(linoleic acid was positively influenced by the geographical localization (r = 0.899, p = 0.038) and the P/S index (r = 0.987, p = 0.002)) followed by saturated fatty acids (20%) with other beneficial compounds from the unsaponifiable fraction like polyphenols and carotenoids. Together with fatty acid content, these minor components are likely to be responsible for its nutraceutical properties and beneficial effects.

Tunisian Argan oil displayed valuable qualitative parameters proving its competitiveness in comparison with Moroccan and Algerian oils, and could be therefore considered as extra virgin edible oil for nutraceutical purposes as well as for cosmetic use.

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TRITERPENOIDS FROM ARGANIA SPINOSA: 20 YEARS OF RESEARCH

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Introduction. The argan tree (*Argania spinosa L.*) Skeels, family Sapotaceae} is exclusively endemic in southwestern Morocco [1]. This tree is largely known for its precious kernels from which argan oil is extracted. Whereas the argan forest was considered strongly endangered some years ago, nowadays it receives the special attention it deserves through a vast sustainable development program that is based on a single product: argan oil [2]. The success encountered by edible and cosmetic argan oil is indisputable and is due to its unique organoleptic, pharmacological, and dermatologic properties [3-5]. Consequently, the Amazigh diet that uses argan oil as a lipid source [6] is becoming almost as popular as the Mediterranean diet that uses olive oil. Regretfully, the present world-wide fame of argan oil has partially dwarfed the initial intensive work carried out on argan triterpenoid saponins. This family of molecules represented, for a while, the most likely output to rescue successfully the argan forest. Indeed, saponins are endowed with so many pharmacological and biological properties [7] that any plant of the family Sapotaceae can be considered of interest for those trying to discover new pharmacological leads. Preliminary and encouraging results [8, 9] quickly triggered the systematic analysis of argan saponins. Even though these compounds are not being investigated as intensively as they were some years ago, the need to diversify argan forest resources is sufficient to

warrant further study. This review is aimed at summarizing the knowledge amassed in the argan triterpenoid domain during the last 20 years.

Materials and methods. Literature sources used to explore the phytochemical composition of Argania Spinosa.

Results and their discussion. Saponin content in fresh argan kernels is 0.5%, of which 40% is composed of arganine A. Arganine B is the second main saponin present in argan press cake. However, its concentration in the crude saponin extract is only about 8%. Arganine C-F, and misaponin A were also identified. Their individual amount in the crude saponin mixture is about 4%. Argan press cake saponins identified, so far, are bidesmosidic saponins whose aglycone is either protobassic acid (arganine D-F, and misaponin A) or 16α-hydroxyprotobassic acid (arganine A-C), a scaffold belonging to the Δ-12 oleanane series. Sugars of argan press cake saponins are β-D-glucose, α-L-rhamnose, α-L-arabinose, β-D-xylose, and D-apiose. Arganine C has also been isolated from the kernels of Madhuca butyracea and from the roots of Crossopteryx febrifuga, as well as from the fruit of Tieghemella heckelii. This last species also contains arganine A and D. Finally, arganine E, which is identical to butyroside E, was found in the kernels of M. butyracea. Argan press cake contains several other saponins in minute amounts. Their isolation and structural analysis remains to be done. Saponin concentration in A. spinosa wood is nearly 5%. Isolated saponins were named arganine G, H, J, L , O, P, Q, and R. All argan wood saponins share an identical aglycone: bayogenine. Again, this triterpene belongs to the Δ-12-oleanane series. However, whereas the aglycone of argan kernel saponins was tetra or penta hydroxylated, bayogenine is a trihydroxylated triterpene. Sugar composition includes β-D-glucose, α-L-rhamnose, α-L-arabinose, β-D-xylose, and D-apiose, as for argan kernel saponins, but also D-glucuronic acid, an oxidized sugar that had not been identified in argan kernel saponins. Crude saponin content of the shell of argan fruit can be estimated to be around 0.01%. The isolated saponins are misaponin A, a saponin already isolated from argan press cake, arganine M, arganine N, and the already known, but unnamed, saponin 18. Arganine M and N share the same ramified sugar pattern, which is composed of seven residues, but the aglycone of arganine M is 16-α-hydroxyprotobassic acid, whereas it is protobassic acid for arganine N. Misaponin A and saponin 18 were also isolated fom the pulp of the argan fruit, together with a new saponin named arganine K, whose aglycone is 16α-hydroxyprotobassic acid. Ubiquitous triterpenes were isolated. From the leaves, oleanolic and ursolic acids were isolated. Their concentration is in the 2 to 4 g/kg range. In addition to these two compounds, betulinic and maslinic acids were also isolated from the fruit pulp. However, in this, the concentration of ursolic acid never exceeds 1 g/kg and that of oleanolic acid is around 0.5 g/kg. Concentration of betulinic and maslinic acid is around 70 mg/k. were not isolated during this study, suggesting that triterpene oxidation occurs at the saponin stage. Studies on rats and mice indicate that acute and chronic toxicity of argan saponins is low. As a mixture, argan press cake saponins have anti-acne properties. The mixture also presents a peripheral analgesic activity in mice and rats. Maximum protection occurs at doses of 500 mg/kg per os.