

A STUDY OF THE MINERAL FRACTION OF THE POLYSACCHARIDE
COMPLEX OF THE LEAVES OF Plantago major AND
PLANTAGLYUTSID

K. A. Sabirov and A. M. Khagi

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The qualitative and quantitative compositions of the mineral fractions of the polysaccharide complexes of rippleseed plantain leaves and of Plantaglyutsid have been studied.

In Plantaglyutsid – the total preparation from the leaves of Plantago major L. (rippleseed plantain) – the undemineralized polysaccharide complex possesses biological activity [1]. However, there is no information in the literature about precisely which metals are present in the complex, and their amounts in the initial raw material and in the Plantaglyutsid substance have not been determined. The aim of the present work was an accurate determination of the composition of the mineral fraction of the polysaccharide complex.

EXPERIMENTAL

To establish the qualitative and quantitative compositions of the mineral fraction of the complex, we analyzed rippleseed plantain leaves, the dry residues from the aqueous extraction of the leaves, and Plantaglyutsid as such.

The initial determination of the composition was performed by the method of approximate quantitative spectral analysis on a ISP-28 medium-dispersion spectrograph with photographic recording of the spectrum.

A sample consisting of the ash of the substance mentioned (about 30 mg) was ground to a grain size of 0.111 mm and was placed in the channel of a carbon electrode with a diameter of 3 mm and a depth of 3 mm, the diameter of the outer machined part being 5 mm. The upper electrode was a conically tapered rod. The same was vaporized and excited in an alternating-current arc. Recording was performed on photographic plates of spectral type I with a sensitivity of 6 units. The results of the spectral analysis are given below (%):

Sample	Al	Si	Ca	Mg	Fe	Mn	Na	K	P	Ag	Cu
Rippleseed plantain leaf		1	1	>1	>1	1	0,06	>1	>1	1	— 0,003
Dry residue from aqueous extraction		0,6	0,6	>1	>1	0,4	0,003	>1	>1	1	— —
Plantaglyutsid substance		0,4	0,6	>1	>1	0,2	0,002	>1	>1	1	— —

Of practical interest for further investigations are Ca, Mg, K, and Na, the amounts of which in the samples exceeded 1%.

The alkali metals potassium and sodium were determined on a Zeiss 3 photometer with a filter by the flame-photometric method using a natural gas-air flame. Both elements were determined by comparing the solution under investigation with two standard solutions by the method of closest standards. The basic standard solution was a mixture of the salts KCl and NaCl. The solution for investigation was prepared in the following way: 0.2 g of the sample was placed in a platinum dish and moistened with water, and a mixture of acids (5 ml of H₂SO₄ and 10 ml of concentrated HF) was added. After two evaporations on an electric

hotplate, the residue was dissolved in 20-30 ml of water and the solution was filtered into a 250-ml measuring flask. The sensitivity of the method was 0.1 $\mu\text{g/ml}$.

Calcium and magnesium were determined complexonometrically. For the analysis, a weighed sample was fused with a sixfold amount of anhydrous sodium carbonate. The melt was leached with hydrochloric acid and then the solution was evaporated almost to dryness and the silicic acid was isolated by precipitating it in a strongly acid medium with a solution of gelatin. Calcium and magnesium were determined in the filtrate by titration with Trilon B in the presence of the sesquioxides, which were masked with triethanolamine. Calcium oxide was determined in an alkaline medium in the presence of the indicator fluorexon on a black background. The color change was from green to orange-pink. Magnesium oxide was determined in combination with calcium oxide in an ammonium buffer medium. The indicator was cresolphthalexon on a background of tropaeolin O. The color change was from violet to pale yellow. The amount of Trilon B consumed in the titration of the magnesium oxide was calculated by difference.

In samples 1-3 the amount of cations in rippleseed plantain leaves was determined; in samples 4-6, that in the dry residue from aqueous extraction; and in samples 7-9 that in the Plantaglyutsid. The results of the analyses are given below:

Sample	Amounts of cations, percent			
	CaO	MgO	Na ₂ O	K ₂ O
1	29,50	5,56	1,53	23,17
2	28,94	3,71	1,33	22,96
3	28,90	3,87	1,25	23,02
4	28,42	5,66	1,25	23,78
5	28,71	3,70	1,20	23,23
6	28,48	3,50	1,40	22,91
7	27,30	3,71	0,51	18,39
8	24,79	4,99	0,59	19,66
9	23,10	3,87	0,61	18,09

Thus, the initial material - rippleseed plantain leaves - and the undemineralized polysaccharide complex contained mainly the metal ions Ca^{2+} , Mg^{2+} , K^{+} , and Na^{+} in amounts of 28-29%, 3-6%, 22-24%, and 1-2%, respectively (calculated as their oxides).

In the process of extracting the raw material with water, the undemineralized polysaccharide complex passes into the extract almost completely (compare the results for samples 1-3 and 4-6). While the amount of potassium and sodium ions in the Plantaglyutsid as such fell almost twofold, that of calcium and magnesium changed insignificantly (samples 7-9). It is obvious that the K^{+} and Na^{+} cations present in the mineral fraction of the polysaccharide complex partially pass into the supernatant liquid.

SUMMARY

1. The compositions of the mineral fractions of the polysaccharide complex of rippleseed plantain leaves, of the dry residue from the aqueous extraction, and of the Plantaglyutsid product have been studied.

2. It has been established that the mineral fraction of the polysaccharide complex contains mainly the cations Ca^{2+} , Mg^{2+} , K^{+} , and Na^{+} . Their quantitative amounts have been calculated.

LITERATURE CITED

1. A. G. Gorin, Khim. Prir. Soedin., 297 (1965).