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IMPROVING THE TECHNOLOGY OF EXTRA VIRGIN PEACH KERNEL OILS

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Abstract. The possibility of using the peach stone kernels of varieties 'Cardinal', 'Nectarine', 'Flamingo' and 'Moldavian' as a promising raw material for the production of oil and fat products was investigated. The peach kernels were characterised and it was found that the oil content in the seeds of the studied peach kernels was 33–38%. The physical and chemical characteristics of the quality of oils from peach kernels of different varieties are presented. The technology of production of oil from kernels of different varieties of peaches from Odesa and Moldova has been improved, namely, the technological modes of moisture-heat treatment and pressing (Extra Virgin) have been substantiated. It is recommended to carry out the moisture-heat treatment of crushed stone kernels at a temperature of 40–50°C for 15–20 minutes. The most effective pressing mode is the following: load holding time of 3.0 minutes, compression force of 10.0 kN and loading speed of 5.0 kN/cm, the thickness of the pressed pulp under these parameters is 33.0 mm, and the oil yield is about 94.0%. Sensory studies have shown that oil from peach kernels of the 'Cardinal' variety has the best average sensory score of 4.9, followed by oil from peach kernels of the 'Nectarine' variety with an average score of 4.8, and oil from peach kernels of the 'Moldavsky' and 'Flamingo' varieties with a sensory score of 4.76 and 4.75, respectively. As a result of the research, it was determined that the fatty acid composition and the ratio of fatty acids practically does not change before and after the technological processing of peach kernels. The content of ω -6 polyunsaturated fatty acids and ω -9 monounsaturated fatty acids in peach kernel oil of the 'Cardinal' variety is 95.2% and 98.2% of the original content, respectively, of the 'Nectarine' variety – 97.1% and 98.0%, of the 'Flamingo' variety – 97.8% and 97.9%, of the 'Moldavian' variety – 97.5% and 97.5%.

Keywords: peach stone kernels, oil, Extra Virgin technology, fatty acids.

Introduction. Formulation of the problem

Plant oils are a source of essential nutrients for humans. It is advisable to include different vegetable oils with varying fatty acid composition in the diet. Species belonging to Prunus (peach (*P. persicae* (L.) Batsch var. *persicae*), apricot (*Prunus armeniaca* L.), plum (*P. domestica* L.) nectarine (*P. persicae* var. *nectarine* (Aiton) Maxim.)) due to their wide distribution can serve as a valuable source of oils and other essential compounds [1-2]. The peach stones and kernels are easily available biowaste which could be useful for the extraction of nutritionally important oils [3-7].

Among the oils produced from *Prunus* Species, the most studied are the oils from the seeds of *Prunus armeniaca* L. (apricot) [8-14]. It is of particular interest to study the properties and technologies of oil production from *P. persicae* L. Batsch var. *persicae* (peach), which is widespread and grown on an industrial scale in the countries of the Balkan Peninsula, southern Asia and other countries [1-2].

Analysis of recent research and publications

There is an increasing demand for functional foods to attend the consumers preference for products with health benefits. Peach (*Prunus persica*) is a worldwide well-known fruit, and its processing

generates large amounts of by-products, consisting of peel, stone (seed shell + seed), and pomace, which represent about 10% of the annual global production, an equivalent of 2.4 million tons [4].

Peach kernel oil is a good source of the unsaturated fatty acid, phenolic compounds with strong antioxidant activity, and has the potential to be used as nutrient rich food oil [15-20]. Among the useful substances of peach oil are the following: vitamins A, P, E, C, D and B, including the rare vitamin B15; carotenoids; tocopherols [16]; phospholipids; trace elements (potassium, calcium, phosphorus, iodine, magnesium, zinc and iron); fatty acids (oleic, linoleic, gamma-linolenic, palmitic, palmitoleic, stearic, peanut) [17-18].

Peach seed oil has a number of valuable physiological effects. In the study [19] *in vitro* and *in vivo* assays to evaluate the potential anti-atherosclerosis activity of peach kernel oil was performed. It has been shown that peach kernel oil could reduce total cholesterol, triglyceride, low-density lipoprotein cholesterol levels, elevate the high-density lipoprotein cholesterol level in serum, and reduce the area of the aortic atherosclerotic lesions in high-fat diet fed ApoE knockout mice. Moreover, peach kernel oil treatment can significantly down regulate the expression of TF protein to inhibit the formation of atherosclerotic plaque. The authors of the paper [4] demonstrated *in vivo* study reports on positive anti-inflammatory, anti-obesity, and anti-cerebral ischemia activities associated with peach components and by-product.

A peach contains a stone, which usually makes up 8–14% of the fruit's weight. The peach stone is very solid and consists of a thick-walled shell, a kernel and a membrane that covers it. The kernel makes up only 10–15% of the stone's weight. The oil content in the kernel is 35–46% [21-22]. Total lipids contained 98% triglycerides; sterols and polar lipids constituted 0.41% and 1.1% respectively. Fatty acid composition consists of oleic (63.8%) and linoleic (15.4%), the content of saturated fatty acids is near 20.7% [23]. In the works [15,17] 25 samples of stones and kernels from various peach cultivars that differed in origin and ripening time, but growing in the same climatic conditions, were characterized by fatty acids composition and physical properties. It has been confirmed that unsaturated fatty acids (oleic and linoleic fatty acids) were the most represented in peach kernel oil and their content depended of peach genotype.

The peach stone kernel is also a source of dietary protein and fibre. It is used as a cheap substitute for almonds in baking and confectionery. The kernels are also used in the production of benzaldehyde, cosmetics, activated carbon and perfumes [24]. The shell, obtained by removing the kernel from the stone, is traditionally used as fuel and in the production of medium-density fibreboard [21].

In addition to nutritional purposes, peach kernel oil can be in high demand in such industries as cosmetics, pharmacy, aromatherapy, etc. due to its unique properties. Apricot kernel oil are used in production of the cosmetic products like body massage cream, soaps massage oil, hair oil, scrubbing cleaning cosmetic creams, UV protection agent, lip balm and many beauty products [24-27]. Apricot kernel oil protects the skin against the adverse effects of free radicals, exhibits anti-inflammatory activity due to components such as triglycerides, phospholipids, phenolic compounds [26].

Peach kernel oil is produced using traditional and modern methods, or a combination of both [24,28-32]. Nowadays, many novel oil extraction methods, including treatment raw materials with ultrasound [32], supercritical fluid [34], microwave, and enzyme [35] have been developed with the purpose to obtain higher oil yield and retention of its nutritional quality.

On an industrial scale, peach kernel oil is produced mainly by two methods: standard (cold) pressing and chemical extraction [36-37]. Higher quality oil suitable for food purposes is obtained by cold pressing peach kernels.

The technological process of peach pits processing by pressing consists of the following operations: cleaning the pits from impurities, drying the pits to a moisture content of no more than 10% [38], splitting the pits, sorting the mixture into kernels and shells, grinding the kernels, preparing the pulp (heating), and pressing the pulp on presses [36-37]. When pressing peach kernels, the efficiency of oil yield is determined by the degree of crushing and processing temperature.

In the solvent oil extraction method, oil from seeds is dissolved in solvents, and then by distillation, it is recovered from the solvent [39]. Existing technologies are based on the use of oil extraction with hydrocarbon solvents such as petroleum ether and hexane, diethyl ether, ethanol. It is one of the widely applied methods for the extraction of oil from organic materials. Solvent selection is based on solubility, solvent-solute ratio, oil viscosity and solvent polarity, cost, and market availability [40]. Ethanol is generally regarded as safe for food oil extraction, but its oil extraction efficiency is lesser than conventional n-hexane solvent, which is toxic in nature [33]. Oil extracted by solvent extraction is free from HCN [41]. Gupta and Sharma [31] reported higher oil recovery (45.6–47.0%) through solvent extraction than mechanical oil expeller.

The quality and safety of oils obtained by extraction is a proven fact. The authors of [16] obtained Peach kernel oil using Soxhlet extraction with different solvents (petroleum ether, ethyl ether, chloroform and hexane). Large proportions of unsaturated fatty acid (91.27%) and high content of phenolic compounds (4.1593 mg GAE/g), which contribute to considerably strong antioxidant activity,

were found in oil. The main fatty acids found in the peach kernel oil were oleic acid (61.87 g/100 g oil) and linoleic acid (29.07 g/100 g oil).

In [18], the authors investigated the effect of different methods of obtaining oils from peach seeds on the fatty acid composition and other characteristics of the oils. The authors used the following oil extraction techniques: soxhlet extractions with different solvents; hydrodistillation; ethanolic maceration followed by fractionation with various solvents, and supercritical fluid extraction at 30, 40 and 50 degrees C and at 100, 200 and 300 bar, performed with pure CO₂ and with a co-solvent. The production of peach almond oil through all techniques is substantially adequate.

The extraction method is more efficient, as it allows to extract almost all oil from the oilseed material compared to the pressing method. But the extraction technology involves the use of organic solvents, which is dangerous to human life and health, as such solvents are explosive and fire hazardous, and their vapours are toxic and can cause poisoning if inhaled. In addition, the release of their vapours into the environment is also a negative environmental impact. The oil obtained by extraction must be refined, which results in the loss of some biologically valuable compounds [10]. The benefits of the mechanical press are that it does not require the use of solvents or additional heat. Thus, it helps in the retention of phenolics, flavonoids, essential fatty acids, and tocopherols in the oil [40].

At the same time, the pressing method is more environmentally friendly and fireproof, unlike extraction, and also allows preserving valuable natural components in the resulting oils. That is why it is important to search for technologies that would intensify the process of pressing (especially cold pressing of Extra Virgin) without compromising its quality.

Among these technologies, the processing of oil material before pressing is promising, as it can not only increase the yield of oil, but also increase its nutritional value by increasing the transfer of biologically active substances to oil. At present, the possibility of obtaining oils from peach kernels of the Odesa region and Moldova has not been studied.

The purpose of the study is to improve the technology of Extra Virgin oils from kernels of different peach varieties in the Odesa region and Moldova with preservation of quality characteristics.

Research objectives:

1. To study the quality characteristics of kernels of different peach varieties.
2. To improve the technology of Extra Virgin oil from the kernels of different peach varieties by establishing new effective technological modes.
3. To study the quality characteristics and fatty acid composition of these oils. Матеріали і методи досліджень.

Research materials and methods

The raw material for the production of the oil is peach kernels of the following varieties, typical for the Odesa region and Moldova: 'Cardinal', 'Nectarine', 'Flamingo' and 'Moldavian' from the 2021 harvest.

The determination of the weight of 1000 pieces of peach pits, the volume weight of peach pits, and the length of peach pits was carried out in accordance with Ukrainian State Standard (USS) ISO 658:2006 'Oilseeds. Method for determination of impurities'. The determination of the mass fraction of weed and oil impurities was carried out in accordance with USS ISO 658:2006 'Oilseeds. Method for determination of impurities'.

The determination of the mass fraction of moisture in peach kernels was carried out by the accelerated method according to USS 4811:2007 'Oilseeds. Methods for determining moisture content'.

In laboratory conditions, the modes of production of Extra Virgin oil from peach kernels were improved. Firstly, peach kernels were cleaned from impurities. Next, the stones were treated in a 2% sodium chloride solution at a ratio of 1:1 for 3–5 minutes to soften the shell. The treated bones were then split.

Determination of the parameters of moisture-heat treatment and their influence on oil yield. 100 g of peach kernels were ground to a size of 90–95% of the passage through a 1 mm sieve on the LZMK-1 mill. The crushed kernels were subjected to moisture and heat treatment in a water bath. The samples were placed on a sieve with spunbond material and placed on the bath under a lid with a hole for a thermometer, thus determining the temperature and saturation duration of the crushed kernels with steam. The temperature of the crushed kernels during the moisture-heat treatment was regulated from 30 to 50 °C and the process duration from 10 to 20 min. The oil was obtained by pressing on a laboratory manual press PROM-1U. The oil yield was determined in % of the maximum oil content in peach kernels.

Determination of the parameters of pressing crushed kernels and their influence on oil yield. The resulting pulp, which was obtained as a result of the moisture-heat treatment of crushed kernels, was pressed using a laboratory hydraulic press of the U1 EPM type. The pulp in the amount of 100 g was poured into the press container, closed with a plunger. Using a hand pump, the pressure was increased to the maximum indicated on the manometer $P = 0.072$ mPa. During the pressing process, the temperature was adjusted to 40–60 °C, the loading rate to 5–15 kN/cm, the compression force to 10–20 kN, and the duration of the load to 3–8 min. The thickness of the pressed pulp in mm and the oil yield in %, which flowed into a pre-weighed flask, were determined.

The moisture content was determined by the accelerated drying method or using an electric moisture analyzer according to USS ISO 771:2006 'Oilseed

meals. Determination of moisture and volatile matter content’.

The fat content was determined by exhaustive extraction in a Soxhlet apparatus according to USS 7577:2014 ‘Oilseeds. Determination of oil content by extraction in the Soxhlet apparatus’.

The acid value was determined according to the patent No. 107906 (Ukraine) [42].

Determination of the smell, taste, colour and transparency of oil from the kernels of different peach varieties was carried out in accordance with USS 8842:2019 ‘Oils. Methods for determination of smell, taste, colour and transparency’.

The fatty acid composition of peach kernels and oils was determined by gas-liquid chromatography using a Hewlett Packard HP-6890 gas chromatograph in accordance with USS ISO 5508-2001 ‘Fats and oils of animals and plants. Analysis by gas chromatography of fatty acid methyl esters’.

All the digital data obtained were processed using Excel software from the Microsoft Office 2007 service package. Data were presented as arithmetic mean and standard error ($M \pm m$).

Results of the research and their discussion

When oilseeds are received by oil and fat enterprises, priority research is carried out on their quality indicators in order to identify the quality characteristics of raw materials, expectations of economic benefits and adjustment of the technological process. Peach stone kernels were studied: ‘Cardinal’, ‘Nectarine’, ‘Flamingo’ and ‘Moldavian’. Table 1 shows the data on the quality characteristics of the studied peach kernels and stones.

According to the results of the research, the highest content of garbage impurities 2.17% is found in the seeds of the ‘Cardinal’ peach variety. The results of determining the moisture content show that all varieties are characterised by a moisture content in the range of 4.0–7.0%. According to the results of the bulk weight measurements, the ‘Cardinal’ variety has the highest value, which means that it is the largest of all the others in size. In terms of weight per 1000 pieces, the ‘Cardinal’ variety is the largest. If the stone is large

and heavy, it indicates a high level of nutritional value and development of the stone kernel. It was found that the bones of the ‘Nectarine’ variety are 21.50 mm long and smaller in comparison with other varieties, and the bones of the ‘Moldavian’ variety are 27 mm long and the largest in comparison with other varieties. ‘Moldavian’ is characterised by the largest bone width and thickness.

The oil content is considered to be one of the most important indicators of peach kernels for further processing in the oil and fat industry. ‘Moldavsky’ peach kernel has the highest oil content of 40.8%, while ‘Cardinal’ peach kernel has the lowest oil content of 39.2%. The highest acid value in the peach stone kernel of the ‘Cardinal’ variety is 1.40 mg KOH/g, and the lowest – in the kernel of the ‘Moldavian’ variety – 0.70 mg KOH/g.

According to the literature, the oil content in the Species Prunus can reach 32.2–52.4% [25-26,43-45], i.e. the oil content in the kernels of the studied peach bones has average values compared to the literature data. The acid value of the obtained oils is much lower compared to the data given in the works of Bachheti et al. [12] – 4.05 mg KOH/g oil, and in the work of Gupta et al. [25] – 3.6–5.27 mg KOH/g oil.

The next stage of work was to develop modes of moisture and heat treatment and pressing of crushed kernels of different peach varieties from the Odesa region and Moldova.

The shell of fruit bones is quite hard and strong. To facilitate the shell cracking, the bones were placed in a water-salt solution (1:1), after which the shell softens and is easier to remove. The softened bones were then sent for cracking.

When bones are cracked, the kernel is separated from the shell. The effect of bone cracking is determined by their physical properties and mechanical strength. The kernel in a bone with a high moisture content adheres very tightly to the shell walls, so cracking a bone with a high moisture content, firstly, leads to inevitable undesirable crushing of the kernel itself, and secondly, requires great effort to break the shell.

Table 1 – Quality indicators of kernels and stones from different peach varieties (n=3; P≥0.95)

Indicators	Peach species			
	‘Cardinal’	‘Nectarine’	‘Flamingo’	‘Moldavian’
Garbage impurities, %	2.07±0.3	2.00±0.4	2.05±0.3	2.04±1.8
Oil impurities, %	0.1±0.01	0.1±0.7	0.0±0.4	0.1±0.1
Moisture content, %	6.10±1.3	4.60±1.2	7.00±1.4	5.70±1.6
Bulk density, kg/dm ³	2.700±4.4	1.600±3.6	1.900±8.3	1.800±4.3
Weight of 1000 pieces, kg	2.150±2.6	1.550±3.6	1.600±8.3	1.580±4.3
Length of the bone, mm	24.00±0.9	21.50±0.8	26.00±0.6	27.00±0.7
Width of the bone, mm	17.00±0.4	19.00±0.3	21.00±0.2	22.00±0.1
Thickness of the bone, mm	12±0.3	13±0.4	14±0.2	15±0.5
Kernel content in the bone, %	10±0.1	11±0.2	12±0.1	13±0.4
Oil content, %	39.20±2.4	36.40±1.9	37.50±2.4	40.80±2.3
Acid value, mg KOH/g	1.40±0.6	0.85±1.2	1.40±0.7	0.70±0.8

When a stone is dried to a moisture content of 11–12% its kernel shrinks in size. As a result, an air gap is formed between the kernel and the shell. The presence of this gap allows the bone cracking process to be adjusted so that when the shell is broken, the kernel remains intact and is subjected to little pressure. When processing peach kernels, it is advisable to carry out moisture and heat treatment of crushed kernels before entering the press in order to overcome or weaken the bonds that retain oil in the crushed kernel and facilitate its separation from non-fat components [5]. Table 2 shows the dependence of the oil yield on the parameters of moisture-heat treatment (temperature and duration).

Table 2 shows that the process of moisture-heat treatment is most effective when using modes II and III. The yield of oil from crushed kernels subjected to heat treatment at 30°C for 10 min is about 80% in all experimental samples. More effective is the processing of crushed kernels at a temperature of 40–50°C for 15–20 minutes, with an oil yield of up to 95%. No significant difference in oil yield was found between the different samples.

The resulting pulp is sent for pressing, which was carried out in three stages at a certain pressure and duration. The dependence of pressing efficiency on the process modes (loading speed, compression force and load holding time) is shown in Table 3.

The thickness of the pressed pulp is one of the main indicators that characterise the operation of the press and the oil yield. This indicator is determined for the purpose of daily monitoring of the press operation, as well as when testing new press models. Table 3 shows that the thickness of the pressed pulp indicates the efficiency of pressing. The smaller the thickness of the pressed pulp, the more efficient the pressing is, the load holding time, compression force and loading rate are significantly reduced, and the oil yield increases. Therefore, mode I of pressing for all varieties of peach kernels is the most efficient, with a pressed pulp thickness of 33.0 mm, a load holding time of 3.0 minutes, a compression force of 10.0 kN and a loading rate of 5.0 kN/cm. The oil yield is about 94.0%.

The pressed oil from the kernels of different peach varieties contains a large amount of suspended particles, including minerals. The oil was purified from mechanical impurities by settling. After that, it can be stored or used for further purposes.

The pressed pulp is suitable for feed and food purposes and can be used to make activated carbon, food additives, cosmetic products or as a fertiliser. Figure 1 shows a flowchart of the Extra Virgin oils production process from the kernels of different peach varieties.

Table 2 – Dependence of oil yield on the parameters of moisture-heat treatment (n=3; P≥0.95)

Parameters	Peach species											
	‘Cardinal’			‘Nectarine’			‘Flamingo’			‘Moldavian’		
	Modes											
	I	II	III	I	II	III	I	II	III	I	II	III
Temperature, °C	30.0 ±2.1	40.0 ±3.0	50.0 ±4.1	30.0 ±2.1	40.0 ±1.1	50.0 ±3.2	30.0 ±1.1	40.0 ±3.0	50.0 ±4.1	30.0 ±2.2	40.0 ±5.1	50.0 ±6.7
Time, min	10.0 ±1.4	15.0 ±0.7	20.0 ±3.4	10.0 ±0.9	15.0 ±2.6	20.0 ±0.7	10.0 ±0.7	15.0 ±2.2	20.0 ±1.8	10.0 ±2.6	15.0 ±3.4	20.0 ±5.6
Oil yield, %.	80.0 ±3.1	90.0 ±5.2	100.0 -0.3	80.0 ±2.1	90.0 ±4.2	100.0 -0.5	80.0 ±2.6	90.0 ±1.8	100.0 -0.6	80.0 ±1.9	90.0 ±2.8	100.0 -0.2

Table 3 – Pressing efficiency depending on process conditions (n=3; P≥0.95)

Parameter	Peach species											
	‘Cardinal’			‘Nectarine’			‘Flamingo’			‘Moldavian’		
	Modes											
	I	II	III	I	II	III	I	II	III	I	II	III
Loading rate, kN/cm	5.0 ±0.3	10.0 ±1.2	15.0 ±5.6	5.0 ±3.3	10.0 ±1.4	15.0 ±4.2	5.0 ±1.5	10.0 ±2.5	15.0 ±3.6	5.0 ±1.7	10.0 ±2.8	15.0 ±2.5
Compression force, kN	10.0 ±1.5	15.0 ±4.2	20.0 ±2.7	10.0 ±1.4	15.0 ±3.1	20.0 ±4.4	10.0 ±2.8	15.0 ±1.2	20.0 ±3.5	10.0 ±2.2	15.0 ±4.3	20.0 ±5.6
Temperature, °C	60.0 ±2.1	50.0 ±3.0	40.0 ±4.1	60.0 ±2.1	50.0 ±1.1	40.0 ±3.2	60.0 ±1.1	50.0 ±3.0	40.0 ±4.1	60.0 ±2.2	50.0 ±5.1	40.0 ±6.7
Load holding time, min	3.0 ±1.6	6.0 ±4.4	8.0 ±1.7	3.0 ±1.5	6.0 ±7.3	8.0 ±1.1	3.0 ±1.4	6.0 ±2.2	8.0 ±4.1	3.0 ±1.6	6.0 ±4.5	8.0 ±8.2
Thickness of pressed pulp, mm	33.0 ±2.2	35.0 ±1.5	38.0 ±4.1	33.0 ±1.7	34.0 ±5.2	39.0 ±6.7	33.0 ±2.5	36.0 ±7.5	41.0 ±5.7	33.0 ±6.4	34.0 ±3.4	37.0 ±6.6
Oil yield, %.	94.0 ±7.8	92.0 ±6.6	89.0 ±5.3	94.0 ±8.1	93.0 ±4.4	88.0 ±2.3	94.0 ±4.7	91.0 ±1.1	86.0 ±2.8	94.0 ±3.9	93.0 ±4.8	90.0 ±1.2

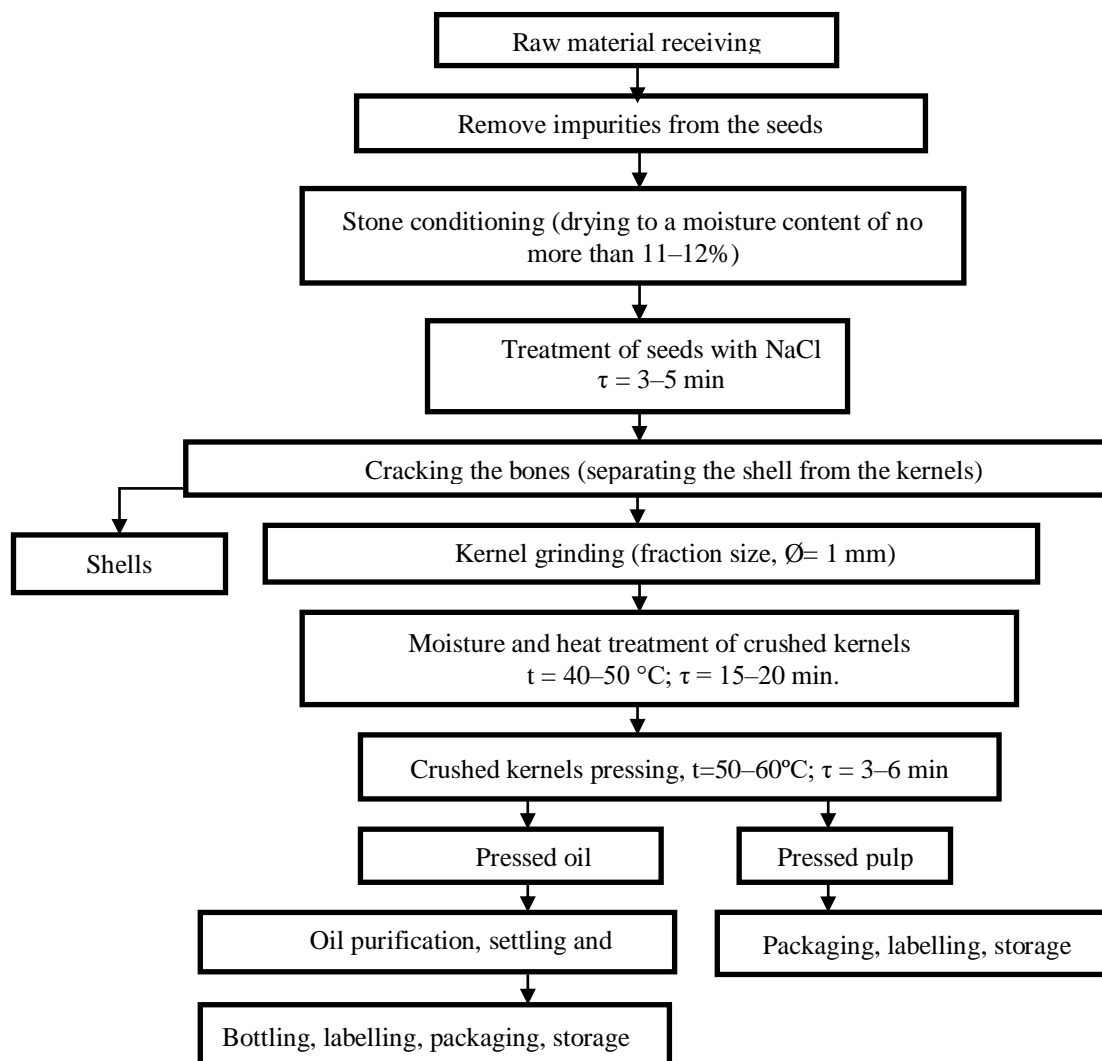


Fig. 1. Flowchart of Extra Virgin oil production technology from kernels of different peach varieties

Sensory studies of oils from different varieties of peach kernels were conducted and are shown in Fig. 2. The taste and smell of oils from the kernels of different peach varieties depend on the type and quality of the processed raw material (oil obtained from defective kernels may have an unpleasant taste and musty smell), the production method (pressing or extraction) and the technological modes of equipment operation. The colour of plant oils is determined by the presence of colouring agents (pigments) such as carotenoids and chlorophyll. Transparency is an indicator that describes the absence of turbidity or suspended particles visible to the naked eye in plant oil at a temperature of 20°C, which impairs the presentation of the oil and reduces its grade.

The profilogram shows that ‘Cardinal’ peach kernel oil has the best average sensory score of 4.9, followed by ‘Nectarine’ peach kernel oil with an average score of 4.8, and ‘Moldavian’ and ‘Flamingo’ peach kernel oils with a sensory score of 4.76 and 4.75, respectively.

According to the literature, peach kernels have a unique chemical composition, containing a lot of

polyunsaturated linoleic acid (PUFA) of the omega-6 class (from 50% to 80%), monounsaturated oleic acid (MUFA) of the omega-9 class (from 15% to 25%) and less saturated palmitoleic acid and other saturated acids [17-18].

In this regard, it became necessary to determine the fatty acid composition of oil samples from the kernels of different peach varieties. The fatty acid composition of the studied oil from the kernels of different peach varieties before (in raw materials before heat treatment) and after pressing is given in Table 4.

As a result of the research, it was determined that the fatty acid composition and the ratio of fatty acids practically does not change before and after the technological processing of peach kernels. The content of ω-6 PUFA and ω-9 MUFA in peach kernel oil of the ‘Cardinal’ variety is 95.2% and 98.2% of the original content, respectively, in the ‘Nectarine’ variety – 97.1% and 98.0%, ‘Flamingo’ variety – 97.8% and 97.9%, and ‘Moldavian’ variety – 97.5% and 97.5%.

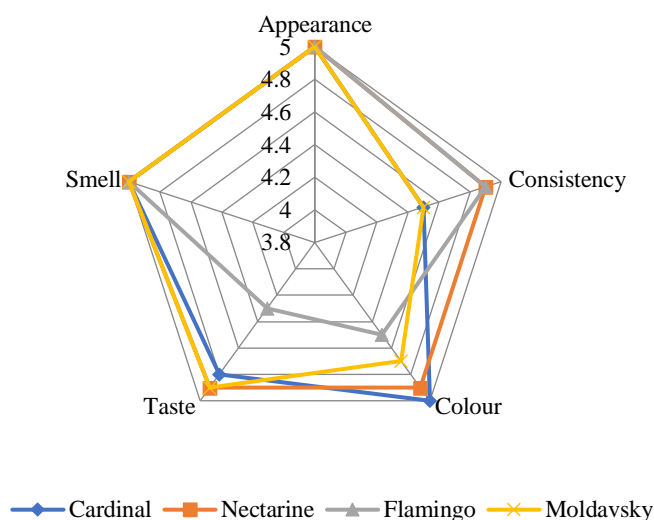


Fig. 2. Sensory profile of oils from kernels of different peach varieties

Table 4 – Fatty acid composition of oils from kernels of different peach varieties before and after pressing (n=3; P≥0.95)

Peach species	Fatty acid content, %.			
	In raw materials		Oil after pressing	
	ω -6 PUFA	ω -9 MUFA	ω -6 PUFA	ω -9 MUFA
'Cardinal'	37.7±2.4	62.3±1.1	35.9±0.3	61.2±1.5
'Nectarine'	50.7±2.2	50.6±1.4	49.2±2.7	49.6±0.7
'Flamingo'	49.3±1.9	51.8±1.0	48.2±3.7	50.7±0.6
'Moldavian'	48.4±1.4	50.7±0.4	47.0±1.9	49.4±1.5

Conclusions

The characterisation of peach pits of the 'Cardinal', 'Nectarine', 'Flamingo' and 'Moldavian' varieties as promising raw materials for the production of oil and fat products has been carried out. It was found that the oil content in the kernels of peach bones of the varieties 'Cardinal', 'Nectarine', 'Flamingo' and 'Moldavian' is 33–38%. The physicochemical characteristics of the quality of oils from peach kernels of different varieties are given.

The technology for the production of oil from kernels of different varieties of peaches from Odesa and Moldova has been improved, namely, the technological modes of moisture-heat treatment and pressing (Extra Virgin) have been selected. It is advisable to carry out the moisture-heat treatment of crushed peach kernels at a temperature of 40–50°C for 15–20 minutes. The most effective mode of pressing of crushed peach kernels, which were previously subjected to moisture-heat treatment, is: the duration of load holding is 3.0 min, the compression force is 10.0 kN and the loading speed is 5.0 kN/cm, the thickness

of the pressed pulp is 33.0 mm, the oil yield is about 94.0%.

Sensory studies have shown that 'Cardinal' peach kernel oil has the best average sensory score of 4.9, followed by 'Nectarine' peach kernel oil with an average score of 4.8, and 'Moldavian' and 'Flamingo' peach kernel oils with a sensory score of 4.76 and 4.75, respectively.

The fatty acid composition and the ratio of fatty acids practically does not change before and after the technological processing of peach kernels. The content of ω -6 PUFA and ω -9 MUFA in peach kernel oil of the 'Cardinal' variety is 95.2% and 98.2% of the original content, respectively, in the 'Nectarine' variety – 97.1% and 98.0%, 'Flamingo' variety – 97.8% and 97.9%, and 'Moldavian' variety – 97.5% and 97.5%.

Research approbation. Based on the results of the research, the technology for the production of Extra Virgin oils from the kernels of different peach varieties was introduced into the production process at the Odesa stone fruit and vegetable oil plant of AVA LLC and recommended for the craft production of vegetable oils.

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УДОСКОНАЛЕННЯ ТЕХНОЛОГІЇ EXTRA VIRGIN ОЛІЙ З ЯДЕР ПЕРСИКОВИХ КІСТОЧОК

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Анотація. Досліджено можливість використання ядер персикових кісточок сортів «Кардинал», «Нектарин», «Фламінго» та «Молдавський» як перспективної сировини для отримання олійно-жирової продукції. Здійснено характеристику персикових кісточок, встановлено, що вміст олії у ядрах досліджуваних персикових кісточок 33–38%. Надано фізико-хімічні характеристики якості олій із ядер персикових кісточок різних сортів. Удосконалено технологію виробництва олій з ядер кісточок різних сортів персиків Одещини та Молдови, а саме, підібрано технологічні режими волого-теплового оброблення та пресування (Extra Virgin). Волого-теплове оброблення подрібнених ядер персикових кісточок доцільно проводити за температури 40–50°C, протягом 15–20 хвилин. Найбільш ефективним режимом пресування є: тривалість витримання навантаження 3.0 хв, зусилля стиснення 10.0 kN та швидкість навантаження 5.0 kN/см, товщина пресованої мезги при цьому складає 33.0 мм, вихід олії – близько 94.0%. Сенсорні дослідження показали, що олія з ядер персиків сорту «Кардинал» за сукупністю показників має найкращу середню сенсорну оцінку – 4.9, на другому місці – олія з ядер персикових кісточок сорту «Нектарин» з середнім показником – 4.8, олії з ядер персикових кісточок сортів «Молдавський» та «Фламінго» мають сенсорну оцінку 4.76 та 4.75 відповідно. У результаті досліджень визначено, що жирнокислотний склад і співвідношення жирних кислот практично не змінюється до та після технологічного оброблення ядер персикових кісточок. У олії ядер кісточок персиків сорту «Кардинал» вміст ω -6 поліненасичених жирних кислот та ω -9 мононенасичених жирних кислот від вихідного вмісту складає 95,2% та 98,2% відповідно, сорту «Нектарин» – 97.1% та 98.0%, сорту «Фламінго» – 97.8% та 97.9%, сорту «Молдавський» – 97.5% та 97.5%.

Ключові слова: ядра персикових кісточок, олія, технологія Extra Virgin, жирні кислоти.