

Some Characteristics and Fatty Acids Composition of Wild Apricot (*Prunus pseudoarmeniaca* L.) Kernel Oil

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In this study, the oil composition and some physical and chemical characteristics of wild apricot (*P. pseudoarmeniaca* L.) kernel oil (WAO) grown in Turkey were determined. Wild apricot kernel contain about 48-50 % crude oil of total dry matter. The oil consist of 93 % of unsaturated fatty acids and the main fatty acids are oleic (75 %), linoleic (17.5 %), palmitic (4.5 %) and stearic (2 %) acids. The other characteristics of the wild apricot oil are approximately as follows: refractive index (20 °C), 1.469; specific gravity, 0.914 g/cm³; insoluble matter in the ether, 0.5 %; unsaponifiable matter, 0.7 % and iodine value, 92.

Key Words: Zerdali, Apricot, Oil, Kernel oil.

INTRODUCTION

Wild apricot, systematically called *Prunus pseudoarmeniaca* L., is a plant species included within the *Prunus* genus of the *Prunoideae* sub-family of the *Rosaceae* family of *Rosales* set. The fruit of the tree of the wild apricot, used as the mature plant in the production of the apricot (*Prunus armeniaca* L.), is smaller than that of the apricot and it is also feathered¹. The wild apricot, locally called Zerdali is found in abundance in the hilly regions of the South Anatolian Region, especially in Malatya province of Turkey. The annual apricot production of Turkey is 499,000 m, while the wild apricot production is 51,000 m in 2003^{2,3}.

It is reported that the shares of the fresh apricot and wild apricot kernels in the fruit vary from 5 to 14 % and internal inner part share in the kernel is ca. 30 %. Of these two plants, both of which have fruits that have a single hard kernel and are yellow-orange. The fruit kernels of most types of the apricot are sweet, while the kernels of the wild apricot are bitter^{1,4}.

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Bitterness of the wild apricot kernels results from two cyanogenic glycosides; amygdalin and prunasin included in the composition of the kernel^{5,6}. As there are no reported findings on the toxicological aspects of wild apricot oil (WAO), a 13-week feeding study was carried out with this oil in albino Wistar rats to assess its suitability as edible oil⁴. In the extraction of kernel oil, these two glycosides that are known to be included in the oilcake and are themselves, not toxic, are subject to enzymatic (β -glycosidase, EC 3.2.1.21; oxynitrilase, EC 4.1.2.10; prunasin hydrolase, EC 3.2.1.118) or chemical (due to the heat effect in the acidic medium) hydrolyzation and first constitute mandelonitrile, an intermediate product⁷⁻¹³. The dissolution of mandelonitrile that is not a stable compound, leads to the formation of benzaldehyde and hydrocyanic acid. Although benzaldehyde does not have any toxic feature, mandelonitrile and particularly hydrocyanic acid are very toxic substances.

Products that are manufactured from the kernels of the apricot and wild apricot are used in leather, pharmacology, cosmetics and food industries^{4,14-17}. The major products manufactured from them are as follows: almond (from the inner part of the kernel) oil, benzaldehyde (increasing aroma), furfural, active carbon, amygdalin and hydrocyanic acid¹⁸.

In this study, it was aimed to determine some physical, chemical characteristics of the wild apricot kernel and the kernel oil, as well as the determination of the composition of the fatty acid and the its compliance for use in the food industry.

EXPERIMENTAL

All chemicals used in this study were supplied from Merck and Sigma chemical companies.

Wild apricot samples: Wild apricot seeds (*Prunus pseudoarmeniaca* L.) were obtained from Malatya Sire Bazaar in Turkey. The whole-split wild apricot samples were received with moisture content of between 8-10 % (wet basis). They were dried and stored at room temperature until analysis. The hard shells were crushed and the inner skins were removed before analysis.

Analyses on wild apricot kernel and its oil: The test weight of wild apricot kernels were analyzed according to the method described in TSE¹⁹. Wild apricot kernel samples were analyzed for protein using a Kjeldahl digestion and distillation units with the AOAC method²⁰. Moisture, oil, free fatty acid contents and iodine value were determined according to the AOAC methods²⁰. Peroxide values were determined by the iodimetric titration method²¹. Unsaponifiable matter was analyzed according to the method described in Pearson's Chemical Analysis of Foods²². Insoluble matter in the ether was analyzed according to the method described in TSE²³.

In order to determine the physical characteristics of wide apricot kernel oil; analyses on the colour²⁴, appearance and volatile substance^{23,25,26} were conducted. Specific gravity and refractive index were carried out according to AOCS methods²⁷.

Unshelled wild apricot kernels were ground to 0.4-0.6 mm in a Waring commercial blender. Extraction of oil was carried out with petroleum ether (at 40-50 °C) in a Soxhlet apparatus for 8 h. The solvent was removed in a rotary vacuum evaporator. The oil contents were determined as the difference in weight of dried samples before and after extraction. The oils were saponified by the usual procedure and the resulting fatty acids were esterified using 10 % (v/v) BF₃-MeOH as reagent²⁸. The fatty acid methyl esters (FAME) of the oils were analyzed on a Hewlett Packard, 6890 gas chromatography equipped with a flame ionization detector and capillary column (25 cm × 0.25 mm). The fatty acid peaks were identified by comparing their relative retention times.

RESULTS AND DISCUSSION

Some physical and chemical characteristics of the wild apricot kernel and its oil: Some characteristics of the wild apricot kernel and results about the physical and chemical characteristics of the kernel oil are given in Tables 1 and 2. Test weight of the wild apricot kernel is determined to be 39.14 g/100 kernels; the average moisture content is 8.74 %. It is also determined that the average crude oil content of the kernel samples is 48.79 %, while the raw protein content is 21.8 %.

TABLE-1
SOME CHARACTERISTICS OF THE WILD APRICOT KERNELS

Characteristics	Min	Max	Average
Test weight (g/100 kernels)	37.40	42.13	39.14
Moisture content (%)	7.49	9.98	8.74
Oil content (%)	47.50	49.62	48.79
Raw protein content (%)	20.97	21.92	21.80

It is determined that the refractive index of the wild apricot kernel oil in 20 °C is 1.4688, the amount of volatile matter is 0.0172 %, the specific gravity in 20 °C is 0.9138 g/cm³, the insoluble matter in the ether is 0.5 %, unsaponifiable matter is 0.7 %, the iodine value is 92.3. The free fatty acids amount of WAO (as oleic acid) is 0.26% and the peroxide number value is ≤ 5 meq O₂/kg.

Fatty acid composition of wild apricot kernel oil: The fatty acid compositions of wild apricot kernel oil are shown in Table-3. The saturated and unsaturated fatty acids contents of the wild apricot kernel oil are about

TABLE-2
SOME PHYSICAL AND CHEMICAL CHARACTERISTICS OF
THE WILD APRICOT KERNEL OIL

Characteristics	Min	Max	Average
Physical characteristics			
Appearance	–	–	Cloudless
Colour (Lovibond)	–	–	40Y+3R
Refractive index (at 20 °C)	1.4686	1.4690	1.4688
Volatile matter (g/100 g)	0.0172	0.0172	0.0172
Specific gravity (g/cm ³)	0.9137	0.9140	0.9138
Chemical characteristics			
Insoluble matter in ether (%)	0.480	0.510	0.500
Unsaponifiable matter (%)	0.600	0.800	0.700
Iodine value	90.910	93.530	92.330
FFA (as percentage oleic acid)	0.223	0.280	0.260
Peroxide value (meq O ₂ /kg)	4.901	4.975	4.934

TABLE-3
FATTY ACIDS COMPOSITION OF THE WILD APRICOT KERNEL OIL

Fatty acids		
Common names	Symbols	Composition (%)
Myristic	C14:0	< 0.1
Palmitic	C16:0	4.7
Palmitoleic	C16:1	0.1
Heptadecanoic	C17:0	< 0.1
Heptadecenoic	C17:1	0.1
Stearic	C18:0	1.9
Oleic	C18:1	74.8
Linoleic	C18:2	17.4
Linolenic	C18:3	0.2
Arachidic	C20:0	0.2
Gadoleic	C20:1	–
Behenic	C22:0	< 0.1
Lignoseric	C24:1	< 0.1
Elaidic	C18:1	0.1
Geometric isomers of linoleic and linolenic acids	C18:2 + C18:3	0.1
Σ Saturated fatty acids		7.1
Σ Unsaturated fatty acids		92.9
Σ Monounsaturated fatty acids		75.2
Σ Polyunsaturated fatty acids		17.7

7 and 93 %, respectively. It is determined that the oleic acid (75 %) is the major fatty acid in the wild apricot kernel. This is followed by linoleic (17.4 %), palmitic (4.7 %) and stearic (1.9 %) acids. Some other fatty acids are also included in the content of the kernel in trace.

The oleic acid amount in the WAO (75 %) is much higher when compared to the sunflower, cottonseed oils similar to the olive oil. Similarly, the linoleic acid (17.4 %) amount in the wild apricot kernel oil is slightly higher than that of the olive oil, while this amount is less than that of the sunflower and cottonseed oil²⁹⁻³¹.

The unsaturated fatty acid content of WAO (*ca.* 93 %), is much higher than that of the sunflower (85-91 %), cottonseed (70-75 %) and olive oil (81-91 %). When compared in terms of the unsaturated fatty acids composition, WAO and olive oil is much higher than the sunflower and cottonseed oil in terms of unsaturated fatty acids, therefore the slightly saturated fatty acid content of them is much lower than those of others²⁹⁻³¹.

Conclusion

When compared to some oilseed (soybean 15-20 %, cottonseed 30-36 %, sunflower 36-55 %) in terms of the crude oil content, the wild apricot kernel oil content of *ca.* 49 % is high in oil content and included in the category of oilseed. Examination of the fatty acid composition and the physical characteristics of the wild apricot kernel, which has a quite small amount of unsaponifiable matter, have revealed that it is quite similar to other edible oils and its fatty acid composition is similar to that of the olive oil. Therefore, while using the wild apricot kernels in the manufacture of some products mentioned in the introduction part, the wild apricot kernel oil can also be used as the edible oil. However, it is recommended that its cost effectiveness be assessed, also studies be carried out on the existence of the amygdalin derivations in the oil.

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