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Compositional and Morphological Characteristics of the Tissues of Three Common Dates Grown in Algeria

H. Amellal-Chibane, Y. Noui, A. Djouab, S. Benamara

Abstract*—Mech-Degla*, *Degla-Beida* and *Frezza* are the date (*Phoenix dactylifera* L.) common varieties with a more or less good availability and feeble trade value. Some morphologic and physicochemical factors were determined. Results show that the whole date weight is significantly different (P= 95%) concerning *Mech-Degla* and *Degla-Beida* which are more commercialized than *Frezza* whereas the pulp mass proportion in relation to whole fruits is highest for *Frezza* (88.28%). Moreover, there is a large variability concerning the weights and densities of constitutive tissues in each variety. The white tissue is dominant in Mech-Degla in opposite to the two other varieties. The variance analyze showed that the difference in weights between brown and white tissues is significant (P = 95%) for all studied varieties. Some other morphologic and chemical proprieties of the whole pulps and their two constitutive parts (brown or pigmented and white) are also investigated. The predominance of phenolics in *Mech-Degla* (4.01g/100g, w.b) and *Frezza* (4.96 g/100g, w.b) pulps brown part is the main result revealed in this study.

***Keywords*—**Common dates, phenolics, sugars, tissues.

I. Introduction

EVERY year, Algeria produces 60000 tons of date (*Phoenix dactylifera*) common varieties as *Mech-Degla*, *Degla –Beida* and *Freeza* having moreover a low trade value [1]. Outside of *Deglet-Nour* variety which is exported and highly appreciated by all consumers, the others are more or less commercialized locally when they are not used as livestock food. Consequently, more cultivars risk disappearing what presents a danger for the biodiversity.

Knowledge of the physicochemical characteristics of common varieties permits to show their technologic ability as well as their nutritional value. This last is of uneven interest since the fruit constitutes the most important part of the ration for persons in Algeria's Sahara like moreover in further countries [2], [3]. Concerning the whole date pulps, in addition to the fact that published physicochemical composition is spreader throughout the literature; many criterions have been introduced in order to compare different commercial varieties [4], [5]. In return we have not found any comparative study about their constitutive tissues. For one thing, this problematic is very important when we seek to product a fruit powder and other technologic process including the heat and/or mass transfers. Indeed, two fundamental types of pulp can be noticed easily: white and brown.

H. Amellal-Chibane is with the Laboratory of Soft Technologies, Valorization, Physicochemical of Biological Materials and Biodiversity, Faculty of Sciences, University M'hamed Bougara of Boumerdès, 35000, Algeria (Phone: +772966400 e-mail: Chibane_hayet@yahoo.fr).

Obviously both tissues, brown and white behave differently during different technologic treatments as drying and the product color risk to prove heterogeneous according as the relative content of previously differentiated both tissues are identical or unlike.

We wish to indicate that some results about the whole date are showed in previous paper [6]

II. Materials and Methods

The vegetal material (*Mech-Degla*, *Degla-Beida* and *Freeza)* is collected in the region of Biskra in southern Algeria during the autumn of 2006 (Figs. 1-3). The dates were stored at 6°C.

The sizes and weights of different parts of the fruit (whole date and pulp) were determined from set of ten dates whereas the densities have been deducted from a set of twenty samples.

To evaluate the densities of different edible parts of pulps (brown or pigmented and white parts), these lasts are cut in parallelepiped form, rending easy the calculations.

For chemical analysis, a homogeneous sample was prepared after petting and grinding; tests were realized in triplicate except phenolics (one determination).

The sugars were analyses (for only Mech-Degla) by HPLC (apparatus type Shimadzu) method according to [7].

The total phenolics were analyzed according to the methods described by [8].

The mineral composition has been measured using atomic absorption spectrometry (apparatus type SOLAAR, 969AA) (NF V05-113, 1972) after mineralization at 600°C and dissolution in hydrochloride acid solution.

III. Results and Discussion

A. Morphologic Characteristics

Results from morphological analysis of the date fruits are listed in Table I.

The highest date weight was found for *Degla–Beida* followed by *Mech-Degla* and then *Frezza*. Significant difference (P = 95%) existed in date weight between *Degla-Beida* and *Mech-Degla* varieties. In addition, this criterion is higher than that found for *Kentichi* variety (≈ 5g) but feebler comparatively to the *Deglet-Nour* (10,8g), both last varieties being grown in Tunisia [3].

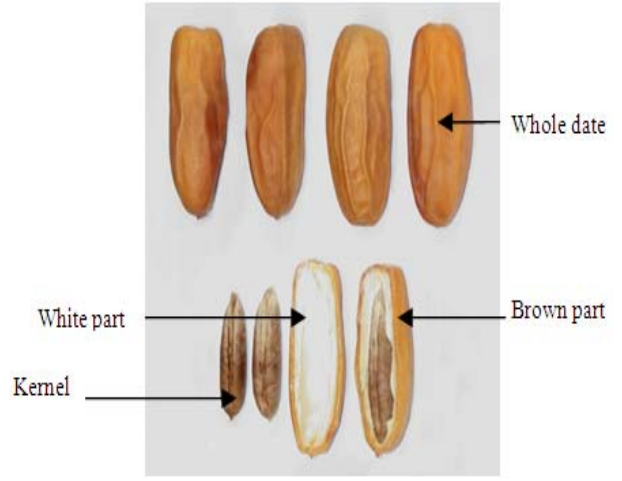

Fig. 1 *Mech-Degla* whole pulp date and its two parts

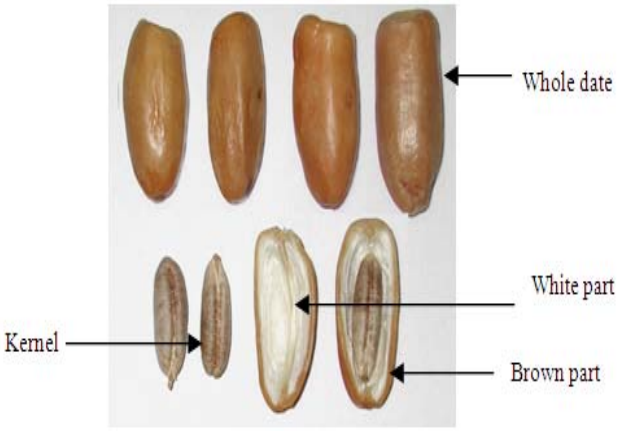

Fig. 2 *Degla*-Beida whole pulp date and its two parts

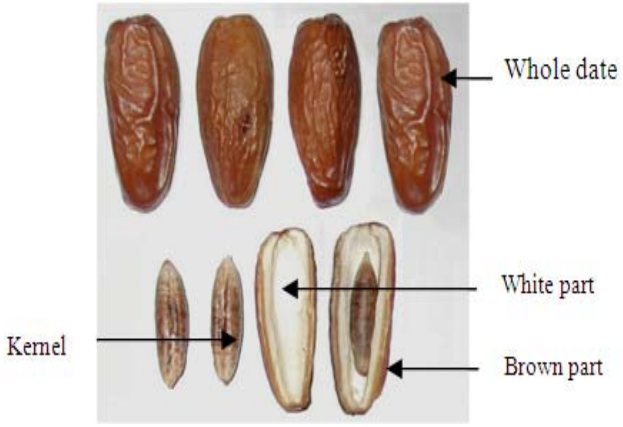

Fig. 3 *Freeza* whole pulp date and its two parts

TABLE I
MORPHOLOGICAL CHARACTERISTICS OF THE THREE DATE COMMON VARIETIES

Parameters	Mean values		
	Mech-Degla	Degla-Beida	Frezza
whole date weight (g)	6.16 ± 0.89	7.10±0.76	6.06±0.85
whole pulp weight(g)	5.10 ± 0.81	5.62±0.77	5.35±0.77
Specific weight of the pulp brown part (g/cm^3)	1.358± 0.38	1.43±0.253	1.328±0.1
Specific weight of the pulp white part (g/cm^3)	1.231± 0.025	1.012±0.23	1.072±0.2
Pulp/whole date ratio (w/w) (%)	82.77	79.15	88.28

The pulp mass proportion in relation to whole fruits is also highest for *Frezza* (88.28%) but this value is lower than that is found (94%) for varieties of Saudi Arabia [9], [10]. Moreover, there is a large variability concerning the weights and densities of constitutive tissues in each variety. Fig. 4 visualizes the mass proportions of these two tissues for the three varieties. As it can be seen the white tissue is dominant in Mech-Degla in opposite to the two other varieties. The variance analyze showed that the difference in weights between brown and white tissues is significant (P = 95%) for all studied varieties. This criterion has not any implication having in mind only the consummating strict aspect of the whole fruits. It is, in return, of very importance concerning the transfer phenomena as well as color of fruit powders. Indeed, the density, thickness and surface area are intimately linked for any geometric form. In our case:

Specific weight = Total weight of the sample (constituted of many parallelipepedic pulp pieces)/ total surface X middle thickness

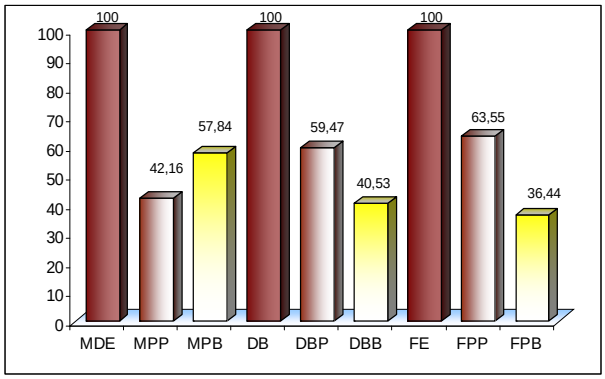

Fig. 4 Mass proportions of different parts constituting the whole pulps of the three date's varieties
MDE = *Mech-Degla* whole pulp; MPP = *Mech-Degla* pulp pigmented part; MPB = *Mech-Degla* pulp white part; DB = *Degla-Beida* whole pulp; DBP = *Degla-Beida* pulp pigmented part; DBB = *Degla-Beida* pulp white part; FE = *Frezza* whole pulp; FPP = *Frezza* pulp pigmented part; FPB = *Frezza* pulp white part

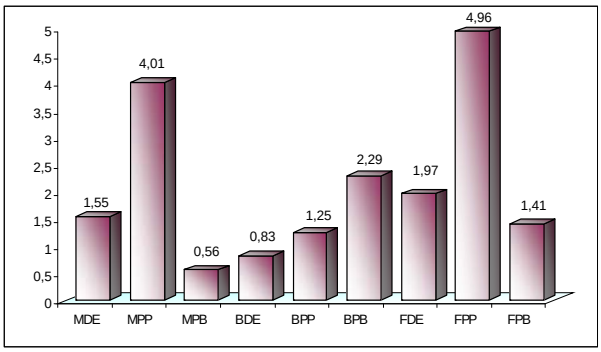

Fig. 5 Phenolics content (%, W.B) of three common dates and their constitutive edible tissues
MDE = *Mech-Degla* whole pulp; MPP = *Mech-Degla* pulp pigmented part; MPB = *Mech-Degla* pulp white part; BDE = *Degla-Beida* whole pulp; BPP = *Degla-Beida* pulp pigmented part; BPB = *Degla-Beida* pulp white part; FDE = *Frezza* whole pulp; FPP = *Frezza* pulp pigmented part; FPB = *Frezza* pulp white part

B. Physicochemical Characteristics of Tissues

The physicochemical composition of the *Mech-Degla*, *Degla-Beida* and *Freeza* pulps is listening in Table II.

It well knows that the phenolics dominate in the fruit peels and they participate to the color formation [11]. Our results seem confirm this noticing concerning particularly *Mech-Degla* and *Frezza* contrarily to *Degla-Beida* (Fig. 5). The literature gives the phenolics content in interval from 2 to 8mg% according to the Algerian varieties [12]. The phenolic concentrations of Egyptian varieties *Siwi* and *Amhat* are of 1.8 and 2.35% (W.B) respectively [13]. It must be recalled the important biologic activity (antioxidant) of phenolics [14] what add the value for studied varieties.

The pectin content of investigated in this work material is also conform to the literature: 0.2% for *Degla- Beida* (Algerian dried variety) and 0.3% for *Khudari* variety grown in Saudi Arabia [15].

TABLE II
PHYSICOCHEMICAL CHARACTERISTICS OF *MECH-DEGLA*, DEGLA –*BEIDA* AND *FREEZA* PULPS (S = SACCHAROSE; G = GLUCOSE; F = FRUCTOSE), WB: WET BASIS, DB: DRY BASIS)

	Tot. acid. (% DB)	Nitro-gen(% wB)	Pectin (% DB)	Sugars(% DB) S	G	F
Mech-Degla	0.30±0.01	2.67	0.18	24	29	26
Degla-Beida	2.93±0.063	2.51	0.154		-	
Freeza	4.39±0.02	2.62	0.27		-	

Globally, relating to the quantitative mineral composition in different parts constituting the whole pulps of the three date's varieties (Table III), we can write the following decreasing sets. Macro elements: K>Ca>Na>Mg (valid for all investigated varieties); microelements: Fe>Zn>Mn>Cu (for *Degla-Beida* and *Frezza*); Zn>Fe>Cu>Mn (for Mech-Degla). The difference in mineral content of the dates must be attributed to the climatic conditions, manure type and variety. It well knows the role of microelements in the activity of more enzymes: Cu is for example a coenzyme in phenoloxydize enzyme, intervening in the oxidation process of phenolics. On the other hand, the dominance of K element is responsible of the cinder alkalinity of fruit date [16]. It must be also recalled the importance of Mg in the sugar assimilation.

TABLE III
MINERAL COMPOSITION OF DIFFERENT PARTS CONSTITUTING THE WHOLE PULPS OF THE THREE DATES VARIETIES (MG/100G OF WET BASIS)

Element	K	Ca	Na	Mg	Fe	Cu
MDE	678	578.9	30.1	2.3	0.99	0.18
MPP	557.9	219.2	1.3	3.1	0.63	0.12
MPB	620.5	250.2	16.2	4.1	0.83	0.17
DB	575	286.2	12.2	2.5	2.74	0.12
DBP	767.5	243.5	1.65	1.2	2.35	0.12
DBB	520	326.8	9.25	2.8	0.78	0.12
FE	610	249.4	15.7	1.8	2.84	0.19
FPP	594.7	222.0	13.9	1.4	1.27	0.02
FPB	530.6	231.5	14.1	1.6	1.87	0.12

MDE = *Mech-Degla* whole pulp; MPP = *Mech-Degla* pulp pigmented part; MPB = *Mech-Degla* pulp white part; DB = *Degla-Beida* whole pulp; DBP = *Degla-Beida* pulp pigmented part; DBB = *Degla-Beida* pulp white part; FE = *Frezza* whole pulp; FPP = *Frezza* pulp pigmented part; FPB = *Frezza* pulp white part

IV. CONCLUSION

Some physicochemical factors were determined in the whole fruits of three common varieties grown in south Algeria: *Mech-Degla*, *Degla-Beida* and *Frezza*. These lasts are different in morphological proprieties and other physicochemical parameters as specific eights of the two constitutive parts of their pulps. The predominance of phenolics in *Mech-Degla* and *Frezza* pulps brown part is also revealed by this study.

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