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DETERMINATION OF AMYGDALIN CONTENT IN PEACH OIL OBTAINED BY PRESSING METHOD

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Abstract: The aim of this study is to determine the amygdalin content in peach oil obtained using the pressing method. This information is crucial for evaluating the quality of peach oil and expanding its potential applications in pharmacological and food industries. Additionally, the study examines the effect of the pressing process on the amygdalin content, providing a significant scientific basis for optimizing peach oil production processes in the future.

Keywords: Peach oil, pressing, amygdalin, chromatography, water-soluble vitamins, acetonitrile, concentration, phosphorus, acetate buffer, acetonitrile.

Introduction. In recent years, there has been a growing interest in natural plant-based oils. Particularly, the production of ecologically safe and biologically active products has gained significant importance in the food, cosmetics, and pharmaceutical industries. Peach oil is one such product, and a thorough investigation of its composition holds substantial scientific and practical value. One of the biologically active compounds in peach oil is amygdalin, a glycoside compound that, while offering certain health benefits, can have harmful effects if misused. To date, several scientific studies have explored the role of amygdalin in food safety and pharmaceutical applications. However, the determination of amygdalin content in peach oil obtained through the pressing method and the study of its compositional characteristics remain insufficiently addressed.

Peach Oil. The peach fruit is a valuable source of nutrition and is widely utilized not only in dietary consumption but also in the cosmetics and pharmaceutical sectors. The production of oil from peach kernels dates back approximately two thousand years. Over this long history, humanity has utilized this oil across various medical fields, both in conventional and alternative practices. Below, the mechanical properties of peach oil are presented (Table 1). The mechanical properties of a product refer to its response to external forces, such as its compressibility, stretchability, or susceptibility to deformation.

Table 1. Physical and Mechanical Properties of Peach Kernel Oil

Indicator	Peach kernel oil
Density at 15 °C, kg/m³	918–925 °C
Refractive Index at 20 °C	1,471–1,473 °C
Solidification Temperature, °C	-20–23 °C
Color	Light yellow
Smell	Mild
Boiling Point °C	232 - 235 °C

The physical and mechanical properties of peach kernel oil are presented in the table above. Density: At 15°C, the density is 918 kg/m³. This density indicator shows that the oil is lighter compared to water. Refractive Index: At 20°C, the refractive index ranges from 1.471 to 1.473. This characteristic defines the oil's ability to refract light and is used for identifying and assessing its purity. Solidification Temperature: The solidification temperature ranges from -20°C to 23°C. A low solidification temperature indicates that the oil has good flow characteristics even at low temperatures. Color: Light yellow. The color of the oil may vary depending on the peach variety and production conditions. Odor: Mild or none, characteristic of peach kernel oil. The odor is either absent or very mild, with a distinct characteristic scent related to the oil. Boiling Point: The boiling point ranges from 232°C to 235°C. A high boiling point demonstrates the oil's stability to heat and its resistance to thermal degradation.

Beneficial Properties. Peach kernel oil is one of the most commonly used base oils for aromatherapy purposes. This oil has almost no bitterness, making it an ideal choice for enriching cosmetic creams, ointments, shampoos, massage and cosmetic oils, balms, lotions, and masks. Peach kernel oil is particularly suitable for regular care of brittle and dry hair, as it helps to restore hair structure and ensures a healthy shine. Additionally, this oil is used as a restorative and softening component in the care of eyebrows and eyelashes. The oil obtained from peach kernels has a strengthening effect on the nail plate and helps prevent brittleness and delamination.

Peach kernel oil demonstrates beneficial effects against atherosclerosis and shows potential in reducing the harm of cardiovascular diseases. In a study conducted with rats, despite being fed a high-fat diet, improvements in blood lipid levels and a reduction in blood lipid content were observed. The study indicates that peach kernel oil has a beneficial effect on reducing the development of atherosclerosis in rats. In this experiment, researchers applied peach kernel oil to ApoE knockout rats (a model of rats predisposed to atherosclerosis) and studied its effects. The findings showed that the treatment led to a decrease in blood lipid levels, an increase in high-density lipoproteins (HDL), and a reduction in the volume of atherosclerotic plaques. These results suggest that peach kernel oil could be beneficial in preventing cardiovascular diseases.

Peach and apricot kernel oils have been explored as raw materials for biodiesel production. The oil extraction process, chemical processing (transesterification), and the physical-chemical properties of the obtained biodiesel were studied. These properties were compared to European biodiesel standards (ELOT EN 14214). The oil content in peach kernels was found to be high (44.04% by weight), while in apricot kernels, it was relatively lower (23.30% by weight). The quality indicators of biodiesel derived from peach oil were shown to be superior to those obtained from apricot oil.

Sample Preparation for Experiment:

For the experiment, peach kernel oil obtained from the fuzzless peach fruits grown in the Pop and Kosonsoy districts of the Namangan region was used. The oil was extracted using the scientific laboratory facilities of the Namangan Engineering and Technology Institute. The seeds were divided into four fractions. The seeds were crushed using our grinding apparatus and sorted into fractions of whole, 6 mm, 4 mm, and 3 mm sieve sizes. Before placing them into the water bath, the moisture content was measured using a moisture analyzer. The samples were then soaked in the water bath for 5-10 minutes. Afterward, the moisture content was measured again, and the oil extraction process continued by pressing the samples in the pressing apparatus. The extracted oil was weighed, and the results were recorded. The oil was then analyzed to determine its amygdalin content.

Amygdalin Detection Method: The goal is to determine the purity and quantity of amygdalin in the oil extracted from the fruit kernels.

The importance of High-Performance Liquid Chromatography (HPLC) and the structure of the equipment is as follows:

The sample mixture, which is to be separated in very small amounts, is passed through a column and directed into a mobile phase flow. Various types of columns are available, each with different particle sizes and surface adsorbents. The mixture moves through the column at various speeds and interacts with the stationary phase, known as the adsorbent. The speed of each component in the mixture depends on its chemical properties, the nature of the column, and the composition of the mobile phase. At a specific time interval, different substances are separated from the column. The retention time is measured under defined conditions and is considered as a characteristic of the particular apparatus.

Table 2. Description of High-Performance Liquid Chromatography (HPLC) Equipment

Instrument	Description
Shimadzu Nexera XR	SPD – M20A
Detector	Ultraviolet (UV)
Flow Rate	1.00 mL/min
Separation Column Type	Shim-Pack GIST, 4.6 x 250mm, 5μm C18
Wavelength	254 nm
Sample Volume	10 μL
Mobile Phase	pH 2.5 buffer solution 50% : 50% acetonitrile
Solvent	Distilled water

Sample Preparation for Analysis №1 (Oil from Fruit Kernels):

Take 1000 mg of oil and place it in a 50 mL volumetric flask. Add 50 mL of distilled water and leave the mixture in an ultrasonic water bath for 15 minutes. Afterward, filter the solution through a paper filter.

Preparation of Amygdalin Standard Solution:

Take 100 mg of amygdalin standard and place it in a 100 mL volumetric flask. Add 50 mL of distilled water and dissolve it. Once fully dissolved, dilute with solvent to the mark.

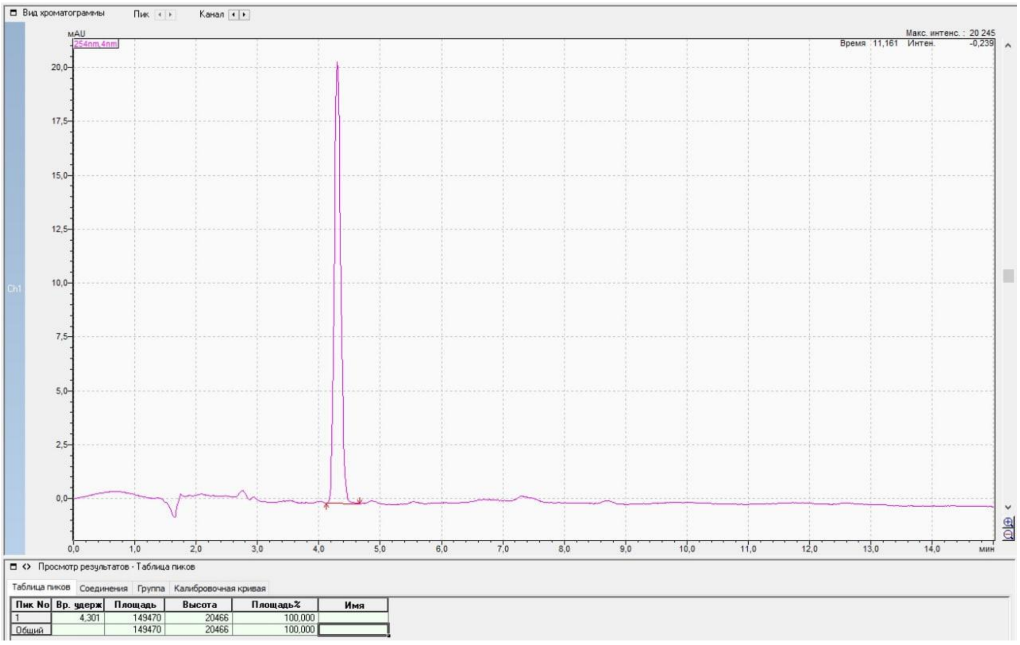

Figure 1. Chromatogram: Peach oil chromatogram

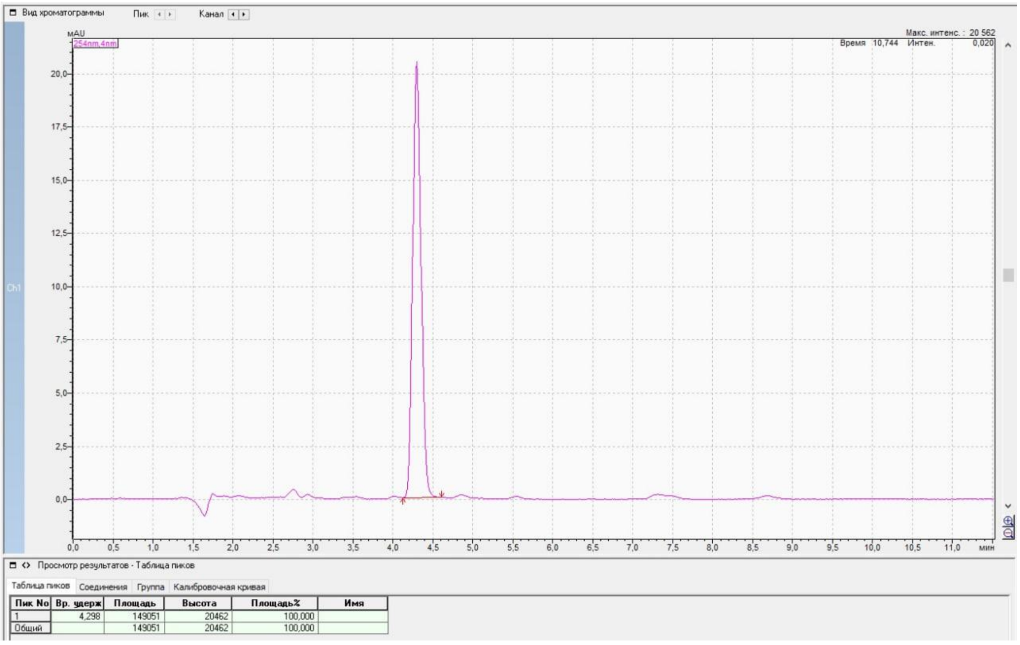

Figure 2. Chromatogram: Amygdalin standard sample

Table 3. Analysis of the amygdalin content of the test sample

№	*Amygdalin standard sample.*	*Preparation of the Sample for Analysis*
Time of Ingestion	4,298min	4,301min
	4,297min	4,300min
	4,299min	4,299min

Determination of the Amigdalin Content in Oil

1. Standard Amigdalin Sample – (ABS) - 149051
2. Sample to be Tested (Oil) – (ABS) – 149470

Then, the following formula was used to determine the amount of amigdalin in the oil:

$$x = \frac{S_1 * m_0 * P}{S_0 * m_1}$$

$S_1 - 149051$ **Amigdalin Standard Sample**

$S_0 - 149470$ Test Sample (Oil) ABS Value

$m_0 - 100mg$ Amount of Standard Sample

$m_1 - 1014mg$ Amount of Test Sample

$P - 99{,}84\%$ Purity of Amigdalin

$$x = \frac{149051 * 50 * 100 * 99.84}{149470 * 1000 * 100} = 4.91mg/gr$$

As a result, the amount of amigdalin in the oil was determined to be 4.91 mg/gr. Through this process, the amount of amigdalin in the tested sample was determined, and its quantity was calculated using the formula above.

Amigdalin: The seed of the peach contains plant oil, protein, and biologically active compounds, which, through processing, yield economically and industrially significant products. In particular, peach oil obtained through pressing stands out due to its natural composition and high-quality properties. One of the components of peach oil is amigdalin, which belongs to the group of glycosides. Amigdalin is a natural compound primarily found in the seeds of peaches, almonds, and other stone fruits. This compound attracts interest as a biologically active substance since it has been used in certain traditional medicinal practices. However, the hydrolysis of amigdalin results in the formation of toxic cyanide, which necessitates studying its safety.

Conclusion. The analysis of the amigdalin compound and the determination of its quantity require highly efficient methods. In this study, high-performance liquid chromatography (HPLC) was used to identify the compound using a standard amigdalin sample and a test sample (oil). The amount of amigdalin in the tested sample was calculated based on the time of ingestion and ABS (absorbance) measurements. This method can be widely used in molecular analysis due to its high accuracy. The results provide reliable and precise data for the detection of significant amounts of amigdalin.

Furthermore, this analytical method is also effective in assessing the quality of active compounds in oil and controlling production processes. According to the results, the amount of amigdalin in the test sample was found to be 4.91 mg/gr. This indicates the high purity and accurate quantity of the amigdalin compound in the oil. Additionally, the process of calculating the amigdalin content using the formula was confirmed to be effective and reliable.

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