UDC 663.1:577.11:543.55:545.74
https://doi.org/10.47533/2020.1606-146X.39

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DETERMINATION OF THE CHEMICAL COMPOSITION OF THE GROUND PART OF XANTHIUM STRUMARIUM PLANTS AND ISOLATION OF PECTIN SUBSTANCES

This article defines the chemical composition and content of biologically active substances, macro-micro elements of plants Xanthium strumarium. In addition, pectin substances were isolated from the ground part (stem and leaves) of the Xanthium strumarium plant; the composition and structure of pectin substances were determined by elemental analysis, IR, UV, NMR spectral methods.

***Keywords*:** *Xanthium strumarium, elements, biological active substances, pectin substances.*

INTRODUCTION. Nature is rich in a variety of plants, the aroma refreshes the person and gives a new boost of energy. The plant itself, which is called poisonous, is useful, of them in the shower is the cure. Medicinal plants, medicinal plants-used in medicine and veterinary medicine for the treatment and prevention of diseases. More than five hundred species of plants growing in Kazakhstan are medicinal plants. Man-one of the most famous, but not studied properties and values. Xanthium strumarium is an annual plant of the complex family (Compositae), widely distributed in Eurasia, North and South America, Australia, Africa, as well as in Kazakhstan [1].Most of the representatives of this group, both cultivated plants and wild species, is one of the breeds of interest to scientists of the world in the XXI century. One of the representatives of this genus, which is found in Kazakhstan – is Xanthium strumarium. Since the representative of this genus has a natural medicinal value, mainly a plant that is widespread in the local flora as an elegant, growing in all places and has a natural medicinal value, a broad study of this plant is one of the urgent problems.

Xanthium strumarium. The name of this plant comes from the Greek word "xanthos – yellow" and the Latin word "struma" – gland tumor (neck tumor; "tumor, bulge"). This name is associated with the coloring properties of plants, use for medicinal purposes. Medieval botanists called Xanthium strumarium[2].

In all regions of Kazakhstan (along roads, at settlements, on arable land) the Xanthium strumarium plant grows. The height of the plant Xanthium strumarium 30-120 cm, a vertical stem, hollow, barbed. Blossom in July-August, seeds of greenish-gray color, length 12-18 mm, width 5-10 mm [3,4,5]. In plants Xanthium strumarium a lot of iodine, so in medicine

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receive medicines for the treatment of diseases of the joints. The seeds produce oil (40% of the olive oil is made), and the leaves and roots produce paint. When ripe, the rocks reduce the quality of wool sticking to the fur of an animal (sheep, goats).

Object of research: leaf and stems of Xanthium strumarium plants collected in November 2017-2018 from the village of Turgen Enbekshikazakh district of Almaty region.

MATERIALS AND METHODS. Moisture and ash content of aerial parts (leaf, stem) of the plant Xanthium strumarium gravity, acidity, ascorbic acid, pectin, tannins titrimetric, Childly protein, sugar Bertranou, S. E. fiber modification Ermakova by the gravimetric method, the content of crude oil in to conventional Soxhlet extractions, sizes carotene, monosaccharides, disaccharides, polyphenol, flavonoid, anthocyanins identified on photocolorimeter brand KFK-2[6,7]. The results of the study are presented in table 1.

The content of macro-and microelements in Xanthium strumarium sheets and stems was determined on the Shimadzu "AA 7000" spectrophotometer by atomic absorption method. The result is shown in table 2.

Amino acid of leaves and stems of Xanthium strumarium was determined by liquid chromatographic method by detector Shimadzu LC 20AD, SPD 20A. The result is shown in table 3.

To extract pectin substances from the leaves and stems of plants, an extraction method is used. Extraction is carried out after 1 hour of boiling 0.5% ammonium oxalate and 0.5% oxalic acid solution. The pectin substance is lowered by ethyl alcohol into the precipitate, filters and dries the precipitate[8, 9].

Elements of "Euro C, H, N" were determined by x-ray spectrum in an electron microscope of CHSN brand[10]. The results of the study are presented in table 4.

The melting point was determined by optical spectroscopic method on the installation of the brand PTP (M) TU - 92.

Quantitative determination of functional groups of pectin (idle carboxyl, metoksifluranom of carboxyl), the total number of carboxyl, as well as the composition of the methoxy groups is titrimetrically method. The results of the study are presented in table 5.

The IR spectrum of pectin in the IR spectroscopy of the brand" Bruker ALFA " issued by the KBr tablet in the zone of fluctuations in the 400-4000 cm^{-1}[14].

The UV-spectrum of the selected substances are determined on the spectrophotometer brand "Uviline 9100" [13].

In ^{1}H JNM-ECA NMR spectrometers Jeol 400 pectin substances (frequency 399.78 and 100.53 MHz) were produced using D_2O solvent[11]. The results of the study are shown in figure 1.2.

RESULTS AND DISCUSSION

Table 1 – General provisions Biologically active substances of plants Xanthium strumarium

Name of raw material	leaves	stems
1	2	3
humidity	10,00	6,70

1		2	3
Total ash content		25,00	15,00
Extravagance in water		11,10	10,50
Pectin substance , %	watersoluble	8,25	5,79
	not soluble in water	9,10	6,63
phenolic acid , %	gallic acid	0,33	0,04
	Caffeine.acid	0,07	0,07
tanning agent ,%	Condensed	0,03	0,01
	Hydrolyzed	0,02	0,01
acidity , %		0,05	0,02
anthocyans %		0,19	0,07
flavanoids %		2,21	0,33
polyphenols %		3,21	6,03
Protein%		5,78	2,54
Cellulose %		0,25	1,50
Carotene mkg / 100g		20,2	10,00
Ascorbic acid мg / %		11,66	0,78
Sugar %		1,35	4,50

According to the results of the study in table 1, the values of plant moisture Xanthium strumarium do not exceed the values of Pharmacopoeia samples, as a rule, the maximum permissible values should not exceed 10-15% [15]. Vegetable raw materials in terms of reliability meets the requirements for Pharmacopoeia samples.

In the aboveground part of Xanthium strumarium carotene, the amount of protein is 2 times more leaves compared to the stem, the content of ascorbic acid is 14 times, the sugar content is 3 times more than the leaves.

Table 2 – General provisions Macro-and microelements contained in the leaves and stems of plants Xanthium strumarium, mg/kg

Raw	Cu	Zn	Mn	Fe	Co	Cd	Pb	Ni	Cr	K
The leaves of Xanthium strumarium	0,1576	0,1583	2,0450	3,2770	0,1356	0,0788	0,1127	0,9064	0,4382	0,4698
The stem of Xanthium strumarium	0,3056	0,1690	3,8573	3,1631	0,2991	0,1013	0,0758	1,2238	0,3202	1,0770

Table 2 shows that all 10 elements found in The Xanthium strumarium plant did not exceed the conditionally permissible concentration (MPC) [15]. The potassium content in the leaves is 2 times greater than the stem, the copper content is 2 times greater than the leaves, the cobalt content is 2 times greater than the leaves.

Table 3 – The amino acid composition of leaves, of stems Xanthium strumarium

№	Name of amino acids	Leaves of Xanthium strumarium g / kg	Stems of Xanthium strumarium g / kg
1	Arginine	0,5384	-
2	Threonine	1,5507	1,6595
3	Alanine	1,4883	-
4	Proline	1,7852	7,8742
5	Sisteyn	4,1735	4,4286
6	Leusine	9,4160	46,0301
7	Phenylalanine	49,9338	49,8792
8	Lysine	9,8465	4,3442
9	Oxyproline	-	0,8554
10	Serine	-	1,1104

Arginine, alanine are found in the leaves of Xanthium strumarium, oxyproline and serine only in the stem. On the stems Xanthium strumarium compared with leaves content threonine in 1.05 times, Proline in 7 times, lysine in 5 times more. The size of lysine is 2.5 times larger than the stem in the leaves of Xanthium strumarium. And the amount of cysteine is approximately.

Method of separation of pectin substances from plants Xanthium strumarium. To do this, the raw material is washed and cleaned, dried at room temperature and ground (3.4 mm). Then the packaged powder is extracted with ethanol 80-83% (2-3 times), the extract is filtered. In the first stage of the filtered solution, inulin is an alcoholic solution, and the solution freezes in 0-4^0 C, the solution filters and centrifuges. Then, when drying, inulin is removed. With the re-crystallization of inulin, pure inulin is removed. At the second stage of filtration cake is dried in 55-60 ^{0} C, then extraction in a ratio of 1:20 solution of oxalic acid ammonium oxalate (2 hours). Filters the extract. Then lowered into the tincture with 96% ethyl alcohol. The solution is frozen in 0-4^0 C. When filtering the precipitate pectin is selected. The resulting pectin is purified at stage II. In stage I with 70% ethyl alcohol in a ratio of 1:8, in stage II with 96% ethyl alcohol in a ratio of 1:8. Then the resulting precipitate is dried at a temperature of 60^{0}C and milled pure pectin. Centrifuged and the solution blows and gets alcohol.

Table 4 – Elemental analysis of pectin from above-ground parts of the plant Xanthium strumarium

№	Xanthium strumarium	Output, %	Melting point, ^{0}C	Found, %		Gross formulas	Calculated%	
							C	H
1	Leaf	3,10	125	4,00	4,40	$(C_7H_{10}O_6)_n$	44,21	5,26
2	Stem	5,70	180	3,10	5,10	$(C_7H_{10}O_6)_n$		

The formula of pectic substances isolated from the leaves and stems of Xanthium strumarium $(C_7H_{10}O_6)_n$. Their melting temperature is 125.1800 C. UV spectra of pectin substances separated from the leaves and stems of Xanthium strumarium: at a wavelength of 400 nm, the highest absorption region was observed. Consequently, the structure of the isolated pectin substance coincides with the literature data[10].

Frequency of IR spectrum of pectin from leaves and stems of Xanthium strumarium plants.

Speaking about IR spectra of pectin substances obtained from the leaves of Xanthium strumarium, the stretching vibrations ten groups correspond to the region 3337,95 cm^{-1}, a group of kenderov shows fluctuations 626,52 cm^{-1}, the group C=C is 1043,73 cm^{-1}, and the oscillation frequency 1085,44 cm^{-1} corresponds to the group of common esters. In the spectrum of IR pectin substances obtained from a simple focal sheet, shows the oscillation frequency of the alkane group 1417.43-2979.64 cm^{-1}. Stretching vibrations of the group of COOH observed in the area 1643,04 cm^{-1}[11,12].

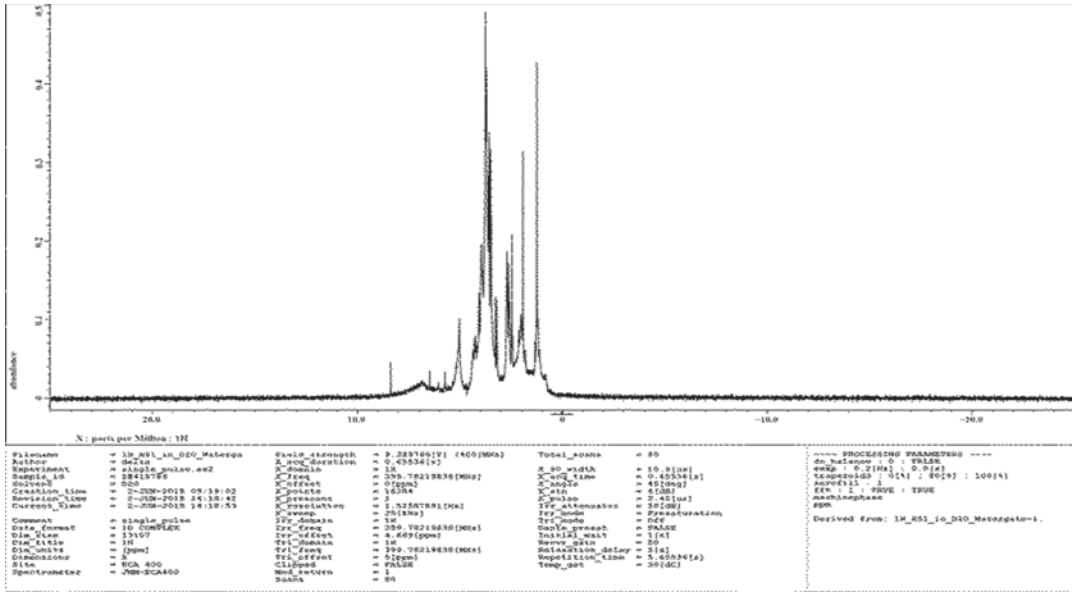

Figure 1 – NMR spectrum of H [1]pectin substances separated from leaves of Xanthium strumarium plants

Table 5 – Analysis of the concentration of functional groups in the composition of pectin substances isolated from leaves and stems of Xanthium strumarium

Functional group	Density, %	
	Stem	Leave
CH_3	10.78	9.74
OCH_3	24.79	26.99
CH_{Arom}	7.40	4.14
$\nu(CH_3):\nu(OCH_3)$	10.78:24.79=1:2.30	9.74:26.99=1:2.77

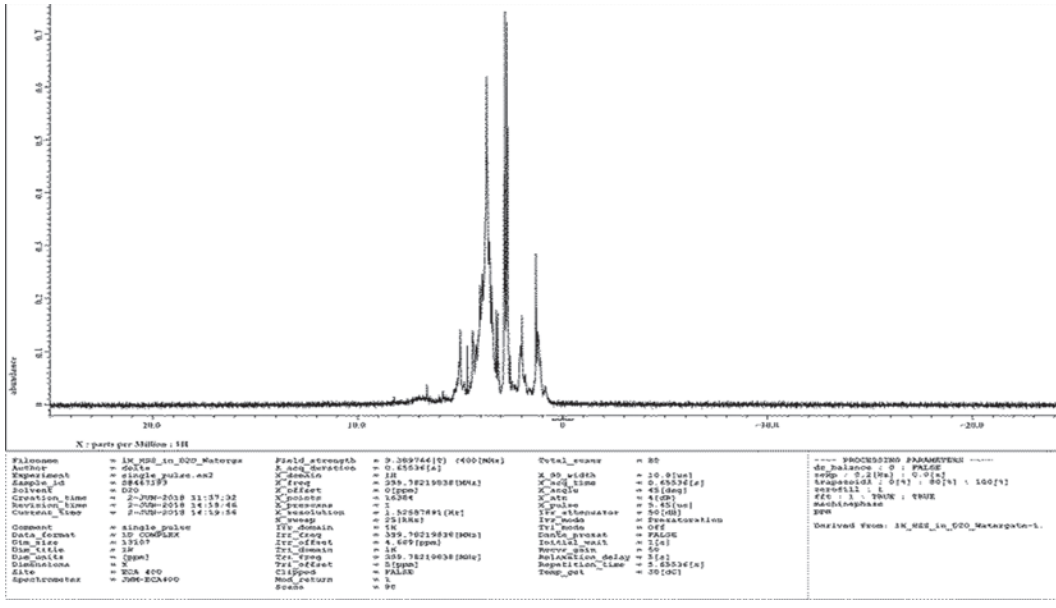

Figure 2 – NMR spectrum of H^1 of pectin isolated from the stem of the plan Xanthium strumarium

CONCLUSION. 1. General provisions biologically active substances of the ground part of Xanthium strumarium plants (leaves, stems) in Turgen village of Enbekshikazakh district of Almaty region were revealed. This: phenolic acids, tanins, anthocyanins, flavonoids, polyphenols, proteins, cellulose, carotene, ascorbic acid. The content of 10 macro - and microelements is established. These are copper, zinc, manganese, iron, cobalt, cadmium, lead, nickel, chromium, potassium.

2. From the ground part of the plant Xanthium strumarium (leaves, stems) pectin substances were isolated. Consumption of pectin in the leaves is 3.1% and in the stems 5.7%.

3. Set the contents of 10 amino acids in the composition of the ground parts of the plant Xanthium strumarium (leaves, stems). Among them are phenylalanine and lysine in the leaves, and in the stems the number of amino acids and more phenylalanine lysine.

4. The composition and structure of pectin substances separated from the ground part (stems and leaves) of Xanthium strumarium plants is confirmed by elemental analysis, IR, UV, NMR spectral methods.

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XANTHIUM STRUMARIUM ӨСІМДІГІ ЖЕРҮСТІ БӨЛІГІНІҢ ХИМИЯЛЫҚ ҚҰРАМЫН АНЫҚТАУ ЖӘНЕ ПЕКТИНДІ ЗАТТАРДЫ БӨЛУ

Мақалада Xanthium strumarium өсімдіктерінің биологиялық белсенді заттары, олардың химиялық құрамы мен құрылысы және макро-микро элементтері анықталған. Сонымен қатар, пектинді заттар Xanthium strumarium өсімдіктерінің жер үсті бөлігінен (сабақтары мен жапырақтары) бөлініп алынды, пектинді заттардың құрамы мен құрылымын элементтік талдау әдісімен, ИК -, УК -, ЯМР-спектрлік әдістермен анықтады.

***Түйін сөздер*:** *Xanthium strumarium, элементтер, биологиялық белсенді заттар, пектинді заттар.*

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ОПРЕДЕЛЕНИЕ ХИМИЧЕСКОГО СОСТАВА НАДЗЕМНОЙ ЧАСТИ РАСТЕНИЙ XANTHIUM STRUMARIUM И ВЫДЕЛЕНИЕ ПЕКТИНОВЫХ ВЕЩЕСТВ

В статье определен химический состав и содержание биологически активных веществ, макро-микро элементов растений Xanthium strumarium. Кроме того, выделены пектиновые вещества из наземной части (стебля и листьев) растения Xanthium strumarium, состав и структуру пектиновых веществ определяли элементным анализом, ИК -, УФ -, ЯМР-спектральными методами.

Ключевые слова: *Xanthium strumarium, элементы, биологически активные вещества, пектиновые вещества.*