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MORPHOLOGICAL DIVERSITY OF DATE PALM (*Phoenix dactylifera* L.) IN EGYPT: III- SOFT DATE PALM CULTIVARS

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ABSTRACT

To generate essential information of the identification, description and documentation the agro-biodiversity of soft date palm cultivars in Egypt, taxonomical relationships of twenty one soft date palm cultivars growing in Egypt were addressed based on one hundred and three morphological attributes of trunk, crown, leaves, fruits and seeds. The most important attributes are arranged according to their taxonomic significance. This is followed by a key to the soft date palm cultivars in Egypt. Fruit and seed attributes are still the most important criteria to distinguish among date palm cultivars, but the blade, spine and crown attributes are useful in delimitation some cultivars. Cultivars Zaghloul, Samani, Hayani, Bent Eisha are the most common soft date palm in Egypt. In fact, Traditional soft date palm cultivars affected and consequently threatened by horticultural systems and socioeconomic factors of local community. It is necessary to emphasize that soft-date palm cultivars in fact demand urgent management action to conserve its threatened and unique biodiversity. Positive conservation action may be necessary at the infra-specific level if diversity of date palm cultivars are to be maintained. The active cultivation is vital to survival date palm diversity and a cultivars are soon lost for ever if it is not regularly propagated. Because of the human cultural of local communities have a heritage associated with date palm, The conservation and sustainable utilization of date palm diversity must be considered as a societal enthusiastic.

Keywords: Agro-biodiversity- date palm– morphology- *Phoenix dactylifera*- taxonomy.

INTRODUCTION

Date palms (*Phoenix dactylifera* L., *Phoeniceae*: *Caryhoideae*) were amongst the first crops domesticated in the Old World (Zohary and Speigel – Roy. (1975). The date palm is an ancient plant with great diversity. Palms have been cultivated in the Middle East and North Africa for at lest 5000 years (Zohary and Hopf, 1988). It was much revered and regarded as a symbol of fertility and of horticultural and economic value in Egypt.

Delile (1813), Brown and Bahgat (1938), Täckholm and Drar (1950), Ibrahim and Hajaj (1993) and Amer (2000) classified Egyptian date palm cultivars into three types based on the fruit moisture content namely: dry dates "Tamr", Semi-dry dates "Agwa" and soft dates "Rutab". The differentiation between cultivars in each group was based on many fruit characters, in addition to vegetative characters. Morphological characters can be used successfully for variety identification, source of information of date palm gene bank and for studying the genetic diversity of cultivars.

The number of Egyptian cultivars are variable. Delile (1813) mentioned 26 cultivars, Sickenberger (1901) mentioned 27 cultivars,

Täckholm and Drar (1950) mentioned 40 cultivars, Ibrahim and Hajaj (1993) described 27 cultivars and Amer (2000) describe 14 cultivars.
Recently in Egypt, Rizk *et al.* (2004) identified 21 cultivars of dry dates palm and Rizk and El Sharabasy (2004) described 10 cultivars of semi-dry date palm cultivars.

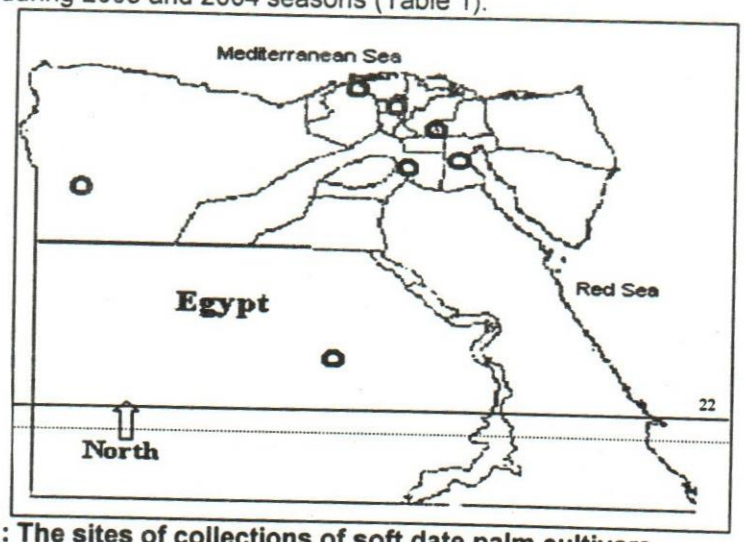
Biodiversity conservation of date palm is vital element in sustaining the various number of date palm cultivars in Egypt. A number of neglected and under utilized cultivars of date palm are expected lost forever and consequently loss of date palm diversity in Egypt if it is not regularly maintain.

To simplified over view framework on the identification, description and documentation the agro-biodiversity of soft date palm cultivars in Egypt, systematical relationships of twenty one soft date palm cultivars growing in Egypt were addressed based on one hundred and three morphological attributes.

It is hoped that the results of the present investigations generate essential information about the status of palms (*in situ*), its utilization and palms under cultivation (*ex situ*). We hope it will find application in the preparation of a future account of the "Biodiversity of Egypt".

MATERIALS AND METHODS

Twenty one soft date palm cultivars were checked *in situ* (Map1), collected and deposited in date palm gene bank of Central Laboratory of Date Palm Research and Development (CLDPRD), Agricultural Research Center, Egypt, during 2003 and 2004 seasons (Table 1).



Map 1: The sites of collections of soft date palm cultivars

One hundred and three attributes of trunk, crown, leaves, fruits and seeds were selected and measured in this study (Table 2). These attributes are included those used by Mason (1915), Brown (1924), Brown and Bahgat (1938), Nixon (1950), Al Baker (1962 and 1972), Ibrahim and Hajaj (1993), Rizk *et al.* (2004) and Rizk and El Sharabasy (2004).

The analysis was carried out for ten randomly select healthy date palm tree at the same old for each cultivar. Leaf attributes were measured and scored as an average of ten well developed mature leaves. Fruit attributes were scored two times: first at the end of khalal stage and the other at full maturation of soft date palm fruit. Sample of one hundred fruits were picked randomly from each cultivar for fruit and seed measurements. The terminology of morphological attributes basically follows Stearn (1973).

The statistical analysis and the relationship between the cultivars were measured by calculating their Euclidean distance and complete linkage method as phenogram using SYSTAT version 7.0 (Wilkinson, 1997).

Table 1: List of soft date palm cultivars and their localities

	Taxa	Sites	Geographic location
1	Oshek Engebel	Siwa Oasis, Azmoro	29° 31' 11" N – 25° 24' 16" E
2	Taktakt	Siwa Oasis, Azmoro	29° 31' 11" N – 25° 24' 16" E
3	Amenzoh	Siwa Oasis, Azmoro	29° 31' 11" N – 25° 24' 16" E
4	Eghrawn Nehloten	Siwa Oasis, Azmoro	29° 23' 17" N – 25° 51' 27" E
5	Azwagh	Siwa Oasis, Azmoro	29° 23' 17" N – 25° 51' 27" E
6	Keabi	Siwa Oasis, Azmoro	29° 23' 17" N – 25° 51' 27" E
7	Samani	Rhasheed	31° 17' 45" N – 30° 14' 36" E
8	El-Falek	El Kharga Oasis, Beer El Boustan	25° 39' 15" N – 30° 34' 11" E
9	Hegazi	El Kharga Oasis, Beer El Boustan	25° 39' 15" N – 30° 34' 11" E
10	Centrawi	El Kharga Oasis, Beer El Boustan	25° 39' 15" N – 30° 34' 11" E
11	Zaghloul	Tanta, Deama, Shiety farm	30° 47' 12" N – 30° 52' 11" E
12	Bent Eisha	El Qureen, El Asdiea Elmoazamea	30° 35' 85" N – 31° 41' 93" E
13	Hayani	El Qureen, El Asdiea Elmoazamea	30° 35' 85" N – 31° 41' 93" E
14	Halawi	Rhasheed	31° 17' 45" N – 30° 14' 36" E
15	Oreebi	Rhasheed	31° 17' 45" N – 30° 14' 36" E
16	Om El-Ferakh	Rhasheed	31° 17' 45" N – 30° 14' 36" E
17	Amhat	Om Khenan, El Hawamdiea	29° 54' 78" N – 31° 14' 89" E
18	Selmi	Sewis	29° 57' 28" N – 32° 30' 30" E
19	Kapoushi	Meet Ghamr, Dondat	30° 42' 12" N – 31° 17' 58" E
20	Sofer El Domin	El Qureen, El Asdiea Elmoazamea	30° 35' 46" N – 31° 41' 46" E
21	Beid El Gamal	Meet Ghamr, Dondat	30° 42' 12" N – 31° 17' 58" E

RESULTS AND DISCUSSIONS

A total of one hundred and three morphological attributes were applied for distinction the soft date palm cultivars in Egypt (Table 2). The fruit and seed characters of the studied soft date palm cultivars are shown in plates 1and2. The most important morphological attributes are arranged according to their systematic value as follow:

1) Fruit shape and dimension (Table2, no. 57:62)

Among the studied soft date palm cultivars, there are seven fruit shapes can be distinguished as follow:

a) Cylindrical: it is stout at all length.
b) Elliptical: the two sides are curved equally from the middle, length: breadth ratio 2:1 to 3:2.
c) Ovate elongate: it is broadest slightly below the middle with length: breadth ratio 2:1.
d) Obovate elongate: it is broadest slightly above the middle with length: breadth ratio 2:1.
e) Falcoid elongate: slightly curved at the middle.
f) Ovate: it's broadest below the middle with length:breadth ratio 3:2.
g) Obovate: it's broadest above the middle with length:breadth ratio 3:2.

Fruit shape at Khalal stage is an important taxonomic criteria to distinguish between date palm cultivars. It is in agreement with Al Baker (1972), Ibrahim and Hajaj (1993), Amer (2000), Rizk *et al.* (2004) and Rizk and El Sharabasy (2004).

Among the soft date palm cultivars in Egypt, Bent Eish is distinguished by oboviate fruits and Kapoushi has elliptical fruits.

The fruit length ranging from 3.3 cm in Taktakt and Azwagh to 6.85 cm in Om El-Ferakh. Among the studied soft date palm cultivars, Keabi recorded the smallest fruit width (1.75cm), smallest fruit volume (7cm^3) and lighter fruit weight (5.4g). A highly positive significant correlation (r=0.80869 , P = 9.1216E-6, Fig.1) between fruit width and fruit weight.

Also a highly positive significant correlation (r=0.89862 , P = 3.1645E-8, Fig.2) between fruit volume and fruit weight.

The larger fruit width (3.35 cm) and larger fruit volume (30 cm^3) was recorded in Samani. A highly positive significant correlation (r= 0.76917, P = 0.00005, Fig.3) was recorded between fruit volume and fruit width. The heavy fruit weight (30g) was recorded in Selmi.

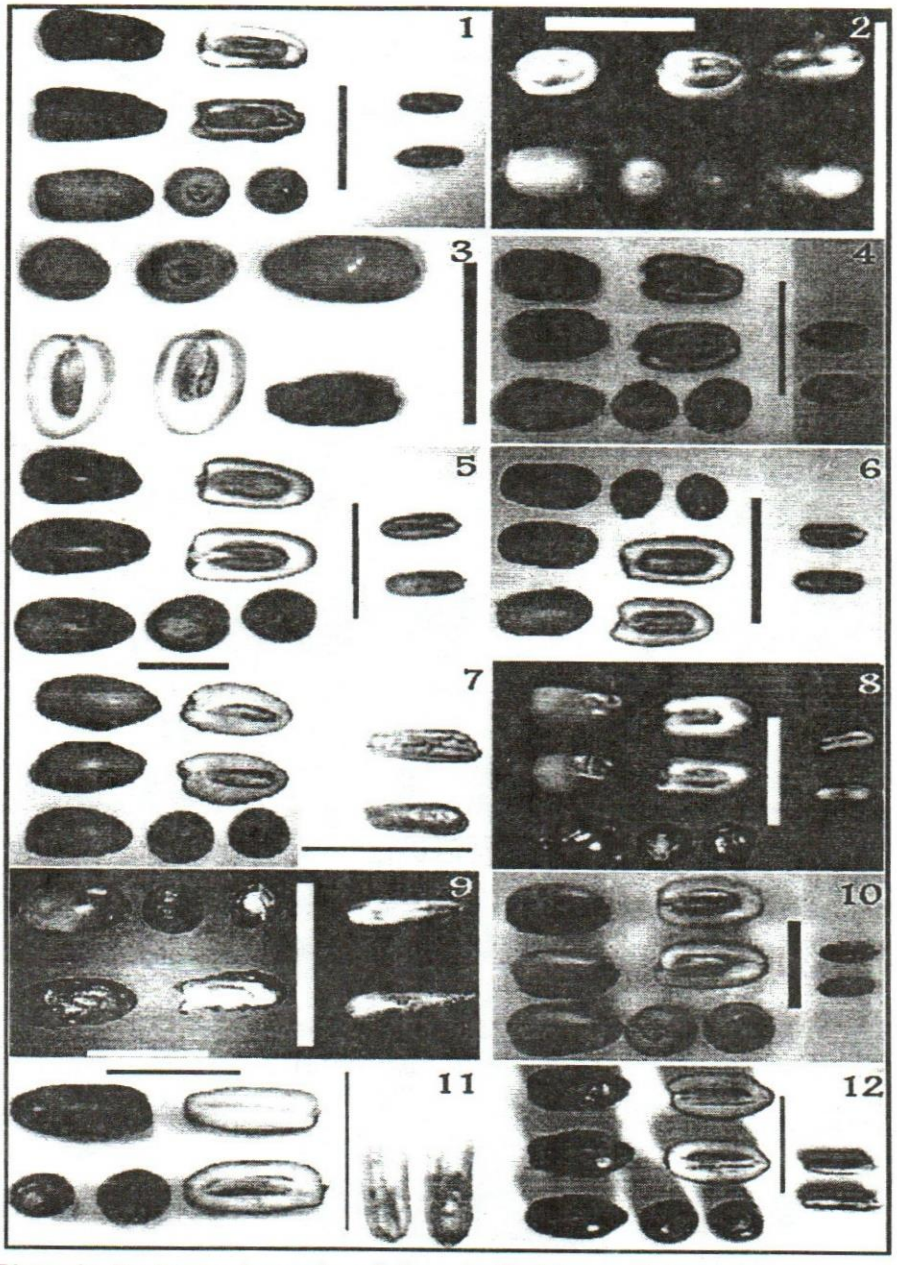


Plate 1: Fruits and seeds of the studied taxa of the soft date palm cultivars in Egypt

1	Oshek Engebel	2	Taktakt	3	Amenzoh
4	Eghrawn Nehloten	5	Azwagh	6	Keabi
7	Samani	8	El-Falek	9	Hegazi
10	Centrawi	11	Zaghloul	12	Bent Eisha

The scale bare equal 5 cm.

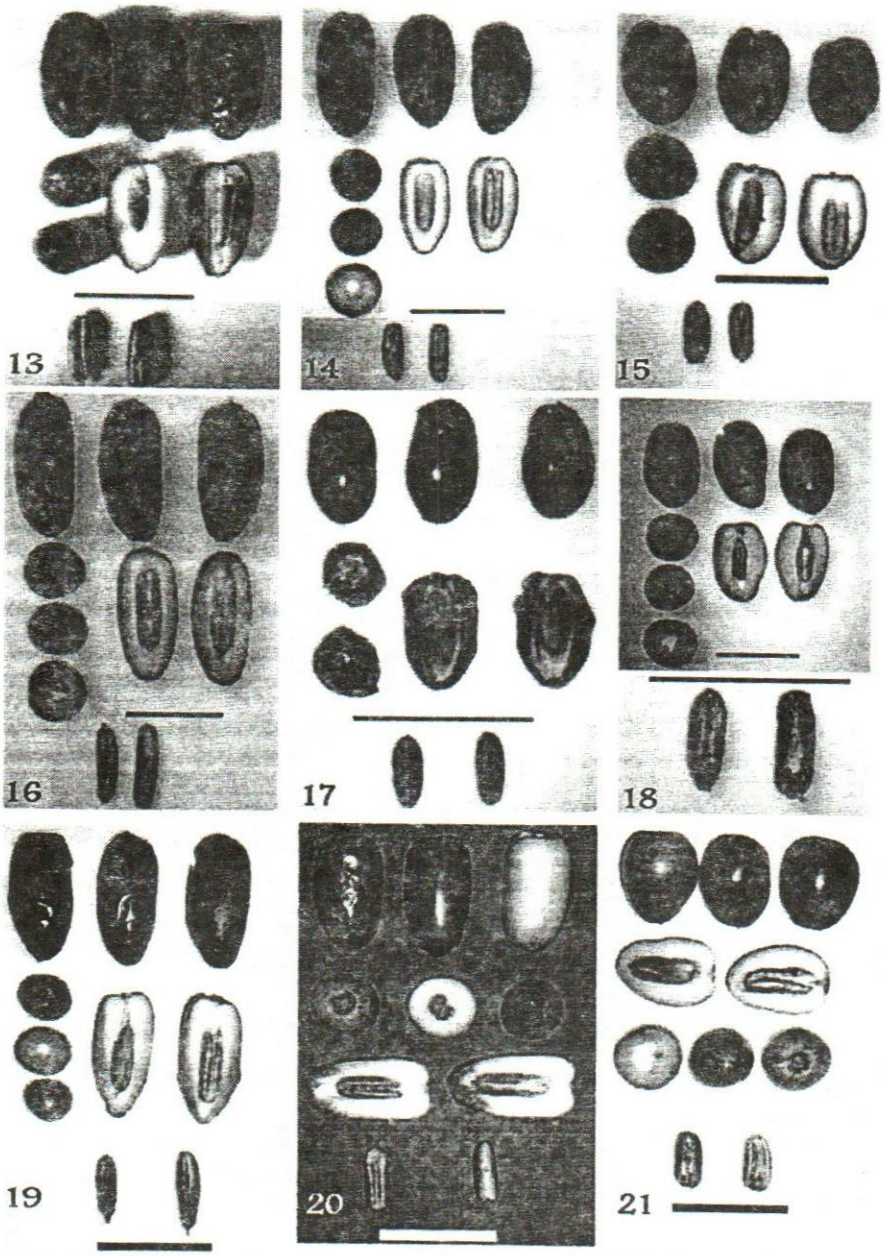


Plate 2: Fruits and seeds of the studied taxa of the soft date palm cultivars in Egypt

12	Hayani	14	Halawi	15	Oreebi
16	Om El-Ferakh	17	Amhat	18	Selmi
19	Kapoushi	20	Sofer El Domin	21	Beid El Gamal

The scale bare equal 5 cm.

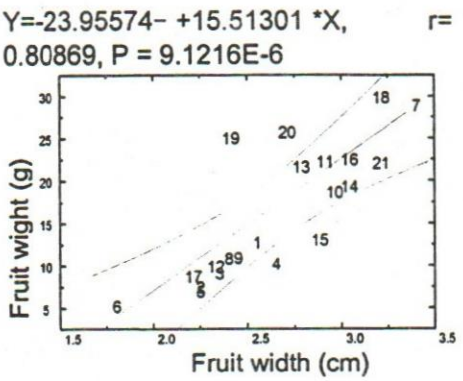


Fig.1 : Regression of fruit width and fruit weight of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

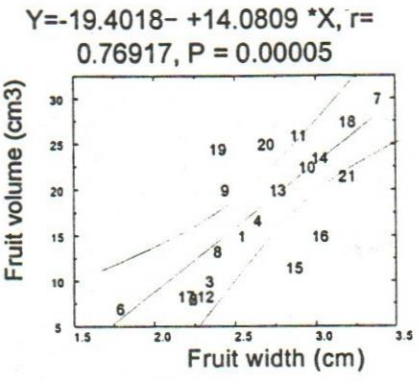


Fig.2 : Regression of fruit width and fruit volume of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

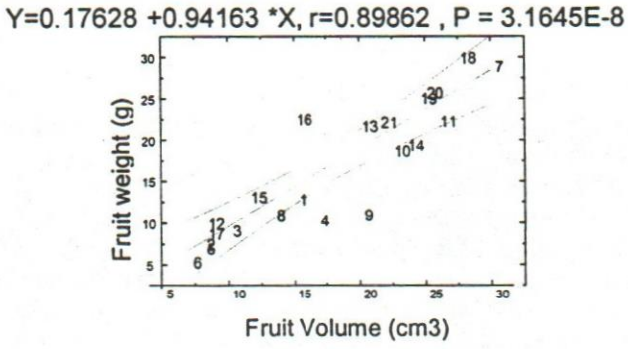


Fig.3 : Regression of fruit volume and fruit weight of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

2) Fruit colour (Table2, No. 65and66)

The evaluation of fruit colour has been done in Khalal and full maturation stages. Six colors are determined in Khalal and eight in maturation stages. In Khalal, they are dark red, shiny red, pale yellow, yellow, yellow-brown and orange. In maturation stage, they are red, dark red, yellow orange mottled pale red, pale brown, brown, brown– red, brownish black and reddish black. Al Baker (1972) mentioned that the fruit colour is the most useful criteria in the differential among date palm cultivars.

Among the soft date palm cultivars in Egypt, at maturity stage Samani is distinguished easily by yellow orange mottled pale red fruit color and Amhat has reddish black fruit color.

3) Fruit apex (Table2, No. 63)

Three types of fruit apex are distinguished in soft date palm cultivars in Egypt viz.: obtuse, blunt and retuse. retuse recorded only in Bent Eisha.

4) Fruit base (Table2, No. 64)

Four types of fruit base are distinguished in soft date palm cultivars in Egypt viz.: obtuse, retuse, truncate and truncate emarginate. Retuse recorded only in Oreebi, truncate emarginated fruit base in Selmi only.

5) Fruit pulp (Table2, No. 80)

The fruit pulp could be divided into three groups according to the turgid of flesh around seed.

a) stout: nearly there is no space between flesh and seed. It is recorded in Keabi, Samani and Bent Eisha.
b) less stout at both ends:It is recorded in Azwagh, Hegazi and Kapoushi.
c) less stout at apex: it is recorded at the rest studied taxa.

6) Flesh texture (Table2, No. 77)

Three categorizes can be determined among the studied cultivars according to flesh texture:

a) fibrous.
b) firm.
c) soft.

7) Fruit skin nature (Table2, No.72)

Two categorizes can be distinguished among the studied cultivars according to fruit skin nature:

d) smooth and united with the flesh.
e) smooth and free from the flesh.

8) Seed shape (Table2, No. 87, 91and92)

Seven shape types can be determined among the studied taxa viz. : Cylindrical, elliptical, elliptical ovate (Oshek Engebel), elliptical obovate (Kapoushi), ovate (Taktakt), obovate (El Falek) and tapering triangular (Hegazi).

Three types of seed apex viz.: obtuse, blunt and retuse. Seed base can be grouped into 5 categories viz.: obtuse, blunt, acuminate, caudate and truncate. Caudate seed base recorded only in Hegazi, while truncate seed base recorded only in Oshek Engebel.

9) Micropyle attributes (Table2, No. 95 and96)

Two characters of seed micropyle are provided to be reliable to distinguish between the stated soft date palm cultivars.

a) micropyle position

Three categories are observed according to the position of micropyle along the long axis of seed.

a. towards the seed apex
b. at the middle of seed
c. towards the seed base

The importance of micropyle position in the differentiation among date palm cultivars was observed by Al Baker (1972), Rizk *et al.* (2004) and Rizk and El Sharabasy (2004).

b) Micropyle elevation

Micropyle elevation could be categorized into three groups:

- superficial
- slightly sunken
- sunken

10) Seed ventral furrow (Table2, No. 98)

The seed ventral furrow can be divided into three groups:

a) Regular.
b) broadest at base
c) broadest at both ends

Al Baker (1972), Amer (2000) and Rizk *et al.* (2004) reported the important of seed ventral furrow in the distinguished among date palm cultivars.

11) Seed / fruit ratio (Table2, No. 89and90)

Volume and weight of seed / fruit ratio are calculated.

Three categories are stated according to the seed / fruit ratio.

d. Low: less than 0.1
e. Medium: between 0.11 – 0.19
f. High: More than 0.2

The most obvious high volume seed / fruit ratio (0.20) is recorded in Azwagh, while the lowest (0.04) is recorded in Halawi and Selmi.

The high weight seed / fruit ratio (0.29) is recorded in Keabi, while the lower (0.04) is recorded in Selmi.

There is a positive significant correlation (r = 0.49723, P= 0.02183, Fig.4) between weight ratio of seed / fruit– volume ratio of seed / fruit.

A highly positive significant correlation (r=0.60338, P=0.0037, Fig.5) was recorded between fruit length and seed length. A positive significant correlation (r=0.40348, P= 0.06971, Fig.6) was recorded between fruit volume and seed volume and (r=0.49723, P= 0.02183, Fig7) was recorded between fruit weight and seed weight. A low significant correlation (r=0.29821, P= 0.18919, Fig.8) was recorded between fruit width and seed width.

Y=1.13618+0.03933*X, r=0.49723, P= 0.02183

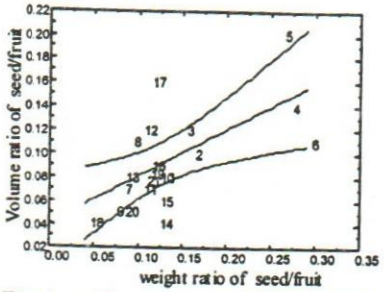


Fig.4 : Regression of weight ratio of seed/fruit and volume ratio of seed/fruit of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

Y=1.5361+0.22595*X, r=0.60338, P=0.0037

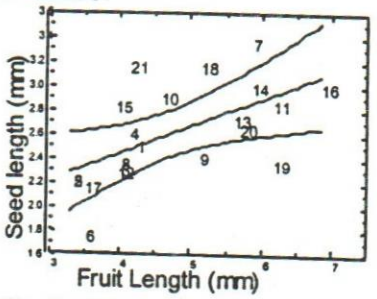


Fig. 5 : Regression of fruit length and seed length of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

Y=0.93863+0.02477*X, r=0.40348, P= 0.06971

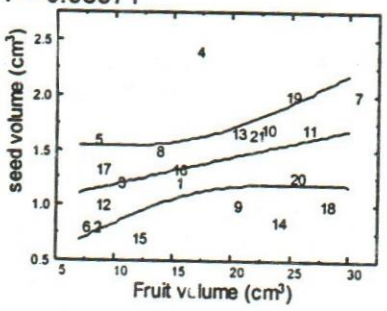


Fig.6 : Regression of fruit volume and seed volume of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

Y=1.13618+0.03933*X, r=0.49723, P= 0.02183

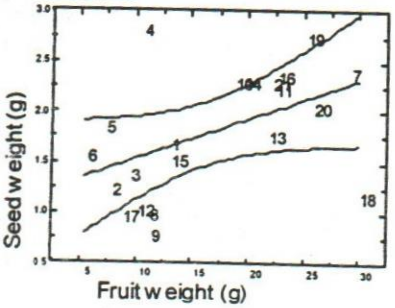


Fig.7: Regression of fruit weight and seed weight of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

Y=0.84343 +0.07157*X, r=0.29821, P= 0.18919

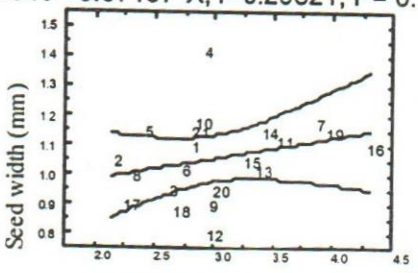


Fig.8 : Regression of fruit width and seed width of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

12) Perianth attributes (Table2, No. 67:70)

Al–Baker (1972) reported the important of perianth colour and shape in distinguished among date palm cultivars.
The colour of perianth differed from yellow, orange – yellow and yellow – pale reddish in the soft date palm studied cultivars.
Perianth apex can be divided into two groups as follow:
a) Rounded
b) Truncate

13) Leaf length (Table2, No. 4)

The leaf length ranged from 310 to 570 cm in the different soft date palm studied cultivars.

The leaves could be divided into 3 groups according to Ahmed *et al.* (1979) as follow:
1. short: less than 325 cm.
2. medium: from 325 – 425 cm.
3. long: more than 425 cm.

Eghrawn Nehloten cultivar is recorded of the small group. Hegazi, Om El-Ferakh, Sofer El Domin and Beid El Gamal are recorded of the medium group, while the rest of cultivars are of long group. In his study on date palm cultivars, Abdalla (1986) mentioned that mature leaves of palms varied according to cultivars. There is a highly positive significant correlation ($r=0.84094$, $P \leq 0.001$, Fig. 9) between leaf length and blade length.

$$Y=19.44446 +0.68564 *X, r=0.84094 , P \leq 0.001$$

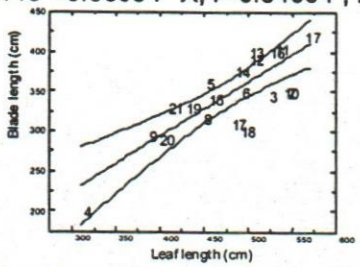


Fig.9 : Regression of leaf length and blade length of the studied taxa of soft date palm cultivars of Egypt, For taxa name see Table 1.

A comparison of leaf part ratio (spine, petiole and blade) are presented in Fig. 10 showing the differences in leaf part ratio among the studied taxa.

14) Crown shape (Table2, No. 3)

Four categorized are observed according to crown shape:
1. dense
2. moderate dense
3. loose and flat above
4. loose open from the middle

15) Petiole area percentage (Table2, No. 11)

The petiole area percentage is medium (> 15% of total leaf length) in Taktakt, Amenzoh, Eghrawn Nehloten, Zaghloul and Selmi, while the rest of

The petiole area percentage is medium (> 15% of total leaf length) in Taktakt, Amenzoh, Eghrawn Nehloten, Zaghloul and Selmi, while the rest of the studied taxa are of Low petiole area percentage (<15% of total leaf length)

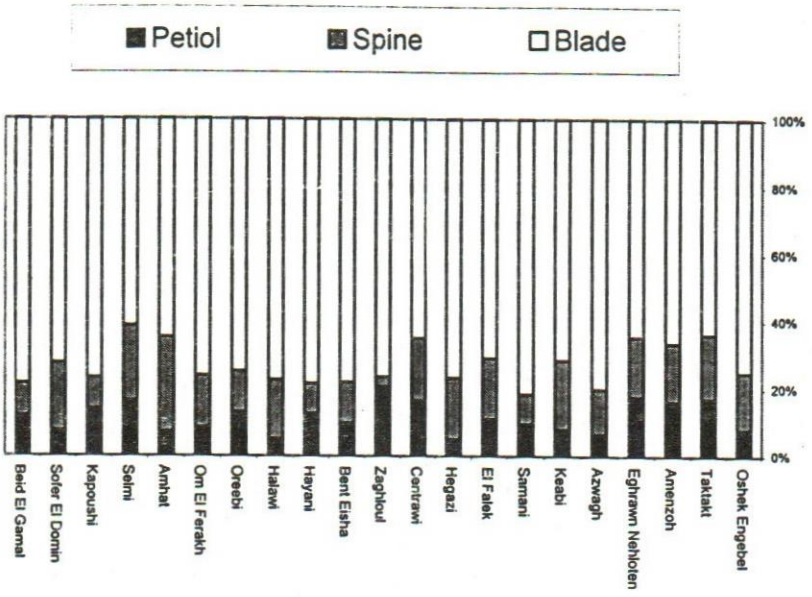


Fig.10: Petiole, spine and blade ratio in relation to leaf length of the studied taxa

16) Spine attributes (Table2, No. 41:56)

Nixon (1945) suggested three groups of spine area percentage in relation to the total leaf length as follow:

a) short: less than 15% of total leaf length.
b) medium: from 15 – 25% of total leaf length.
c) long: more than 25% of total leaf length.

The spine area percentage ranging from 3% in Zaghloul to 28% in Amhat.

The shorter spine length (4 – 8 cm) is recoded in Zaghloul, while the longer spine length (10 – 41 cm) is recorded in Oshek Engebel.

The most homogenous spine is recorded in Taktakt, Zaghloul, Hayani, Oreebi and Azwagh

17) Pinnae attributes (Table2, No. 22:46)

The studied cultivars can be divided into four groups according to the ratio between blade length and the number of pinnae as follow:

a) very dense: blade length / pinnae number ratio less than 1.5
b) dense: blade length / pinnae number ratio from 1.6 – 1.9
c) lax: blade length / pinnae number ratio from 2.0 – 2.4
d) very lax: blade length / pinnae number ratio more than 2.4

Hayani and Kapoushi have very lax pinnae, while Taktakt, Eghrawn Nehloten and Centrawi have very dense pinnae.

Artificial Key to the Soft Date Cultivars in Egypt

1A. Fruit elliptical. ..... **Kapoushi**

2A. Fruit Cylindrical

1B. Fruit apex blunt ..... **Sofer El Domin**

2B. Fruit apex obtuse

1C. Fruit yellow at khalal ..... **El-Falek**

2C. Fruit red at khalal

1D. Spine area ratio 3% of the leaf ..... **Zaghloul**

2D. Spine area ratio 9% of the leaf ..... **Hayani**

3D. Spine area ratio 15% of the leaf ..... **Om El-Ferakh**

3A. Fruit ovate elongate

1E. Seed elliptical, base obtuse..... **Eghrawn Nehloten**

2E. Seed elliptical ovate, base acuminate ..... **Oshek Engebel**

3E. Seed cylindrical, base obtuse

1F. Fruit red changed to brownish black at maturity, Seed apex retuse, micropyle towards the apex ..... **Azwagh**

2F. Fruit orange changed to yellow orange mottled red at maturity, Seed apex blunt, micropyle at the middle of the seed ..... **Samani**

4A. Fruit oboviate elongate

1G. Fruit apex obtuse, pinnae lax, spine 8-21 cm long..... **Amenzoh**

2G. Fruit apex blunt, pinnae dense, spine 2-15 cm long

1H. Seed base obtuse..... **Keabi**

2H. Seed base caudate ..... **Hegazi**

3H. Seed base blunt ..... **Selmi**

5A. Fruit Falcoid - elongate

1I. Fruit skin smooth and united to flesh, Micropyle towards the seed base, crown loose and open at the middle .... **Halawi**

2I. Fruit skin smooth and loose from the flesh, Micropyle towards the seed apex, crown dense ..... **Amhat**

6A. Fruit Ovate

1J. Seed ventral furrow broad at base ..... **Beid El Gamal**

2J. Seed ventral furrow broad at both ends

1K. Fruit yellow changed to brown at maturity, base obtuse.... ..... **Taktakt**

2K. Fruit orange changed to pale brown at maturity, base truncate ..... **Centrawi**

3K. Fruit pale red changed to dark red at maturity, base retuse ..... **Oreebi**

7A. Fruit Oboviate ..... **Bent Eisha**

According to Al Baker (1972), the pinnae width could be divided into three groups:

a) narrow: less than 3.8 cm.
b) medium: from 3.8 – 4.4 cm.
c) broad: more than 4.4 cm.

Cultivar Azwagh and Kapoushi have the broadest pinnae (4.5 cm), Amenzoh, Zaghloul and Selmi cultivars are of narrow pinnae (2.5 cm.).

18) Divergence angles (Table2, No. 37:39)

The studied soft date palm taxa can be divided into 3 groups according to the value of angles as follow:

a) small: less than 50°
b) medium: from 50°– 60°
c) large: more than 60°

Results showed that apical and middle divergence angles differed greatly among the soft date studied taxa.

The apical divergence angles is ranged between 35° (Keabi) and 90° (Hayani and Sofer El Domin).

Data analysis

Cluster analysis was conducted to generate a dendrogram (Fig. 11) illustrating possible relationships among twenty one soft date palm cultivars in Egypt based on the most useful morphological attributes (Table 2).

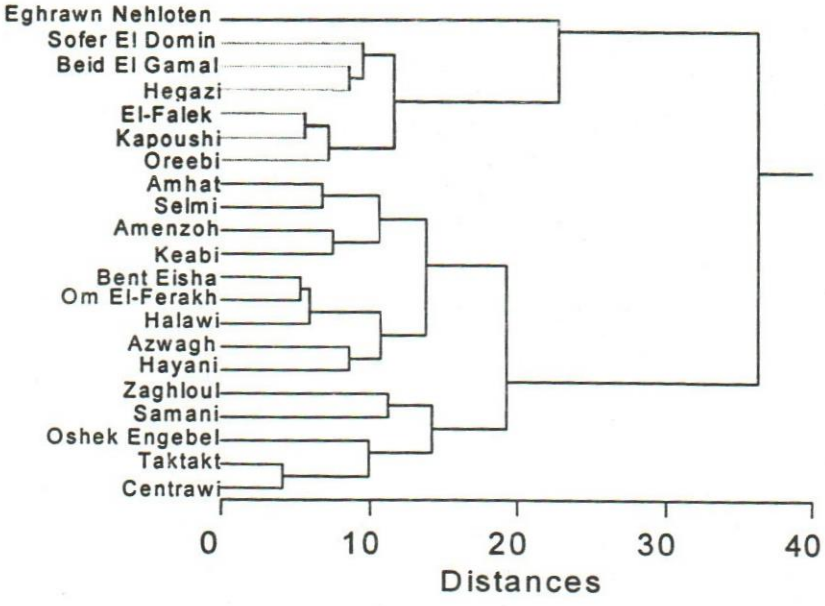


Fig. 11 : Phenogram showing the relationships between 21 soft date palm taxa using Euclidean distance and Complete linkage method

All taxa are divided into two groups at a distance of 36.19. Within the first group El Falek and Kapoushi are most similar (5.604), but Eghrawn Nehloten is most dissimilar and separate from the rest of taxa at the distance of 22.775. the second group is subdivided into two sub group at the distance 19.264. Within the second group, Taktakt and Centrawi are the most related to each other (4.147).

To get the linkage between the studied soft date palm cultivars in Egypt and the most important useful morphological attributes, data matrix were standardized and compute coordinates for plotting Biplot mapping by using perceptual mapping (PERMAP). Perceptual mapping (PERMAP) using combination of taxa and attributes was shown in Fig. 12 and for studied taxa only was shown in Fig.13.

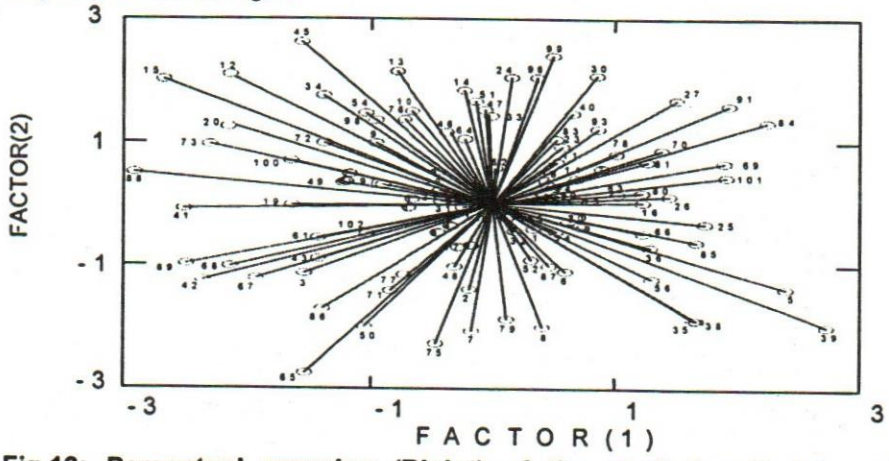


Fig.12: Perceptual mapping (Biplot) of the studied soft date palm cultivars for combination of taxa and attributes, Configuration has been standardized. For cultivars name see table 1, for attributes see table 2.

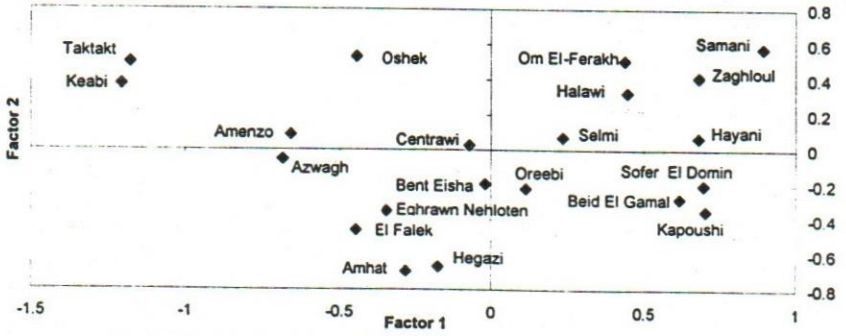


Fig. 13 : Perceptual mapping (Biplot) of the studied soft date palm cultivars, Configuration has been standardized

Table 2: Morphological attributes used in the study of soft date palm in Egypt

	Character	Oshek Engebel	Taktakt	Amenzoh	Eghrawn Nehloten	Azwagh	Keabi	Samani	El Falek	Hegazi	Centrawi	Zaghloul	Bent Eisha	Hayani	Halawi	Oreebi	Om El Ferakh	Amhat	Selmi	Kapoushi	Sofer El Domin	Beid El Gamal
	Vegetative																					
1	Trunk width (1. homogenous 2. base broad than above)	2	1	1	2	1	1	2	1	2	1	1	1	1	1	1	2	2	1	1	1	2
2	Trunk aspect (1.dark colour, 2.pale colour, 3.ashy colour)	1	2	3	3	1	1	2	2	2	3	1	1	3	1	3	1	2	1	1	2	2
3	Crown shape (1. dense, 2. moderate dense, 3. loose and flat above, 4. Loose and open from the middle)	4	1	4	3	1	3	1	4	4	4	1	2	1	4	4	2	2	2	2	2	1
4	Leaf length (cm)	560	540	520	310	450	490	570	445	385	540	530	500	500	485	455	525	480	490	430	400	410
5	Leaf width (at the middle) (cm)	70	55	70	65	84	44	105	110	85	52	55	95	90	105	75	90	90	75	100	130	80
6	Colors of leaf (1. dark green, 2.green, 3. light green, 4. ashy green,)	1	1	1	3	1	1	2	2	2	4	2	2	1	1	1	1	1	1	2	1	2
7	Midrib color (1. dark green, 2. glosy green, 3. light green)	1	3	1	3	3	1	3	3	3	3	2	3	2	2	3	1	3	2	2	1	3
8	Leaf curvature (1. high curved, 2. moderately curved, 3.slightly curved,)	2	1	2	3	1	2	1	2	3	1	3	3	2	3	2	1	3	2	3	1	2
9	Leaf curvature point (1. at first half of blade, 2. at middle of blade, 3. at second half of blade, 4. at all blade length)	1	4	3	1	4	4	3	4	1	4	3	2	2	4	4	4	4	3	2	2	3

10	Petiole length (cm)	45	95	85	55	30	40	50	50	20	90	110	50	65	25	60	45	35	80	60	30	50
11	Petiole / leaf ratio	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.11	0.05	0.11	0.2	0.1	0.13	0.05	0.13	0.09	0.08	0.16	0.14	0.08	0.12
12	Petiole thickness (at the middle) (cm)	8	6	6	3.5	7	4	5	5	2	4	3	3	3.5	5	3	4	4	4	3.5	3.5	3.5
13	Petiole width (at the middle) (cm)	8	10	8	10	9	8	10	7	5	6	5.5	7	8	10	7	8	6	6	7	7	7.5
14	Petiole shape (1. slender, 2. base stout than above)	2	2	2	1	1	2	2	1	2	1	1	1	1	2	1	2	1	2	2	1	2
15	Leaf base width (at the attachment point) (cm)	18	22	18	14	16	20	17	12	18	9	10	10	11	15	12	16	11	14	11	8	13
16	Color of leaf base abaxial surface (1.dark green , 2.light green,)	1	2	1	2	1	1	2	1	2	1	1	2	1	2	1	2	1	1	2	2	1
17	Blotches on leaf base abaxial surface(1.large brown blotches, 2.small reddish brown blotches, 3. absent)	2	1	1	2	1	1	3	1	1	2	2	2	2	3	2	2	3	2	3	3	3
18	Position of blotches on leaf base abaxial surface(1.at the base and margin, 2.at the base with little blotches dispersed at the petiole, 3.at the base, 4. at the middle, 5.dispersed, 6.not applicable)	4	2	3	5	3	1	6	2	3	4	4	5	5	6	5	4	6	4	6	6	6
19	Leaf base fibers (1. firm, 2. loose)	1	2	1	2	1	2	1	2	2	2	1	1	2	1	1	2	1	1	1	1	1
20	Color of leaf base fiber (1.dark brown, 2.light brown)	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	Bent of blade (1.blade bent to one side, 2. blade bent to two sides, 3.not bent)	1	2	1	3	2	1	1	1	1	1	1	1	2	3	1	2	2	1	1	1	1
22	Blade length (cm)	420	350	345	200	360	350	420	315	295	350	405	390	400	375	340	400	310	300	330	290	330

23	Blade/leaf ratio	0.8	0.7	0.7	0.7	0.8	0.9	0.7	0.65	0.77	0.65	0.8	0.78	0.8	0.79	0.75	0.75	0.64	0.61	0.77	0.73	0.80
24	Number of pinnae	272	242	167	136	153	180	243	185	182	249	213	231	151	209	213	201	185	175	169	218	206
25	Pinnae density (1.very dense, 2.dense, 3.lax, 4.very lax)	2	1	3	1	3	2	2	2	2	1	2	2	4	2	2	3	2	2	4	2	3
26	Length of blade/number of pinnae ratio	1.6	1.5	2.1	1.5	2.4	1.9	1.7	1.7	1.6	1.4	1.9	1.7	2.6	1.8	1.6	2	1.7	1.7	2.5	1.8	2.0
27	Pinnae types (1. Introse & antrose, 2. antrose & retrose, 3. antrose, introse & extrose)	2	2	2	1	[illegible]	3	3	1	1	1	3	3	3	3	3	3	3	3	1	3	3
28	Pinnae length (cm)	65	60	58	42	65	42	65	60	56	55	65	67	60	60	45	60	65	55	55	65	50
29	Pinnae width (cm)	4	4	2.5	3	4.5	3	4	4	3	4	2.5	3	3.5	4	3.5	3.25	3.5	2.5	4.5	3.5	3
30	Pinnae shape (1. lanceolate, 2.linear)	2	1	2	1	1	2	2	1	1	1	2	2	1	1	1	2	1	2	1	2	2
31	Pinnae apex (1. pungent, 2. acute, 3. soft end)	1	3	2	2	1	3	2	3	2	2	2	3	3	3	2	3	3	2	2	2	2
32	pinnae splitting (1.split to halves,2. slightly split, 3.not split)	3	1	3	3	3	1	2	1	3	1	2	2	2	2	1	2	2	2	1	2	3
33	longest pinnae (1. at the base,2. at the middle)	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
34	Pinnae bent (1. straight, 2. slightly bent)	1	2	2	1	1	2	1	2	1	1	2	2	1	2	1	2	1	1	1	1	1
35	Pinnae nature (1. semi-drooping, 2. non-drooping, 3.semi-erect)	2	1	1	2	2	1	3	3	2	2	2	3	2	2	2	1	3	3	3	1	3
36	Terminal pinnae (1. pari, 2. impair)	1	1	2	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	1	1
37	Pinnae – Rachis angle (°)	25	30	30	30	35	25	58	60	45	30	40	45	60	55	70	50	57.5	55	65	75	60
38	Apical divergence (°)	60	50	65	75	80	35	68	70	65	62.5	50	70	90	65	85	70	80	75	65	90	55
39	middle divergence of pinnae (°)	60	60	75	85	85	60	110	110	85	60	65	90	110	110	135	95	110	95	115	130	120

40	Valley angle (1.small, 2.large, 3.absent)	3	1	3	1	1	1	2	2	1	3	1	1	3	3	1	3	2	1	1	2	1
41	Spine area length (cm)	95	105	90	55	60	100	45	80	70	100	15	60	45	85	55	80	135	110	40	80	40
42	Spine area/leaf ratio	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.18	0.18	0.19	0	0.12	0.09	0.17	0.12	0.15	0.28	0.23	0.09	0.20	0.10
43	Spine shape (1. pyramids, 2. pyramids with longitudinal fold, 3.mixed)	2	2	3	3	3	3	2	3	3	1	1	1	1	1	2	2	2	3	1	3	2
44	Spine folded nature (1.deep, 2.shallow, 3.not folded)	2	1	1	2	2	2	1	2	1	3	3	3	3	3	2	1	1	2	3	2	1
45	Shorter spine length (cm)	5	15	8	3	7	5	9	6	2	2.5	4	5	6	6	5	7	3	4	3	4	2
46	Longer spine length (cm)	41	20	21	11	10	15	21	23	12	14	9	22	12	22	11	25	24	15	15	25	18
47	Spine base (1.not raised, 2.rasied, 3.raised and pulvinous)	2	3	2	2	2	1	3	3	1	1	1	2	1	3	3	3	1	2	1	2	2
48	Spine base color (1.creamy, 2.yellow, 3.pale green, 4. pale brown)	1	2	4	2	1	3	2	4	4	2	1	1	1	2	1	4	2	3	3	3	3
49	Spine type (1. single, 2. di, 3. mixed)	3	2	3	1	3	3	2	1	3	1	1	1	1	2	3	3	3	3	1	3	2
50	Spine symmetrically (1.symmetrical, 2.asymmetrical)	2	1	2	2	2	2	1	2	2	1	1	1	1	1	2	2	2	2	2	2	2
51	Spin color (1. dark green, 2. light green, 3. yellowish green)	2	2	2	3	1	2	3	1	1	1	1	1	2	2	1	2	2	2	1	1	2
52	Spine gradually (1. equality, 2. top large than other)	2	1	2	2	1	2	2	2	2	2	1	2	1	2	1	2	2	2	2	2	2
53	Spine nature (1. flexible, 2. rigid)	2	2	2	1	1	2	2	2	2	2	1	1	1	2	2	2	2	1	2	2	2
54	Spine apex (1.very pungent, 2. acute)	2	1	2	1	2	2	1	1	1	2	2	2	2	1	1	1	1	2	1	1	1
55	Spine rachis angle (°)	10	10	15	15	30	30	55	45	47.5	35	40	62.5	40	60	55	50	35	45	55	80	70

56	a-r divergence of spines (°)	5	5	10	0	2.5	5	7.5	0	27.5	0	0	0	0	15	15	10	12.5	7.5	0	40	57.5
	Fruit																					
57	Length (cm.)	4.2	3.3	4	4.1	3.3	3.5	5.9	4	5.1	4.6	6.2	3.96	5.6	5.85	3.95	6.85	3.5	5.15	6.15	5.7	4.15
58	Width (cm.)	2.5	2.2	2.3	2.6	2.2	1.8	3.4	2.35	2.4	2.9	2.9	2.27	2.72	2.98	2.82	2.98	2.15	3.15	2.35	2.65	3.15
59	Weight (gm)	12.9	7.6	9.2	10.4	7.1	5.4	29.0	11.0	11.1	18.8	22.4	10.1	21.8	19.5	13.2	22.6	8.9	30.0	25.2	25.9	22.2
60	Volume (cm^3)	15	8	10	17	8	7	30	13.3	20	22.5	26	8.33	20	23.5	11.5	15	8.33	27.5	24.5	25	21.5
61	Fruit denisty (W/V)	0.9	1	0.9	0.6	0.9	0.8	1	0.83	0.56	0.84	0.9	1.21	1.09	0.83	1.15	1.51	1.07	1.09	1.03	1.03	1.03
62	Shape (1. cylindrical, 2. elliptical, 3. ovate-elongate, 4. obviate-elongate, 5. Falcoid-elongate, 6.ovate, 7. obviate)	3	6	4	3	3	4	3	1	4	6	1	7	1	5	6	1	5	4	2	1	6
63	Apex (1.obtuse, 2.blunt, 3.retuse)	2	1	1	1	1	2	2	1	2	1	1	3	1	1	1	1	1	2	1	2	1
64	Base (1. obtuse, 2.retuse, 3. truncate,4.truncateand emarginated)	3	1	3	3	3	3	3	3	3	3	3	1	3	3	2	3	3	4	1	3	3
65	Color (khalal) (1. pale red, 2. shiny red,3. Pale yellow , 4.yellow , 5. yellow-brown , 6. orange)	5	3	4	6	1	4	6	4	1	6	2	2	2	4	1	1	3	6	2	3	4
66	Color of the maturity (1.red, 2. dark red, 3.yellow-orange mottled pale red, 4. pale brown, 5. brown, 6. brown-red, 7. brownish black, 8. redish black)	4	5	7	6	7	5	3	5	6	4	2	7	7	2	2	1	8	4	6	4	5
67	Perianth color (1. yellow,2. orange-yellow, 3.yellow-pale redish)	1	2	1	2	1	1	2	1	1	2	1	3	1	3	3	3	3	2	3	1	2
68	Perianth elevation (1. the same level, 2.elevated)	1	2	1	1	1	2	1	2	2	1	1	2	1	1	1	2	2	1	2	1	1

69	Perianth apex (1. broad and rounded, 2. broad and truncate)	1	2	2	1	1	2	1	2	2	2	1	2	1	1	2	2	2	1	2	1	1
70	Perianth margin color (1.Translosent yellow, 2.yellow, 3. redish yellow)	1	2	3	1	2	1	3	2	1	1	3	2	3	3	3	3	3	2	3	1	2
71	Receptacle elevation (cm.)	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.39	0.25	0.27	0.4	0.24	0.36	0.25	0.21	0.26	0.17	0.24	0.45	0.26	0.21
72	Skin nature at maturity (1.smooth and united with flesh, 2.smooth and loose from flesh)	2	1	2	2	1	1	1	2	2	1	1	2	2	1	1	1	2	1	2	1	1
73	Skin appearances (1. shiny, 2. not shiny)	1	1	2	1	2	2	1	2	1	1	1	1	1	2	1	2	1	2	1	1	1
74	Skin thickness (cm.)	0.1	0.1	0.1	0.1	0.8	0.7	0.2	0.08	0.06	0.06	0.1	0.05	0.04	0.05	0.06	0.09	0.02	0.05	0.06	0.07	0.06
75	Flesh thickness (cm.)	0.6	0.5	0.6	0.8	0.5	0.4	1	0.7	0.68	0.8	0.9	0.65	0.8	0.77	0.75	0.94	0.65	0.85	0.73	0.81	0.92
76	Flesh color (1. white, 2. whitish yellow, 3.whitish creamy, 4. cream, 5. cream-brown)	1	2	5	1	5	1	1	5	5	4	1	1	5	3	2	2	5	1	3	1	5
77	Flesh texture (1. soft, 2. firm, 3. fibrous)	2	2	1	3	3	3	2	1	1	1	2	1	1	2	2	2	1	2	2	2	2
78	Flavor (1. poor, 2. good, 3. excellent)	3	3	2	2	3	1	1	2	3	2	2	3	2	2	1	1	2	2	2	3	3
79	Flesh taste (1. palatable, 2. delicious, 3. delicious-sweet)	3	3	2	3	3	1	3	2	3	2	3	2	3	2	2	2	2	3	2	2	2
80	Fruit pulp (1. stout, 2. less stout at apex, 3.less stout at both ends)	2	2	2	2	3	1	1	2	3	2	2	1	2	2	2	2	2	2	3	2	2
81	Distance between the seed apex and flesh (cm.)	0.5	0.4	0.8	0.5	0.2	0	0	0.42	0.76	1.6	0.9	0.3	0.89	0.85	0.28	0.9	0.3	1.1	0.72	0.81	0.32

82	fully maturation (1. early, 2. internecine, 3. late)	2	3	1	2	2	2	2	2	2	3	2	2	1	3	3	3	1	3	2	3	3
	Seed																					
83	Length (cm)	2.8	2.2	2.6	2.9	2.4	2.7	3.9	2.3	2.95	2.85	3.6	2.95	3.35	3.42	3.25	4.3	2.25	2.65	3.95	3	2.82
84	Width (cm)	1.1	1.1	1	1.4	1.2	1	1.2	1	0.9	1.18	1.1	0.8	1.02	1.15	1.05	1.1	0.9	0.88	1.15	0.95	1.15
85	Weight (gm)	1.7	1.2	1.4	2.8	1.8	..6	2.4	0.99	0.78	2.3	2.2	1.02	1.76	2.29	1.53	2.35	0.96	1.18	2.75	2.05	2.3
86	Volume (cm^3)	1.2	0.8	1.2	2.4	1.6	0.8	2	1.5	1	1.7	1.7	1	1.66	0.85	0.7	1.33	1.33	1	2	1.25	1.65
87	Shape (1. cylindrical, 2. elliptical, 3. elliptical-ovate, 4.ellioptical obovate, 5.ovate, 6. Obovate, 7.tapering triangular)	3	5	1	2	1	1	1	6	7	2	1	1	1	1	2	1	2	2	4	1	1
88	Color (1.cream,2. pale brown)	2	1	2	1	2	1	1	2	1	2	2	2	1	1	2	2	2	1	2	2	2
89	Weight of seed/ weight of fruit	0.1	0.2	0.2	0.3	0.3	0.3	0.1	0.09	0.07	0.12	0.1	0.1	0.08	0.12	0.12	0.11	0.11	0.04	0.11	0.08	0.10
90	Volume of seed/ volume of fruit	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.11	0.05	0.08	0.1	0.12	0.08	0.04	0.06	0.09	0.16	0.04	0.08	0.05	0.08
91	Seed apex (1. obtuse, 2. blunt, 3.retuse)	2	2	2	3	3	1	2	1	3	2	3	1	2	2	1	3	2	1	2	1	3
92	Seed base (1. obtuse, 2. blunt, 3.acuminate,4. caudate, 5.truncate)	3	1	5	1	5	1	5	2	4	2	5	1	5	5	1	5	1	2	2	5	2
93	Seed surface (1. smooth, 2. rough)	1	1	1	1	1	1	2	1	2	1	2	2	2	1	1	2	1	2	2	2	2
94	Transverse grooves (1.absent, 2.moderately)	2	1	2	2	1	2	2	2	1	1	2	2	2	1	1	2	1	2	2	2	1
95	Micropyle position (1. towards the apex, 2. at the middle, 3. towards the base)	2	1	2	2	1	2	2	2	3	1	1	3	3	3	2	1	1	2	1	2	1
96	Micropyle elevation (1. not sunken, 2. moderately sunken, 3.sunken)	2	1	2	2	2	2	2	3	1	1	2	1	2	1	1	1	1	1	2	2	2

97	Micropyle appearance (1.clearly appear, 2.difficulty appear)	2	2	1	1	1	1	1	1	1	2	1	1	2	2	2	2	1	2	1	1	1
98	Ventral furrow shape (1. regular, 2.broadest at base, 3. broad at both ends)	3	3	1	3	3	1	1	1	1	3	1	3	2	2	3	1	1	3	1	2	2
99	Ventral furrow ends (1. Open at one end, 2. Open at both ends)	2	2	2	2	1	2	2	2	1	2	1	2	2	1	2	2	1	2	2	1	1
100	Ventral furrow nature (1. shallow, 2.deep)	2	2	1	1	2	2	2	1	2	2	2	1	2	2	1	2	1	1	1	2	2
101	Seed dorsal depression (1.at the base, 2.absent)	2	2	2	2	2	2	1	2	2	2	2	2	1	2	1	2	1	2	2	2	1
102	Length of basal appendages (cm)	0.3	0.1	0.2	0.2	0.2	0.1	0.8	0.2	1	0.24	0.6	0.3	0.35	0.35	0.14	0.6	0.15	0.15	0.44	0.11	0.12
103	Color of basal appendages (1. white, 2. whitish-creamy, 3. yellowish)	1	3	2	2	3	2	2	3	2	2	2	3	2	3	2	2	2	1	2	2	2

Table 3 : The Spearman correlation matrix between the soft date palm cultivars in Egypt.

	Oshek Engebel	Taktakt	Amenzoh	Eghrawn Nehloten	Ezwagh	Keabi	Samani	El-Falek	Hegazi	Centrawi	Zaghloul	Bent Eisha	Hayani	Halawi	Oreebi	Om El-Ferakh	Amhat	Selmi	Kaboushi	Sofer El Domin	Beid El Gamal
Oshek Engebel	1.00																				
Taktakt	0.69	1.00																			
Amenzoh	0.79	0.71	1.00																		
Eghrawn Nehloten	0.75	0.71	0.66	1.00																	
Azwagh	0.76	0.77	0.79	0.71	1.00																
Keabi	0.73	0.75	0.79	0.65	0.69	1.00															
Samani	0.77	0.75	0.78	0.74	0.75	0.73	1.00														
El-Falek	0.67	0.72	0.78	0.73	0.71	0.71	0.68	1.00													
Hegazi	0.76	0.71	0.78	0.70	0.74	0.68	0.68	0.73	1.00												
Centrawi	0.69	0.74	0.70	0.77	0.72	0.64	0.69	0.79	0.67	1.00											
Zaghloul	0.69	0.64	0.68	0.72	0.80	0.65	0.77	0.72	0.61	0.74	1.00										
Bent Eisha	0.68	0.70	0.64	0.74	0.68	0.68	0.71	0.73	0.64	0.74	0.78	1.00									
Hayani	0.69	0.66	0.73	0.71	0.79	0.61	0.74	0.74	0.65	0.76	0.84	0.75	1.00								
Halawi	0.75	0.78	0.80	0.70	0.77	0.75	0.82	0.70	0.70	0.75	0.75	0.74	0.76	1.00							
Oreebi	0.72	0.81	0.75	0.68	0.78	0.74	0.76	0.72	0.71	0.74	0.68	0.75	0.72	0.83	1.00						
Om El-Ferakh	0.66	0.72	0.78	0.57	0.74	0.72	0.80	0.65	0.65	0.62	0.72	0.59	0.70	0.82	0.76	1.00					
Amhat	0.74	0.78	0.82	0.71	0.77	0.72	0.79	0.76	0.79	0.74	0.69	0.73	0.72	0.82	0.84	0.74	1.00				
Selmi	0.83	0.77	0.79	0.73	0.78	0.81	0.83	0.71	0.73	0.71	0.72	0.76	0.69	0.81	0.82	0.73	0.81	1.00			
Kapoushi	0.66	0.69	0.67	0.74	0.71	0.63	0.70	0.80	0.70	0.77	0.79	0.77	0.76	0.72	0.72	0.68	0.76	0.70	1.00		
Sofer El Domin	0.82	0.71	0.81	0.69	0.78	0.78	0.83	0.70	0.73	0.69	0.76	0.69	0.73	0.80	0.75	0.80	0.74	0.84	0.68	1.00	
Beid El Gamal	0.74	0.76	0.80	0.73	0.83	0.71	0.87	0.68	0.76	0.74	0.76	0.69	0.72	0.81	0.79	0.75	0.87	0.83	0.75	0.82	1.00

PERMAP-Biplot shows the importance of spine area length, leaf base attributes and leaflets density to splitting the soft date palm cultivars into two groups along the Factor 2 axis (one at the positive and the other at the negative). Petiole, spine, pinnae, seed micropyle and seed ventral furrow attributes are the most important to divided the first group (positive axis 2) into two sub groups along factor 1 axis. Fruit pulp and flesh, trunk, leaf curvature are the most important to divided the second group (negative axis 2) into two subgroups along the factor1 axis.

Table (3) showing the Spearman correlation matrix between twenty one date palm cultivars. The iowest similarity (٠,٥٧١) was recorded between Om El-Ferakh and Eghrawn Nehloten. The highest similarity (٠,٨٧٤) was recorded between Beid El Gamal and Amhat.

Table 4 stated the distribution of studied soft date palm cultivars in Egypt. Cultivars Zaghloul, Samani, Hayani, Bent Eisha are the most common soft date palm in Egypt.Traditional date palm cultivars have no future because they do not fit into the increasingly popular/ accessible intensive agricultural/ horticultural systems. There is a risk that this impression could lead to the conclusion that traditional cultivars "Beid El Gamal, Sofer El Domin, Centrawi, El-Falek, Om El-Ferakh, Halawi, Oreebi, Taktakt, Oshek Engebel, Amenzoh, Eghrawn Nehloten, Keabi and Azwagh" do not deserve any further attention.

Table 4: the distribution of studied soft date palm in Egypt

	Oshek Engebel	Taktakt	Amenzoh	Eghrawn Nehloten	Azwagh	Keabi	El-Falek	Hegazi	Centrawi	Beid El Gamal	Halawi	Oreebi	Om El-Ferakh	Sofer El Domin	Amhat	Selmi	Kapoushi	Samani	Bent Eisha	Hayani	Zaghloul
Damietta																		+	+	+	+
El Sharqia														+			+		+	+	+
El Behera											+	+	+				+	+	+	+	+
El Dakahlia										+							+			+	+
El Fayoum															+						
El Gharbia																				+	+
El Giza															+	+		+	+	+	+
El Kaarga Oasis							+	+	+												
North Sinai																		+		+	+
Sewis																+					+
Siwa	+	+	+	+	+	+															

In conclusion, it is necessary to emphasize that date palm cultivars in fact demand urgent management action to conserve its threatened and unique biodiversity. The conservation of date palm biodiversity must be considered as a societal enthusiasts, because the human cultural of local communities have a heritage associated with date palm.

Because of the very old cultivars in Egypt, certain cultivars could be of considerable scientific interest as a member of a critical group relevant to

studies of plant conservation. Positive conservation action may be necessary at the infraspecific level if diversity of date palm cultivars are to be maintained. The active cultivation is vital to survival and a cultivar is soon lost for ever if it is not regularly propagated.

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التنوع المورفولوجي لنخيل البلح في مصر – أصناف البلح الرطبة

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أجريت هذه الدراسة للوقوف علي مدي التنوع البيولوجي وتحديد الطرز المظهرية لنخيل البلح الرطبة في مصر وذلك من خلال دراسة صفات الشكل الظاهري لعدد ٢١ صنف من نخيل البلح الرطبة النامية في مصر. أمكن تحدد ١٠٣ صفة ظاهرية الجذع والتاج والأوراق والثمار والبذور ودراسة العلاقة الترابطية والتحليلات العنقودية وحساب نسب التقارب والتباعد بين الوحدات التصنيفية كما تم وضع مفتاحا اصطناعيا للفصل بين الأصناف قيد الدراسة وذلك اعتمادا علي صفات الشكل الظاهري. ولقد ثبت من الدراسة أن صفات الثمرة والبذرة لازالت الأكثر أهمية في التفرقة بين أصناف نخيل البلح الرطبة في مصر إلا أن صفات الورقة والتاج لها بعض الأهمية في التفرقة بين الأصناف قيد الدراسة. يعتبر الأصناف زغلول والسماني وبنت عيشة والحياني من الأصناف الأكثر شيوعا في مصر ولكن باقي الأصناف الرطبة تعاني من خطر الانقراض في مصر لأنها لا تستحوذ علي اهتمام المزارع والمستهلك في مصر. كما انه يمكن الحفاظ علي التنوع البيولوجي لنخيل البلح في مصر من الاندثار وتعظيم قيمته الاقتصادية وذلك من خلال زراعته والمساعدة علي تكاثر الأصناف القابلة للاندثار لتخفيف ظروف الإجهاد والمعاناة البيئية والاقتصادية المعاكسة.