DETERMINATION OF ACUTE TOXICITY (LD_{50}) OF FRUITS AND SEEDS OF *HIBISCUS ESCULENTUS* L.

[1]Bozorova D.O.
[2]Islomov A.Kh.
[1]Namozov N.Ch.
[1]Tashkent State Agrarian University
[2]Institute of Bioorganic Chemistry named after Academician O.S. Sodikov, Academy of Sciences of the Republic of Uzbekistan
e-mail: islomov-72@mail.ru, islomovakmal1972@gmail.com

Abstract: *This article provides information about okra (Hibiscus esculentus L.), its use in medicine, and the results of studies on the acute toxicity of powdered samples of the fruits and seeds of Hibiscus esculentus L. Acute toxicity was determined in mice and rats.*

Keywords: *Hibiscus esculentus L., protein, fat, carbohydrates, vitamins.*

Introduction: In recent years, large-scale measures have been implemented in our country to ensure food security, fully meet the population's demand for vegetable products, and expand the diversity of vegetable crops. In recent years, it has been recommended to cultivate vegetable species distinguished by early maturity, high productivity, and resistance to various pests and diseases in the agricultural areas of the republic. Such plants include representatives of the genera Amaranthus, Crotalaria alata, Guizotia abyssinica, Stevia rebaudiana, Helianthus tuberosus, Hibiscus esculentus, Ipomoea batatas, Raphanus raphanistroides Makino, and others.Among these, okra (Hibiscus esculentus L.) stands out due to its multifunctional characteristics. These rare and promising plants are expected to play an important role in the near future

in supplying the population with vitamin-rich vegetables, providing raw materials for industry, and supplying nutritious fodder for livestock [1-2].

Theoretical Part: Okra (Hibiscus esculentus L.) is an annual plant belonging to the Malvaceae family. The plant can grow up to 2.5 m in height. In appearance and flowering, it resembles cotton. The stem may be simple or branched, reaching a height of 150–200 cm, and is covered with sparse, sharp hairs that can cause skin irritation upon contact.The leaves are single, heart-shaped to round, with broad serrated edges. The central root is long and penetrates deeply into the soil; externally it is light brown with dark longitudinal stripes, while internally it is white. The flowers are hermaphroditic, large, bell-shaped, and solitary, located in the leaf axils. They have short, hairy, fibrous pedicels. The calyx is double; the outer sepals fall early, and the inner calyx splits longitudinally after flowering. The petals are light yellow with a dark red spot at the base.The fruit is a multi-seeded, elongated conical capsule consisting of five prominent ridges, reaching 5–10 cm in length and splitting longitudinally when mature. Externally, the fruit is covered with numerous stiff grayish-white hairs. The seeds range in color from olive-green to dark brown. Flowering occurs in July–August, and fruiting in August–September.

The native habitat of okra is Eastern Africa. Its varieties are divided into vegetable and fiber-producing groups. Fiber-producing varieties are cultivated in India, Africa, and the USA. The immature pod-like fruits are used as vegetables in soups and salads. The fruits contain 3% protein, 0.5% fat, and 8% carbohydrates, while mature seeds contain up to 18% oil. The fruits can be consumed raw, cooked, fried, or canned. The stem produces coarse white fiber, and roasted seeds are used to prepare a coffee substitute.Okra is cultivated mainly as a vegetable crop in tropical and subtropical countries, as well as in North America, Southern Europe, Transcaucasia, Crimea, southern Ukraine, and partly in Central Asia.The fruit of okra contains a high amount of

biologically active compounds with diuretic, hypotensive, and antioxidant properties. It includes mucilaginous substances such as hexoses, galacturonic acid, methylpentoses, pentoses, proteins, as well as vitamins B_6, C, A, E, and K, and mineral elements including potassium, iron, calcium, phosphorus, magnesium, and zinc. The seeds contain fatty oil. The fruit contains 3% protein, 0.5% fat, and 8% carbohydrates, while mature seeds contain up to 18% oil. In folk medicine, okra (Hibiscus esculentus L.) as a vegetable plant exhibits emollient, antispasmodic, diaphoretic, and diuretic effects. Its roots are used in the treatment of syphilis. Okra is applied in the treatment of inflammatory diseases of the upper respiratory tract, colds, inflammatory diseases of the stomach and intestines, and is also consumed in cases of gastric ulcers.It is widely used in dietary regimens for weight loss and metabolic disorders, in the regulation of blood glucose levels, and in diets for cardiovascular diseases, atherosclerosis, and hypertension. There is an opinion that okra enhances sexual potency. In Nepal, the juice of the roots is applied externally for the treatment of cuts, wounds, and burns, while the leaves are used as a sedative remedy [1-3].

Results and Discussion: All pharmacological studies were conducted on healthy, sexually mature mice and rats that had completed a 10–14-day quarantine period. The test samples were administered once intragastrically using a special gastric probe at doses of 2000 and 5000 mg/kg. Animals in the control group received an equivalent volume of purified water.Under laboratory conditions, the general condition of animals in both the experimental and control groups was monitored hourly on the first day, including observation for possible tremors and mortality. During the subsequent two-week period, animals were observed daily under vivarium conditions for general condition, activity, fur condition, skin appearance, respiratory rate and depth, urination, changes in body weight, and other physiological parameters. All animals were maintained under standard feeding conditions with free access to food and

water.At the end of the experiment, the median lethal dose (LD_{50}) and toxicity class of the tested substances were determined.When the powder of Hibiscus esculentus L. fruits and seeds was administered to mice at doses of 2000 and 5000 mg/kg, no signs of acute toxicity were observed based on the evaluated parameters. Only at a dose of 5000 mg/kg, within 5-10 minutes after administration, transient signs such as increased respiratory rate, clustering behavior, and narrowing of the eyes were noted. These effects persisted for 25-30 minutes, after which the animals gradually returned to normal behavior and continued to consume food and water. Throughout the entire observation period, no mortality was recorded at the tested doses (5/0).

Similarly, intragastric administration of the oily extract of Hibiscus esculentus L. fruits and seeds to rats at doses of 2000 and 5000 mg/kg did not result in any signs of acute toxicity. During the 14-day observation period, no mortality was observed in rats at either dose level (5/0). Compared to the control group, no decrease in body weight was observed in either mice or rats at both administered doses.Based on the obtained results, it can be concluded that the median lethal dose (LD_{50}) of the fruit and seed powder of Hibiscus esculentus L. administered once intragastrically to mice and rats is greater than 5000 mg/kg. The obtained results are presented in Tables 1 and 2.

Table 1

Acute toxicity indicators of the fruit and seed powder of *Hibiscus esculentus* L. in mice (n = 5)

Name and dose of the test sample	Animal type, gender	Dose mg/kg, ml	Number of animals/dead animals in the group	Average animal weight (g) (1 day)	Average animal weight (g) (7 days)	Average animal weight (g) (14 days)	LD50 with confidence interval
		2000	5/0	23	25	28	

Hibiscus esculentus L. fruit powder	The mouse is a single species.	5000	5/0	22	224	26	>5000mg/kg
Hibiscus esculentus L. seed powder		2000	5/0	19	21	24	
		5000	5/0	20	22	25	
Control (water)		0,5 ml	5/0	18	21	24	-

Table 2

Acute toxicity of Hibiscus esculentus L. fruit and seed powder in rats, n=5

Test sample name	Animal type, gender	Dose mg/kg, ml	Number of animals/dead animals in the group	Average animal weight (g) (1 day)	Average animal weight (g) (7 days)	Average animal weight (g) (14 days)	LD50 with confidence interval
Hibiscus esculentus L. fruit powder	Rats are monoga-mous	2000	5/0	184	189	196	>5000mg/kg
		5000	5/0	184	190	199	
Hibiscus esculentus L. seed powder		2000	5/0	180	187	190	
		5000	5/0	181	187	195	
Control (water)		0,5 ml	5/0	183	188	196	-

According to the results of the analysis, when the acute toxicity of the powder sample of the fruit and seeds of the Hibiscus esculentus L. plant was studied in mice and rats, it was found that this substance belongs to the V-group of non-toxic compounds, and when administered once into the stomach, the median lethal dose (LD50) was found to be more than 5000 mg/kg.

Conclusion

When the acute toxicity of the powder sample of the fruit and seeds of the Hibiscus esculentus L. plant was studied in mice and rats, it was found that this substance belongs to the V-group of "non-toxic compounds" class.

REFERENCES

1.Bozorova.D.O'.,KhudayarovY.Sh., Arifdjanova D.T., Shodmonov B.G.,// Determination of mineral elements in the fruit of Hibiscus esculentus l.//Web of Scientist:International Scientific Research Journal Volume 6,November-2025. P. 109-115.

2.Bozorova D.O'.,Namozov N.Ch., Islomov A.X.,SH.A.Tinchlikova// Determination of the amount of amino acids in the vegetable okra (hibiscus esculentus l.)// Research focus :International Scientific Journal Volume 4, November-2025. P.49-54.

3. Bozorova D.O., Namozov N.Ch., Islomov A.Kh., Ishimov U.J.// Determination of the amount of mineral elements in the composition of the okra (Hibiscus esculentus L.) plant.// Scientific and practical conference on the scale of our republic dedicated to the 80th anniversary of the birth of academician Takhir Fatikhovich Aripov named after the current problems of the development of bioorganic chemistry. 2025. Tashkent.-P.59-60.