

STUDY OF PHYSICAL -CHEMICAL COMPOSITION OF LOCAL (PRUNUS CERASUS L.) PLANTS AND CHERRY FRUITS GROWN IN FERGANA REGION

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<https://doi.org/10.5281/zenodo.14030888>

Abstract. *The given article presents the studies of the physicochemical properties of oil obtained from the leaves, flowers and core of the cherry plant (Prunus Cerasus L.), grown locally in the Toshlok and Altyarik districts of Fergana region. The results obtained from cherry fruits grown in both districts were compared. Recommendations for the use of pressed oil in cosmetology are given. Different modern methods determined the amount of vitamins, macro- and microelements, organic acids, the amount of carbohydrates and flavonoids in the oil of flowers, leaves and seeds of cherry.*

Keywords: *cherry seed oil, Prunus Cerasus L., water-soluble vitamins, macro- and microelements, organic acids, total carbohydrates and flavonoids, Agilent Tech 1200.*

Introduction. At present time due to the rapid development of chemical, food and other industrial enterprises in the world, production volumes are also increasing. As a result, various industrial wastes are generated. An example is the waste of plant seeds, which are produced in large quantities at enterprises producing cherries, dried fruits and wine. Their accumulation in large quantities causes serious environmental problems. It is important to determine ways to use fruit seeds as secondary raw materials by recycling and using them effectively. Currently, scientific research is being conducted in the world to obtain natural, environmentally friendly oil from secondary raw materials and use it in cosmetology, medicine and practice. In this regard, fruit seeds produced at enterprises producing cherry juice, dried fruits and wine are the most promising and effective source of a complex of biologically active substances and are secondary plant raw materials obtained during the processing of cherries. The shells containing precious cherry kernel oils consist of a complex of biologically active substances.

According to the information received, the following countries produce cherries: Greece - (58,200 tons), Poland - (47,552 tons), Austria - (41,430 tons), France - (39,272 tons), Bulgaria - (37,724 tons), China - (35,700 tons). Serbia - (28,146 tons), Germany - (24,462 tons), Japan (18,100 tons), Australia (17,720 tons), Albania (17,090 tons), Morocco (13,909 tons) and India (13,500 tons). According to FAO (2016), the production of cherries (*Prunus cerasus*) in Turkey is 194,989 tons. Poland is the leader in the production of cherries for consumption (more than 270 thousand tons in 2017 and 2018) and ranks fourth in the world after Russia, Turkey and Ukraine.

It is important to suggest that for studying the mineral and chemical composition, biological activity and toxicology of various parts of the local plant *Prunus cerasus* L. and waste obtained after processing the fruits, as well as the effectiveness of their action and various biologically active additives based on them, conducting scientific research on this issue has important scientific and practical significance.

Research object and methodology. The object of the study was cherry fruits grown in Toshlok and Altıarik districts of Ferghana region, which are second only to apricot in terms of the area occupied by grain. Both of these varieties are considered to be fruit-bearing fruits, and today their fruits are used for various purposes in the food industry. In particular, juice, puree, jam, dried fruits are prepared from fruits. But in most cases, fruit seeds are thrown away without being used in industry as waste, and in some cases, they are burned as fuel. Seed core contains oil containing useful vitamins that have a positive effect on human health. Cherry fruits contain the following essential oils: squalene, linoleic (39.1-46.2%), oleic acid (25.4-41.0%), phenols, α -stearic acid (8.00-15.62%), palmitic acid (5.45-7.41%), stearic acid (2.49-3%) heals.

Cherry leaves and flowers contain 0.0 g of proteins, 0.0 g of fats and 0.1 g of carbohydrates. Cherry leaves contain the following biologically active substances: coumarins - have a positive effect on the formation of blood cells, improve blood composition, phytoncides - natural antibiotics, suppress the growth of pathogenic microflora, essential oil - has an anti-inflammatory and antiseptic effect, gives aroma to the leaves of the plant, macro- and microelements - actively participate in metabolic processes occurring in the body, vitamins A, B, C, PP - actively participate in metabolism and have an antioxidant effect. Cherry contains up to 10% sugar, hemicellulose, fiber, pectins, organic acids, vitamins C, group B, PP, biotin, flavonoid glycosides, dyes, essential oil, amygdalin, coumarins. The pulp contains a large amount of iron salts. In the conducted studies, not only macro- and microelements, vitamins, fatty acids and physicochemical indicators of seed oil were carefully analyzed, but also the chemical composition of the leaf, flower and core of the cherry plant were studied. This type of fruit has been studied by foreign scientists, but some physical and chemical parameters have not been studied enough.

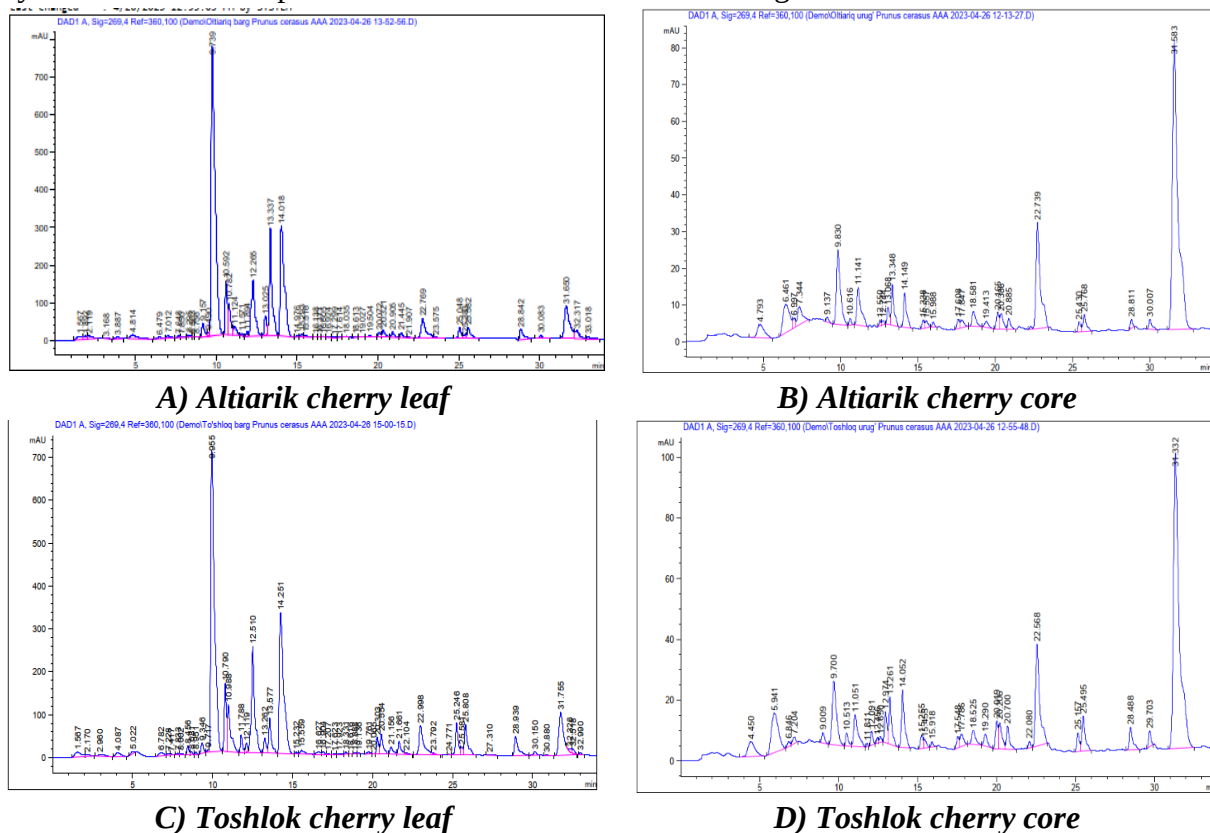


Figure 1. IR spectral analysis for determination of amino acids in cherry core and leaf.

Isolation of free amino acids. Precipitation of proteins and peptides of the aqueous extract of samples was carried out in centrifuge cups. For this, 1 ml (upper volume) of 20% TKHUK was

added to 1 ml of the studied sample. After 10 minutes, centrifuge the oil at 8000 rpm for 15 minutes. Separate 0.1 ml of the sedimentary liquid, lyophilize. The hydrolyzate is dissolved in a dry solution and dried in a mixture of triethylamine-acetonitrile-water (1:7:1). Eight operations and a repeated bilateral operation are made to neutralize the acid (Stephen A., Cohen Daviel) [1; p.1-16.].

Results and their discussion. The research began with the study of cherry blossoms and leaves. First, the amount of amino acids in the cherry blossoms and leaves in Toshlok and Altariak areas was analyzed. The results are shown in Figure 1 and Table 1.

Besides that, based on the obtained Ik spectrum graphs, the amount of amino acids present in the seed core leaf is presented in tabular form.

Method of identification and extraction of amino acids. VEJX conditions: chromatograph Agilent Technologies 1200 s DAD detector, column 75x4.6 mm Discovery HS C¹⁸. Solution A: 0.14 M CN³SOONa + 0.05% TEA rN 6.4, V:CH³CN. Flow rate 1.2 ml/min, absorption 269 nm. Gradient %B/min: 1–6%/0–2.5 min; 6–30%/2.51-40 min; 30–60%/40.1-45 min; 60–60%/45.1-50 min; 60-0%/50.1-55 min.

Table 1

Amount of amino acids in the core of seeds and leaves of cherries in Toshlok and Altariak districts

Name of amino acids	Toshlok cherry leaf	Toshlok cherry seed core	Altariak cherry leaf	Altariak cherry seed core
	Concentration mg/gr			
Aspartic acid	0,631546	0,478206	1,004077	0,354343
Glutamic acid	0,526797	1,259458	0,343317	0,719105
Serine	4,716837	0,136161	4,396365	0,051658
Glycine	8,903117	0,321819	10,63834	0,289685
Asparagine	18,0633	0,644602	20,99004	0,581298
Glutamine	5,172311	0,658035	2,915671	0,065073
Cysteine	3,991257	0,140984	3,461202	0,136612
Threonine	11,14923	0,063539	7,848159	0,620398
Argenine	1,083963	0,330112	1,578979	0,141649
Alanine	1,434147	0,29731	5,221427	0,21272
Proline	27,21624	1,127096	22,9947	0,565755
Tyrosine	2,41179	0,533927	1,09754	0,121713
Valine	0,684403	0,308604	0,564305	0,166008
Methionine	1,142985	0,063317	0,477111	0,111772
Histidine	8,452292	2,194548	2,016729	0,39777
Isoleucine	2,16551	0,184785	0,233359	0,083012
Leucine	30,75587	0,530396	0,406883	0,225153
Tryptophan	2,23533	0,346271	1,445905	0,075183
Phenylalanine	4,530542	0,104976	4,064927	0,077872
Lysine	0,217234	0,483567	0,846894	0,109419
Total	135,4847	10,20771	92,54593	5,106197

Table 1 shows that the amount of total amino acids in the rock leaf is higher than in the cherry. The same situation can be seen in the amino acid composition of the kernel.

The quantity of water-soluble vitamins was studied using high-performance liquid chromatography.

5-10 g are taken from the analytical balance box and placed in a 300 ml flat flask. 50 ml of 40% ethanol solution are added to it. The mixture is heated with vigorous stirring for 1 hour, equipped with a magnetic stirrer, a reflux condenser, and then stirred at room temperature for 2 hours. The mixture is cooled and filtered. 25 ml of 40% ethanol are added to the remaining part and re-extracted 2 times. The filtrates were combined and topped up to the mark with 40% ethanol (5-10%) in a 100 ml volumetric flask. The resulting solution was centrifuged at 7000 rpm for 10 minutes. The resulting solution was collected from above for analysis. Water-soluble vitamins in the leaves and core of both varieties were also tested, the results are presented in the table. (See Table 2.)

Table 2

The amount of water-soluble vitamins in seed cores and leaves of cherries in Toshlok and Altirik districts

Vitamins	Toshlok cherry leaf	Toshlok cherry seed core	Altirik cherry leaf	Altirik cherry seed core
	Concentration mg/gr			
B-1	0,0512	0	0,0237	0,046192
B-12	2,6898	11,29679	3,848141	2,06581
B-6	1,8021	4,682455	1,120146	1,664216
B-9	0,3055	9,665505	8,356079	0,329781
PP B-3	0,0288	0,283061	0	0,044533
C	0,0281	0,04223	0	0,023313

Based on the obtained results, it was established that the kernel of the seed is rich in vitamins. The presence of vitamins V⁶, V⁹ and V¹² in the composition of the heart, growing in the abdominal region, is the reason for the highly efficient extraction and consumption of oil from the heart.

However, Brand VEJX "Agilent-1200" Column Agilent C¹⁸ 5 µm, 4.6x250 mm. Elution is carried out in the isocratic mode, using a mixture of 0.1% orthophosphoric acid and acetonitrile in the ratio (70:30). The speed of the eluent in the vessel is 1.0 ml/min, the volume of the aqueous sample is 10 µl. Dlina v. 254, 276 nm.

Moreover, we analyzed contents of flavonoids and cherry kernels. Steroids and flavonoids and liquid chromatography with image specific methods. 5-10 g of the sample is weighed and placed in a flat flask containing 300 ml by adding 50 ml of 70% solution of ethanoyl to it. The mixture is heated at 70-800°C with intensive stirring and pouring 1 cup, supplied with a magnetic stirrer, reverse cooling, and then stirred at room temperature and pouring 2 cups.

What is more important, the mixture is cooled and filtered. To the remaining part, 25 ml of 70% ethanol is added and re-extracted for 2 times. Filtrate is mixed with 70% ethanol in a conical flask with a volume of 100 ml. The resulting solution is centrifuged at a speed of 6000-8000 rev/min for 20-30 minutes.

The resulting solution was collected from above for analysis. In the literature, phosphorus, acetate buffer systems and acetonitrile were used as eluents for determining steroids and flavonoids using SSHC. We used a phosphate buffer system and acetonitrile.

Table 3

The amount of flavonoids in cherry pits of Toshlok and Altıarik regions

Flavonoids	Toshlok cherry pits	Altıarik cherry pits
	Concentration mg/g	
Dihydroquercetin	3,01	2,2
Luthionin	1,6	2,1
Quercetin	2,5	6,6
Rutin	3,75	4,11
Seneroside	1,01	0,85
Apiginin	3,7	11,9
Salidroside	1,18	1,35

By summarizing it can be suggested that the obtained results, it is proved that the creation of a complete, waste-free complex processing of the cherry plant, which ranks second in geographical distribution among the studied pome crops, will cover its economic indicators. In the chemical industry, no experiments are conducted to obtain effective products from secondary grain sources.

REFERENCES

1. Steven A., Cohen Daviel J. Amino acid analysis utilizing phenylisothiocyanata derivatives // Jour. Analytical Biochemistry – 1988. - V.17.-№1.-P.1-16.
2. Karabaeva R.B., Ibragimov A.A., Nazarov O.M. Determination of the content of chemical elements and amino acids in *Prunus persica* var. *Nectarina*. *Universum: chemistry and biology*.2020. 9 (75). P.15-18.
3. R.B. Karabaeva, A.A. Ibragimov, O.M. Nazarov. Component composition of the essential oil of *Prunus persica* var. *nectarina* growing in Uzbekistan. *Chemistry of plant raw materials* 2020, n. 4, pp. 165-170 DOI: 10.14258/jcprm.2020046542.
4. Saminov Kh, Ibragimov AA, Nazarov O. Study of volatile components of leaves and flowers of *Punica granatum* L.variety “Kayum” growing in Uzbekistan. *Sci J.FSU*
5. Davlyatov A. A., Khudaiberdiev A. A., Madaminova Z. T. Analysis of the granulometric composition of fruit grain // *Educational research in the field of universal sciences*. - 2023. - V. 2. - n. 2. - P. 286-291.
6. Davlyatov A., Khudaiberdiev A., Khamdamov A. 664.34. 063.8 Physical-chemical indicators of plum oil obtained by the pressing method: physical-chemical indicators of plum oil obtained by the pressing method // *Scientific and Technical Journal of Namangan Institute of Engineering and Technology*. – 2024. – T. 9. – №. 1. – P. 102-108.
7. Davlyatov A. et al. Physico-chemical properties of oil from plums and prospects for its use // *E3S Web of Conferences*. – EDP Sciences, 2024. – T. 486. – P. 02014.

8. Davlyatov A. A., Khudaiberdiev A. A. Extraction of oil from plum kernels by cold pressing // Educational research in the field of universal sciences. - 2022. - T. 1. - no. 7. - P. 315-320.
9. Khamdamov, A., Xudayberdiyev, A., Davlyatov, A., & Kadirov, A. (2023, June). Intensification final distillation process of vegetable oils using floating wooden nozzles. In *AIP Conference Proceedings* (Vol. 2789, N. 1). AIP Publishing.