Fatty Acid Variation of Runner Peanut (*Arachis hypogaea* L.) Among Geographic Localities from Córdoba (Argentina)

N.R. Grosso[a,*], A. Lamarque[b], D.M. Maestri[b], J.A. Zygadlo[b] and C.A. Guzmán[b]

[a]Cátedra de Química Biológica, Facultad de Ciencias Agropecuarias, Universidad Nacional de Córdoba, 5000 Córdoba, República Argentina and [b]Cátedra de Química Orgánica, Facultad de Ciencias Exactas Físicas y Naturales, Universidad Nacional de Córdoba, 5000 Córdoba, República Argentina

Fatty acid compositions of runner peanuts were determined among fifteen geographic localities from Córdoba, Argentina. Significant differences were found within these fatty acid profiles. Samples from the Reducción zone had the best oleic-to-linoleic ratio and iodine value.

KEY WORDS: *Arachis hypogaea* L., fatty acid composition, geographic locality variation.

Traditionally in the United States, runner market types have been predominantly utilized for the peanut butter trade, and oil composition plays an important role in the manufacturing of this end-use product (1).

Runner-type peanuts accounted for over 80% of the total production area in Argentina. The main cultivar utilized in Córdoba is Florman, bred in Argentina from Florunner (2).

Differences in fatty acid composition of peanuts due to the effect of the geographic location have been reported (3–5).

The oleic-to-linoleic (O/L) ratio and iodine value (IV) are important indicators of oil stability and quality (6). The objective of this study was to determine the fatty acid variation of runner peanuts among geographic localities from Córdoba, Argentina.

MATERIALS AND METHODS

All peanut (*Arachis hypogaea* L.) seed samples were obtained from Córdoba, Argentina. Localities studied: Reducción (7 km north), Reducción (4 km south), General Cabrera (9 km south), General Cabrera (7 km north), General Cabrera, General Cabrera (11 km west), General Cabrera (6 km east), General Deheza, General Deheza (8 km south), Río Cuarto, Rincón, Las Higueras, Gigena, Manfredi (6 km west) and The Instituto Nacional de Tecnologia Agropecuaria (INTA)-Manfredi. The cultivar used in this work was Florman from the 1991, 1992 and 1993 crop years. The material was provided by Georgalos S.A. and INTA of Manfredi-Córdoba.

The seed oils were extracted with *n*-hexane in a Soxhlet apparatus. The fatty acid methyl esters (FAMEs) of total lipids were prepared by transmethylation with a 3% solution of sulfuric acid in methanol, as previously described (7). Methyl esters were analyzed on a Shimadzu GC-R1A (Tokyo, Japan) gas chromatograph equipped with a flame-ionization detector and a capillary column, AT-WAX Superox II (30 m × 0.25 mm i.d.). Column temperature was programmed from 180°C (held for 10 min) to 240°C at 4°C min^{-1}. The injector temperature was 250°C. The carrier gas (nitrogen) had a flow rate of 20 mL/min^{-1}. A standard FAME mixture was run to use retention times in identifying sample peaks. Fatty acid levels are reported as relative proportions of the total composition. IVs were calculated from fatty acid percentages (8) by means of the formula:

$$IV = (\%\ oleic \times 0.8601) + (\%\ linoleic \times 1.7321) + (\%\ eicosenoic \times 0.7854) \quad [1]$$

Data were analyzed by analysis of variance. *T*-test (least significant differences) was used for statistical mean separations (1).

RESULTS AND DISCUSSION

Palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), arachidic (C20:0), eicosenoic (C20:1), behenic (C22:0) and lignoceric (C24:0) acids were detected (Table 1). Percentage means were all within the ranges recently

TABLE 1

Average Percentages (1991–1993) of Fatty Acid Composition of Runner Peanut (from fifteen geographic localities of Córdoba, Argentina)[a]

	Fatty acid composition (%)							
Samples (locations)	C16:0	C18:0	C18:1	C18:2	C20:0	C20:1	C22:0	C24:0
Reducción (north)	9.2c	1.6a	49.0d	33.4g	1.2b	1.6ad	2.5ac	1.4ab
Reducción (south)	9.9a	2.3f	45.8c	35.3b	1.1bc	1.8b	2.5ac	1.4ab
General Cabrera (south)	9.9a	1.7ab	44.0a	39.1ab	0.9a	1.8b	1.9ef	0.8f
General Cabrera (north)	9.9a	1.7ab	44.1a	38.6a	0.9a	1.6ad	2.1bde	1.1cde
General Cabrera	9.8a	1.7ab	45.2b	37.0c	0.9a	1.8b	2.3ab	1.3abc
General Cabrera (west)	10.2b	1.8bc	44.1a	38.6a	0.9a	1.5d	2.0def	1.0def
General Cabrera (east)	10.0ab	1.3e	44.0a	39.5b	0.7d	1.8b	1.8f	0.9ef
General Deheza	10.2b	1.9cd	45.2b	36.7c	1.0ac	1.6ad	2.3ab	1.2bcd
General Deheza (south)	9.8a	1.4e	43.8a	38.1ad	0.9a	1.8b	2.7c	1.5a
Rio Cuarto	9.9a	1.8bc	44.0a	37.8d	0.9a	1.8b	2.4a	1.3abc
Rincon	10.2b	1.8bc	40.8e	40.6e	0.7d	2.1c	2.5ac	1.3abc
Las Higueras	9.9a	1.9cd	45.8c	36.1f	1.0ac	1.7ab	2.4a	1.2bcd
Gigena	9.8a	1.9c	41.7f	40.6e	0.7d	2.2c	2.3ab	1.2bcd
Manfredi (west)	9.3d	1.8bc	44.1a	37.9d	0.9a	1.8b	2.4a	1.3abc
INTA-Manfredi	9.9a	2.0d	45.2b	37.0c	1.0a	1.5d	2.4a	1.0def

[a]Percentages within each column followed by the same letter do not differ significantly at $P = 0.05$.

*To whom correspondence should be addressed at Cátedra de Química Biológica, Facultad de Ciencias Agropecuarias, Universidad Nacional de Córdoba, Avda. Valparaiso s/n, 5000 Córdoba, República Argentina.

TABLE 2

Oleic-to-Linoleic Fatty Acid Ratios (O/L), Iodine Values (IV) and Saturated-to-Unsaturated Fatty Acid Ratios (S/U) of Runner Peanut (from fifteen geographic localities of Córdoba, Argentina)[a]

Samples (locations)	O/L	IV	S/U
Reducción (north)	1.46	101	0.19
Reducción (south)	1.30	102	0.21
General Cabrera (south)	1.12	107	0.17
General Cabrera (north)	1.14	106	0.19
General Cabrera	1.22	104	0.19
General Cabrera (west)	1.14	106	0.19
General Cabrera (east)	1.11	108	0.17
General Deheza	1.23	104	0.20
General Deheza (south)	1.15	105	0.19
Rio Cuarto	1.16	104	0.19
Rincon	1.00	106	0.19
Las Higueras	1.26	103	0.19
Gigena	1.02	108	0.18
Manfredi (west)	1.16	105	0.19
INTA-Manfredi	1.22	104	0.19

[a]Calculated from fatty acid composition of Table 1.

reported by Branch *et al.* (1), except for O/L acids, which appear to be lower and higher, respectively. Significant differences were found within the fatty acid profile among fifteen geographic localities studied.

Higher O/L ratios and lower IVs would suggest better oil stability and longer shelf life (6). Accordingly, runner peanut from Reducción zone (north and south), followed by the Las Higueras locality, had higher oleic acid contents and, correspondingly, the best O/L ratios and IVs (Tables 1 and 2). These zones are located southeast of the cultivation area and have more sandy soil and higher precipitation than the other localities (9,10). Here, the peanut is sown and harvested early. Therefore, the temperature during seed maturation is higher. Holaday and Pearson (3) found that higher temperatures during the last weeks before harvest resulted in a higher O/L ratio. These environmental factors could favor the O/L ratios and IVs in these localities.

Saturated (C16:0, C18:0, C22:0 and C24:0)-to-unsaturated (C18:1, C18:2 and C20:1) ratios (S/U) are also given (Table 2). Samples from General Cabrera (east) and General Cabrera (south) had the lowest S/U ratios.

The differences in fatty acid composition and oil stability of peanuts are influenced by production location (4,6). The environment in all localities studied is not the same (9). The environmental factors appear to influence the differences in fatty acid composition, IV and O/L ratio of runner peanut from Córdoba, Argentina.

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