



## Chemical Composition of Lavender Acclimatized in Uzbekistan and Its Use in Folk Medicine

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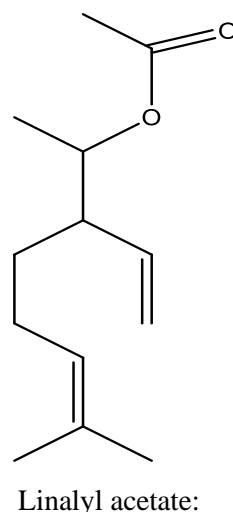
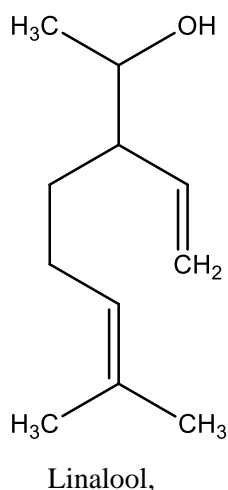
Article History	Abstract
Received: 07 June 2023 Revised: 15 Sept 2023 Accepted: 25 Oct 2023	<i>Diseases of the nervous system, contributing to significant social and economic burdens worldwide, are a growing concern. Among various causes of neurological disorders, magnesium deficiency stands out, affecting about 46% of the population. Herbal medicines, known for their therapeutic potential, have gained attention for treating nervous system-related ailments. Lavender, a widely used medicinal herb, exhibits properties such as mood stabilization, sedation, pain relief, and neuroprotection. This study explored the macroelement composition of Lavandula acclimatized in Uzbekistan, revealing rich magnesium content (434.88 mg/%) essential for combating nervous system fatigue. Additionally, flavonoid analysis via HPLC indicated the presence of gallic acid, rutin, and quercetin, suggesting lavender's potential for improving cognitive function and mental stress reduction. The study promotes lavender-based food supplements for nervous system-related diseases' prevention and treatment, offering an economically advantageous alternative. The harmlessness and therapeutic potential of such supplements emphasize their significance in addressing the growing challenges of nervous system disorders.</i>
CC License CC-BY-NC-SA 4.0	<b>Keywords:</b> Magnesium deficiency, herbal medicine, Lavandula, flavonoids

### 1. Introduction

It is known that diseases of the nervous system cause important social and economic problems all over the world. According to WHO, 25% of functional disorders in the world are caused by diseases of the nervous system [1]. There are many different causes of nervous system diseases, one of them is magnesium deficiency in the body as a result of excessive excretion of magnesium ions in the blood through urine, and this situation leads to strong nervousness (stress) in people [2]. 99% of the element composition of the human body is made up of 12 basic chemical elements, among which magnesium ranks fourth after potassium, calcium and sodium. Magnesium is not synthesized in the human body, it comes in the form of Mg<sup>2+</sup> ion, along with food, water and salt. The diagnosis of magnesium deficiency in the body is often determined based on the patient's clinical symptoms, and this method of diagnosis is very common. Magnesium deficiency among the population is 46%.

Herbal medicines are widely used in many traditional systems for the treatment of various diseases [3]. Lavender has several therapeutic properties, from parasitic infections to treating burns, insect bites, and spasms. There is growing evidence that lavender oil can be an effective medicine in the treatment of a number of neurological disorders. Several studies have shown that lavender has mood-stabilizing, sedative, analgesic, anticonvulsant, and neuroprotective properties [4].

Medicinal lavender is characterized by the fact that it contains a large amount of essential oils among plants with a sedative effect [5]. Below is the structure of Linalool, the most important terpenoid in lavender, and its complex ether Linalyl acetate:



The results of many clinical studies of lavender flowers (Flores Lavandulaye) have proven to have a mild sedative effect, this activity is related to the combination of linalool and linalylacetate in lavender essential oil. Biologically active lavender essential oil can be used for the purposes of excessive excitement of the nervous system, insomnia, overexcitement, headache spasms, improvement of cerebral blood circulation, and increasing the body's resistance to fatigue [6].

Several studies have been conducted to elucidate the mechanism by which lavender acts on nerve tissue. Lavender inhibited lipopolysaccharide-induced inflammatory response in human THP-1 monocyte cells, which may be related to HSP70 expression [7].

In addition, according to the results of the research, the alcohol extract of lavender has been recorded as an anti-cancer agent and is one of the effective methods of liver cancer treatment [8].

In order to prevent and treat nervousness among the population and various diseases caused by it, we began to study the chemical composition of medicinal lavender (*Lavandula*) acclimatized in the conditions of Uzbekistan. For this purpose, the macro-elements in the plant were experimentally determined using an optical emission spectrometer and flavonoids using high-performance liquid chromatography.

### 3. Results and Discussion

#### Experimental part

In order to analyze the above-ground part of the medicinal lavender plant and to dry the moisture content, it was first dried in a drying cabinet (VWR DRY-line, Germany) until the mass did not change. 200 mg of the dried plant sample was weighed on an analytical balance (FA220 4N). A mineralization device (MILESTONE Ethos Easy, Italy) was used to mineralize the sample. The solution in the flask is placed in special test tubes in the auto-sampling department for analysis. The prepared sample was analyzed in an Avio200 ISP-OES inductively coupled plasma optical emission spectrometer (Perkin Elmer, USA). The accuracy level of the device is high and allows to measure the elements in the solution up to 10<sup>-9</sup> g accuracy. The data obtained as a result of the study are presented in the following table:

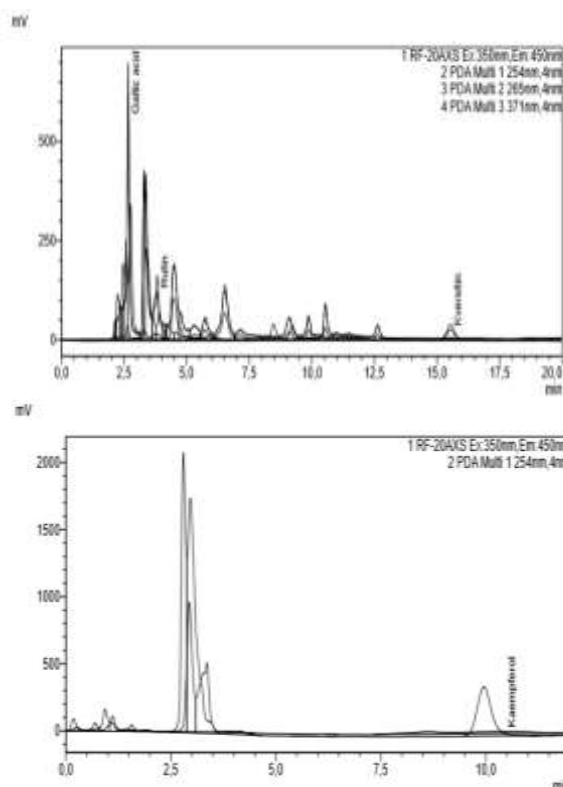
**Table 1.** Macroelement composition of lavender plant (mg/%)

Type of macroelement	Ca	K	Na	Mg	P	S	K	Ba
Lavender	553,36	515,32	26,08	434,88	139,23	134,52	51,53	3,52

According to the results of the conducted research, the above-ground part of the lavender plant is very rich in elements of calcium, potassium and magnesium, which are very necessary for human life. It has been proven that 100 g of the plant contains 434.88 mg of Mg, which eliminates nervous system fatigue and nervousness. Along with macroelements, the flavonoid content of lavender was also studied during the research.

## Flavonoid composition

In the extraction process, we used 96% ethyl alcohol as a solvent. For this, the obtained sample and alcohol were mixed in the ratio of 1:10 and extracted using a magnetic stirrer for 75 minutes at a temperature of 35°C. As a stationary phase, the amount of rutin, gallic acid and quercetin in the samples was determined using an Agilent Zorbax 4.6 mm ID x 12.5 mm cartridge and a Perkin Elmer C18 250x4.6 mm 5 mm C18 (USA) column. For this, a 0.5% solution of acetic acid in a ratio of 35:65 and standard solutions in acetonitrile with different concentrations: 0.025 mg/ml and 0.05 mg/ml were prepared, the flow rate was 1 ml/min, and the temperature of the thermostat was 40°C. A calibration curve was created at 10 µl of injection sample. Based on standard samples, 2.5 min of gallic acid, 3.6 min of rutin and 16 min of quercetin were obtained on the HPLC device (LC 2030 C 3D Plus Shimadzu Japan).



**Figure 1.** Flavonoid chromatogram of lavender extract

In the above chromatogram, the quantitative analysis of the 5 most important flavonoids in the introduced lavender plant was carried out using HPLC. The following table shows the results of the research.

**Table 2.** Flavonoid composition of the plant according to HPLC

Plant name	Gallic acid mg/g	Rutin mg/g	Quercetin mg/g	Apigenin mg/g	Kempferol mg/g
Lavender	2,77	0,55	0,05	0,0	0,23

According to the results of the conducted research, medicinal lavender plant is rich in macroelements, including magnesium, which is considered the main factor in the treatment of neurological diseases, neurosthenia 434.88 mg/%. It has been proved that it is rich in elements K and Na, which play an important role in the transmission of nerve impulses.

According to the results of the experimental study of the flavonoid composition of the plant using HPLC the concentration of gallic acid is 2.77 mg/g, rutin flavonoid - 0.55 mg/g, quercetin is 0.05 mg/g, if kaempferol determined in 0.02 mg/g, apigenin flavonoid was not found in the plant.

## 4. Conclusion

The role of magnesium, iron, manganese, thiamine, riboflavin, niacin, and pantothenic acid, which play an important role in the functioning of the central nervous system, in glucose metabolism, as well as the importance of glucose metabolism. Spirit and vitamin C play an important role for adequate blood circulation in the brain [9].

In pathological conditions of the central nervous system, including memory loss, the plant leaf has the property of angioprotector (dilation of capillary blood vessels) [10]. Biologically active flavonoids contained in the plant normalize the supply of nutrients to nerve cells by increasing the permeability of brain capillaries, and in return, cognitive ability increases.

Among other things, since medicinal lavender is rich in flavonoids (gallic acid, quercetin, rutin and kaempferol) that exhibit angioprotective activity, and is rich in magnesium and spirit elements that calm the nervous system, we make the following suggestions.

- 1) Take a tablespoon of lavender flowers, put in 200 g of boiling water and inhale;
- 2) Use of plant flowers in aromatherapy;
- 3) By preparing and consuming medicinal herbal tea from lavender flowers and leaves, it is possible to eliminate mental stress and prevent memory loss. Production of new natural healing and harmless food additives named "ALINAB" and "ASNABALI" for prevention and treatment of diseases of the central nervous system based on "Lavender" was launched. These products of ours are economically superior to "Zelenaya Apteka" (Elfa, Ukraine) and "Doktor Ali" (Mehrigiyo, Uzbekistan) nutritional supplements used in diseases of the nervous system due to their low price.

In addition, it is recognized by scientists that the use of food supplements prepared on the basis of perennial plants in nervousness and depression has a good effect. Although it is necessary to take these tools for a long time, their harmlessness is of great importance [11].

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