



DETERMINATION OF THE ACUTE TOXICITY (LD₅₀) OF THE ROOT OF ZINGIBER OFFICINALE ROSE

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Abstract

This article provides a comprehensive review of the biological properties and chemical composition of Zingiber officinale Rose, its medicinal uses, and the determination of its acute toxicity (LD₅₀).

Keywords: Ginger, Zingiber officinale Rose, camphene, eucalyptol, essential oil, quercimeritrin, quercetin, luteolin.

Introduction:

Cultivation of medicinal plants in the world, creation of primary raw materials bases and study of their chemical composition, isolation of biologically active compounds and creation of new types of import-substituting cheap and high-quality biologically active additives and medicines based on plants are one of the urgent problems. Currently, most of the medicines used in medical practice are obtained from natural sources. Medicines obtained from natural sources are fundamentally different from artificially created medicines due to their efficiency of extraction, easy absorption by the body, low side effects, biocompatibility and specific effects. Due to the high demand in the pharmaceutical industry, especially for chemical compounds with antioxidant, antibacterial and antifungal effects and inflammatory diseases of the respiratory tract, the identification of plant species rich in biologically active substances, their isolation of biologically active substances and their recommendation to the pharmaceutical industry are of great importance in the field of biology and chemistry.





Ginger root extract is known to have immune-boosting properties, so it is used in the prevention and treatment of colds and flu. Anti-inflammatory, Bactericidal, Antiseptic, Antibacterial, Diaphoretic, Expectorant, Stimulant, Spasmolytic, Cardiogenic, helps maintain normal body temperature, and has been used in medicine to prevent colds in internal organs. [1-6].

Theoretical part:

Zingiber officinale Rose (medicinal ginger, Ginger lekarstvennyy), widely used in medicine and folk medicine; *Zingiber zerumbet* Rose (Wild ginger, Ginger dikiy) is a perennial reed-like plant of the family Zingiberaceae, with a thick root-stem, growing up to one meter tall, with clusters of pink flowers blooming yellow (Figure 1). Due to the aesthetic appeal of the plant and its adaptation to hot climates, it is widely distributed in tropical and subtropical regions and is used as a landscaping around houses. It is grown in South and Southeast Asia. The composition of ginger root is rich in essential oils, and the dried root is fragrant and tasty. The appearance of the *Zingiber officinale* Rose plant and rhizome is shown in Figure 1. [4-8].



Figure 1. *Zingiber officinale* Rose plant and root fruit

The chemical composition of the root of *Zingiber officinale* Rose contains beneficial elements. Ginger root contains up to 70% organic compounds, as well as camphene, cineole, bisabolene, borneol, citral, linalool, essential amino acids, carbohydrates, fats, 1.5 to 3% essential oils and cellulose. *Zingiber officinale* Rose is very rich in vitamins (especially B vitamins, ascorbic acid, tocopherol, vitamin K). Vitamins C, B₁, B₂, It also contains potassium, phosphorus, magnesium, iron, calcium, zinc and other micro and macro elements [5-6].

Abu Ali Ibn Sina used ginger root as a mood-boosting, energizing, and anti-vomiting and diarrhea-fighting medicine. Ginger root extract or powdered ginger root has analgesic, invigorating, and antibacterial properties. He recommended its use for muscle aches, tendon or ligament strains, and tissue damage. Its root is very useful, improves blood circulation, and is an effective aid in the weight loss process. It thins the blood and lowers blood pressure. *Zingiber officinale* Rose root extract or



powdered ginger root tea improves the memory of the person who consumes it. It also strengthens the digestive organs such as the stomach, liver, intestines, and spleen, strengthens sexual power, invigorates the person, and accelerates the melting of fat deposits in the muscles. This tea warms the body well, protects against colds, so it is especially pleasant to drink it on cold and damp days. [3-7].

Drinking powdered ginger root with honey is a harmless local product that can be used as a natural treatment and prevention at the first signs of colds and flu. The memory of the person who drinks ginger root tea is strengthened. It also increases the strength of the digestive organs such as the stomach, liver, intestines and spleen, strengthens sexual power, invigorates the person, and accelerates the melting of fat deposits in the muscles. This tea warms the body well, protects against colds, so it is especially pleasant to drink on cold and damp days. [8-10].

Quercetin is a widely distributed natural pigment in the root of the *Zingiber officinale* Rose plant. It belongs to the group of plant pigments, namely Flavanoids, more precisely flavanols. Quercetin plays an important role in giving color to many fruits, flowers and vegetables. The P-vitamin activity of quercetin is twice as high as that of rutin, and it is 4-5 times more effective in treating diseases caused by vitamin P deficiency. Quercetin is a natural antioxidant, a substance that neutralizes carcinogens, prevents the formation of blood clots and protects cell membranes from hydrogen peroxide oxidation of lipids, and exhibits hepatoprotective, anti-inflammatory, anti-ulcer and tumor-preventing properties. The chemical formula of quercetin is $C_{15}H_{10}O_7$. M.w. 302.236. T liquid = 316 ± 2 . The chemical structural formula of quercetin is shown in Figure 2.

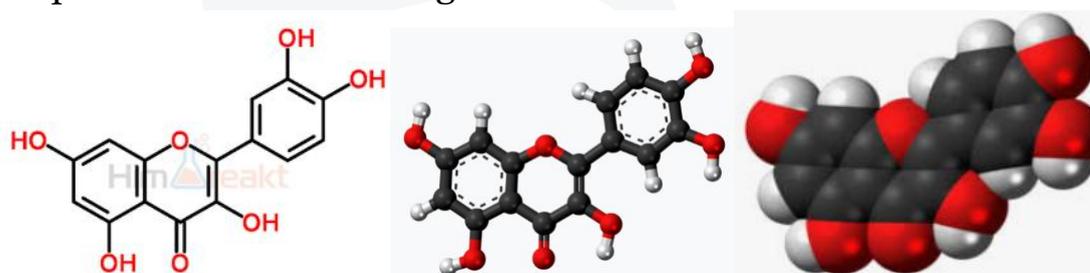


Figure 2. Chemical structural formula of quercetin

Research method and material:

In assessing the acute toxicity of the studied sample by intragastric administration, it is carried out by administering to groups of animals of the same sex in a stepwise manner at fixed doses of 5, 50, 300 and 2000 mg/kg in accordance with OECD (2002), Test No. 420: Acute Oral Toxicity - Fixed Dose Procedure, OECD Guidelines



for the Testing of Chemicals, Section 4, OECD Publishing, Paris, <https://doi.org/10.1787/9789264070943-en>. In the experiment, studies to determine acute toxicity were conducted on the root powder of the Ginger plant. The experiments were conducted on male outbred white laboratory mice with a body weight of 20 ± 2.0 g. In the experiment, 5 mice were taken for each group, and their total number was 30.

All pharmacological studies were conducted on healthy, sexually mature mice and rats that had passed a 10-14-day quarantine period. The samples were administered once into the stomach of the animals using a special probe at a dose of 2000 mg/kg. The control group animals were given an equal volume of purified water.

On the first day of the experiment, the general condition of the animals in the experimental and control groups was checked every hour in the laboratory. For two weeks, the general condition, activity, skin cover, skin and tail condition, behavior, respiratory rate and depth, feces volume, body weight changes, and other indicators of the animals in all groups were checked daily in the vivarium. During the experiment, the animals were fed as usual, with unlimited access to water and food. At the end of the experiment, the median lethal dose (LD₅₀) of the studied sample and, accordingly, the toxicity class were determined [9-10].

When *Zingiber officinale* Rose root powder was administered orally to experimental animals at a dose of 2000 mg/kg, tachycardia, increased salivation, and hoarding were observed after 10-15 minutes, these signs of the animals disappeared after 30 minutes, and the mice became active. No deaths were recorded during the 14-day observation of the experimental animals. *Zingiber officinale* Rose root powder was found to belong to the class of non-toxic compounds of class V according to the OECD classification. The results obtained are presented in the table.

Table 1:

Acute toxicity indices of <i>Zingiber officinale</i> Rose root, ($M \pm m$; n=5)							
Test sample name	Animal gender type,	Dose mg/kg, ml	Number of animals in the experimental group/number of dead animals (individuals)	Average weight of animals (g) (day 1)	Average weight of animals (g) (day 7)	Average weight of animals (g) (Day 14)	LD ₅₀ (m+m mg/kg)
<i>Zingiber officinale</i> Rose	Male mice	2000	5/0	22±0,5	24±0,7	26±0,5	> 2000 V-grade
Control (water)	Male mice	0,5 ml	5/0	21,5±0,65	24±0,9	25±0,6	-



Thus, the acute toxicity of Zingiber officinale Rose root powder in mice was found to belong to class V - non-toxic compounds, and when administered once into the stomach, the median lethal dose (LD₅₀) was found to be higher than 2000 mg/kg.

Conclusion

The acute toxicity study showed that Zingiber officinale Rose root powder, when administered once into the stomach of mice, belongs to class V according to the OECD classification, and (LD₅₀) was found to be higher than 2000 mg/kg.

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