Технологии *RA+ SmartFresh* и *CA+ SmartFresh* позволяет продлить сроки хранения и обеспечивают комплексную защиту от болезней, сохранение твердости и сочности плодов, по сравнению с технологиями *RA* и *CA* без обработки.

Лучшее сохранение качества яблок опытных образцов было отмечено после разных условий холодильного хранения в комплексе с послеуборочной обработкой препаратом *SmartFresh*, что позволяет надежно транспортировать яблоки до потребителя и провести реализацию в магазинах.

Применение препарата *SmartFresh* позволяет снизить действие этилена на процессы дозревания яблок при хранении. Обработанные плоды при хранении в течение 3-4 месяцев в обычных условиях и контролируемой атмосфере по качеству (твердость, сочность, свежесть) практически равноценны, но при дальнейшем хранении плоды, находящиеся в *CA*, обладали лучшим качеством. В обработанных плодах, снятых в оптимальные сроки, в регулируемой атмосфере обеспечивается длительная стабилизация физиологических процессов, что позволяет хранить плоды до нового урожая с минимальными потерями и максимальным сохранением исходного качества.

Максимальный эффект по сохранению исходного качества плодов отмечен при совместном действии препарата 1-метилциклопропен и регулируемой атмосферы (1,5 % O_2 и 1,5 % CO_2), где выход товарных сортов составил 95-98 %.

Выводы.

Таким образом, соблюдение рекомендаций по срокам уборки яблок, технологических параметров послеуборочной обработки и хранения плодов с использованием регулируемой атмосферы позволяет максимально сохранить исходное качество плодов при длительном хранении, снизить потери при хранении и повысить эффективность производства.

1. Причко Т.Г. Биохимические и технологические аспекты хранения и переработки плодов.- Краснодар.- 2002. - 150с.
2. S.Musacchi, S. Serra. Apple fruit quality: Overview on pre-harvest factors. Scientia Horticulturae 2017, doi.org/10.1016/j.scienta.2017.12.057 P 1-22.
3. Причко Т.Г. Сроки уборки и режимы хранения яблок с учётом сортовых особенностей. Методические рекомендации. Краснодар: ФГБНУ СКФНЦСВВ. - 2018. 61 с. <https://elibrary.ru/item.aspx?id=35622817>
4. Методическое и аналитическое обеспечение исследований по садоводству / СКЗНИИСиВ; редкол: Е.А. Егоров и др. - Краснодар, 2010.–310 с.
5. Программа и методика сортоизучения плодовых, ягодных и орехоплодных культур / ВНИИСПК; под общ. ред. Е.Н.Седова и Т.П. Огольцовой. – Орел: ВНИИСПК, 1999. – 608 с.
6. Причко Т.Г., Дрофичева Н.В., Смелик Т.Л., Германова М.Г. Критериальные показатели, характеризующие съемную зрелость плодов селекции СКФНЦСВВ // Новые Технологии. – 2019. – Т.4. – С. 168-191.

**Satayev M.I.¹, Azimov A.M.², Myrkhalikov Z.U.¹, Berdikulov M.A.¹, Alekseyeva N.V.²,
Baiysbay O.P.², Ashirbayev Z.S.¹, Duisebayev S.Y.¹, Yessenbek A.S.²**

Studying the features of splitting apricot, plum and peach pits

¹*InnovTechProduct LLP*

²*NPJSC M. Auezov South Kazakhstan University
(Kazakhstan, Shymkent)*

doi: 10.18411/scienceconf-03-2021-26

idsp: scienceconf-03-2021-26

Abstract

In this article, the authors studied the methods of splitting apricot, plum and peach pits (hereinafter fruits), with the aim of obtaining a whole kernel for its further processing. The main parameters of fruit pits, such as length, width, thickness of the shell wall, width of the shell joint and mass of fruit pits, were analyzed, the efforts required for splitting were revealed. The influence of force on the splitting of fruit pits was studied using the plant developed by the authors. The fruit pits were split from the side of the pit joint and from the

side of the hollow part. According to the results of the experiments, the optimal conditions for splitting the pits with approximately the same shape and structure were revealed. When the pits are squeezed along the joint and from the side of the hollow part in the direction of the major axis of their elliptical section the kernel is not damaged. The graphs of the dependence F (kN) on the distance (mm) and duration (sec.) were obtained, the results are shown in Table 1. The dependence of the increase in the effort exerted on the destruction of fruit pits on the thickness of the shell walls was also revealed. The force spent on splitting the pit depends on the wall thickness and the fruit shell joint width: the thinner the shell and the smaller the width of the shell joint, the less force is spent on splitting the pit.

Keywords: apricot, plum, peach, fruit seeds, strength, splitting, shell, core, joint

Introduction. The southern region of Kazakhstan is a large producer of fruits. More than 2,700 tons of fruits were harvested in Maktaaral region alone in 2020 in South Kazakhstan [1]. The harvested fruits are exported to other regions of Kazakhstan and abroad. Existing fruit canning factories produce only juices, jams and compotes. There are no processing enterprises in Kazakhstan that produce products from fruits: from pulp – dried fruits; from pit shells – activated carbon; from kernels of pits – cosmetic and edible oil. The import of dried fruits is 98%, activated carbon – 99%, kernel oil – 100%. One of the main advantages of fruits in the south of Kazakhstan is high sugar content and aroma. Fruits grown in dry, hot climates maximize the accumulation of sucrose and fructose.

When storing and processing agricultural products, inevitable losses of raw materials occur, reaching 20-35%. This is due to the fact that agricultural products are perishable, and also due to the imperfection of technological processes for processing agricultural products. These phenomena require timely high-quality processing of the grown crop.

In enterprises processing plant raw materials are among wastes, a special role is given to fruit pits, which are formed in the production of jam and compotes from pit fruits, cut into halves, as well as in the production of confiture, juices, jams.

In ancient times, men were assigned to split apricot pits, since this activity requires certain physical effort, dexterity and skill.

In the food industry, the masses subjected to pressure (seeds, fruits and berries, plant stems, animal tissues) have a complex cellular structure that offers significant resistance to the release of a liquid phase from it. To reduce this resistance, the material is subjected to mechanical, hydrothermal, thermal, enzymatic and electrical treatment before squeezing. Mechanical treatment consists in crushing the cell tissue in order to destroy the cell membranes that prevent the liquid from leaving the cells [2].

Previously, scientists conducted experiments on splitting local varieties of apricots such as “Sin-chalak”, “Kandak”, “Ak navat”, “Javzak”, “Shirin jaupazak”, “Maisky”, “Childo- na”, “Kandak krasny” and “Bodomcha” for the formation of cracks in the pit shells [3, 4].

The authors of the grant project financed by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan submitted for the competition for the grant financing of scientific and (or) scientific and technical projects for 2020-2022 with a period of implementation of 27 months No. AP08855596 on the topic “Development of technology for complex processing of fruits to obtain dried fruits, activated carbon, cosmetic and edible oil”, the purpose of which is the complex processing of fruits (apricots, peaches, plums, cherries and grapes) and the development of technology for obtaining dried fruits by infrared drying of pulp, activated carbon by mechanical-chemical-thermal activation of the pit shells, cosmetic and edible oils by cold pressing of the pit kernels, during the implementation of the project studied methods of splitting the fruit pits in order to obtain a whole kernel.

Methods and results. The authors conducted a study of the effect of force on splitting the fruit pits. The experiments were carried out on a plant developed by the authors; the fruit pits were split from the side of the pit joint and the hollow part. The fruit pits were set in a position in which their plane, passing along the joint, is perpendicular to the flat surface of the

plant, in this position they are evenly and with a gradually increasing force squeezed by the flat surface.

As a result, the shell of the fruit pits is split at the joint and from the side of the hollow part into two halves, while maintaining the integrity of the pit kernel. The optimal condition for splitting the fruit pits, which have approximately the same shape and structure, is the condition when the pits are squeezed along the joint and from the side of the hollow part in the direction of the major axis of their elliptical section. In this case, the shell splits at the joint and from the side of the hollow part into two halves, and the pit kernel remains intact. In addition, when the pit is squeezed in this direction, its kernel is less affected by the shell side, since in this direction the gap between the kernel and the shell is maximum.

According to the research, the main factors influencing the fruit pit split were identified. After carrying out the experiments, in processing the revealed data, the authors plotted the dependence of the force F (kN) on the distance (mm) and duration (sec.).

These studies showed that the split of “Sary Uryuk” variety fruit pit (length 20 mm, width 13 mm, shell wall thickness 0.7 mm, shell joint width 4 mm, mass 1.2 g) from the pit joint side occurred at 6th second of the experiment at a load of 0.6 kN (Fig. 1).

The split of “Sary Uryuk” variety apricot pit (length 21 mm, width 14 mm, shell wall thickness 4 mm, shell joint width 4 mm, mass 1.3 g) from the pit’s hollow part side occurred at 5th second of the experiment at a load of 0.6 kN. The apricot pit kernels were not damaged (Fig. 2). The rest of the experimental data of the fruit pits are given in Table (in the first line – from the joint side, in the second – from the hollow part side).

Conclusions. The data obtained from the studies carried out allow the authors to draw the following conclusions: for the splitting of fruit pits, a force acts depending on their sizes.

An increase in the force exerted on the destruction of the pits depending on the shell wall thickness was also revealed. The force expended on splitting the pit depends on the wall thickness and the shell joint width: the thinner the shell and the smaller the shell joint width, the less force is expended on splitting the pit.

Table

No.	Fruit	Length, mm	Width, mm	Shell wall thickness, mm	Shell joint width, mm	Mass, g	Duration, sec	Load, kN
1	Peach	37	27	2	7.5	23.4	15	0.812
		39	26	2	7.4	23.3	15	0.818
2	Plum	20	14	0.8	4	0.7	4	0.385
		20	14	0.7	4	0.6	4	0.367

Figure 1. Graph of dependence of force F (kN) on distance (mm) and duration (sec.) (apricot pit of “Sary Uryuk” variety, split from the joint side)

Figure 2. Graph of dependence of force F (kN) on distance (mm) and duration (sec.) (apricot pit of “Sary Uryuk” variety, split from the hollow part side)

1. <https://kapital.kz/business/62442/maktaaral-skiye-krest-yane-sobrali-2766-tonn-fruktoy.html>
2. V.N. Ivanets, I.A. Bakin, S.A. Ratnikov. Processes and apparatuses of food production: Teaching aid. – Kemerovo Technological Institute of Food Industry. – Kemerovo, 2004. – p. 149
3. Baimetov, K.I. Peculiarities of cultivation of local varieties of apricot in Uzbekistan / K.I. Baimetov, M.K. Turdiyeva, P. Nazarov. – Tashkent, 2011
4. M.F. Yamaletdinova. Influence of mechanical force on splitting apricot pits // Food industry. 2019. No. 11. P. 81-83.