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Food Value of Soft Dates Cultivated in Tunisian Coastal Oases

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Abstract: Coastal date palm cultivars are interesting through their soft dates, their abundant and earliest production than continental cultivars. Maintaining bio-diversity in Tunisian oases has become a subject of first interest in date palm cultivation in Tunisia. Coastal oases still retain a very rich and varied plant biodiversity in comparison with the continental oases, weakened by the mono cultivation of "Deglet Nour" cultivar. Study of soft date's composition can make there well known to date consumers, help to valorize there and to help of sustainability of coastal oases ecosystem. Fresh dates from 15 cultivars was collected, dried by 80 °C in 20-24 h. Acidity was determinate by pH meter. Sugars were appreciated by enzymatic method. Ash and minerals was calculated by photometer and spectrometer. Chemical date composition study showed that coastal date palm cultivars are predominantly rich of carbohydrates, have a low quantity of sucrose which gives them an important dietary value. Their pH varies from 5 to 6, classifies them as the best date quality for fresh consumption. Their richness in Total Nitrogen Matters and total minerals makes them at almost the same level as the other date palm cultivars analyzed by different authors in different areas of date palm production. Mineral composition showed that these dates are K and P-rich and relatively poor in Na and Ca.

Key words: Dates, coastal oases, Tunisia, chemical composition, sugars, Total Nitrogen, minerals.

1. Introduction

The Tunisian oases cover a total area of 36,000 ha [1]. They are distributed into three geo-topographic: Saharan oases, mountain oases and coastal oases. The first group (i) the saharan continental oasis located in the region of Nefzaoua and Jerid covers a total area of 23,500 ha (i.e. 65% of the Tunisian oases area) and characterized by the dominance of the "Deglet Nour" cultivar; (ii) the mountain oases located in Gafsa (Tameghza, Chebika and El Guettar), covering an area of 4,500 ha (13%), include diverse cultivars with low presence of "Deglet Nour" [1, 2-8]); (iii) the coastal oases are situated on the coastal region of Gabes, cover an area of 7,000 ha (19% of the total oases).

The tradition of the date palm production is very old in the coastal oases together with various fruit trees [9].

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The one cultivar production orientation in the Tunisian Saharan oases perturbed the oases ecosystem [2-7]). The coastal oases have been keeping their rich cultivar for a long time. There are forty five (45) cultivars in these oases [9]. Five cultivars constitute half of the date palm population. The "Kenta" cultivar occupies the first place with 28% of the total. "Bouhattam" and "Rochdi" occupy the second place with 9% each. "Eguiwa" and "Lemsi" come third with 3% each enrolment [1]. Other cultivars represent 50% of the population.

The present paper presents the coastal soft date's composition. Water content, sugars (total and reducing) and proteins were studied in fresh dates. In dry dates ash and minerals was determinate.

2. Materials and Methods

The studied cultivars were the following: "Kenta", "Bouhattam", "Rochdi", "Eguiwa", "Lemsi", "Smiti", "Ksebba", "Garn Ghazel", "Ammari", "Halwai

Abiadh", "Mermella", "Mattata", "Eguiwa", "Korkobbi" and "Ftimi". These cultivars had been the subject of morphological description [10]. Majority of them are soft, have yellow color in "Khalal" stage and consumed in "Khala" or "Rutab" stage. Some are semi dry dates, have yellow red to yellow dark color and consumed in "Tamar" stage (Table 1).

The moisture dates was determined by drying the date flesh under 80 °C temperature for 24 h [6]. Dates acidity was valued in juice dates with a pH meter calibrated at 25 °C to pH 4 and 7.

The sugar content of the dates on glucose, fructose and sucrose was performed by the enzymatic method using "Boehringer Mannheim" kits. This enzymatic method was based on the principle of phosphorylation of simple sugars such as process by the French standard for determining the sugars in fruit [4].

Calcium, sodium and potassium rates were determined by the flame photometer. Phosphorus content was determined by the ultra violet spectrometer at 430 nm.

3. Results and Discussions

3.1 Moisture Content of Dates

The water content in dates (Fig. 1) varies from 56% of the fresh pulp weight of the "Halwai Abiadh" date to 51% for "Korkobbi" to a minimum of 20% of "Smiti" cultivar. Satsitical analysis (Table 3) shows significant difference between cultivars. To conserve dates, it'sconsidered that this rate should not exceed 20% [3, 6, 11, 12]. This is the case for cultivars such as "Smiti". Other cultivars storage can be better made under improved conditions (low temperature).

Table 1 Date palm trees in different regions of Tunisia.

Governorate	Area		Number of trees	
	(ha)	%	Trees	%
Kebili	15,450	43	2,190,072	49
Tozeur	8,000	22	1,575,130	35
Gabes	7,000	19	510,000	11
Gafsa	4,500	13	188,723	4
Medenine	750	2	40,000	0.8
Tataouine	300	1	7,000	1.5
Total	36,000	100	4,510,925	100

Table 2 Studied cultivars in Tunisian costal oases.

Cultivar	Color of "Blah" stage	Stage of consumption
Ammari (AM)	Yellow	Rtob
Bouhattam (BO)	Yellow	Blah
Eguiwa (EG)	Yellow	Tamr
Feliane (FE)	Yellow	Tamr
Ftimi (FT)	Yellow red	Tamr
Garn Ghazel (GG)	Yellow dark	Tamr
Halwai Abiadh (HA)	Yellow	Rtob, Tamr
Kenta (KE)	Yellow	Tamr
Korkobbi (KO)	Yellow	Blah, Rtob
Ksebba (KS)	Yellow	Tamr
Lemsi (LE)	Yellow-red	Blah
Mattata (MA)	Green-yellow	Blah
Mermella (ME)	Yellow	Tamr
Rochdi (RO)	Yellow	Blah
Smiti (SM)	Yellow	Tamr

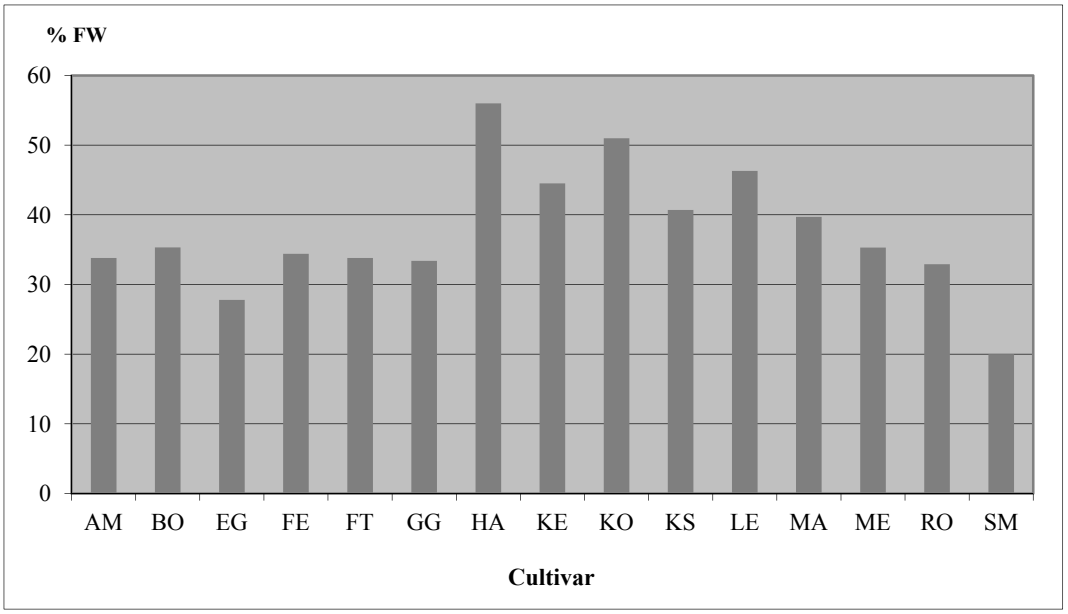

Fig. 1 Water content (moisture) in fresh flesh of dates of different coastal cultivars (% MF).

Table 3 Analysis of variance of the moisture of coastal date cultivars of Tunisian coastal oases.

Cultivar	Groups (1)
HA	56.000a
KO	51.000ab
LE	46.500bc
KE	44.500bc
KS	41.000bcd
MA	40.000bcd
ME	35.500cd
BO	35.500cd
FE	34.500cd
AM	34.000cd
FT	33.500cd
GG	33.000cd
RO	33.000cd
EG	27.950d
SM	20.000e

$P = 0.0001$.

3.2 Sugar Content

Sugar composition of date cultivars on coastal oasis (Fig. 2) shows values ranging from 25% to 66% of fresh flesh by each cultivar. Statistical analysis by ANOVA (Table 4) showed significant difference between cultivars in their content of reducing sugars, sucrose and total sugars. Dates of coastal cultivars, except "Garn Ghazel" have proved to be rather rich compared to "Deglet Nour" sugars. The rate of sugars in the "Deglet Nour" dates is 81% of the pulp weight [2, 3, 13-15]. Relating to the nature of the sugars in the dates, sugars of most cultivars are glucose and fructose, excepting "Garn Ghazel" for which the rate of sucrose is 30% of the total date sugars.

3.3 Acidity of Dates

The degree of acidity in dates (Fig. 3) varies from 4.9 to 6.2. Statistical analysis (Table 5) showed no significant difference between cultivars in acidity of

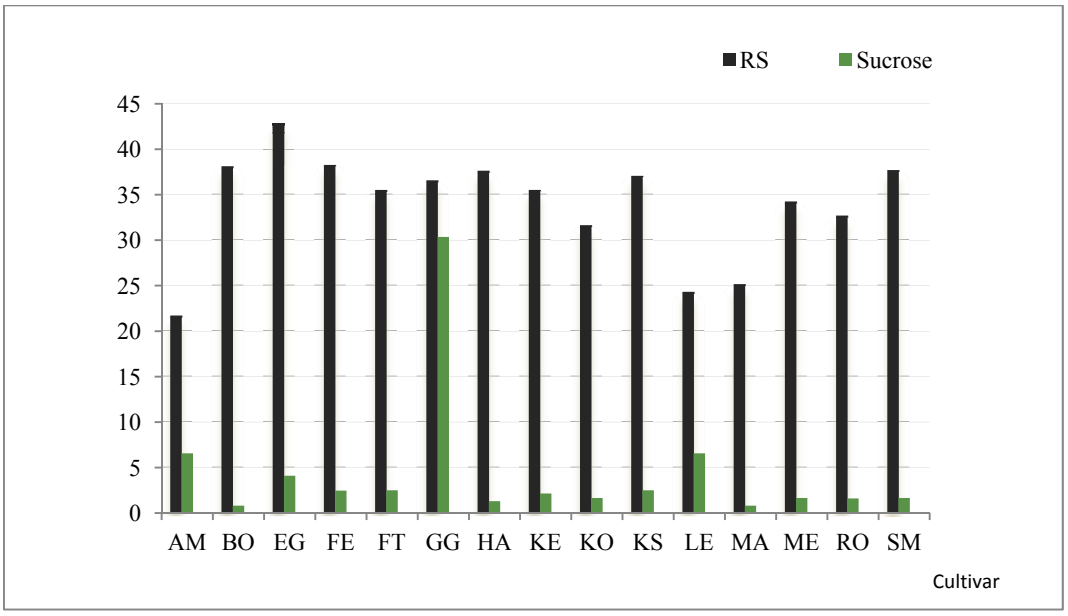

Fig. 2 Composition of reducing sugars (RS) and sucrose (S) in fruits of coastal date cultivars (% FM).

Table 4 *Anova* composition of coastal dates cultivars of sucrose, reducing and total sugars.

Sucrose		Reducing sugars		Total sugars	
Cultivar	Groups	Cultivar	Groups	Cultivar	Groups
GG	30.358a	EG	47.445a	GG	66.858a
AM	6.564b	FE	38.250ab	EG	51.547b
LE	6.564b	BO	38.080ab	FE	40.712bc
EG	4.103c	SM	37.650ab	SM	39.290bc
KS	2.500cd	HA	37.555ab	KS	39.040bc
FT	2.500cd	KS	36.540ab	BO	38.880bc
FE	2.462cd	GG	36.500ab	HA	38.855bc
KE	2.133cd	KE	35.490ab	FT	37.975c
KO	1.641cd	FT	35.475ab	KE	37.623c
ME	1.641cd	ME	34.190ab	ME	35.831c
SM	1.640cd	RO	32.640ab	RO	34.240c
RO	1.600cd	KO	31.595ab	KO	33.236c
HA	1.300cd	MA	25.105b	LE	30.814c
MA	0.800d	LE	24.250b	AM	28.204c
BO	0.800d	AM	21.640b	MA	25.905c

P sucrose = 0.0029.
P reducing sugars = 0.0001.
P total sugars = 0.0001.

dates. The degree of acidity is considered as the criteria of quality [13]. Dates with a low level of acidity are considered of a poor quality. According to many authors [5, 6, 13] pH of dates is generally sited between from 4.5 to 7. Equally it was found that the pH of the "Barhi" of Iraqi origin cultivar is 7.2 [13]. On the other hand, the pH was 4 in the "BesserHelou" cultivar cultivated in the region of Jerid in Tunisia [6]. The pH of among 91 eastern Algerian cultivars was 1.8 for 8 [16].

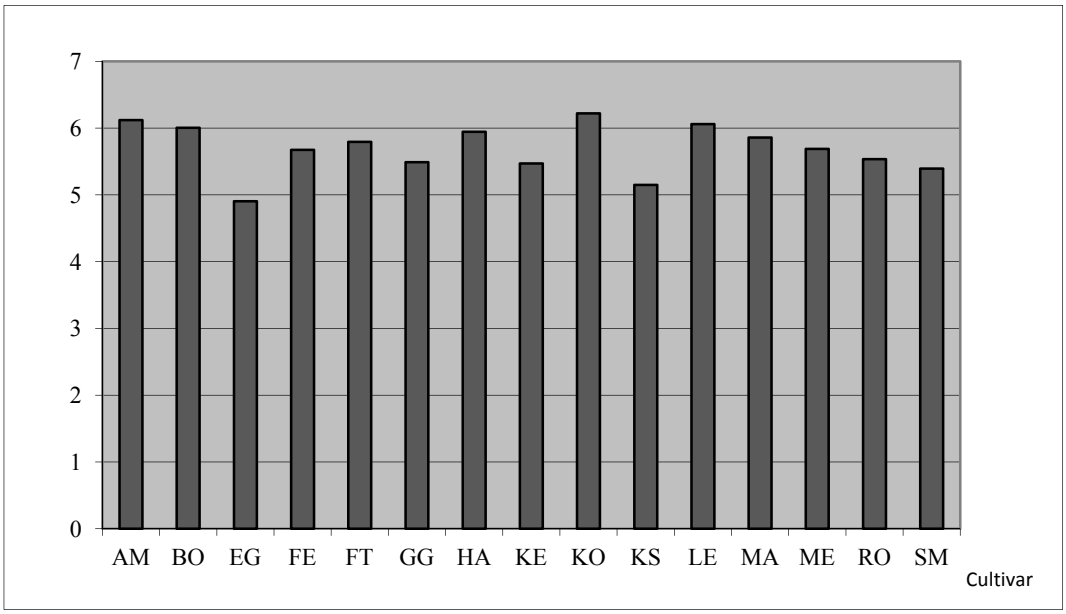

Fig. 3 Date acidity in fruits of coastal date palm cultivars.

Table 5 Analysis of variance of the acidity of the dates of different cultivars of Tunisian coastal oases.

Cultivar	Groups
KO	6.220a
AM	6.120a
LE	6.060a
BO	6.005a
HA	5.900a
MA	5.860a
FT	5.795a
ME	5.690a
FE	5.675a
RO	5.535a
GG	5.490a
KE	5.470a
SM	5.395a
KS	5.150a
EG	4.905a

P = 0.8381.

3.4 Total Nitrogen

The results of coastal date's cultivars (Fig. 4) show rates of Total Nitrogen in date varying from 1 for "Rochdi" to 4% in "Kenta" and "Mattata". Other cultivars are about 2% to 3%. Statistic analysis (Table 6) showed significant difference in the level of 1% between cultivars. Total nitrogenous matter is the total of proteins, amino acids and other nitrogen compounds in dates [17]. It was indicate a rate of 0.98% fresh weight of the date pulp of Moroccan cultivars [5]. A rate of 1.43% of the weight of the Algerian cultivar "Degla" pulp was reported [5]. Many other studies were interested in the rate of proteins in dates as in 12 Sudanese cultivars 2.06% to 4.06% of dry fruit weight [15] and 1.5% to 2% of the dry weight in the Moroccan cultivars [17]. The rate was higher in 6 cultivars cultivated in the United Arab Emirates than those in Kuwait from 1.7% to 5.8% of weight of dry matter [14].

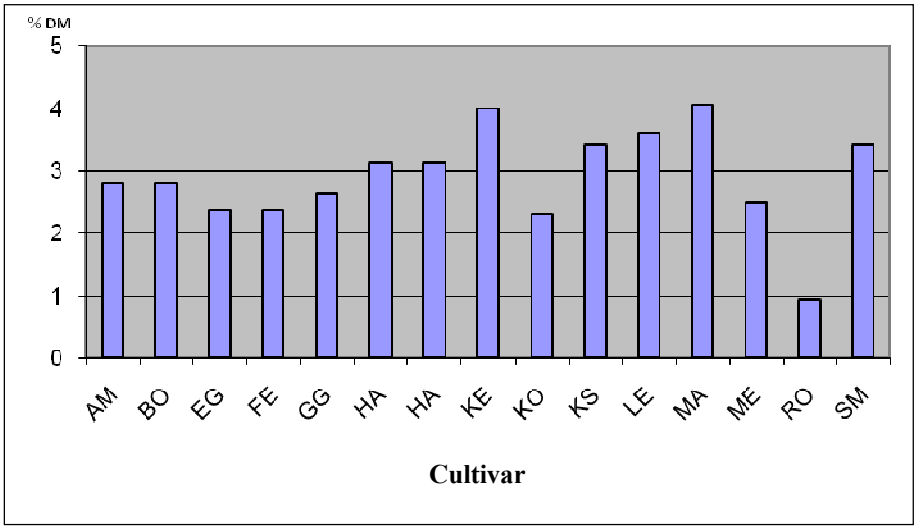

Fig. 4 Total Nitrogen dates palm cultivars in coastal oases in dry matter (% DM).

Table 6 Analysis of variance of Total Nitrogen on the dates of different cultivars of Tunisian coastal oases.

Cultivars	Groups
MA	4.060a
KE	4.000a
LE	3.600ab
SM	3.430ab
KS	3.430ab
HA	3.130ab
GG	3.120ab
AM	2.810ab
BO	2.800ab
FT	2.620b
ME	2.500b
FE	2.370b
EG	2.370b
KO	2.310b
RO	0.930c

P = 0.0001.

3.5 Minerals

The mineral composition of coastal cultivars (Table 7) shows that sodium rate varies from 0.01% of the DM (dry matter) of "Ammari" cultivar up to 0.1%. The highest P in dates levels are 0.85-0.87% for "Smiti" and "Halwai Abiadh" cultivars. The minimum rate is found in "Kenta" (0.20%). "Ksebba" is the richest cultivar in Na. "Ammari" and "Smiti", follow with a rate of 0.97%. As far as Ca is concerned, the maximum rate is 0.7% for the "Rochdi" cultivar. Cultivars which contain the least Ca are "Korkobbi", "Ftimi", "Garn Ghazel", "Ksebba" (0.07% to 0.08%). Statistic analysis showed no significant difference between cultivars. It was reportedthat Algerian dates composition rates of 0.08% of the fresh weight of Ca and 0.02% of P [5]. The mineral composition of "DegletNour" dry flesh dates showed 0.34% of K, 0.10% of P, 0.03% of Ca and 0.09% of Na [13]. In 49 Saudi date palm cultivars [8] and in 4 Iraqi cultivars [18] K went beyond all other minerals. It was also proved the high content of K in the dates of 21 Tunisian cultivars from JeridSaharan oases [6].

Table 7 Mineral composition of coastal dates (% DM).

Cultivar	P	K	Na	Ca
AM	0.77	0.97	0.01	0.20
BO	0.30	0.53	0.06	0.22
EG	0.60	0.85	0.02	0.20
FE	0.75	0.75	0.05	0.20
FT	0.50	0.75	0.05	0.07
GG	0.50	0.67	0.07	0.07
HA	0.85	0.80	0.02	0.10
KE	0.20	0.35	0.09	0.25
KO	0.70	0.60	0.03	0.08
KS	0.65	1.30	0.05	0.07
LE	0.30	0.70	0.08	0.20
MA	0.72	0.75	0.02	0.20
ME	0.40	0.75	0.10	0.52
RO	0.65	0.85	0.05	0.70
SM	0.87	0.97	0.02	0.35

4. Conclusions

The coastal oases are close to the fifth area of the total Tunisian oases and have, for a long time, preserved a rich and varied date palm cultivar biodiversity. Coastal dates are distinguished by their consistency as soft dates. The chemical composition shows that the coastal cultivars are rich of reducing sugars and poor in sucrose. This richness classifies the coastal date as dietary important aliment. Their pH is relatively high, which is appreciate and considered as criteria of quality. The mineral composition shows that the dates are rich on P and K, what qualify that the dates are good aliment.

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