

ВЛИЯНИЕ СТЕПЕНИ ОЧИСТКИ И ИЗВЛЕЧЕНИЯ ПЕКТИНОВЫХ ВЕЩЕСТВ ИЗ ВЫЖИМОК БАХЧЕВЫХ КУЛЬТУР ОТЕЧЕСТВЕННЫХ СОРТОВ НА КАЧЕСТВО ПОЛУЧЕННЫХ ПЕКТИНОВ

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Аннотация. Основными параметрами исследований являются бахчевые культуры: перспективные казахстанские сорта дыни и тыквы, выжимки указанных культур, тыквенный и дынный пектиновые экстракты.

При подборе технологических режимов (гидромодуль, температура, рН-среда) для получения пектин содержащего экстракта из выжимок тыквы и дыни перед введением ферментного препарата осуществлено предварительное набухание сырья в воде при температуре 48-50 °С в течение 12-15

часов.

Современные технологии производства пектина могут принципиально различаться по способу ведения процесса, уникальным приемам экстракции (ультразвук, замораживание, электрическое поле) и аппаратурному оформлению (от использования типового оборудования до применения специально разработанной аппаратуры).

Ключевые слова: дыня, тыква, сырье, пектин, пектинсодержащий экстракт, сахар.

INFLUENCE OF THE DEGREE OF PURIFICATION AND EXTRACTION OF PECTIN SUBSTANCES FROM THE POMACE OF MELON CROPS OF DOMESTIC VARIETIES ON THE QUALITY OF THE OBTAINED PECTINS

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Abstract. The main parameters of the research are melons: promising Kazakh varieties of melon and pumpkin, pomace of these crops, pumpkin and melon pectin extracts.

When selecting the technological modes (hydromodule, temperature, pH medium) to obtain a pectin-containing extract from pumpkin and melon pomace, prior to the introduction of the enzyme preparation, the raw material was pre-swelled in water at a temperature of 48-50 °C for 12-15 hours.

Modern technologies of pectin production can differ fundamentally in the method of conducting the process, unique extraction techniques (ultrasonic freezing, electric field) and hardware design (from the use of standard equipment to the use of specially designed equipment).

Keywords: melon, pumpkin, raw materials, pectin, pectin-containing extract, sugar.

ПЕКТИН ЗАТТАРЫН ТАЗАЛОО ЖАНА ЭКСТРАКЦИЯЛОО ДАРАЖАСЫНЫН ИЧКИ ЖЕРЛЕРДИН САПАТЫНА ИЧКИЛИКТҮҮ САПАТТАРГА ТААСИРИ

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Аннотация. Изилдөөнүн негизги параметрлери - коондор: перспективдүү казакстандык коон жана ашкабак сорттору, бул өсүмдүктөрдүн помасы, ашкабак жана коондун пектин экстракттары.

Ашкабактан жана коондун помасисинен пектин камтыган экстрактты алуу үчүн технологиялык режимдерди (гидромодуль, температура, pH-орто) тандоодо, фермент препаратын киргизгенге чейин, чийки заттын суусу 48-50 ° температурада алдын-ала шишип кетет. 12-15 саатка С жүргүзүлдү.

Пектин өндүрүшүнүн заманбап технологиялары процессти өткөрүү ыкмасы, экстракциялоо (УЗИ, тондуруу, электр талаасы) жана приборлорду алуу (стандарттуу жабдууларды колдонуудан баштап атайын иштелип чыккан жабдууларды колдонууга чейинки) өзгөчө ыкмалары менен түп-тамырынан айырмаланышы мүмкүн.

Ачык сөздөр: коон, ашкабак, чийки зат, пектин, пектин камтыган экстракт, шекер.

The current state and main trends in the development of technology for obtaining pectin from vegetable raw materials, the traditional technology of pectin production consists of the following main stages of pectin-containing raw materials; hydrolysis-extraction of pectin with mineral or organic acids; filtration of the extract; clarification of the filtrate; concentration of the extract; precipitation of pectin substances with aliphatic alcohols or polyvalent metal salts; purification of pectin; drying, grinding and mixing of pectin with sugar to a standard degree of strength.

Pectin's are natural compounds widely used in industry. In the food industry, they are used in the production of marshmallows, marmalades, jams, sausages, juices, yoghurts and some other products.

Modern technologies for the production of pectin can differ fundamentally in the method of conducting the process, unique extraction techniques (ultrasonic freezing, electric field) and hardware design (from the use of standard equipment to the use of specially designed equipment).

Analysis of existing technologies for the production of pectin substances allowed us to conclude that the main (traditional) method of obtaining pectin from plant raw materials is hydrolysis-extraction under the influence of acid solutions. The most acceptable hydrolyzing agent in this case, according to many authors, is hydrochloric acid. The existing methods of acid hydrolysis have a number of disadvantages, since they are based on hydrolysis-extraction in closed systems, prolonged exposure to temperature and aggressive environment of the extracting, which leads to degradation of pectin macromolecules and loss of the main properties of the target products. [1]

The analysis of the current state of pectin production technology is carried out. The schemes of pectin production using membrane technology, pectin production using Electro-activated water and cavitations-membrane technology of pectin production, their advantages and disadvantages over the traditional production scheme are considered. Modern pectin technologies can fundamentally differ in the way of conducting the process and hardware design (from the use of standard equipment to the use of specially designed equipment). It should be noted that the world's leading manufacturers of pectin's use specially designed or modified equipment.

The developed technologies for obtaining pectin from apple pomace, citrus fruits, beet and pumpkin pulp, and technological modes are also presented.

The analysis of literature sources and our research indicate the expediency of extracting pectin substances by the enzyme method from cheap raw materials-pomace of melon crops of domestic varieties (pumpkins and melons) and the selection of rational technological modes.

The objects of research are melons: promising Kazakh varieties of melon and pumpkin, pomace of these crops (pulp), pumpkin and melon pectin extracts. [3]

The selection of enzyme preparations suitable for the production of pectin substances from the pomace of melons will be based on the study and analysis of the experiments of various researchers who worked on the production of pectin and practical work with firms that supply enzyme preparations. In this case, the range of enzyme preparations or their compositions that are most suitable for the isolation of pectin from vegetables will be selected empirically. In the future, the selected enzymatic preparations will be experimentally studied for their suitability for obtaining pectin from pumpkin and melon pomace.

Based on previous studies, it was found that the pumpkin content of total pectin and the yield of pomace is quite suitable for obtaining a pectin-containing extract. Therefore, for further research, the pomace can be dried using a gentle technology and then used to produce pectin extract. To isolate pectin from pumpkin, the enzymatic drug polygalacturonase was used.

When studying the technological modes (hydromodule, temperature, pH medium) for obtaining a pectin-containing extract from pumpkin pomace, before the introduction of the enzyme preparation, the raw material was pre-swelled in water at a temperature of 48-50°C for 12-15 hours. Pectin extracted from pre-swollen raw materials has higher quality indicators.

Based on previous studies, it was found that melon in terms of total pectin content and the yield of pomace is quite suitable for obtaining a pectin-containing extract. As a result of the study of the optimal technological mode: the extract temperature, it was found that the optimal temperature of the extract during the enzymatic extraction of pectin from the pomace of the melon variety "Torpeda" is the temperature of 40-41°C, which is unfavorable for many obligate microorganisms, which undoubtedly has a positive effect in the technological process.

Since one of the criteria for the quality of pectin is the content of pure pectin in the commercial sample, additional studies of raw materials and pectin products were conducted for the presence of sugars, which are ballast substances in relation to pectin. Experimental data on the total content and fractional composition of sugars are shown in Figure 1

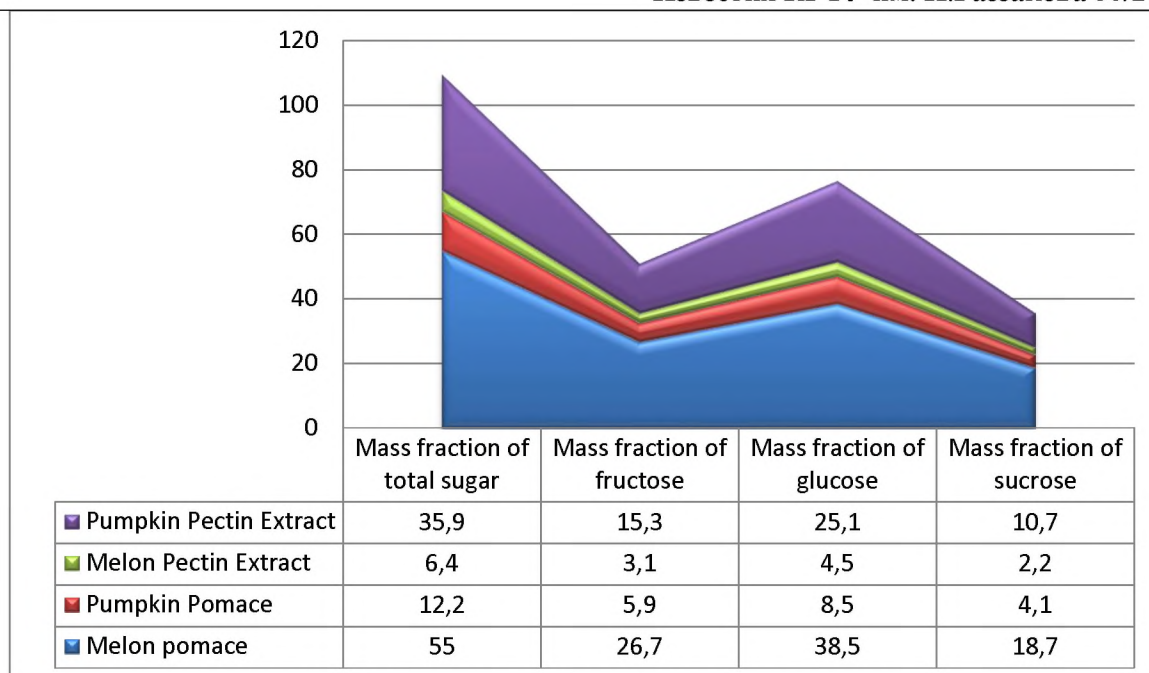


Fig. 1-Mass fraction of sugars, % in terms of absolutely dry mass

From Figure 1, it follows that almost all samples of the studied raw materials contain sugars. This makes it necessary to prepare these types of raw materials for hydrolysis-extraction of pectin substances.

Raw materials for pectin production should contain a minimum amount of reducing sugars, since the reaction with amino acids forms colored products.

The content of ballast substances in dry pectin should not exceed 30 % (for pectin used in the food industry). The presence of ballast substances in pectin's reduces their gelatinous properties and worsens complex formation. Therefore, before extracting the pectin substances, the water-soluble components are extracted.

To extract pectin from plant tissues, hot water, solutions of hydrochloric, sulfuric, nitric, and sulfurous and oxalic acids, oxalic acid and citric acid of ammonium, polyphosphates are used. The properties of the extracted pectin depend not only on the extraction methods, but also on the condition of the raw material, which can be fresh, well-dried or partially dried.

The successful application of membrane technology for the concentration and purification of various biologically active compounds, including pectin, is largely determined by the rational choice of the membrane material, the shape of the membrane elements, and the optimal physic-chemical and hydrodynamic regime of the process. Optimization of the modes of efficient use of membranes required the study of the mechanism of the mass transfer process, taking into account the component composition and properties of the separated system.

The work carried out has shown that the use of semi-permeable membranes of a new generation for the concentration of pectin extracts allows you to significantly remove carbohydrates from the extract, achieve partial discoloration of the pectin extract, ensure 100 % retention of pectin substances by the membranes, and achieve a high degree of concentration of the extract.

The use of membrane filters for the purification of pectin concentrates allowed us to obtain a pectin preparation with a purity of 95 %. Pectin's with this degree of purification have a much wider range of applications than crude ones.[5]

In the case of concentrating the pectin extract by the method of membrane filtration, the question arises of restoring the performance of the membranes after the completion of the work cycle. On the working surface of the membrane, a layer of deposits of pectin, proteins, sugars and other components of the pectin extract is deposited. In addition, in the process of concentrating the extract, there is an increase in the number of microorganisms that are in it.

It should be noted that the stage of membrane regeneration is a crucial and necessary moment in the development of the process of membrane concentration, which requires careful study. Restoring the performance of membrane devices is usually a multi-stage process that requires the sequential use of several cleaning agents.

Conclusion

We conducted a reasonable search for chemical reagents and washing modes to restore the performance of the membranes after the working cycle of the extract concentration, allowing for the regeneration of the membranes, and selected an option that fully meets the requirements of the basic technological process.

The need to expand the production of pectin is due to the constant deterioration of environmental indicators around the world, leading to contamination of the environment and food with toxic substances and radionuclides, and requires food safety and preventive measures. Due to the properties identified in recent years, they attract special attention for use in the diet of a healthy diet. Pectins can be widely used for prevention, auxiliary therapy and support in the physiological boundaries of the functional activity of organs and systems of the human body.

The analysis of literature sources and our research indicate the feasibility of extracting pectin substances by the enzyme method from cheap raw materials-pomace of melon crops of domestic varieties (pumpkins and melons).

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