

**I.Z. Bejanidze<sup>1</sup>**  
**T.S. Kharebava<sup>1</sup>**  
**V.D. Pohrebennyk<sup>2</sup>**  
**N.N. Didmanidze<sup>1</sup>**  
**N.A. Nakashidze<sup>1</sup>**

## **HIGH-QUALITY PECTIN FROM WASTE OF CITRUS JUICE PRODUCTION USING ECOLOGICALLY PURE AND REAGENT- FREE METHOD – ELECTRODIALYSIS**

<sup>1</sup> Batumi Shota Rustaveli State University, Georgia

<sup>2</sup> Lviv Polytechnic National University, Ukraine

### **Abstract**

Is shown the possibility of food fibers obtaining, in particular pectin, from the withdrawals of the juice production of citrus fruits, by the application of an ecologically clean and reagent-free method - electro dialysis, which made it possible to solve two key problems: ecological- the problem of withdrawals and economic from the worthless raw material is obtained high-quality pectin without the consumption of reagents, whose cost to 30% lower than imported.

**Keywords:** food fibers, pectin, electro dialysis.

### **Аногація**

Показана можливість отримання харчових волокон, зокрема, пектину, з відходів сокового виробництва цитрусових і яблук, застосуванням екологічно чистого і безреагентного методу – електродіалізу, що дозволило вирішити дві важливі проблеми: екологічну – проблему відходів, і економічну – з непридатної сировини отримано високоякісний пектин без витрати реагентів, вартість якого на 30% є нижчою від імпортного.

**Ключові слова:** харчові волокна, пектин, електродіаліз.

### **Introduction**

Nutrition is the basis of life, health, the main factor that determines the longevity and performance of a person. It must be rational (that is, reasonably justified), appropriate to age, gender, type of work, etc. Dietary fiber is currently recognized as a necessary component of nutrition, because their consumption with food is essential for the normal functioning of the gastrointestinal tract and maintaining the health of the body as a whole. Dietary fibers differ in composition and properties. Distinguish between soluble and insoluble dietary fiber. Soluble dietary fiber includes plant polysaccharides, in particular pectins, which are obtained from plant materials. Among them, the most common are citrus and apple pectin. It was found that soluble pectin fibers better remove heavy metals, toxic substances, radioisotopes and cholesterol. Of scientific and practical interest is the study of the possibility of obtaining dietary fiber – high-quality pectin from juice production waste of local varieties of citrus fruits, by means of an environmentally friendly and reagent-free method – electro dialysis.

### **Results and Discussion**

The research was carried out on the wastes of citrus juices production: "Unshiu" tangerine, "Meyer" lemon, "Local" orange and "Duncan" grapefruit. The content of dietary fiber in the peel (albedo, flavedo) and juice was investigated: soluble and insoluble (protopectin) pectin, alcohol insoluble (cellulose, hemicellulose) residue, fiber, sugar, starch, as well as the dynamics of changes in these parameters depending on the variety, time ripening and storage of fruits. To obtain pectin isolates, hydrochloric acid (HCl) was used, obtained by the method of membrane technology - electro dialysis during desalination of water in electrode chambers and dialysate-desalinated water obtained in desalination chambers.

Studies carried out on citrus fruits have shown that citrus peels contain a large amount of pectin, the conversion of which is of great importance for the storage process of the fruit, which lasts for several

months. In oranges and lemons, the change in pectin substances occurs almost the same. During the ripening of orange fruits, the content of total pectin in the pulp is almost halved, and the amount of soluble pectin at the beginning of ripening increases and then falls. During the storage of orange fruits, the content of soluble pectin in the albedo and pulp increases, but the total content does not change.

Pectin samples were obtained from the peel (flavedo and albedo), juice and pulp of the fruit. It was found that pectin is found in a greater amount in albedo than in pulp; it is more methoxylated, i.e. of higher quality, with good prophylactic properties, has a high gelling ability and a coarse-fiber structure. therefore, high quality pectin should be obtained from citrus peel albedo. The fruit juice contains only a small amount of pectin (up to 0.1-0.2%).

### Conclusions

It follows from the studies carried out that in order to achieve detoxification of the body, it is necessary to consume soluble fiber (soluble pectin), i.e. take lemons and / or oranges in a state of technical maturity and storage for 6 months. The proposed technology for the extraction of dietary fiber from plant raw materials will allow solving such important problems as: ecological - the problem of waste, economic - high-quality pectin will be obtained from waste raw materials without the consumption of reagents, the cost of which is 30% lower than imported and, most importantly, obtaining high-quality dietary fiber - pectin with medicinal and prophylactic properties.

### REFERENCES

1. Bejanidze I., Kharebava T., Kontselidze Z. Dietary fiber - multifunctional food ingredients RS Global Sp. z O.O., Scientific Educational Center Warsaw, Poland. Science Review 1(8), January 2018 Vol.2, p. 30-34.
2. Method of pectin extraction from plant raw materials. 2012. P6038 National Center of Georgian Intellectual Property.
3. Bejanidze I., Kharebava T. An efficient method for allocation of natural polymers from plant raw. 4 th Intern. Conf. on polymer & Advanced Materials. Collection of works. Batumi, Georgia, July 1-4, 2015, p.17.

**Бежанидзе Ирина Зурабовна** — д.х.н., профессор департамента химии, Батумского государственного университета, факультет естественных наук и здравоохранения, Грузия, e-mail: irina.bejanidze@bsu.edu.ge

**Харебава Тина Шалвовна** — д.х.н., ассистент-профессор департамента химии, Батумского государственного университета, факультет естественных наук и здравоохранения, Грузия, e-mail: tina.kharebava@bsu.edu.ge.

**Погребенник Владимир Дмитриевич** — д.т.н., профессор кафедры экологической безопасности и природоохранной деятельности, Национальный Университет "Львовская политехника", Украина, e-mail: volodymyr.d.pohrebennyk@lpnu.ua.

**Дидманидзе Наталья Нодариевна** — д.х.н., старший преподаватель департамента химии, Батумского государственного университета, факультет естественных наук и здравоохранения, Грузия, e-mail: nato.didmanidze@bsu.edu.ge.

**Накашидзе Нуну Автандиловна** — д.с.-х.н., ассистент-профессор департамента агроэкологии и лесного хозяйства, Батумского государственного университета, технологический факультет, Грузия, e-mail: nunu.nakashidze@bsu.edu.ge

**Bejanidze Irina** — Doctor of Chemical Sciences, professor of faculty of Natural Sciences and Health Care, Department of Chemistry, Batumi Shota Rustaveli State University, Georgia; e-mail: irina.bejanidze@bsu.edu.ge

**Kharebava Tina** — Doctor of Chemical Sciences, assistant-professor of faculty of Natural Sciences and Health Care, Department of Chemistry, Batumi Shota Rustaveli State University, Georgia; e-mail: tina.kharebava@bsu.edu.ge

**Pohrebennyk Volodymyr** — Doctor of Technical Sciences, professor of Department of Ecological Safety and Nature Protection Activity, V. Chornovil Institute of Sustainable Development, Lviv Polytechnic National University, Ukraine, e-mail: volodymyr.d.pohrebennyk@lpnu.ua.

**Didmanidze Nato** — Doctor of Chemical Sciences, Senior Lecturer of faculty of Natural Sciences and Health Care, Department of Chemistry, Batumi Shota Rustaveli State University, Georgia, e-mail: nato.didmanidze@bsu.edu.ge

**Nakashidze Nunu** — Doctor of Agricultural Sciences, assistant – professor of Department of Agroecology and Forestry, Batumi Shota Rustaveli State University, Georgia, e-mail: nunu.nakashidze@bsu.edu.ge