

RESULTS OF DETERMINATION OF ELEMENTAL COMPOSITION OF TRIGONELLA FOENUM-GRAECUM SEEDS

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Abstract: grains of fenugreek collected in the foothills of Kopetdagh mountains of Ahal province were used as a research material. Spectral analysis was carried out by evaporation method from the channel of carbon electrode into the AC terminal of quartz spectrograph STE-1. In total 46 chemical elements were proved and quantitatively determined in hay fenugreek seeds by spectral methods.

Keywords: fenugreek (*Trigonella foenum-graecum*), seeds of fenugreek, spectral analysis, 46 chemical elements.

РЕЗУЛЬТАТЫ ОПРЕДЕЛЕНИЕ ЭЛЕМЕНТНОГО СОСТАВА СЕМЯН TRIGONELLA FOENUM-GRAECUM

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Аннотация: для проведения исследований в качестве исследуемого материала использованы зёрна пажитника сенного, собранные в предгорьях Копетдага Ахалского велаята. Спектральный анализ проводили методом испарения из канала угольного электрода в клемму переменного тока кварцевого спектрографа СТЭ-1. Всего в семенах пажитника сенного спектральными методами доказано и количественно определено 46 химических элементов.

Ключевые слова: пажитник сенной (*Trigonella foenum-graecum*), зёрна пажитника сенного, спектральный анализ, 46 химических элементов.

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Topicality of scientific work: In the era of Renaissance of the new epoch of the powerful state the domestic health care system reaches high milestones. Large-scale work is carried out to effectively use the potential of medical institutions with orientation to innovative directions, to provide the population with treatment and preventive services of high quality, to ensure the health of citizens.

This postulate, enshrined in the Constitution of Turkmenistan, is the ideological basis of the national policy in the health resort sector, the development of which is aimed at creating an effective system of recreation and restoring the health of citizens.

Within the framework of the State Programme “Saglyk” and other large-scale socio-economic programmes, new health and tourism facilities are systematically put into operation in the capital and all regions of Turkmenistan.

Along with climatotherapy, balneo-physiotherapy and acupuncture, special attention is paid to phytotherapy using medicinal plants growing on Turkmen soil. Phytobars functioning in sanatoriums offer healing drinks - therapeutic cocktails, teas and herbal infusions prepared on the basis of information from the multi-volume scientific encyclopaedia “Medicinal Plants of Turkmenistan” by Hero Arkadag, Academician of the Academy of

Sciences, Doctor of Medical Sciences, Professor Gurbanguly Berdimuhamedov and his book “Tea - Medicine and Inspiration”.

Another famous book of the National Leader of the Turkmen people, who for many years supervised the sphere of national health care, “Turkmenistan - the Land of Healings”, devoted to the development of health resorts, reveals the huge potential and prospects of our country as a health resort of international scale. It gives a detailed description of the influence of mineral waters, muds, climate, various methods of resort therapy on the human body, contains comprehensive information about domestic resorts, natural attractions of the regions, healing properties of plants successfully used in the national practice of healing for many centuries.

As noted in the fundamental work, the Turkmen land has many unique healing places that are waiting to be discovered and researched.

In this regard, the task of our research was to conduct qualitative and quantitative analysis of elemental composition of seeds of Fenugreek (*Trigonella foenum-graecum*), which is a local medicinal raw material containing vital biologically active substances.

Purpose of scientific work: Qualitative and quantitative analysis of elemental composition of seeds of fenugreek.

Materials and methods of research: For carrying out of researches as the investigated material were used grains of fenugreek collected in foothills of Kopetdag of Ahal velayat.

Fenugreek seeds were cleaned from dust, washed in purified water and dried in a dryer at 100-110°C. The dried raw material was crushed to the size less than 2 mm, the crushed particles were mixed and passed through a sieve with a mesh size of 2 mm. From the finished raw material, a 10-20 g weighted sample was selected to the nearest 0.01 g and placed in a specially heated and weighed porcelain crucible. Then it was fired in a muffle furnace at 450±25°C, firing was continued until white or grey colour was formed. The ash was burned until the soot particles were completely removed.

Cooled in the desiccator, weighed to the nearest 0.01 g and calculated the ash content of the plant in per cent (%). The obtained ash was grinded in stoneware and mixed with pure spectral carbon powder in the ratio of 2:1. The channel of carbon electrode was filled with the obtained mixture.

The spectral analysis of ash was carried out by evaporation method from the channel of carbon electrode into the AC terminal of STE-1 quartz spectrograph.

Conditions:

- 1 exposure - 30 sec at current 13A
- 2 exposures - 90 sec at current 20A

Dimensions of the electrode:

- Outer diameter - 6 mm
- Inner diameter - 4 mm
- Channel depth - 2 mm
- Diameter of the central rod - 1.5 mm.

At the test stage, the number of elements was determined by the intensity of blackening of individual areas of the plate. Elemental analysis at these locations was compared with atlas and tabulation of spectral lines. Spectra of 3 comparison samples were taken, the number of elements in them corresponds to the index of the number of elements in the analyzed sample. For the preparation of comparison samples, the exact number of elements is introduced into a pure spectral base consisting of macrocomponents of the investigated phase (oxides of calcium, magnesium, sodium, oxides of silicon, iron, aluminium).

Analytical results: For each element to be determined, a calibration graph is plotted with the percentage of the substance as the concentration. The results of the analysis are presented in Tables 1 and 2.

Table 1. Results of chemical analysis of hay fenugreek seeds.

Chemical element	Method of analysis	Mass fraction, mg/kg
Potassium (K)	Flame photometry	21618
Sodium (Na)	Flame photometry	380,1
Phosphorus (P ₂ O ₅)	Photometry	2089
Sulphur (S)	Gravimetry	475,5
Calcium (Ca)	Titrimetry	1167
Magnesium (Mg)	Titrimetry	1026
Iron (Fe)	Photometry	111,7
Copper (Cu)	Atomic absorption	0,82
Zinc (Zn)	Atomic absorption	26,3
Manganese (Mn)	Atomic absorption	14,9
Nickel (Ni)	Atomic absorption	1,37

Table 2. Results of spectral and X-ray fluorescence analyses of hay fenugreek seeds.

№	Chemical element	Mass fraction, mg/kg	№	Chemical element	Mass fraction, mg/kg
1	Barium (Ba)	44	19	Tungsten (W)	<1
2	Strontium (Sr)	44	20	Scandium (Sc)	0,4
3	Molybdenum (Mo)	7,3	21	Cadmium (Cd)	<4
4	Lithium (Li)	1,5	22	Hafnium (Hf)	<4
5	Yttrium (Y)	1,5	23	Thallium (Tl)	<0,3
6	Chromium (Cr)	1,8	24	Cobalt (Co)	<0,7
7	Bismuth (Bi)	0,3	25	Indium (In)	1,8
8	Tin (Sn)	0,2	26	Platinum (Pt)	<0,4
9	Titanium (Ti)	18	27	Tantalum (Ta)	<70
10	Ytterbium (Yb)	0,14	28	Cerium (Ce)	<30
11	Vanadium (V)	1,5	29	Gold (Au)	<0,7
12	Beryllium (Be)	0,15	30	Zirconium (Zr)	4,4
13	Silver (Ag)	0,04	31	Gadolinium (Gd)	<10
14	Niobium (Nb)	<1	32	Thorium (Th)	<40
15	Antimony (Sb)	<0,7	33	Arsenic (As)	<3
16	Germanium (Ge)	<0,4	34	Uranium (U)	<1
17	Gallium (Ga)	0,15	35	Lanthanum (La)	<1
18	Lead (Pb)	0,2	36	Rare elements	0,7

Conclusion: A total of 46 chemical elements were proved and quantified in hay fenugreek seeds by spectral methods.

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