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THE BEGINNING OF ETHNOBOTANICAL STUDY OF ACCLIMATIZED GINKGO BILOBA IN UZBEKISTAN

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vitamin, neurasthenia, encephalopathy, food additive, high-performance liquid chromatography

ANNOTATION

The chemical composition of the Gingko biloba plant introduced to the temperate climate of Uzbekistan was studied using high-performance liquid chromatography. During the research, qualitative and quantitative analysis of the vitamins content of the leaves of the plant was carried out in different period. In addition, based on the results of the conducted experimental research, after proving that the plant is rich in vitamins, it was recommended for the prevention and treatment of encephalopathy diseases. At the same time, the development of new medicinal food supplements based on acclimatized G. biloba was started

Introduction. G. biloba has been used as a traditional medicinal plant for longer than 2000 years in China and other parts of the world (Singh etc, p. 401) The Ginkgo tree is now cultivated extensively in Asia, Europe, North America, New Zealand, and Argentina (Tarun .B, 2018).

Several chemical compounds have been derived from G. biloba with a wide range of therapeutic activities (Liu. L., 2021). It is necessary to thoroughly study the chemical composition of the organs of this medicinal tree and analyze the mechanism of its effect on the body. We believe that the use of Ginkgo biloba is an effective solution to one of the major challenges currently facing the WHO. Active chemical components found in G. biloba leaves include flavonoids and terpenoids, and plant extracts have exhibited a variety of pharmacological activities, including antibacterial, antioxidant, anti-inflammatory, antiallergic, and cytotoxic anticancer activities (Chan.P, 2007). The rapid progression of neurodegenerative diseases occurring within the general population has highlighted the increased need for research to identify the pathogenesis of neurodegenerative disease and develop alternative therapies. Excitatory toxicity is a primary cause of intracerebral neuron death. Neurodegenerative disorders may be prevented by enhancing the cerebral blood supply. G. biloba prevents pathological hyperactivity, allowing the body to reclaim its natural physiological equilibrium. In addition, terpenoids and flavonoids in G. biloba seeds have been shown to improve blood circulation in the brain (Wang. H, 2019)

The number of people suffering from diseases of the central nervous system, including encephalopathy, is increasing among the population worldwide (Selina, 2017.). As a result of microcirculation disorders, cognitive activity in humans is impaired. In Europe, neurological diseases account for 35% of all diseases. Stroke, dementia, epilepsy and Parkinson's disease remain the leading causes of death in the world's population. Over a quarter of a century, the incidence of Parkinson's disease increased by 15.7%, Alzheimer's disease by 2.4%, musculoskeletal system by 3.0%, diseases of the brain and nervous system by 8.9%. (Asqarov, 2023). Nervousness and similar diseases caused by the tension of the nervous system are one of the most common diseases today. Nervous people quickly get sick due to their anger, blood pressure rises. Changes in the internal organs of such people also occur (Аскаров, 2023).

Ginkgo biloba is known to have "memory enhancing" properties. The concentration of flavonoids in the leaves of G. biloba is related not only to the participation of genes, and environmental factors affect the concentration of flavonoids. Among all environmental factors, light and temperature are the most important (Shui-Yuan, 2009).

For successful introduction, it is necessary to have up-to-date scientific information about ecological and physiological features, ecological plasticity and adaptive potential of species. High summer temperature, dry air and soil, late spring and early autumn frosts, gas pollution and dusting are the most unfavorable factors of the habitat of plants in Tashkent and other regions (Fergana Valley and Samarkand) where G. biloba was introduced. In the Tashkent region, it was introduced in the Tashkent botanical garden and in the Amir Temur alley of the city of Tashkent, and in the plantations of the Forestry Research Institute in the Fergana Valley (Fergana, Andijan and Namangan regions) and Samarkand regions. The accumulated experience in the introduction of ginkgo biloba (Ginkgo biloba L.), a relic of the Mesozoic era in Uzbekistan, indicates the prospects of its cultivation in Uzbekistan for landscaping and the pharmaceutical industry. We aimed to study the chemical composition of the G. biloba tree introduced to Uzbekistan using modern physico-chemical methods and, relying on the obtained research results, to obtain natural medicinal food additives from it and to contribute to the integration of modern medicine with folk medicine.

Metodology. The amount of water-soluble vitamins in the plant was measured using a LC-40 Nexera Lite high-performance liquid chromatograph manufactured by Shimadzu, Japan. Analytical signal (peak area) of each vitamin was recorded at four wavelengths 361, 291, 265 and 244 nm.

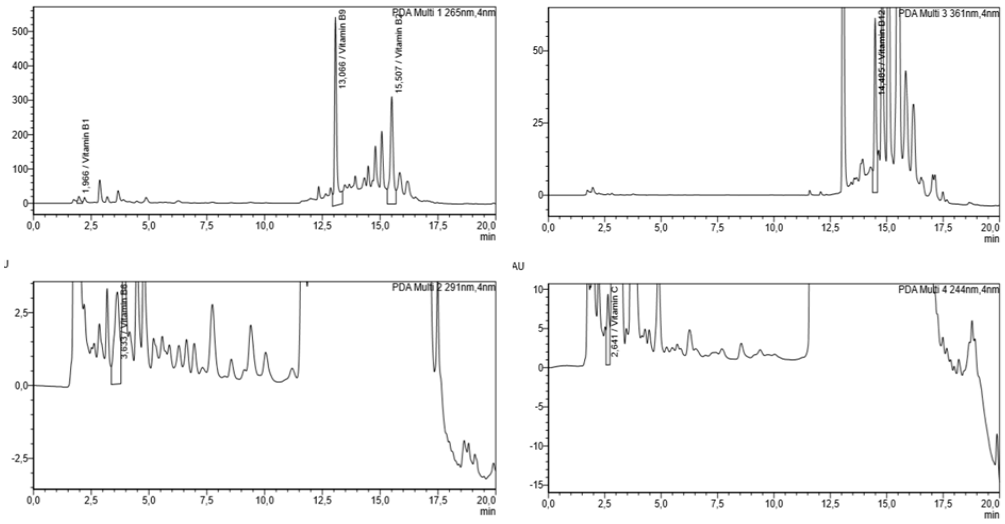

Figure 1. Chromatograms for vitamin determination of Gingko biloba leaf

According to the results of the research obtained with the help of HPLC, it was proved that the leaves of the Defoliation period are also rich in water-soluble vitamins. The HPLC results are tabulated below:

Table 1. Amount and retention times of vitamins in the extract

Vitamins	Retention time (sec)	Concentration mg/l	Amount per 100g sample, mg
Vitamin B_1	1,966	4,519	11,298
Vitamin B_9	13,066	100,87	252,175
Vitamin B_2	15,507	157,94	394,845
Vitamin B_6	3,633	1,811	4,528
Vitamin B_{12}	14,485	250,27	625,680
Vitamin C	2,641	6,775	16,938

First of all, we took leaf samples of the acclimatized Ginkgo biloba tree in the first fruiting period (summer season) and the plant's seasonal period (autumn season). The amount of important biologically active polyphenols in its content was studied using high-performance liquid chromatography.

Fruiting period. For flavonoid extraction, 1 g of sample was weighed with an accuracy of 0.01 g on a scale, placed in a 50 ml conical flask, and 25 ml of 96% ethanol was added. Below is the resulting chromatogram:

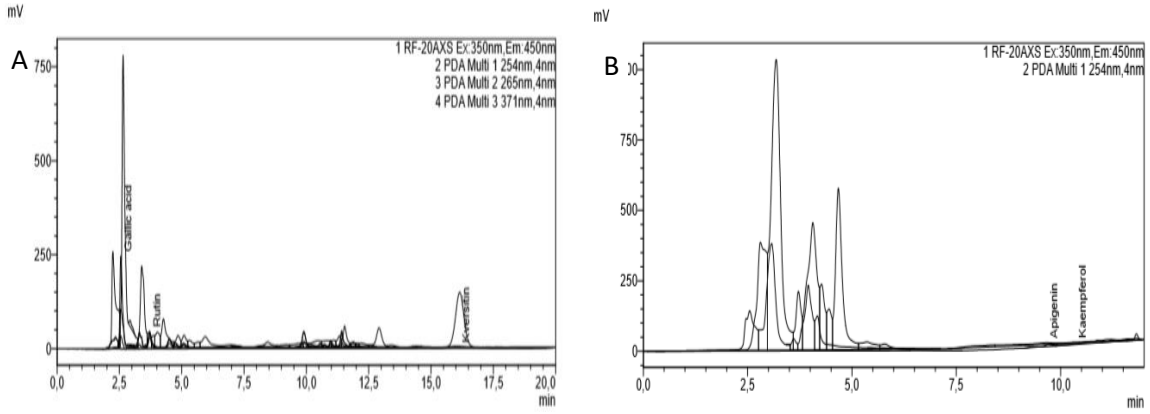

Figure 2. HPLC of the plant during the fruiting period.

In the above chromatogram, the chromatogram of the most important flavonoids content of the leaf samples of the introduced G. biloba tree collected during the fruiting period is given using HPLC. The following table shows the results of the research.

Table 2.

Flavonoids of the plant during fruiting period (mg/g)					
Plant part	Gallic acid	Rutin	Quercetin	Apigenin	Kaempferol
Leaves	1,12	0,16	0	0,11	0,02

Defoliation period analysis. Leaf samples were taken in the autumn season of the acclimatized G. biloba tree, the period of the end of the annual activity of the plant, and the amount of biologically active important polyphenols in G. biloba was studied using high-performance liquid chromatography.

Below is the resulting chromatogram:

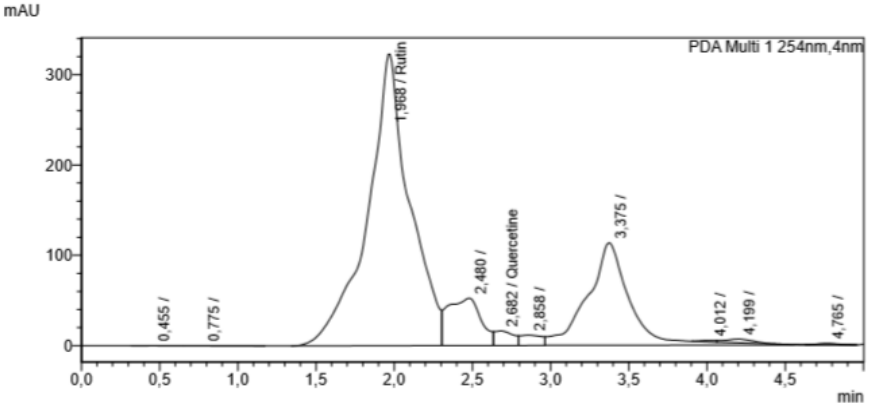

Figure 3. HPLC of the plant during the defoliation period

In the above chromatogram, the chromatogram of the leaf samples of the introduced G. biloba tree at the end of its annual activity is given, the amount of the most important flavonoids was determined using HPLC. The following table shows the results of the research.

Table 3.

Flavonoids of the plant during defoliation period (mg/g)					
Plant part	Gallic acid	Rutin	Quercetin	Apigenin	Kaempferol
Leaves	0	1,338	0,015	0	0

Discussion of results. Light and temperature are the most important of all environmental factors. The biosynthesis of flavonoids in plant organs depends on light and temperature, and its concentration is closely related to the intensity of these two factors (Xie.B, 2006). According to the results of the experimental study of the flavonoid content of G. biloba leaves with HPLC, the concentration of gallic acid in the summer sample was 1.12 mg/g. By autumn, it became known that it was spent in the process of metabolism. Rutin flavanoid increased from 0.16 mg/g to 1.338 mg/g, while quercetin was not found during the fruiting period of the plant, and 0.015 mg/g in the last phase of plant development. Apigenin (0.11 mg/g) and kaempferol (0.02 mg/g) were present during the fruiting period, but as a result of biochemical processes in cells, it was found that both flavonoids were transformed into other types of products.

Therefore, it was found that the content of acclimatized G. biloba leaves contains the most water-soluble vitamins B12 (625,680 mg/%), B2 (394,845 mg/%) and B9 (252,175 mg/%). It was experimentally determined that their concentration in plant leaves is in the order B12 > B2 > B9 > C > B1 > B6. It is especially important to store a large amount of vitamin B12. In neurological diseases, group B vitamins (primarily B1, B6, B12) have been widely used in clinical practice for many years (23). Depletion of vitamin B12 in the body is associated with cognitive decline (24). A low level of vitamins B9 and B12 in the blood, especially in cases of their combined deficiency, increases the risk of developing cerebral ischemia. Thus, further prospects for the use of b vitamins (B9, B1, B6, B12) in vascular and neurodegenerative brain diseases are unquestionable.

Based on the results of the conducted research, neurasthenia, which is common among the population, and encephalopathy, which is causing a big problem for health care professionals and is increasing all over the world, are considered diseases. it leads to the scientifically based conclusion that for the purposes of prevention and treatment of these diseases, it is possible to obtain natural healing and harmless new food supplements based on G. biloba. This medicinal plant extract not only improves blood circulation in arteries and veins, but also improves microcirculation (circulation in the capillary blood vessels in the brain), prevents the formation of blood clots, and exhibits antioxidant activity (Koch, 2005).

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