



## Characterizations of Rif's Argan tree in North of Morocco

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### ABSTRACT

The argan tree is especially known in the south of Morocco, but in this paper we present the experience of its introduction in Moroccan northern, in a rural commune called Snada, located at 45 km from the city of Al-Hoceima, and 10 km from the Mediterranean coast. The experiment started by planting the tree in 2007, and led in 2012 to fruiting bodies containing argan oil similar to that known in the Agadir region. It is therefore possible to generalize this experience in Moroccan northern and it will be a way to contribute to sustainable development of this region, which is very famous by the illicit cultivation of cannabis.

**Keywords:** argan tree, argan oil, sustainable development, Moroccan northern.

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### INTRODUCTION

The argan tree, *Argania spinosa*, belongs to a tropical family, those of Sapotaceae, which includes about 10 genera and 600 species. This is a Moroccan endemic, with longevity of more than 300 years. The Argan tree grows in a semi-arid Mediterranean bioclimate with oceanic influence, on the Safi coastal strip in Agadir, of Jbel Siroua and of the Anti-Atlas. The arid zone, strongly tinged with oceanic influence (Temperate variant) covers the largest part of the region of the argan tree, more than 800,000 ha.

The optimum rainfall of the argan tree is 250 mm; while its thermal limit coincides with the isotherm 3 °C in January. However, these rainfall amounts are offset by the mild climate and relatively high humidity due to the climatic influence of the Atlantic Ocean. For cons, the argan tree is indifferent to the lithological nature of the soil; it can grow on various soils.

The different types physiognomic and ecological of Arganeraies existing, fall within of the floor infra-Mediterranean which does not meet to a thermal criteria, but rather to vegetation criteria. Its value is essentially biogeographic [1].

The argan tree repartition at the north-eastern Morocco, is much more complex than would have foreshadowed a simple examination of Morocco's vegetation map published by Emberger (1939), which indicates the presence of argan tree only at the foothills of Beni Snassen (Jbel Takermine) [2].

The argan tree, tree specifically Moroccan, endemic to south-west, classified by UNESCO in 1998 "International Cultural Heritage of Humanity" is also present in the province of Berkane, more exactly in the rural commune of Chouihia, extending over a provincial area of about 300 hectares and with nearly 1,000 trees in good state of vegetation. The existence of this mythical tree is a priceless ecological wealth, and constitute for the province of Berkane, in addition to a tourist attraction, an undeniable economic opportunity.

In this study we present a successful experience of the introduction of the argan tree in the rural commune of Snada, more exactly in the peripheral zone at National Park of Al Hoceima (NPAH). This work opens future horizons for the development of the region, and prospects for planting argan tree at large scale in the Rif.

## EXPERIMENTAL SECTION

### 2-1 Planting:

In 2007, 70 young plants (having two years old; in soil clods), from the greenhouse of the Faculty of Sciences of Oujda, were installed in a farm on the flanks of a hill north of the coastal road, in the municipality of Snada (Al Hoceima province) located 10 km from the Mediterranean coast (Fig.1,2,3). The analysis of some samples of the soil of the region, carried out in the laboratory of Soil Science of the Faculty of Sciences of Oujda, revealed that the soil has a sandy-loamy texture with a lower size to 40  $\mu$ m, an average content of active lime of 15.5%, a very high phosphorus content (25-55 ppm), a very high potassium content (770-1090 ppm), in addition that it is non-salin (0.25 mmhos / cm), slightly basic (pH = 8.3) and contains very little organic matter (1.5%) (Fig. 4).

Planting was done in a simple hole without any special treatment or irrigation.

The climate of the province of Al Hoceima, which includes the rural district of Snada (Fig.3) is Mediterranean, it is characterized by rainy and cool winters and dry, hot summers, temperatures vary between 10 °C and 30 °C.

Average annual rainfall is 300 mm on the coast and 1000 mm in the highest elevations.

Climate is, by its effects, an important physical constraint that adds to the effect of terrain.

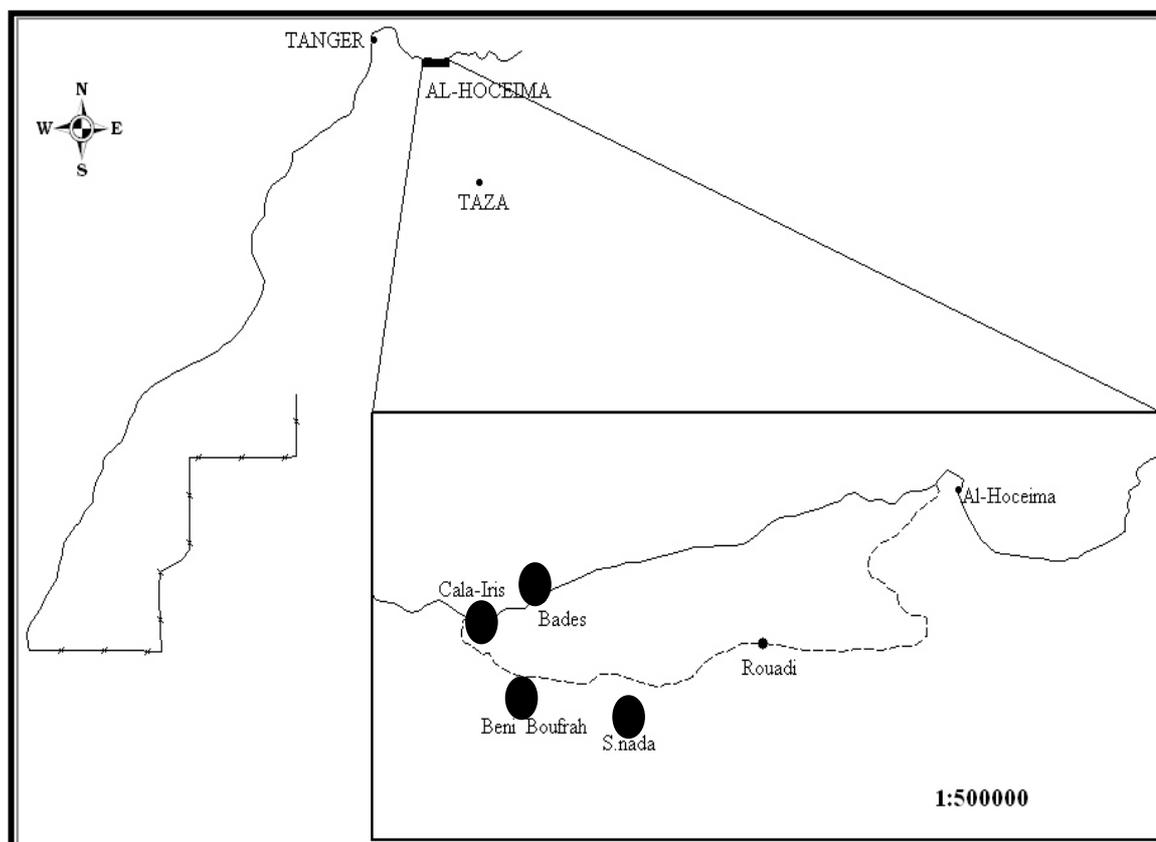
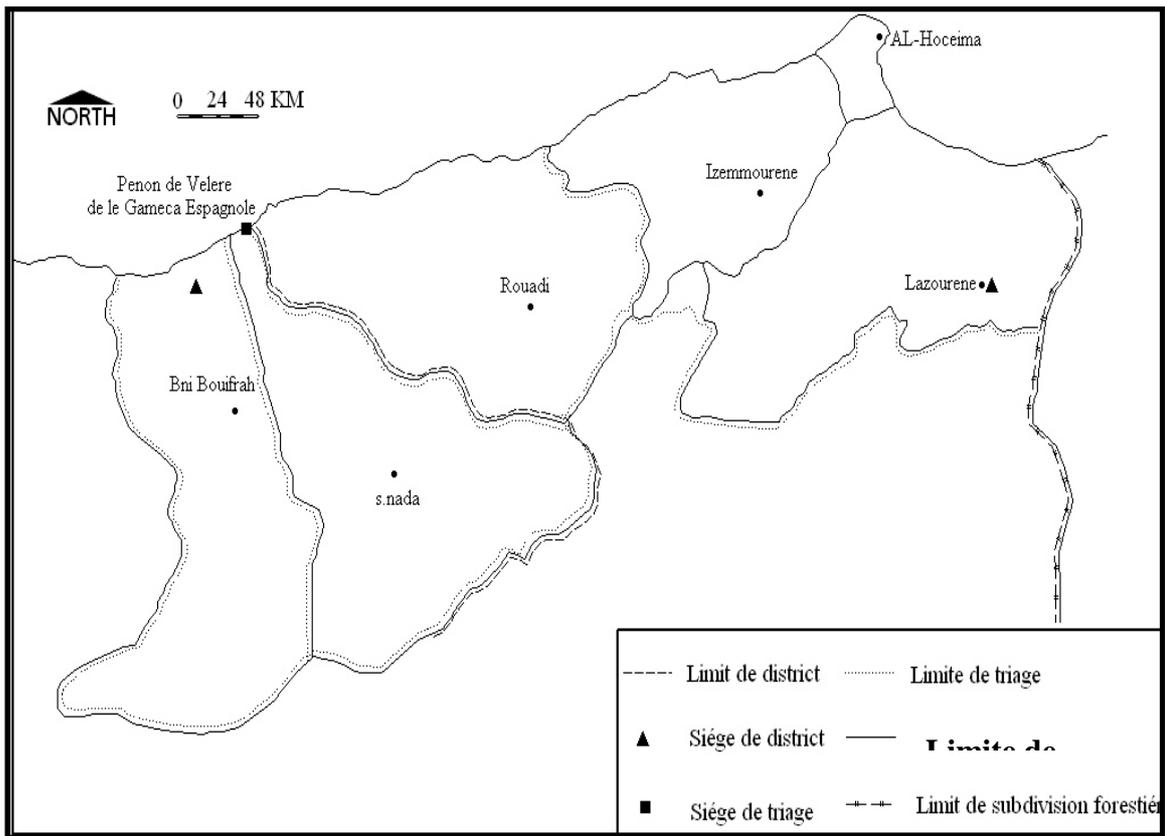
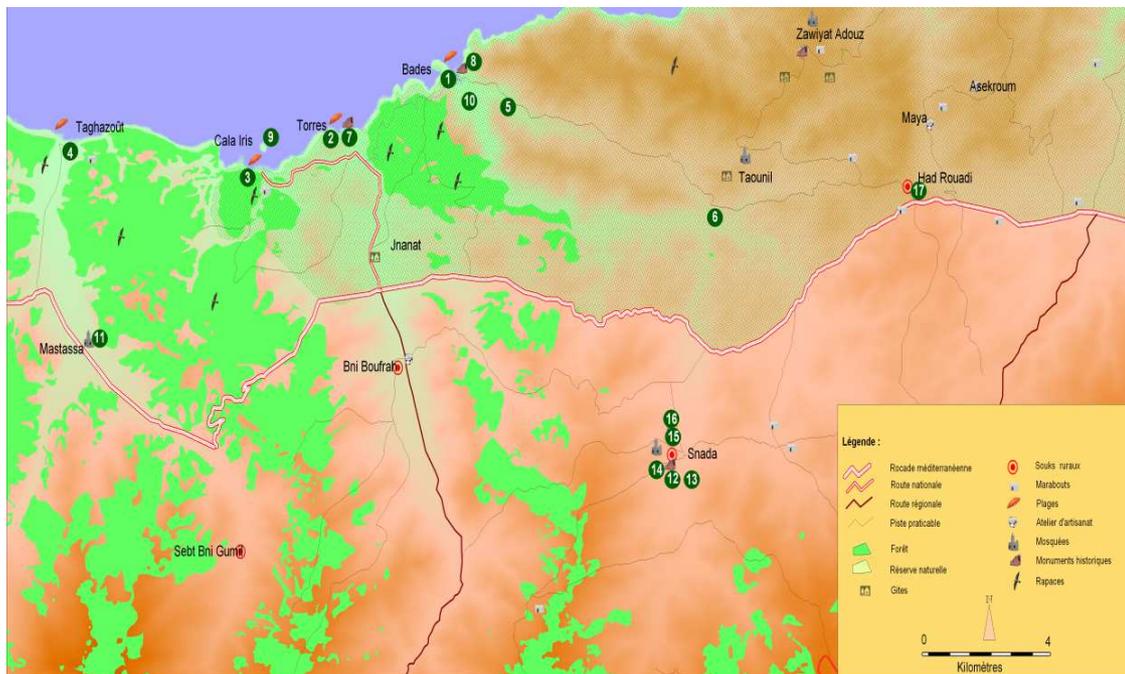


Fig. 1: Location of study's stations at level of NPAH



**Fig.2: The place of our work (City Snada)**



**Fig.3: The climate of the city Snada**

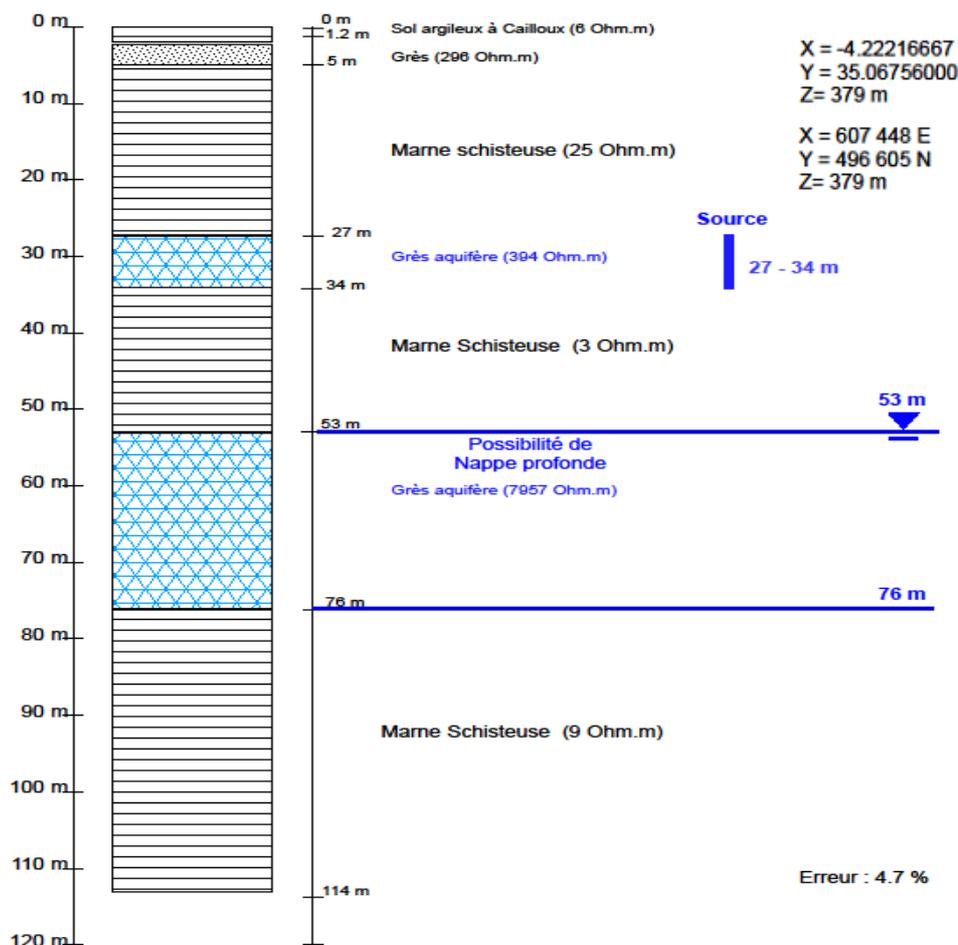


Figure 4: Geological and hydrogeological interpretation of the planting site

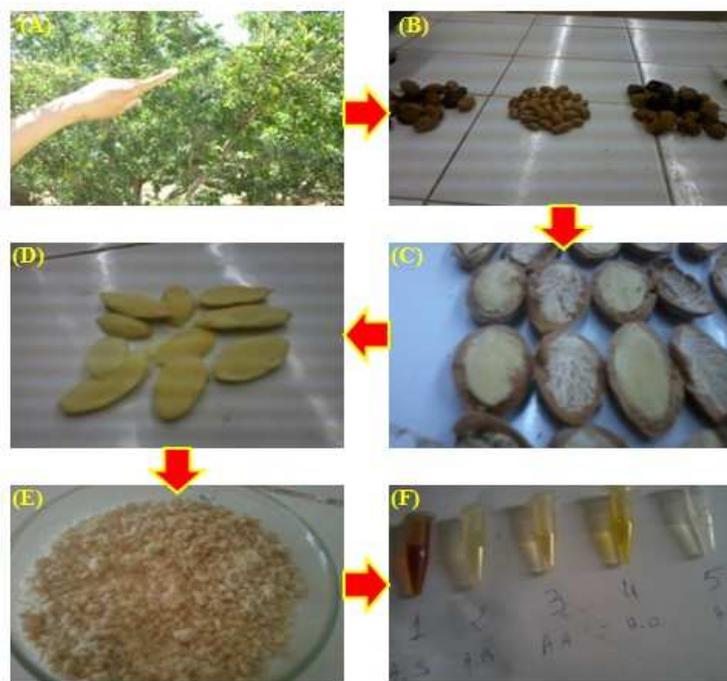


Figure 5: Different stages of the extraction process of argan oil. A : Tree; B: Fruit; C: Nucleus; D: Almonds; E: Almond powder; F: Extraction of oils; 1 : Rif argan oil chemically extracted in the laboratory; 2 : Berkane argan oil mechanically extracted at workshop; 3 : Agadir argan Oil extracted traditionally for food.

2-2 Determination of yield fruit:

The first fructification was obtained after 5 years. In 2013, the grains of the second fructification were recovered, peeled and then broken to obtain the yield of almonds (Fig. 5).

2-3 Determination of argan oil:

The figure 5 shows the different stages of the extraction process of argan oil. Thus, we have crushed a few grams of almonds that we have homogenized by Ultra Turrax, and then we have used a Soxhlet extractor with hexane like solvent.

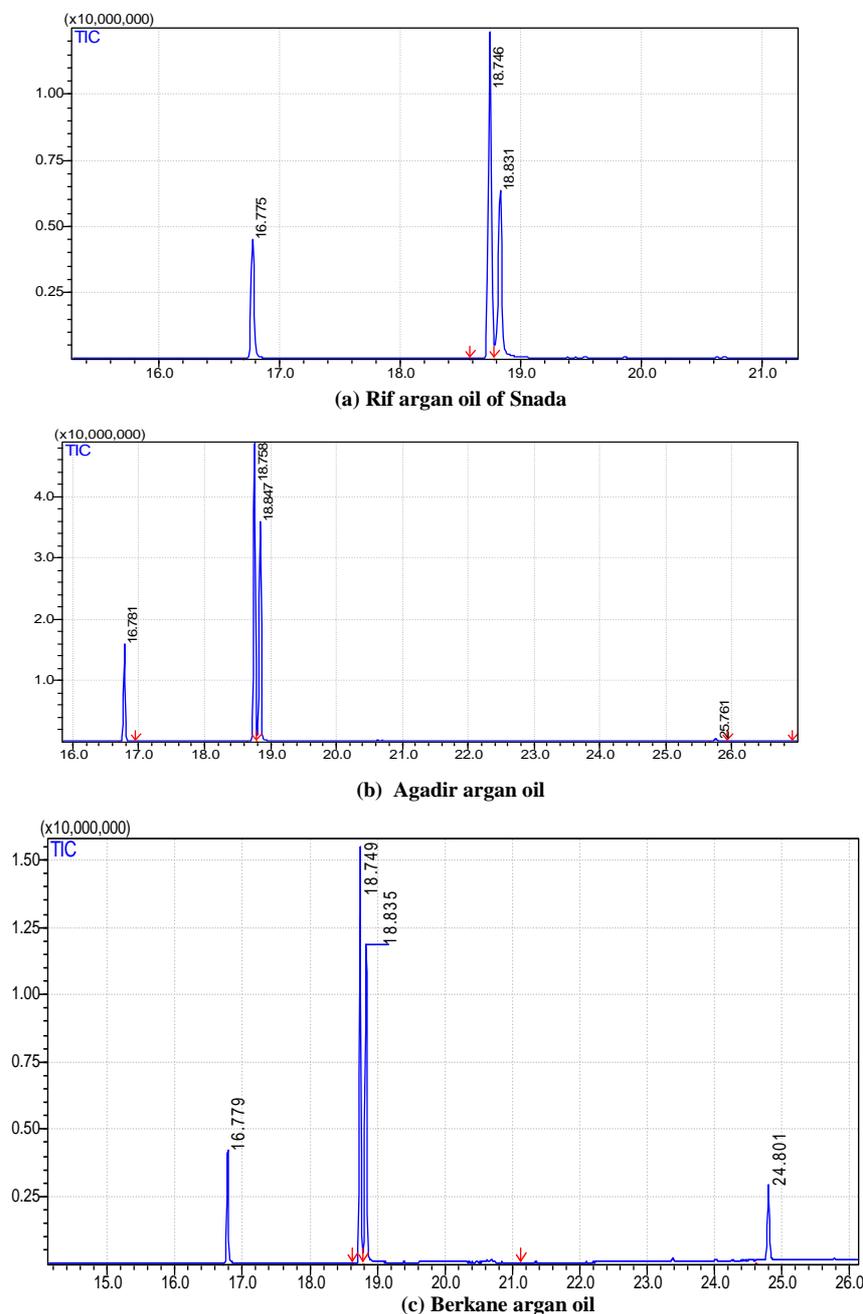


Figure 6 : Chromatograms of different oils, (a) Rif argan oil of Snada; (b) Agadir argan oil. (c) Berkane argan oil.

**RESULTS AND DISCUSSION**

3-1 Chromatographic profile of the oil:

A chromatographic analysis of rif's argan oil was performed and compared to those of Berkane and Agadir. This study was done in gas coupled to mass spectrometry (Shimadzu QP 2010) on capillary column DB 5 of length 30 m, internal diameter 0.25mm and film thickness of 0.25µm, with the following temperature program :  $T_i = 80\text{ }^\circ\text{C}$  (2

min), temperature range: 10 ° C / min, Tm = 300 ° C (5 min). Helium was used as carrier gas. The figure 6 shows the chromatographic profile of argan oil from the 3 regions, and table 1 compares their various components.

**Table 1: Comparison of argan oil from different regions (Agadir, Berkane and Snada)**

Origin of oil	Percentage of palmitic acid (%)	Percentage of 8-Octadecenoic acid, methyl ester (%)	Percentage of 8,11-Octadecadienoic acid, methyl ester (%)	Percentage of All-trans-Squalene (%)
Agadir	16.958	18.792	26.925	25.933
Berkane	18.633	18.792	21.117	29.867
Snada	18.583	18.783	26.900	00

### 3-2 Argan oil yield:

Table 2 summarizes yield of different steps. The oil yield is relatively high compared with almonds (40%) but low compared to the original fruit (1.8%). Note, however, that these findings relate to a chemical extraction in the laboratory under optimal conditions. The yield of oil, extracted by artisanal method, is rather in the order of 1.1% to 1.5% compared to weight of fresh fruit [2].

**Table 2 : Argan oil yield**

Samples	Mass (g)	Percentage (%)
Gross fruit	1000	100
Envelope	449	40
Nucleus	502	50
Almonds	47	10
<b>Almonds</b>	<b>10</b>	<b>100</b>
<b>Oil</b>	<b>3,9</b>	<b>40</b>

### 3-3 Chemical characteristics of different oils:

The last peak obtained in argan oil of Berkane and Agadir, extracted with the traditional method, is absent of that of Snada extracted chemically in the laboratory. So the extraction method changes the composition, which deserves to be studied with more precision.

## CONCLUSION

The results show clearly that the introduction of the argan tree in Snada region (province of Al Hoceima) give a very similar oil to those obtained in Berkane and Agadir, the difference and thus the quality depend only on the method of extraction, subject that deserves to be studied and optimized to perform better in quantity and quality.

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