

MORPHOLOGICAL DIVERSITY OF THREE ELITE DATE PALM (*PHOENIX DACTYLIFERA* L.) CULTIVARS GROWN IN SOUTH OF LIBYA

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Abstract: *Characterization of date palm (*Phoenix dactylifera* L.) cultivars is valuable for identification, conservation and breeding programs are one of the most important areas of date palm cultivation in Libya. Three elite date palm cultivars (Taghyat, Tafsert and Talees) grown in the one of the most important areas of date palm cultivation in south Libyan region (Sabha, Ubari and Murziq). These cultivars were investigated through out of fruit physical characters. The obtained results from this study cleared that physical property of date palm fruit were affected significantly by different cultivars and geographical growing regions*

Keywords: *morphological characters, fruit traits, diversity, moisture content and TSS.*

INTRODUCTION

The date palm is considered as one of the main important crops with highly income source and staple food for local populations in arid and semiarid regions, which have played significant roles in the economy, society, and environment of those countries [17], [4].

The date palm is selected for cultivation on the basis of better fruit quality and post-harvest life or the presence of specific location [1]. However it was engaged in the social and economic importance of the south Libyan oasis ecosystem. Libya's date varieties can be divided into three major groups: the fleshy-fruited coastal varieties, the semi-soft varieties from the central zone and the less succulent varieties, from the southern oases. More than 400 different date cultivars are still grown in the country, out of which 95 are of commercial interest [19].

This important crop is threatened by genetic erosion, conversion of agricultural land, pest and diseases. Many studies have highlighted this concern, and used either molecular markers or phenotypic data to classify dissimilar date palm cultivars. The vegetative parameters are informative for description, phenotypic diversity and phylogenetic relationship among date palm ecotypes [11].

Date palm has wide genetic diversity due to a high degree of out breeding [18]. The characterization of germplasm is of great importance for cultivar

identification, conservation, utilization and advancement in fruit crops which is needs a generous set of phenotypic data that are sometimes difficult to measure as a result of sensitivity to the environmental influences or vary with the progressive stages of the plant age [11].

The use of morphological parameters is one of the common methods implemented to identify the date palm variation and level of diversity. Therefore, it has been strongly assumed that traits related to the fruit parameters are useful for date palm characterization [7].

Date palm cultivars are region specific characterized by unique vegetative and reproductive traits. These traits play an important role in characterization of a particular cultivar in respect to its adaptation to a particular agro-ecosystem besides impacting the yield and commercial norms of dates, particularly the studies on characterization of date palm cultivars in Libya are rare [3]. Many studies have highlighted this concern, and used the fruits parameters as informative for description, phenotypic diversity and phylogenetic relationship among date palm [1].

The aim of this study was to apply some of the reproductive traits which are easily recognized to identify the variation and the diversity level of the most famous Libyan date palm cultivars, in addition to investigate the link between geographical areas and the variation of date palm cultivars.

MATERIAL AND METHODS

A total of 54 date palm trees of three famous date palm cultivars (Taghyat, Tafsert and Talees) selected from three locations in southern Libya

Murziq, Ubari and Sabha (Figure 1) consisted of six replicates for each experimental unit, each replicate

consist of 10 fruits. TSS%: The percentage of Total soluble solid was measured by hand refractometer



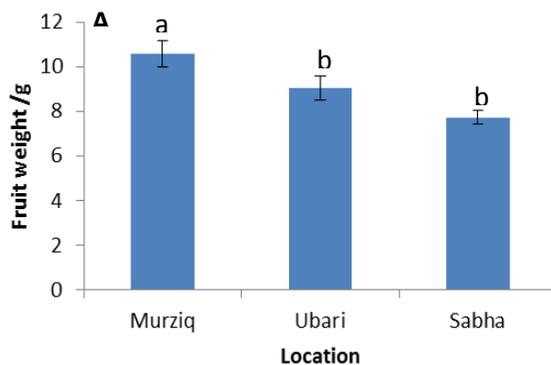
Fig. 1. Locations of date palm samples in south of

The average weight, length, diameter, size, of fruit and stone, in addition to the ratio of fruit pulp to stone weight and total soluble solid brix were determined. Fruit moisture and dry matter contents were calculated as follows:

Fruit moisture (%) = [(average fresh weight – average dry weight)/average fresh weight] x 100 [12]. Data were analyzed with ASSISTAT statistical program Version 7.7 beta, 2016, and means of data were compared with Tukey test at a level of 5% of probability.

Results and discussion

Fruit, weight (g) were shown in (Figure 2A) which was significantly influenced by locations, the highest value for fruit weight was noticed in Murziq



region by 10.18g per fruit, while in Ubari and Sabha region were 9.05 and 7.73 respectively, with no significant difference between both of them. It may seem to be that the source-of-collection base which suggested that there was variation of date palm fruit due to ecological effect. The humidity in southern Libya from July to September at date palm fruit ripening season ranged from 27-33, 26-33 and 29-36 in Sabha, Ubari and Murziq respectively, it may give an explanation that the high fruit weight in Murziq may be due to high humidity, especially when the fruits were collected in Rutab stage which was more moisture in the fruits. [2] classified the dates according to their moisture contents into soft dates which usually possessed moisture content more than 30% and had low sucrose content and this must be eaten fresh. Semi-dry dates which had a moisture content between 20% and 30% and had a low sucrose content and finally dry dates contained less than 20% moisture content and this type of dates require high temperature and sun level for maturation and contained approximately equal quantities of sucrose and reducing sugars.

The same trend of fruit, weight was observed in this respect with fruit size as shown in (Figure 2 B). Likewise in apple fruits the only strong positive correlation found was between fruit size and fruit weight [5], moreover in pomegranate fruit the volume and, fruit weight are closely correlated, accordingly fruit weight can be used as an indicator of fruit size [21].

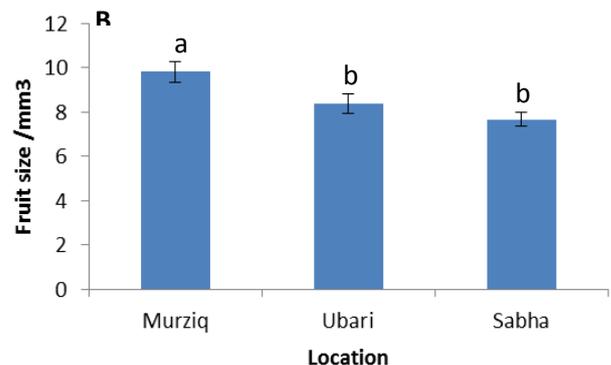


Fig. 2.(A) Fruit weight/g and locations (B) Fruit size/mm³ and locations. Separation of means by Tukey test at the 5% level and means with the same letter are not significantly different.

Fruit, weight (g) were shown in (Figure 3A) which was significantly influenced by genotype, the highest value for fruit weight was noticed in cultivar Taghyat and Talees by 10.18g and 9.76g per fruit respectively, while in Tafsert was 7.42g, indicating the effect of genotype and superior of some cultivar over others. In southern Libya they considering Talees and Taghyat as the top cultivars

(Figure 4), while Tafsert was normal and sometimes in the late season they used as a feed for animals. This result was more than Amhat cultivar (8.5g) and less than Zaghoul cultivar (26.67g) recorded by [20]. The same trend of fruit, weight was observed in this respect with fruit size as shown in (Figure 3 B).

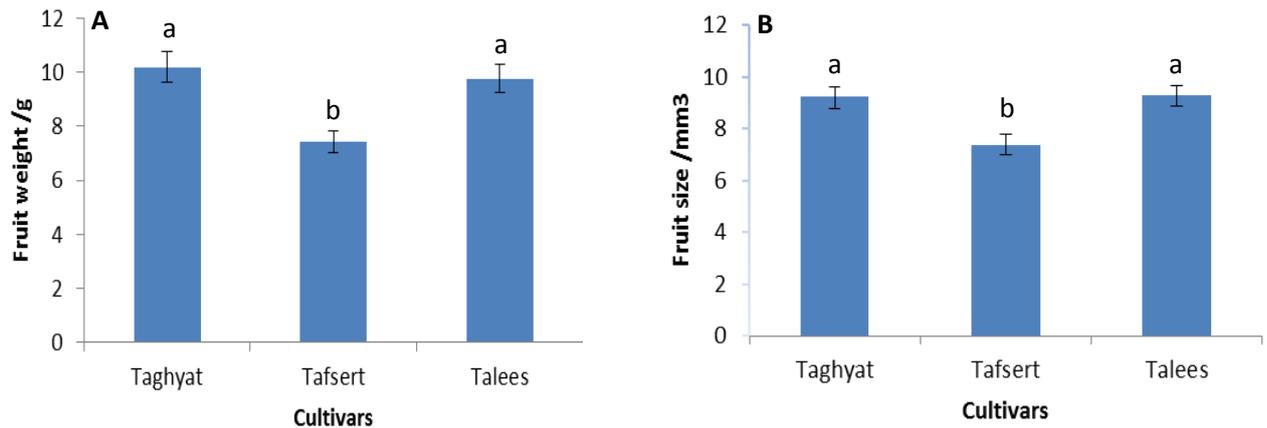


Fig. 3.(A) Fruit weight/g and cultivars (B) Fruit size/mm³and cultivars. Separation of means by Tukey test at the 5% level and means with the same letter are not significantly different.



Fig. 4.Date palm fruits of cultivars grown in southern Libya (Taghyat, Tafsert and Talees).

The location influence was clearly appear in relationships between datepalm fruit characteristics such as fruit length/mm,fruit width/mm,flesh size/mm³and flesh weight/g, it is clear that Murziq region is significantly higher in most fruit physical characters as showed in (Table 1).The results of the present study indicate a slight degree of dependency between the geographical origin and morphological data; it may due to environmental effects such as humidity and temperature or may influence by the type of pollinator used.

The location also influenced fruit moisture content and dry matter as will, the highestfruit moisture content % was recorded inMurziq with 53.42%, furthermore seed moisture content % in Murziq was

also great 22.82%, which was the highest among cultivars, while Sabha region recorded the lowest fruit and seed moisture with 30.25and 12.08% respectively (Table 1).. The moisture content of south Libyan date palm was more than in Egypt ranged between 40.88 % and 46.55 %, as recorded by [14] and 13.8% as noted by [9].The morphological studies of date palm have always been considered difficult to undertake because they require a large set of phenotypic data and because they are varied due to the environment effect [16].

Table 1. Relationships between fruit characteristics in date palm and location. Separation of means by Tukey test at the 5% level and means with the same letter are not significantly different.

	Location		
	Murziq	Ubari	Sabha
Fruit length/mm	37.7 ^a	33.22 ^b	40.18 ^a
Fruit width/mm	24.53 ^a	17.82 ^b	17.94 ^b
Flesh size/mm ³	8.91 ^a	7.55 ^b	6.87 ^b
Flesh weight/g	9.28 ^a	7.85 ^b	6.52 ^b
Fruit moisture content %	53.42 ^a	50.53 ^a	30.25 ^b
Seed moisture content %	22.82 ^a	22.54 ^a	12.08 ^b

Flesh weight/g, flesh size/mm³, seed weight/g, seed size/mm³ and seed long/mm were shown in (Table 2) which was all significantly influenced by genotype, the highest value for Flesh weight/g, flesh size/mm³ was noticed in cultivar Taghyat and Talees, while the lowest recorded in Tafsert. The

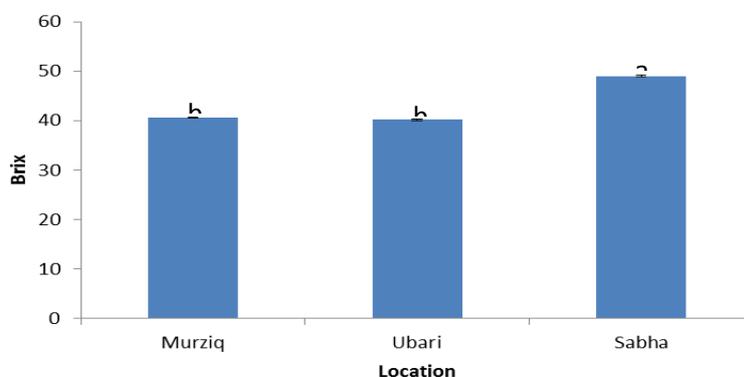
cultivar Taghyat superior over both Talees and Tafsert in seed weight/g, seed size/mm³ and seed long/mm (Table 2). Characters like fruit weight and length, flesh thickness, seed weight and seed length and diameter were of importance in differentiation between the cultivars [6].

Table 2. Relationships between fruit characteristics in date palm and cultivars. Separation of means by Tukey test at the 5% level and means with the same letter are not significantly different.

	Cultivars		
	Taghyat	Tafsert	Talees
Flesh weight/g	8.77 ^a	6.30 ^b	8.57 ^a
Flesh size/mm ³	8.15 ^a	6.62 ^b	8.56 ^a
seed weight/g	1.41 ^a	1.12 ^b	1.19 ^b
Seed size/mm ³	1.07 ^a	0.73 ^b	0.71 ^b
Seed long/mm	26.44 ^a	24.17 ^b	24.87 ^b

Data regarding mean TSS values shows that the date palm grown in Sabha contain TSS value (49) brix as compared to Murziq and Ubari which were 40.67 and 40.17 respectively. [14] tested semi-dry palms revealed that, average T.S.S content ranged between 41.17 % and 57.50 % Freshly harvested dates are said to contain more water and less TSS.

So there was gradual increase in TSS level with ripening. In this respect, [10] recorded that, average total soluble solids content in Khalal stage was ranged between 21.20 and 49.83 %. In Tamer stage, [13], [8] found that, it ranged within 35.80 and 62.97 %.

**Fig. 5.** Total soluble solids TSS of south Libyan date palm fruits in relation to growing location. Separation of means by Tukey test at the 5% level and means with the same letter are not significantly different.

The studied parameters of fruit physical characters in date palm were of a value in differentiation between the cultivars grown in south Libyan, in addition to great importance for the cultivar identification. These properties were varied in its significance in the differentiation between the cultivars. Indeed, a precise description of the phenotypic and genetic diversity of the Libyan gene pool requires a combination of morphological, biochemical, and molecular markers.

CONCLUSION

This study provides baseline information on important date cultivars grown in South Libya. The results show that the geographical locations have influence on the date fruits characteristic such as fruits weight, size, length, width, moisture and TSS, the highest content recorded in Murziq region, on the other hand there were significant differences among the cultivars, Taghyat recorded

Date palm selection by peasants is often based on fruit characteristics. Hence, this study highlighted the relationship between growing location and fruit characteristics which may be genetically related. Vegetative tools are so important in genotype evolution process; they are decisive in date palm cultivar selection and adaptation. This should be backed up by other studies such as molecular ones to provide reliable tools for measuring genetic divergence.

the highest in the fruits weight, size and flesh weight, size in addition to seed weight, size and seed long. It can be concluded that there exists variability among the date palm cultivars studied and further molecular analysis will help to determine the relationship among these cultivars forming the basis to categorize date palm varieties in South of Libya.

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