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КОМПЛЕКС ЖИРНЫХ КИСЛОТ, ВЫДЕЛЕННЫЙ ИЗ МАСЛА НЕКОТОРЫХ ОРЕХОВ, РАЗЛИЧНЫХ ПЕРИОДОВ СБОРА УРОЖАЯ

FATTY ACID COMPOSITION OF OILS EXTRACTED FROM SOME NUTS HARVESTED AT THE DIFFERENT HARVEST PERIODS

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Oil content of kernels changed depending on harvest times. Pine stone contained between 42,2 % (first harvest) to 48,9 % (fourth harvest) oil. Oil contents of nuts shown increased at high level from first and second harvest periods. While palmitic acid contents of pistachio nut change between 14,08 % and 8,70 %; palmitic acid contents of peanut oil varied between 11,14 % and 8,82 % ($p < 0,05$). Generally, palmitic acid content of samples decreased depending on harvest periods. While oleic acid contents were found high levels in pistachio nut and peanut oils. It was found low in pine stone oil (36,42–37,25 %). In addition, the highest linoleic acid (omega-6) contents were found in pine stone oil (48,30 % (first harvest) to 47,64 % (fourth harvest)). Harvest time was affect on fatty acid composition of pistachio nut, peanut and pine stone oils.

Содержание масла в ядрах менялось в зависимости от времени сбора урожая. Орехи кедровой сосны содержали от 42,2 % (первый урожай) до 48,9 % (четвертый урожай). Концентрация масла в орехах увеличилась до высокого уровня с первого и второго периодов уборки. В то время как содержание пальмитиновой кислоты в фисташковом орехе изменяется между 14,08 % и 8,70 %; уровень пальмитиновой кислоты в арахисовом масле варьировал от 11,14 % до 8,82 % ($p < 0,05$). Как правило, содержание пальмитиновой кислоты в образцах уменьшалось в зависимости от периодов сбора урожая. Концентрация и содержание олеиновой кислоты были обнаружены на высоком уровне в фисташковых орехах и арахисовом масле. Олеиновая кислота была найдена на низком уровне в масле орехах кедровой сосны (36,42–37,25 %). Кроме того, самое высокое содержание линолевой кислоты (омега-6) было обнаружено в масле орехов кедровой сосны (48,30 % (первый урожай) до 47,64 % (четвертый урожай)). Время сбора урожая влияет на состав жирных кислот из фисташковых орехов, арахиса и кедрового масла.

Keywords: harvest periods, peanut, stone pine, pistachia, oil, fatty acid, GC

Ключевые слова: период сбора урожая, арахис, кедровая сосна, фисташка, масло, жирная кислота, ГХ

Introduction. *Pistachio* is a small tree, a member of the family Anacardiaceae, native to Asia and the Mediterranean, which grows in southern Turkey. Ağar et al. (1997) determined that 10 Turkish and 36 Iranian pistachio nuts contained 48,55–58,50 % and 47,65–63,31 % oils. Wild pistachio kernels are a good source of fat (50–60 %) and contain unsaturated fatty acids, essential for human diet [Shokraii, 1977; Maskan and Karataş 1998]. Peanut oil is used exclusively as an edible oil in Adana, Mersin (Anamur) and Antalya province in Turkey [Özcan and Seven 2003]. The aim of current study was to establish oil content and fatty acid composition of oils extracted from nuts collected at the different harvest periods and growing Alanya (Antalya), Bursa and Gaziantep provinces in Turkey.

Material and Methods. Fruits from *Pinus vera*, *Arachis hypogaea* and *Pinus pinea* L. were provided from Gaziantep, Alanya (Antalya) and Bursa provinces at the different harvest periods (with 15 day intervals; 0, 15, 30 and 45 days) in Turkey in 2012.

Oil content. About 5 g of the samples were ground in a ball mill and extracted with petroleum ether in a Twisselmann apparatus for 4 h.

Determination of Fatty acids. Fatty acid compositions of nut oils were determined using a modified fatty acid methyl ester method as described by Hişil (1998). The oil samples (50–100 mg) was converted to its fatty acid methyl esters (FAME). The methyl esters of the fatty acids (1 µl) were analysed via a gas chromatography (HP 6890) equipped with a flame ionisation detector (FID), a fused silica capillary column (60 m × 0,25 mm i.d.; film thickness 0,20 micrometer).

Results and Discussion. Oil content of kernels changed depending on harvest times. Oil content of pistachio more increased from first to second harvest periods. Pine stone contained between 42,2 % (first harvest) to 48,9 % (fourth harvest) oil. While palmitic acid contents of pistachio nut change between 14,08 % to 8,70 %; palmitic acid content of peanut oil varied between 11,14 % and 8,82 % ($p < 0,05$).

Palmitic acid contents of pistachio oil decreased till last harvest period. Generally, palmitic acid content of samples decreased depending on harvest periods. While oleic acid contents are found high levels in pistachio nut and peanut oils, it was found low in pine stone oil (36,42–37,25 %) ($p < 0,05$). In addition, the highest linoleic acid (omega-6) contents of pine stone oil (48,30 % (first harvest) to 47,64 % (fourth harvest)) were found than those of pistachio and peanut oils. Harvest time was affect on fatty acid composition of pistachio nut, peanut and pine stone oils. So, fourth harvest period had the most suitable period for all samples depending on fatty acid composition of oil samples. The oil content of *P. vera* kernels were found between 56,03 % to 61,93 % [Pala et al. 1994; Küçüköner and Yurt, 2003]. The stone pine seed contains 45 % lipids and 21 % proteins on a dry weight basis [Nasri and Triki, 2004].

Previous studies showed that the seeds of *Pinus* cultivars contained oleic and linoleic acids at relatively high levels [Sagrero-Nieves, 1992; Nasri et al., 2005]. Our results were found partly similar with the reported values for peanut and pistachio samples. These minor differences of kernel oils may be due to growth conditions, genetic factors, harvesting time, soil properties, geographical varieties and analytical procedures [Johansson et al., 1997]. The pine nuts are rich in source of many important nutrients such as oil, fatty acids. According to results, stone pine seed oil could be utilized successfully as a source oil for human consumption and production of potential value-added products. The results indicate that the oil contains linoleic acid as the major fatty acid accompanied by oleic acid.

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