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A glance on characterization of almond kernels from five varieties cultivated in eastern Morocco

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Introduction

The ability to develop a deep and extensive root system and to endure water deficit and summer heat, allows that almond trees could be cultivated in different soils and climatic conditions that go from the Takla Makan desert in western China to the Mediterranean area. (Kester et al. 1991; Ladizinsky 1999). In Morocco, the green Moroccan program (period 2008-2020) has been established to improve productivity in different agriculture sectors such as olive and almond. Belgian Development Agency (BTC) supports extension of almond orchards in eastern Morocco in purpose to achieve socio-economic improvement with positive impacts on farmer's revenues, and with the same aim, this applied research is part of a local project (PROFAO*) for development of almond in the eastern region of Morocco.

*Projet de Développement de la Filière des Amandiers dans la région de l'Oriental: www.btcctb.org/files/web/project/flyer/Brochure%20PROFAO.pdf



A: Whole, double, scratched, broken & chipped Kernels after a mechanical cracking of shelled almond



B: Selected whole undamaged Kernels
C: Broken & chipped Kernels



Packaged whole almonds for commercial purposes: Production of pilot cooperatives [Ain Sfa (C1) Sidi Bouhria (C2) and Chark (C3)] in eastern Morocco.

Material and methods

Damaged almond kernels recovered were triturated using an oil press "KOMET DD85G in PREDIGIA Company, Casablanca, Morocco

Almond oils and almond press cake of five varieties (*Ferragnes-Ferraduel Marona, Beldi, and Fournat*) were been analyzed to determine some chemical characteristics in order to suggest new end uses (culinary and cosmetic applications) with the best commercial added value. Acidity (AV) Peroxide value (HV), and UV-absorbance values were determined according to classical standard methods; fatty acids analysis were performed by Gaz chromatography "GC-FID". Furthermore, analysis of "almond press cakes" were carried out by: Kjeldahl for proteins, Van Soest & Wine method for dietary fiber.

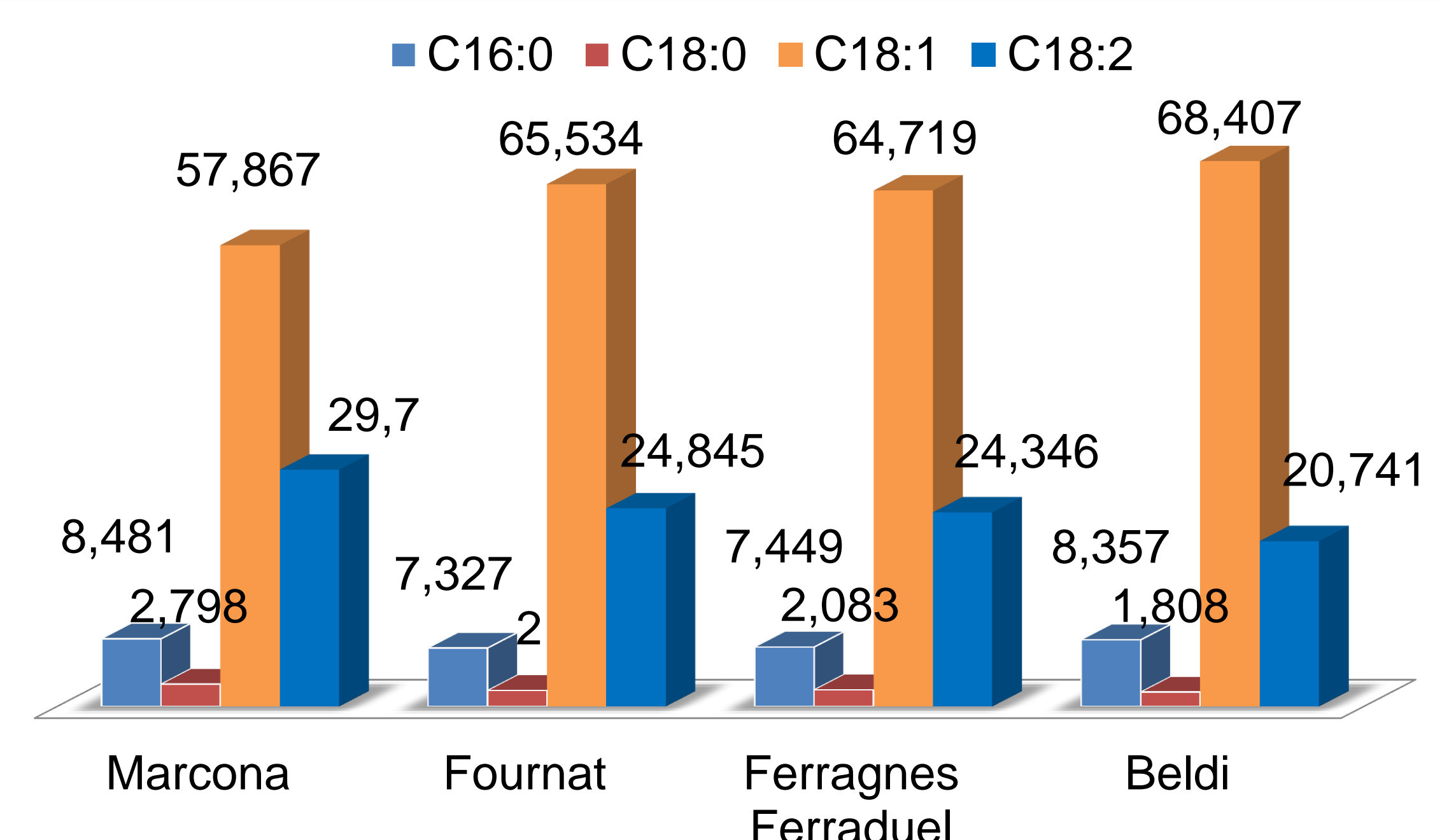
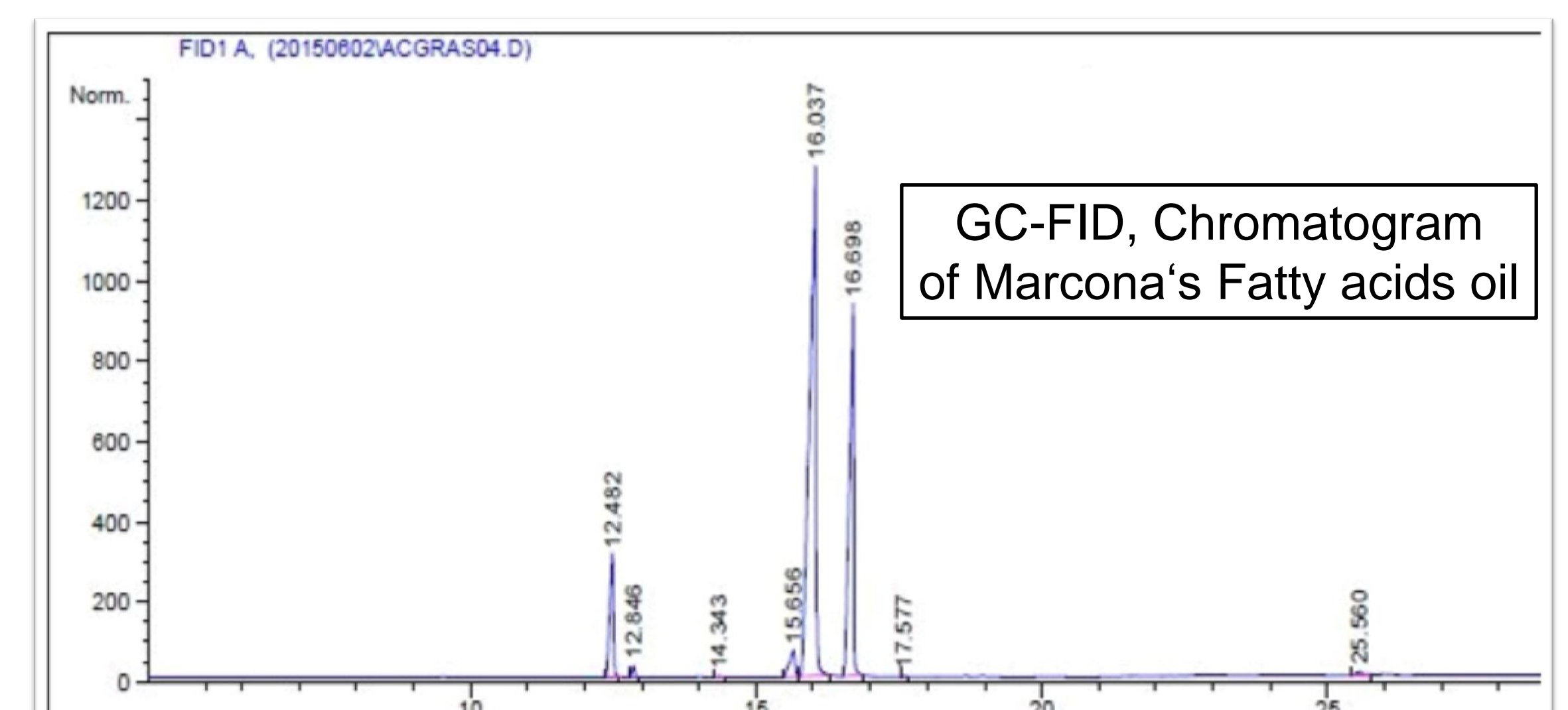
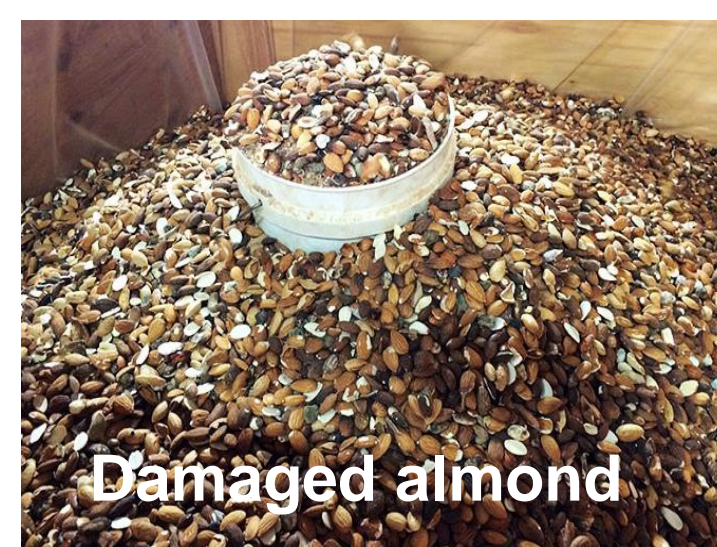


Figure 2: Fatty acid fractions of almond kernel oils

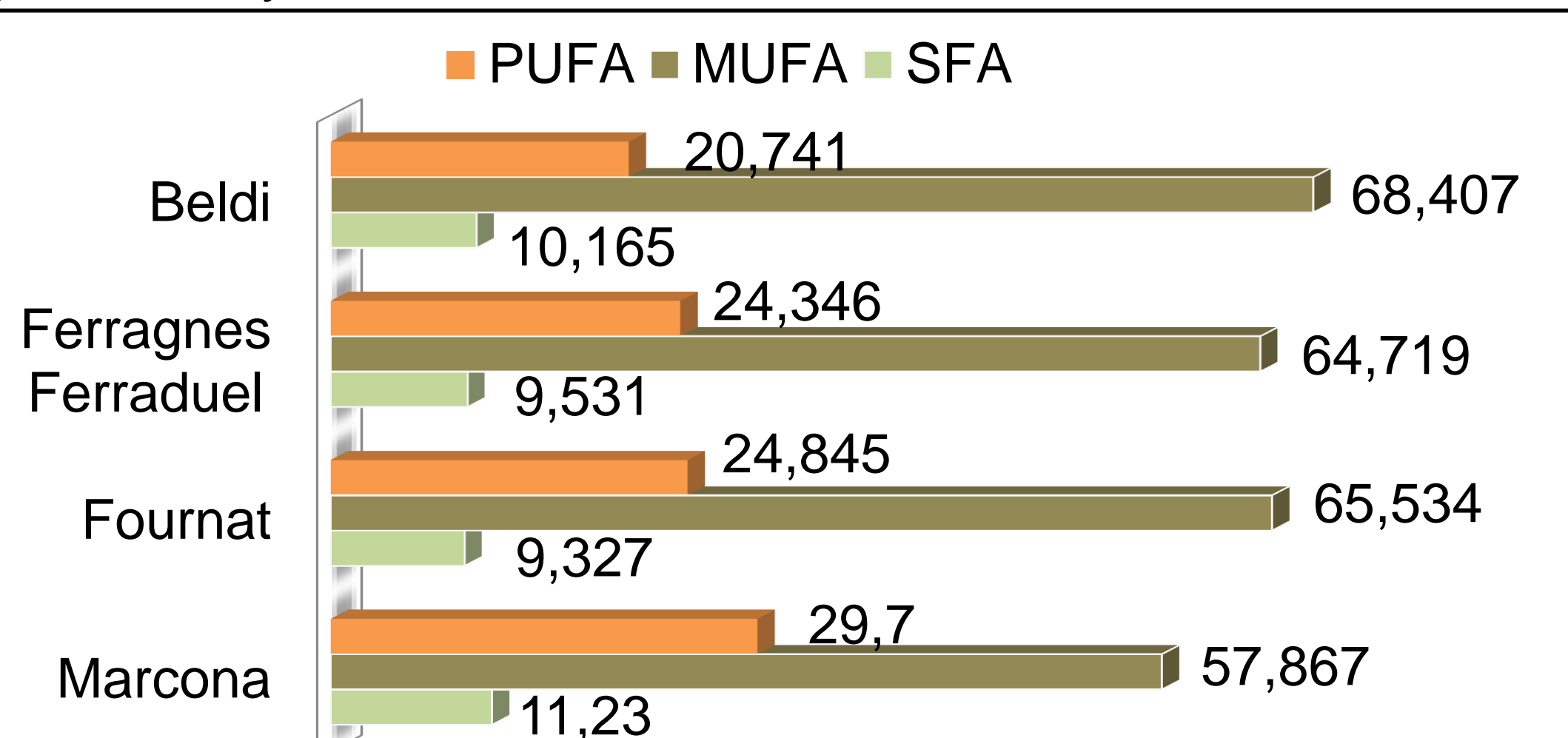


Figure 3: Polyunsaturated Fatty Acids (PUFA), Mono Unsaturated fatty acids (MUFA) and Saturated Fatty Acids (SFA)

Results and discussion

The oil and press cake obtained were analyzed. Table 1 & 2 shows the results. Table 1 shows proteins and fibers of almond press cakes. Beldi contains the highest protein content compared to other varieties. Fournat and Ferragnes –Ferraduel contains the highest total dietary fiber

Table 1: Oil, fiber and protein contents of almond press cake

	Marcona	Fournat	Ferragnes Ferraduel	Beldi
Proteins %	52,683	48,1479 ± 2,47	51,4719 ±	55,2654 ± 0,3
Total Dietary Fiber %	19,55 ± 1,33	25,425 ± 0,3	25,255 ± 4,8	16,425 ± 2,3

From table 2 Marcona and Beldi contains the highest Hydroperoxide value.(HV) No significant difference was found between varieties for acidity value(AV) .

Table 2: Quality of almond kernel oils

	Marcona	Fournat	Ferragnes Ferraduel	Beldi
Oil yield (%)	61,62 ± 1.4	48,62 ± 2.1	58,99 ± 1.1	61,00 ± 1.7
AV (%)	0,2463 ± 0,006	0,2215 ± 0,014	0,263 ± 0,006	0,264 ± 0,0007
HV (meq./kg)	14,3223 ± 0,41	7,1908 ± 3,39	7,213 ± 3,28	17,1544 ± 3,74
K232	1,571 ± 0,03	1,54 ± 0,05	1,505 ± 0,01	1,85 ± 0,01
K270	0,17 ± 0,004	0,11 ± 0,007	0,118 ± 0,006	0,09 ± 0,002

Figure 1,2 & 3 shows the fatty acid fractions of almond kernel oils. These oils were dominated by Mono Unsaturated Fatty Acid (Oleic fatty acid C18:1). Marcona has the least Mono Unsaturated Fatty Acid and the highest Poly Unsaturated Fatty Acid. This compositions allows Marcona's oil to be the least preserved compared to the other oils. That explain why it has high Hydroperoxide value.

Conclusion

The characteristics of oils depends on profile of fatty acids. Almond oil is characterized by the dominance of Monounsaturated fatty acid and the high content of polyunsaturated fatty acid that's allows this oil an average stability compared to other oils.

Almond press cake is dominated by proteins. This characteristics permit the almond press cake to be used in food technology as foodstuffs like almond powder.