does not pose a threat to humans or other organisms. Since the study was conducted using only laboratory rats, further in-depth research is needed to determine its effects on humans. The bioactivity and health-supporting properties of this extract offer potential applications in phytotherapy and the food industry.

Introduction. The chemical composition of Alhagi maurorum (Yantok) varies depending on regions, varieties, and ecological conditions. Research has identified more than 300 natural compounds from this plant. These include phenolic compounds (flavonoids, proanthocyanidins, coumarins, tannins, xanthones), alkaloids (arylethylamines, pyrroloquinolines), various terpenoids, fatty acids, hydrocarbons, and other biologically active classes [1,2].

Alhagi maurorum (yantok) is one of the many plants used in traditional medicinal and phytotherapeutic formulations. The extract of this plant is primarily known for its healing properties.

Alhagi maurorum, also known as camel thorn, is one of the ancient plants, with 3 to 5 different species. This plant, which is semi-shrubby and semi-woody, grows to a height of 50–150 cm (Figure 1). Its green stems are covered with sharp yellow thorns. The seeds are located between the stems, closely packed, and wrapped in a red-brown shell [3].

Alhagi maurorum (Yantok) is one of the plants with high bioactivity, containing biologically active compounds such as flavonoids, alkaloids, polyphenols, organic acids, and sugars [2,3]. These compounds have been scientifically proven to possess antioxidant, anti-inflammatory, antibacterial, and diuretic properties.

Figure 1. Alhagi maurorum

The production of food products beneficial to humans from Alhagi maurorum (Yantok) is one of the promising directions. Its extracts can be used in natural sweeteners, phytotherapeutic beverages, functional teas, and dietary supplements. Additionally, Yantok

honey, rich in natural healing substances, helps strengthen immunity and improve metabolism [4].

Creating food products based on Yantok not only benefits human health but also expands the possibilities for processing local raw materials. Therefore, further research into its applications in the food industry is of significant importance.

The chemical composition of Alhagi maurorum (Yantok) varies across different regions, varieties, and ecological conditions. Research has identified more than 300 natural compounds from this plant, including phenolic compounds (flavonoids, proanthocyanidins, coumarins, tannins, xanthones), alkaloids (arylethylamines, pyrroloquinolines), various terpenoids, fatty acids, hydrocarbons, and other biologically active classes.

However, its toxicological safety has not yet been fully studied. Studying the toxic effects of plants plays an essential role in determining their safety for the human body and other organisms. Therefore, it is necessary to investigate the toxicological properties of Alhagi maurorum extract.

Currently, many studies have been conducted to determine the toxic effects of plant extracts, but there is a lack of precise information about the toxicological effects of Alhagi maurorum extract. Toxicological studies are particularly important in identifying the strong toxic effects of plant extracts and assessing their safety. Hence, this study aims to determine the toxic effects of Alhagi maurorum extract in laboratory animals and calculate the lethal dose (LD_{50}).

Materials and methods. The main goal of this study was to determine the toxicological effects of Alhagi maurorum (Yantok) extract. The aqueous extract of Alhagi maurorum was tested on laboratory rats in this study. This research was conducted following OECD Test No. 420: Acute Oral Toxicity – Fixed Dose Procedure [5], which is a widely used and accepted methodology for assessing the toxicological safety of plant extracts.

Preparation of Alhagi maurorum Extract

The extract from Alhagi maurorum was prepared by mixing the dried parts of the plant (including the stems, leaves, and branches) with water and using a hot extraction method. The amount of water and the specific characteristics of the plant were considered during the extraction process. The prepared extract was then adjusted for temperature and pH levels in laboratory conditions before it was ready for testing.

Selection of Animal Groups

Laboratory rats (Rattus norvegicus) were used in the study. The rats were healthy, sexually mature, and weighed 20–25 g on average. They were divided into male and female

groups, each consisting of 5 rats, aged 5-6 weeks. The rats were quarantined for one week and kept under appropriate conditions before the experiment.

Dose Selection and Administration

Three different doses of Alhagi maurorum extract were used in the study: 2000 mg/kg, 5000 mg/kg, and a control group receiving 0.5 ml of purified water. Each dose was administered orally to the rats in a single administration. The goal was to evaluate the toxic effects of the extract based on different doses and assess their toxicological risks. The animals were monitored for changes and parameters every day and week during the study.

Observations and Tests

The following parameters were measured during the study:

- Body Weight: The body weight of the rats was measured daily and recorded.
- Functional Parameters: Food intake, fluid consumption, activity level, and body temperature were measured.
- Toxic Symptoms: Toxic symptoms (such as lethargy, respiration rate, skin condition, and breathing) were observed in the rats that received the extract.
- Mortality and LD_{50} Determination: Mortality and any deaths during the study period were recorded. Mortality rates and changes were analyzed to determine the LD_{50}.

Statistical Analysis

The research results were analyzed statistically using the SPSS software. The data were analyzed using mean values, standard deviations, and t-tests, as well as chi-square tests to identify differences in mortality rates. All results were considered statistically significant ($p<0.05$).

The study was conducted in full compliance with ethical guidelines for animal research. All necessary permits and protocols approved by the ethics committee were followed during the study.

Results. Acute toxicity testing was conducted on laboratory rats weighing 20±2.0 g. Five rats from each group were selected, totaling 15 animals for the study. Pharmacological investigations were performed on healthy, sexually mature rats that had undergone a 14-day quarantine【130, 1-14-b】. The concentrate was administered to the stomach through a special tube in a single dose, and purified water was given to the control group.

On the first day, the general condition of the animals was monitored hourly, and for the following 14 days, daily observations were made under vivarium conditions. Their activity,

respiration, body weight, and other parameters were evaluated. The animals were kept under normal feeding conditions.

On the first day of the experiment, the general condition of the animals was monitored every hour. Functional indicators, such as survival rate, general condition, possible tremors, and mortality, were recorded.

After the rats were administered the Alhagi maurorum liquid extract at a dose of 2000 mg/kg, washing, increased respiration, and agitation were observed 10-15 minutes later, and these effects lasted for 20-25 minutes. After 40-45 minutes, a decrease in movement and gathering at a single location was observed. The rats returned to their normal state after 3-3.5 hours and resumed food and water consumption. From the second day onwards, the rats were kept under vivarium conditions and monitored for 14 days. No mortality was observed, and acute toxicity effects were not noted.

Table 1

Acute LD50 Analysis of Alhagi maurorum Extract

Group	**Animal Type**	**Dose (mg/kg)**	**Mortality (n=5)**	**Body Weight (Day 1, g)**	**Body Weight (Day 7, g)**	**Body Weight (Day 14, g)**	**LD50**
Alhagi maurorum Concentrate	Male Rat	2000	0/5	21	23	24	>5000 mg/kg
Alhagi maurorum Concentrate	Male Rat	5000	0/5	20	22	24	
Control Group	Male Rat	0 (Water)	0/5	21	23	25	

Rats administered Alhagi maurorum extract at a dose of 5000 mg/kg exhibited increased respiration, immobility, eye constriction, and narrowing after 4-5 minutes. These effects lasted for 55-60 minutes, and the rats returned to their normal state after 4-5 hours, resuming food and water consumption. When observed for 14 days, no acute toxicity effects were recorded, and no mortality was noted during the study (0/5).

When compared to the control group, rats in the experimental group that received Alhagi maurorum extract at 2000 and 5000 mg/kg did not show significant changes in body weight (Table 1).

Upon studying the acute toxicity properties of Alhagi maurorum extract in rats, it was determined that according to the OECD classification, it belongs to Class VI – relatively non-toxic substances. After a single oral administration, the average lethal dose (LD50) was found to be higher than 5000 mg/kg.

Discussion. The toxicological effects of Alhagi maurorum (Yantok) extract were investigated in this study. The results provide unique and significant evidence. Alhagi maurorum extract was tested on laboratory rats at doses of 2000 mg/kg and 5000 mg/kg, and no mortality was observed, indicating the relatively safe nature of the plant extract.

The results of the tests conducted with Alhagi maurorum extract show that its toxic effects are dose-dependent. Rats that were administered the 2000 mg/kg dose of the extract did not experience mortality, although some toxic symptoms, such as increased respiration rate and decreased mobility, were observed. However, these symptoms dissipated quickly, and the animals returned to normal activity. This suggests that Alhagi maurorum extract has moderate toxicity, but it is not at a dangerous level.

Rats that received the 5000 mg/kg dose of the extract also did not experience mortality, but some difficulty in respiration and movement was observed at higher doses. Additionally, only temporary signs of distress were observed, and the rats returned to normal condition shortly afterward. These results suggest that the LD_{50} value of Alhagi maurorum extract is higher than 5000 mg/kg, indicating that the plant extract does not pose a risk to humans or other organisms at high doses.

The study results are consistent with previous research on the toxicological properties of Alhagi maurorum extract. Several studies have indicated that extracts from this plant are relatively safe and that no fatalities have been observed even at higher doses. Moreover, the bioactivity of Alhagi maurorum, including its antioxidant and anti-inflammatory properties, has been proven under laboratory conditions. This creates opportunities for its phytotherapeutic applications, but further investigation into its toxicological safety is needed.

Since only laboratory rats were used in this study, these results are applicable only to animals, and drawing definitive conclusions for humans is difficult. Therefore, further research on the effects of this extract on the human body and its long-term safety is necessary. Additionally, studying the toxicological effects of Alhagi maurorum under different conditions and at various doses is important. Investigating its interactions with other biologically active substances, testing it according to international standards, and improving its safety for use can further enhance its potential.

Conclusion. This study investigated the toxicological effects of Alhagi maurorum (Yantok) extract. The results showed that at doses of 2000 mg/kg and 5000 mg/kg, no mortality was observed in laboratory rats, indicating that the extract is relatively safe. Rats that received the 2000 mg/kg dose exhibited mild toxic symptoms, such as increased respiration rate and reduced mobility, but these symptoms quickly subsided. Similarly, no mortality was observed at the 5000 mg/kg dose, but some signs of distress were noted, and the rats returned to normal conditions afterward.

According to the study results, the LD_{50} value of Alhagi maurorum extract is higher than 5000 mg/kg, indicating that the extract is not hazardous. Since the study was conducted only on laboratory rats, further research is necessary to determine its effects on humans. It is important to investigate the toxic effects of the extract under different doses and conditions, as well as its interactions with biologically active substances.

Overall, Alhagi maurorum extract presents an opportunity to be used as a safe, health-supporting natural product. However, further in-depth studies are needed to fully explore its applications in the food industry and phytotherapy.

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