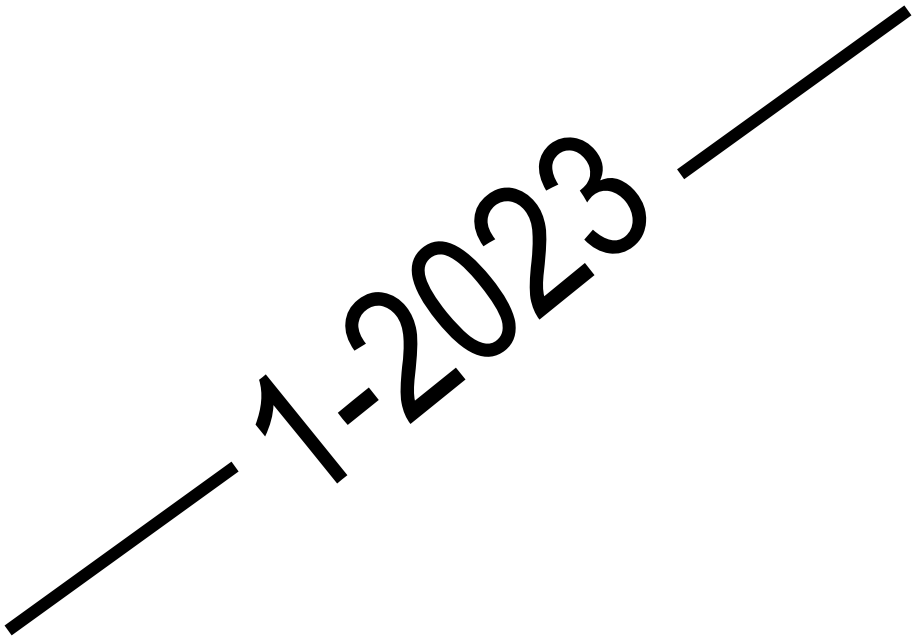
O‘ZBEKISTON RESPUBLIKASI

OLIY TA’LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

FARG‘ONA DAVLAT UNIVERSITETI

FarDU. ILMIY XABARLAR

1995 yildan nashr etiladi
Yilda 6 marta chiqadi



НАУЧНЫЙ ВЕСТНИК. ФерГУ

Издаётся с 1995 года
Выходит 6 раз в год

M U N D A R I J A

Aniq va tabiiy fanlar

MATEMATIKA

FIZIKA– TEXNIKA

KIMYO

KIMYO

UDK:121.356.986.567 **DOI: 10.56292/SJFSU/vol29_iss1/a121**

QOVUN URUG‘I VAPO‘STLOG‘I TARKIBIDAGI POLISAXARIDLAR MIQDORINI VA ULARNING FIZIK-KIMYOVIY USULLAR BILAN ANIQLASH

ЭКСТРАКЦИЯ ПОЛИСАХАРИДОВ ИЗ СЕМЯН И КОЖУРЫ ДЫНИ И ОПРЕДЕЛЕНИЕ ИХ СОСТАВА ФИЗИКО-ХИМИЧЕСКИМИ МЕТОДАМИ

EXTRACTION OF POLYSACCHARIDES FROM SEEDS AND PEEL OF MELON AND THE DETERMINATION OF THEIR COMPOSITION BY PHYSICO-CHEMICAL METHODS

Ibrahimjon Rakhmonovich Askarov,[1] Abdurakhimova Nodira[2], Isakov Khayatulla[3]

[1]**Ibrahimjon Rakhmonovich Askarov** – Andijan State University, Doctor of Chemistry, Honored Inventor of the Republic of Uzbekistan, Chairman of the Academy of Medicine “TABOBAT” of Uzbekistan

[2]**Abdurakhimova Nodira Khayatulla** – teacher of Andijan State University, Department of Chemistry

[3]**Isakov Khayatulla** – Doctor of Chemical Sciences, Andijan State University, Andijan, Republic of Uzbekistan

Annotatsiya

Qovun urug'i va po‘stlog’i suv bilan ekstraksiya qilindi va polisaxaridlar miqdori o‘rganildi. Olingan natijalarga ko‘ra suvda eruvchan polisaxaridlar (VRPS) 7,5%, pektik moddalar (PS) - 2,5% va gemitsellyuloza - 2,1% ekanligi aniqlandi. Urug'larning tarkibini o‘rganishda VRPS 7%, PV 2% va gemitsellyuloza 0,5% ekanligi aniqlandi.

Аннотация

Содержимое семян и стручков дыни экстрагировали водой и изучали количество полисахаридов. По полученным результатам было определено, установлено, что водорастворимых полисахаридов (ВРПС) составляет – 7,5 %, пектиновых вещества (ПВ) – 2,5 % и гемицеллюлозы – 2,1 %. При изучении состава семян было обнаружено, что ВРПС составляет 7 %, ПВ - 2 % и гемицеллюлоза - 0,5 %.

Abstract

Contentfruit peel and melon seeds were extracted with water and studied the amount of polysaccharides. According to the results obtained, it was determined that water-soluble polysaccharides (WSP) is 7.5%, pectic substances(PS) - 2.5% and hemicellulose– 2.1%. When studying the composition of the seeds, it was found that the VRPS is 7%, the PV is 2% and hemicellulose 0.5%.

Kalit so‘zlar: *meva qobig'i, urug'lar, alkogolda eruvchan shakar, suvda eriydigan polisaxaridlar, pektin, gemitsellyulozalar*

Ключевые слова: *корки и семена, спирторастворимые сахара, водорастворимые полисахариды, пектиновые вещества, гемицеллюлозы*

Key words: *fruit peel, seeds, alcohol-soluble sugars, water-soluble polysaccharides, pectin, hemicelluloses*.

INTRODUCTION

Natural plants and their wastes are a source of medicines with various therapeutic effects. The study of the molecular mechanisms of the pathogenesis of a large number of plant and human diseases has shown that all of them, to one degree or another, are associated with the activation of free radical processes [1-2].

VRPSwaste-derivedfruit peel and seedsmelon, normalizes the acid-base balance of cells, dissolves kidney stones, slows down the development of prostatitis, provides carbohydrate metabolism.

The rich chemical composition of gourds is evidenced by the research data of various scientists [3].

The main indicator of melon quality is its chemical composition. Water is the main component of the melon and, depending on the variety of the crop, its content is determined in the range of 84-88.5%. The composition of the substances contained in the melon includes proteins, carbohydrates (sugar, starch, fiber), organic acids, vitamins, minerals. The chemical composition of fruits largely determines the soil and climatic conditions of cultivation, the level of agricultural

technology, the correctness and timeliness of the application of the irrigation regime, the timeliness of collection, the organization of the storage regime, and the preparation of products for storage. Based on the foregoing, it should be noted that the most important stage in the development of technology for the production of long-term storage products of increased nutritional and biological value is the determination of the chemical composition of melons.

MATERIALS AND METOD

The carbohydrate complex of melon (fruit peel and seeds) growing in Uzbekistan has been studied.

As a result of the study, the presence of alcohol-soluble sugars, water-soluble polysaccharides, pectin substances and hemicelluloses was established.

10 g of crushed air-dry raw materials were extracted with boiling chloroform in a ratio of 1:8 in a round-bottom flask with a reflux condenser to remove coloring and low molecular weight compounds [7]. The extraction was carried out three times, after which the raw material was separated by filtration and dried [4].

*Isolation and study of alcohol-soluble sugars.*The dried raw material was extracted with boiling 82% ethanol (1:10, 1:6) in a round bottom flask under reflux. The extraction was carried out twice. Alcoholic extracts were combined, evaporated on a rotary evaporator to a small volume, and chromatographed on Filtrak-FN-13 paper for 18 h using a descending method in a solvent system of butanol-pyridine-water (6:4:4) in comparison with known samples of monosaccharides. For the development of hexosaccharides, the chromatograms were developed with acid aniline phthalate and heated in an oven at 105°C for 2–3 min. For the development of ketosaccharides, a 5% alcohol solution of acidified urea was used, followed by heating them in an oven at 105°C.

*Isolation and study of water-soluble polysaccharides (WSPS).*The rest of the raw material after isolation of alcohol-soluble sugars was extracted twice, at a hydromodulus of 1:15, 1:10 (600, 500 ml of water) in a water bath at 70-750 C, constantly stirring. Each extract was separated by filtration through coarse calico under vacuum. The extracts were combined, evaporated on a rotary evaporator to 40 ml, and precipitated with alcohol (1:3). The precipitate that formed was separated by centrifugation (5000 rpm, 10 min), dried, and washed with alcohol.

Hydrolysis of VRPS. 100 mg of isolated VRPS were hydrolyzed with 3 ml of sulfuric acid solution (1 mol/l) in a sealed ampoule on a boiling water bath for 8 h at 1000C. After the specified time, the ampoule was opened, the hydrolyzate was placed in a beaker with a capacity of 50 ml, and barium carbonate was neutralized. The precipitate formed in this case was filtered off, the filtrate was deionized with a KU-2(H*) cation exchanger, evaporated to a small volume (0.5 ml), and chromatographed on Filtrak FN 12 paper using the descending method in the solvent system butanol-pyridine-water (6:4:3) with known monosaccharides ("witnesses"). The chromatograms were dried, developed with acid aniline phthalate, followed by heating in an oven at 100^0C for 1–2 min.

*Isolation and study of pectin substances (PV).*The rest of the raw material after extraction of WPRP was treated twice with 300 ml of a mixture of 0.5% solutions of oxalic acid and ammonium oxalate (1:1) at a hydromodule (1:15, 1:10) at 70-75°C for 1 hour, with stirring. The resulting extracts were separated by filtration through coarse calico, combined and dialyzed against running water for 18 hours. Then they were evaporated on a rotary evaporator to 50 ml and precipitated with alcohol (200 ml). The precipitate that formed was separated by centrifugation (5000 rpm, 10 min), the precipitate was washed with alcohol and dried.

*HP hydrolysis.*100 mg of HP was hydrolyzed with 3 ml of sulfuric acid solution (2 mol/l) in an ampoule on a boiling bath for 24 h. The procedure for processing the hydrolyzate and its analysis are described above.

Isolation and study of hemicelluloses. Hemicelluloses (HMC) were isolated from the rest of the raw material (after HP extraction) by double extraction with 5% sodium hydroxide solution (1:10, 1:5) at room temperature, stirring constantly for 2 hours. The extracts were separated by filtration, combined, neutralized with a 50% solution acetic acid, dialyzed against running water for 20 hours, then evaporated and precipitated with alcohol.

Hydrolysis of HMC. 100 mg of HMC were hydrolyzed with 3 ml of sulfuric acid solution (2 mol/l) in an ampoule in a boiling water bath for 48 h. The hydrolyzate was treated and analyzed as described above.

RESULTS AND DISCUSSION

As a result of the study, it was found that the alcohol-soluble sugars of the fruit peel and seeds epresented by hexose - glucose (brown spot with Rf=0.36), ketosaccharides fructose and sucrose (blue spots with Rf=0.60 and Rf=0.46, respectively) [5].

The yield of WSPS was 0.75 g (7.5%) and 0.7 g (7.0%) for fruit peel and seeds. VRPS are light beige amorphous powders, highly soluble in water. The monosaccharide compositions of VRPS did not sharply differ qualitatively, but the difference was in the quantitative ratio. The main monosaccharides of VRPS-x are Ara, Glu, Gal and in VRPS-g Ara, Glu; other monosaccharides are present in smaller amounts. The ratio of monosaccharides suggests that heterogeneous polysaccharides with a dominant content of glucans form the basis of the WSPS from the rind of the dudis, while the presence of both glucans and glucoarabinans is possible in the WSPS of the seeds [6].

The yield of pectin substances (PV) was 0.25 g (2.5%) of melon peels and 0.2 g (2.0%) of seeds. HP is a white amorphous powder, highly soluble in water. A solution of HP gives with iodine a barely noticeable blue color that quickly disappears.

It is shown that the monosaccharide composition of pectin substances is represented by galacturonic acid (Rf=0.14), galactose (Rf=0.37), arabinose (Rf=0.48), in small amounts (chromatographic zones were fuzzy and had a weak color) xylose (Rf=0.56) and rhamnose (Rf=0.67).

The yield of HMC was 0.1 g (1.0%) melon peels and 0.05 g (0.5%) seeds. Hemicelluloses are a beige amorphous powder, insoluble in water, readily soluble in dilute alkalis.

As a result of chromatographic analysis, the presence of glucuronic acid (Rf=0.14), galactose (Rf=0.37), arabinose (Rf=0.48), xylose (Rf=0.56) was found in hemicelluloses, in smaller amounts of glucose (Rf=0.36) and rhamnose (Rf=0.67).

Table 1 summarizes the data on the quantitative content and monosaccharide composition of the isolated polysaccharides.

Table 1.

The content of various groups of polysaccharides in the fruit peel and seeds of Cucumis Melo and their monosaccharide composition

No.	Type of Carbohydrates	Exit, %	Monosaccharide composition						UAc
			Gal	glc	Ara	Man	Xyl	Rha	
Fruit peel	VRPS	7.5	21.2	42.7	26.5	5.3	3.4	1.0	-
	PV	2.5	4.4	21.0	44.6	3.0	1.7	1.8	+
	HMC	2.1	3.0	1.0	60.0	7.3	6.0	6.0	+
seeds (urughalta)	VRPS	7.0	1.6	21.7	56.7	2.6	5.9	1.0	-
	PV	2.0	5.6	18.1	40.1	3.4	5.5	2.0	+
	HMC	0.5	4.1	2.1	65.2	5.1	4.9	5.8	+

Note: VRPS-water-soluble polysaccharides, PV-pectic substances, HC-hemicelluloses, Gal-galactose, Glu-glucose, Ara-arabinose, Xyl-xylose, Rha-rhamnose, GalUA-galacturonic acid.

As can be seen from table 1, VRPS are dominant in crusts and their content ranges from 7.0 to 7.5% (from air dry raw materials), in which the main monosaccharides are glucose and arabinose.

PV and HMC are also characterized elevated content of arabinose and xylose. This is characteristic of HMC, which are based on xylans.

In VRPS isolated from seeds, the predominant monosaccharides are arabinose, glucose, and small amounts of galactose. In PV glucose, arabinose, galactose. The monosaccharide composition of HMC is characterized by the main sugars xylose and arabinose.

It should be noted that in all samples there is a sufficient amount of glucose, arabinose and xylose.

CONCLUSION

Contentfruit peel and melon seeds were extracted with water and studied the amount of polysaccharides. Based on the results obtained, it was determined that VRPS is 7.5%, PV - 2.5% and HMC - 2.1%. When studying the composition of the seeds, it was found that VRPS is 7%, PV 2% and HMC 0.5%.

REFERENSES

1. И.Р.Аскаров, Н.Х.Абдурахимова, М.М.Мўминжонов, Х.Исаков // Қовун уруғи ва пўстлоғининг кимёвий таркиби. Journal of chemistry of goods and Traditional medicine. -2022. №2. –Б.-411.

2. Н.Х.Абдурахимова, И.Р.Аскаров // Қовун чиқиндиларини таркибини аминокислота миқдорини аниқлаш ва халқ табобатида ишлатилиши. Journal of chemistry of goods and Traditional medicine. - 2022. №4. - Б 206-216.

3. Медведков Е.Б.,Кизатова М.Е.,Шевцов А.А.,Муравьев А.С. // Многокритериальная оптимизация процесса отделения корки от мякоти дыни методами экспериментально-статистического анализа // Вестник ВГУИТ/Proceedingsof VSUET. -2016. № 2. -С.28-36.

4. N.X.Abduraximova, Sh.A.Matamirova, I.R.Asqarov//Qovun urug'i tarkibidagi biologik faol moddalarni o'rgan HMC va undan xalq tabobatida foydalan HMC. Journal of chemistry of goods and Traditional medicine. -2022. №4, -Б.261-274.

5. Рахманбердиева Р.К. Пектиновые вещества Gleditsia macracantha // VIII Молодежная школа – конф. по органической химии. Тез. докл. – Казань, 2005.

6. Dubois M., Gilles K.A., Hamilton J.K., Rebers P.Q.. Smith F. Anal.Chem. New-York. 1956. №3 (28).P.350-356.

7. Ibragim R. Askarov, Sultanoy Kh. Mikhmanova, Nodira Kh. Abdurakhimova, Isakov Khayatulla // Obtaining Food Additives Based on Local Plant Waste and Determination of the Quantity of Polysaccharides in Their Composition by the Physico-Chemical Method. International Journal of Materials and Chemistry. -2022. V.12 (3). –P.49-53.