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Physio Chemical Properties of Bitter and Sweet Apricot Kernel Flour and Oil from North of Pakistan

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Abstract

Apricot is largely grown in north of Pakistan. During processing of apricot (drying) pits (kernels) were produced. These pits were used for oil extraction from traditional method. The peoples of this area extracted apricot kernel oil were used for shortening as well as medicinal purposes and flour was prepared from kernel cake used in various dishes. In the present studies oil were extracted from two apricot varieties bitter and sweet by traditional method. Some physiochemical characteristics of bitter and sweet apricot kernel flour like mass of 100 pits and kernels, moisture, ash, crude protein, crude oil, crude fiber and total energy were studied. For extracted oil acid value, sponifiction value, ester value, peroxide value refrective index and iodine value were studied. Fatty acid compositions of these two apricot kernel oils were also studied. The result shows that bitter apricot kernel flour has maximum values for ash, fat proteins fiber and carbohydrates as well as posse's low total energy. The observed values for moisture content shows that bitter apricot kernel flour lower than sweet apricot kernel flour. Chemical properties of apricot kernel oil like specific gravity, acid value, sponifiction value, ester value, peroxide value refractive index and iodine value almost same for both extracted oils. Results regarding Fatty acid analysis showed that bitter apricot kernel oil has high value for its fatty acid. It was concluded that the apricot oil bitter and sweet were suitable for shortening purpose and may be good replace for commercial vegetable oil.

Key words: Apricot oil, analysis, kernel flour, fatty acid, extraction.

Introduction

Apricot (*Primus armeniaca L.; Rosacea family*) is mostly grown in Mediterranean countries, Pakistan, Russia, USA and Iran. Total world production of fresh apricot is between 2.2 and 2.7 million tons per year. In Pakistan, it can be found in the inner valley of Baluchistan, Kurrum agency, Hunza, Gilgit and Ladakh, (Baquar 1989 Fazlin et al. 2002). Pakistan is one of the leading producing countries both for fresh and dried apricot.

Total fresh and dried apricot production of Pakistan in was 500 and 120 thousand metric tons, respectively, composing a 15–20% fresh and 65–80% dried apricot production of the world (FAO, 2002). The fruit of apricot are eaten both fresh and dried. Beyer and Melton (Beyer and Melton, 1990) studied the composition of New Zealand apricot kernels. It is estimated that kernel contains more oil. Previous researchers have pointed out that there is an important proportion of (50%) in Egyptian apricot kernels (Abd El-Aal et al. 1986). Indian varieties are containing 44% oil reported (Joshi et al. 1986). In addition, (Salam and Salem, 1973; Halloba et al.1977) indicated that there is about mean 53.17%, 49.93% and 52% oil, respectively (Abd El-Aal et

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al. 1986).Investigated chemical composition of the seed shell of the apricot (Prunus *armeniaca)* who reported that there areoleic and linoleic acid as dominant fatty acids. The same researcher known that the use at food and cosmetic of apricot oil is more useful due as it contains nonamygdalin were investigated the effects of process parameters on extraction of apricot (*Prunus armeniaca* L.) kernel oil with supercritical carbon dioxide. The major fatty acids were oleic, linoleic and palmitic. Chloroform-methanol extracts consisted mainly of neutral lipids in which triglycerides were predominant components. The triglycerides consisted of six types of glycerides. Glycolipids and phospholipids were the minor fractions of the total lipids and their major constituents were acylsteryl glycosides (62·3%) and phosphatidyl choline (72·2%), respectively. Evaluation of the crude apricot kernel oil added to different types of biscuits and cake revealed that it has excellent properties and is comparable with corn oil at the same level. Apricot kernels are generally used in the production of oils, cosmetics, active carbon and perfume industry. Its kernels are rich source of oil with oil content up to 48.70% (Ozcan, 2000).studied the physiochemical and functional properties apricot kernel flour. The flour contained about 48% protein, mainly albumins. The solubility at different pH values showed a single isoelectric point at pH 4 and the solubility increased in both acidic and alkaline pH. The digestibility of the protein was high in the pepsin-pancreatin system and quite low when pepsin or trypsin was used. Water and fat absorption and emulsification capacity of flour and protein isolates were quite comparable with that of soybean. Detoxified apricot kernel flour and protein isolates appear to be good sources of protein for food products.

Apricot kernel flour mainly contains amino acids methionine, phenylalanine, valine, threonine, arginine, aspartic acid and glutamic acid (Kamel and Kakuda 1992). Apricot kernel flour contains high level of potassium and magnesium minerals, B group vitamins; its oil is rich in unsaturated fatty acids, especially oleic (31-80%) and linoleic (6.3-51%) acids and is also good source of tocopherol (Lazos 1991). The results obtained in this study suggest that acceptable noodles in terms of physicochemical and sensory properties could be produced by incorporating apricot kernel flour into wheat flour up to the level of 15% flour weight basis. (Eyidemir and Mehmet 2009). The aim of present study was to investigated the kernel oil as well as kernel flour prepared from two cultivars of apricot bitter and sweet which grown in north of Pakistan.

Material and Methods

Materials

Apricot pits bitter and sweet were collected from Northern areas of Pakistan they were kept in polypropylene bags. The endocarp was removed from kernels by hand. In addition, they kept at room temperature until required for extraction of oil.

Methods

Extraction of oil

The kernels were dried, ground and oil was extracted by traditional expeller method from expeller's machine which use in this area for oil extraction from apricot kernels. After extraction oil was collected in glass bottles for further studies. Remaining material (seed cake) was also collected in polypropylene bags for analysis.

Physical and chemical analysis of apricot kernel flour

After extraction of from remaining kernel material, flour was prepared and analyzed for Moisture, ash, fat, proteins., carbohydrate and fiber according to recommended method of (AOAC 2000).

Total energy (calorific value)

Energy will be calculated as described by (Osborne and Voogt, 1978) using the Atwater factors: 1g of carbohydrates (C.) provides (4Kcalories), 1g of protein (P.) provides (4Kcalories) and 1g fat (f.) provides (9 K calories). c. (g) X 4: Kcal of carbohydrate p. (g) X 4: Kcal of protein f. (g) X 9: Kcal of fat.

Physiochemical analysis of Oil

Mass of 100 pits and kernels were determined from randomized selected 100 pits (Gezer and Dikilitas,2002) and acid value, sponification value, ester value, peroxide value refractive index, iodine value and specific gravity(pycnometer method) were analyzed according to (AOAC 2000).

LGC analysis of fatty acid

Fatty acids were differentiated by using the borontrifluoride method as described

(Hışıl 1988). Samples were injected as 5 µl into a Varian, model 2100 equipped with 10% DEGS (diethylene Glycol Succinate)+ 1%H_3PO_4 constant phase, a flame ionization detector (FED), and chromosorb G (100/120 mesh) support matter, internal diameter (2mm) and stainless steel (190 cm) column. Column temperature was programmed 200 ℃. Injector and detector temperatures were set at 225 ℃. Nitrogen (N_2) (6ml/min.) was used as the carrier gas. Hydrogen (40ml/min.) and air (60ml/min) were used as burnt and dry gas, respectively. Fatty acid methyl esters were identified by comparison with fatty acid internal standards. Individual fatty acid concentration was expressed as percent.

Statistical Analysis

All the analyses were conducted in triplicate. The mean standard deviation of three values was calculated. Data were subjected to Analysis of Variance (Steel and Torrie 1960).

Results and Discussion

properties of seed cake flour from two apricot varieties bitter and sweet were used in present studies. Results were given in Table 1. mass of 100pits for bitter apricot was (42)and for sweet apricot was (28.72g), mass of 100 kernels for bitter apricot was(150g) and (42g) for sweet apricot. Moisture for bitter apricot kernel flour was (8.85±0.02%) and (9.07±0.48%) for sweet apricot kernel flour.

Table-1: Composition of bitter and sweet apricot seed cake flour

Sr.#	Name of Component	Bitter apricot Kernels	Sweet apricot Kernels
1	Mass of 100 Pits	82.±0.07	150± 0.06
2	Mass of 100 Kernels	28.72± 0.2	42±0.3
3	Moisture %	8.850 ± .02	9.07±0.48
4	Ash %	4.48±0.08	3.94±0.70
5	Fat %	14.27±0.04	14.72±0.01
6	Protein %	35.52±0.12	35.76±0.06
7	Fiber %	2.28±0.34	2.6+0.12
8	Carbohydrate %	34.43±0.5	33.91 ± 0.6
9	Food Energy (Calories/100g	419.506± 0.5	422.543± 0.6

Results regarding ash content were showed that bitter apricot oil has high ash content (4.48±0.08%) than sweet apricot kernel flour(3.94±0.79%).Fat content for bitter apricot kernel flour was (14.27±0.04%) and (14.72±0.01%) for sweet apricot kernel flour. Results for protein content were showed that sweet apricot kernel flour has slightly higher protein content (35.76±0.06%) than bitter apricot kernel flour (35.76±0.06%). The reported protein content of apricot kernel ranged from 14.1 to 45.3% (Femenia *et al*. 1995). Results for fiber content were showed that bitter apricot kernel flour has high value (2.8±0.34%) than sweet apricot kernel (2.6±0.12%) flour. Results regarding Carbohydrate content were showed that bitter apricot oil has high carbohydrate content (34.43%) than sweet apricot kernel flour (33.91%). Carbohydrate content of apricot kernel was reported variously as 25.5% (w/w), 17.3% and 18.1–27.9% (Tuncel et al.1990). The results reported for proximate analysis of the bitter kernels shows that fat content in the bitter kernels was high 54.24% , protein content was found to vary from 17.75 to 22.56%, carbohydrate from 21.16 to 35.26%, crude fiber from 0.84 to 4.71%, and dietary fiber from 6.03 to 22.24%, (Dwivedi and Ram 2006). Moisture, crude oil, crude protein, crude fiber, crude ash, crude energy values and mineral contents in apricot kernels are affected by variety (Kacar and Bitki 1977).The calculation observed for food energy showed that sweet apricot kernel (422.543 Calories/100g) flour has high food energy than bitter apricot kernel (419.506 Calories/100g) flour. Chemical properties of bitter and sweet apricot kernel oil were also studied and result are pertaining in Table-2.Thes findings shows that bitter apricot kernel oil has high acid value(7.80%) than sweet apricot kernel oil (7.76%) this shows that bitter apricot oil has more free fatty acid than sweet apricot kernel oil.

Table-2: Chemical Analysis of bitter and sweet apricot kernel oil

S #	Name of Component	Bitter apricot Kernels	Sweet apricot Kernels
1	Acid Value	7.80±0.02	7.76±0.02
2	Sopnification Value	180±0.04	182±0.03
3	Ester Value	177±0.02	176±0.04
4	Peroxide Value (meq/kg	4.9±0.03	5.0±0.02
5	Refractive Index	1.45±0.01	1.45+0.01
6	Iodine Value	95±0.02	95±0.03
7	Specific Gravity g/cm^3	0.88±0.001	0.88±0.001

Bitter apricot kernel has low sponification value (180) than sweet apricot kernel oil (182).It indicates that bitter apricot kernel oil has long chain fatty acid and sweet apricot kernel oil has slightly short chain fatty acid than bitter apricot oil. The results for ester values shows that bitter apricot kernel oil has higher ester value than (177) than sweet apricot kernel oil (176).Sweet apricot kernel oil has more peroxide value(5meq/kg) than bitter apricot oil (4.5meq/kg).The results for refractive index and iodine value was similar for both bitter and sweet apricot oil (1.45) and (95) respectively. The reported findings show that iodine values varied from 97.93 to 103.85 and saponification values from 189.57 to 191.71. Apricot oil is dominated by the presence of unsaturated fatty acids (Dwivedi and Ram 2006). The reported results for saponification number ranged from 187.3–199.0 (Vursavus and F. Ö zgüven, 2004) iodine value ranged from 90.0–104.8 (Ozcan 2000). Specific gravity ranged from 0.876–0.932 (Rafique et al. 1986) and refractive index ranged from 1.464–1.480 (Aydemir et al. 1993)

Table-3 Fatty acid Profile bitter and sweet apricot Kernel oil

S.#	Name of Component	Bitter apricot Kernels	Sweet apricot Kernels
1	Myristic Acid C_{14}	0.51	0.47
2	Palmitic Acid C_{16}	6.75	6.32
3	$C_{16:1}$	0.95	0.47
4	$C_{18:0}$	1.12	0.57
5	Oleic Acid $C_{18:1}$	66.22	63.81
6	Linoleic Acid $C_{18:2}$	21.66	28.42
7	$C_{18:3}$	1.61	------

8	$C_{20:0}$	0.54	------
9	$C_{22:0}$	0.62	--------

The fatty acid profile study of bitter and sweet apricot kernel oil results pertaining to response of GLC is presented in Table 3.These results shows that bitter apricot kernel oil rich in fatty acids and had higher value for myristic acid C14 (.051%), palmitic acid C_{16} $C_{16:1}$, $C_{18:0}$ (6.75%, 0.95%, 1.12%) oleic acid$_{18:1}$(66.22) and Linoleic acid $C_{18:2}$, $C_{18:3}$, $C_{20:3}$ $C_{22:2}$, (21.66%, 161%, 0.54%, 0.62%) respectively while sweet apricot oil had myristic acid C_{14} (0.47%), palmitic acid C_{16} $C_{16:1}$, $C_{18:0}$ (6.32%, 0.47%, 0.57%) oleic acid$_{18:1}$ (63.81) and Linoleic acid $C_{18:2}$ (28.42%) respectively. The lipid profile shows that oleic acid was the primary fatty acid, and its content varied from 70.52 to 75.99% in the different samples. In addition, linoleic acid (14.13–22.83%), arachidic acid (0.08–0.39%), and ecosenoic acid in small quantities have been found. Stearic acid (0.34–1.22%) has been observed as a component saturated fatty acid, but palmitic acid (3.5–5.04%) and palmitoleic acid (0.56–0.91%) were observed to be present in larger quantities (Tunçel *et al.*, 1990) Fatty acid composition and iodine values are similar to that found from previous studies (Gutfinger et al. 1972; Ogihara et al. 1982; Farines et al. 1986)

Conclusion

The results of present studies of apricot kernel flour and oil showed that bitter apricot flour and have maximum values for chemical analysis and food energy. Fatty acid analysis showed that bitter apricot kernel oil have high value for its fatty acid the composition the apricot oils indicates that were suitable as edible oil.

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