

# The foliar and fruiting- architectural study of the date palm “*Phoenix dactylifera* L.,”



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## 1- Introduction :

Plant architecture is defined as the whole of the structural forms that the plant presents through its existence. In the context of the present study, a statistical check of relationships between the characteristic parameters in terms of vegetative aerial and reproductive architecture of the date palm has been achieved, this allows to implement a new measurement protocol for computing and simulating realistic 3D models.

## 2- Experimental procedures:

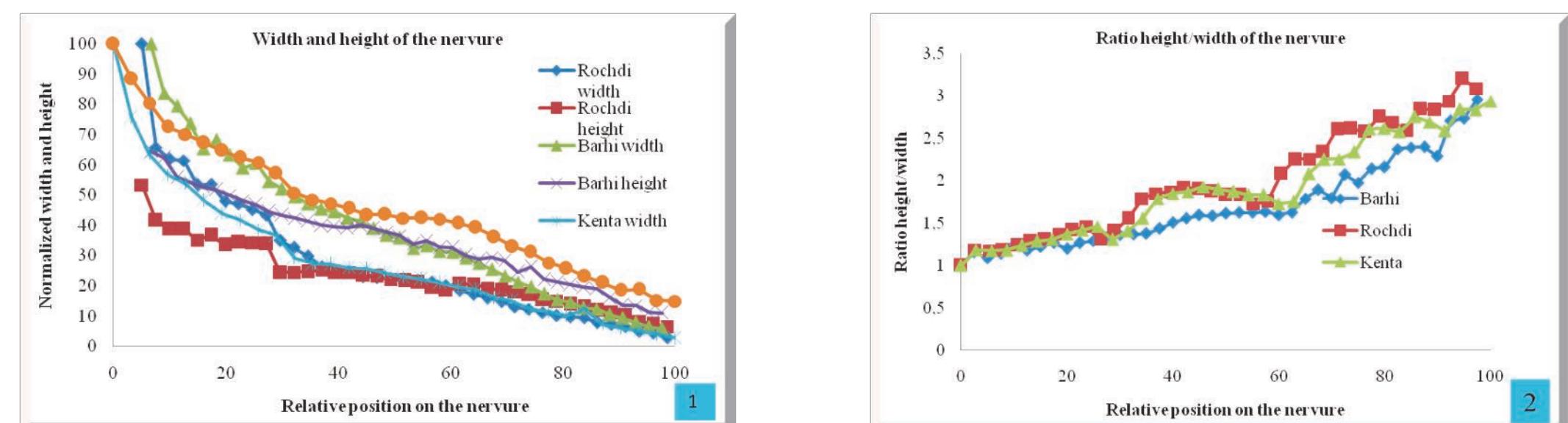
The palms and mature inflorescences were taken in the palm groves of Gabes in Tunisia, Figuig in Marocco and Biskra in Algeria. Modeling palms and inflorescences requires the observation of many parameters which are architectural, metric and geometrical:

- Metric characteristics of the nervure including the nervure length, length of the spiny and pinnate parts ,height and width evolution along the nerve.
- Metric characteristics of the pinnae include pinnae length and opening at the first and second third of their length, width at the base, the first and the second third of their length.
- Geometrical characteristics of the fronds and pinnae including pinnae axial angle; radial angle and basal rotation angle
- Metric measurements relate to the length, the width and the height of the stalk and the rachis, the length and the diameter of the spikelets and of the flowers at several check points.

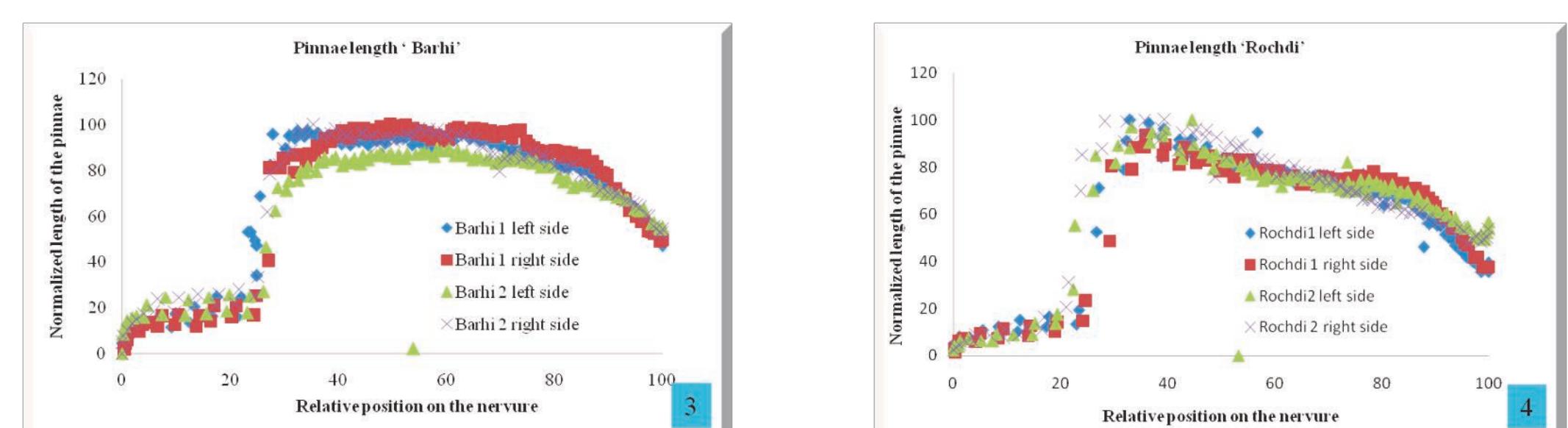
## 3- Results and discussion :

### 3.1. Metric characteristics of the nervure and the pinnae:

The width and height data recorded for the three cultivars showed that the width and height of the nervure are strongly dependent of their position on the nervure Graphic (1). The ratio data Height/Width of nervure sections noted for the three cultivars Graphic (2) varied between 1 and 3 along the nervure.

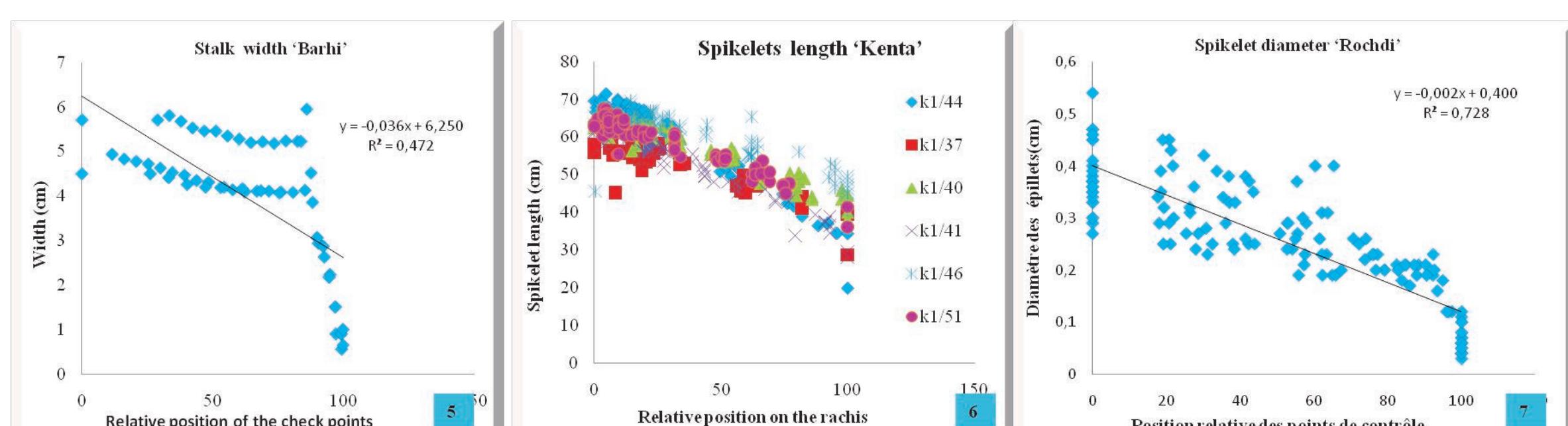


It seems evident that the length and width of the pinnae is strongly dependent of its position on the nervure Graphic (3) and (4). The pinnae length seems to be an indicator of the cultivar.



### 3.2. Metric measurements on female inflorescences:

The width and height of the stalk are strongly dependent of their position on the nervure Graphic (5). The observations confirms that the total and fertile length of the spikelets Graphic (6) and the diameter Graphic (7) decrease towards the inflorescences apex.



### 3.3. Simulation of the fronds and inflorescences:

All geometrical and morphometric parameters allow the fronds, inflorescences and palm tree simulation at different ages (Pictures 1 and 2).



Photo 1:Simulation of the fronds.

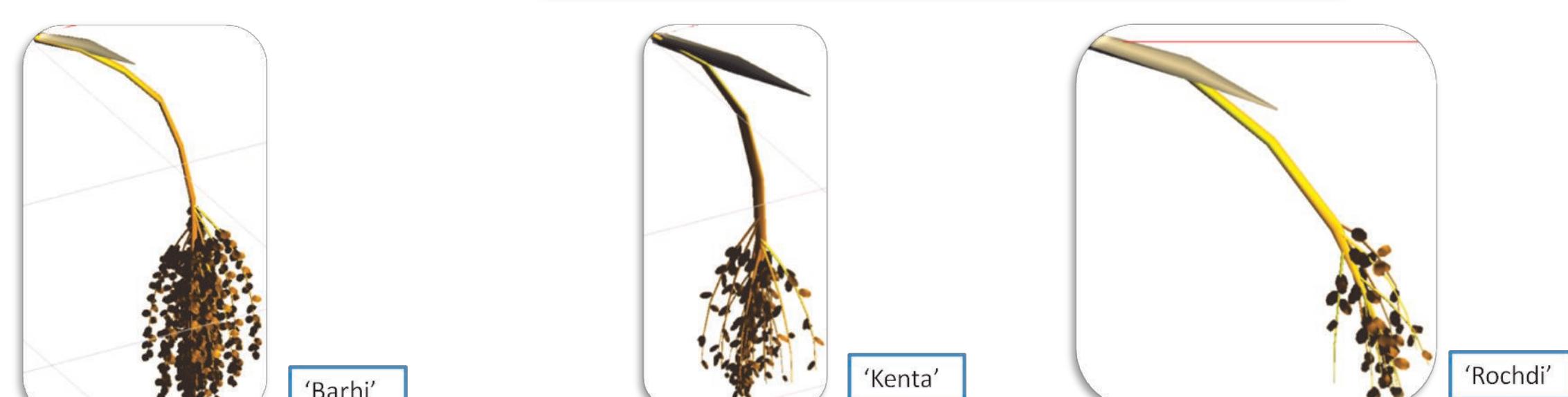


Photo 2:Simulation of the female bunches.

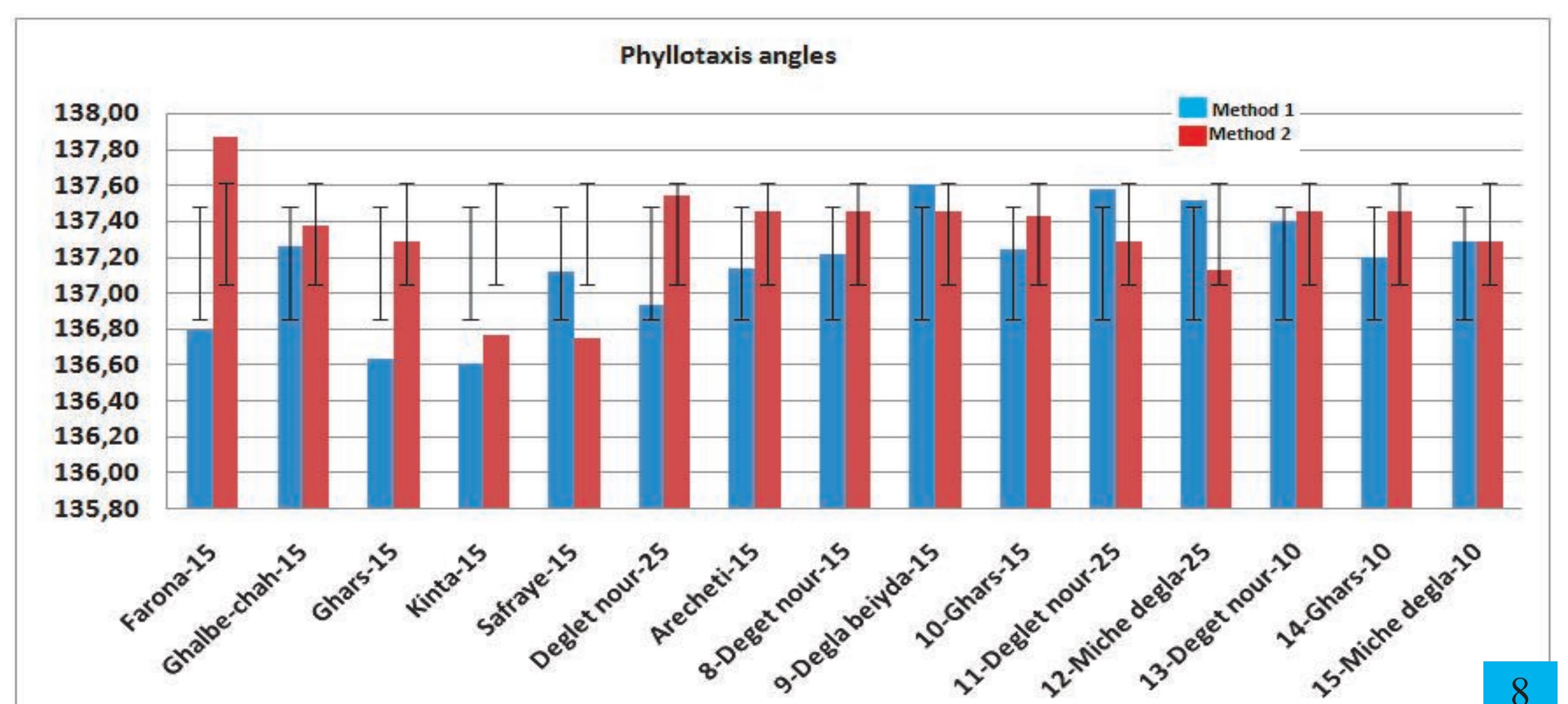
### 3.4. Phyllotaxis in date palm:

The obtained results by two different methods do not show great difference.

The averages are 137.17 and 137.33 for Rey method and the method of calculating the number of petiole bases until intersection between parastiche 8 and orthostiche Graphic (8).

Method 1: Divergence angle=  $135+(360*\Delta/\text{circumference})/8$

Method 2: Divergence angle =  $135+360/(8*\text{number of stumps})$

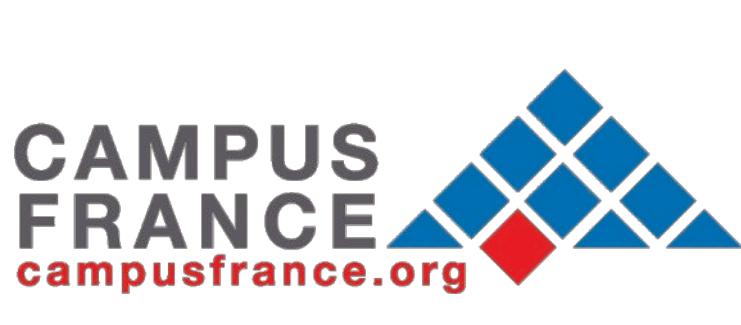
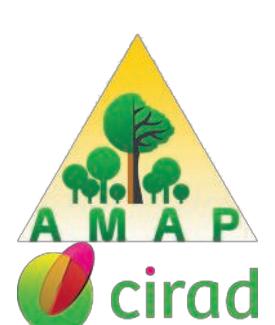
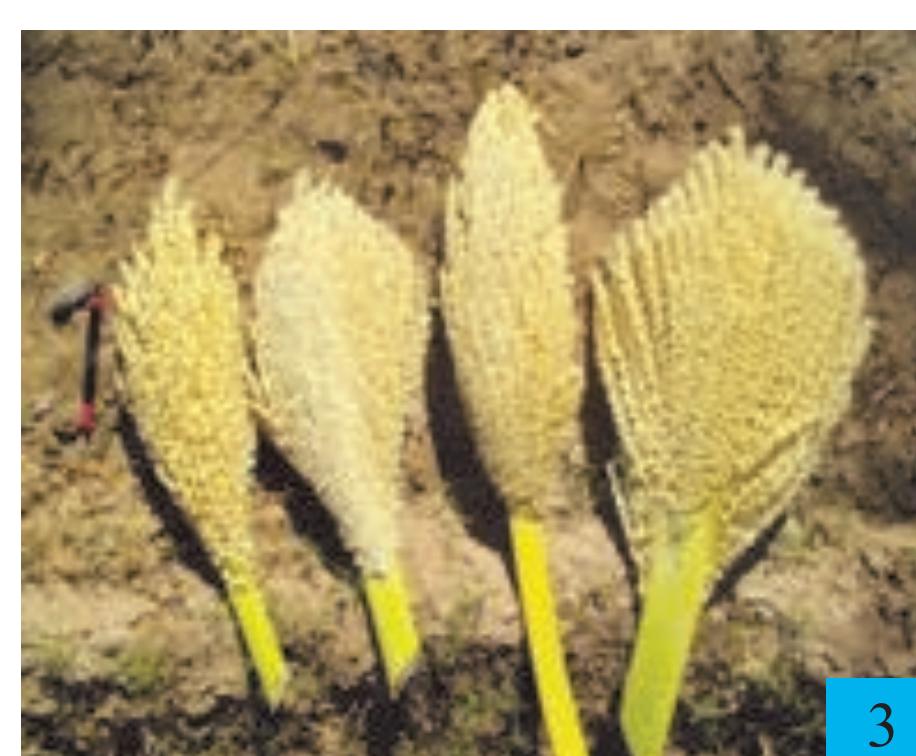


### 3.5. Metric measurements on male inflorescences:

Male palms were significantly different in their spathe length(40-160cm), spathe width(10-18cm),Flower spike length(27-52cm),No. of strand per spathe(80-329) Tab (1). It is thus, concluded that male varied in floral characteristics (Photos 3 and 4).

Table 1: Morphometric measurements on male inflorescence.

Male	Spathe length (cm)	Spathe width (cm)	Peduncle length (cm)	Peduncle width (cm)	Flower spike length (cm)	Strands length (cm)	No.of strand per spathe
ABOU1	90	18	35	5	36	Low:9;middle:8;top:5	100
ABOU2	45	13	20	3	27	low:11;middle:7;top:5	124
ATS 1	60	18	10	4		low:11;middle:13;top:8	329
ATS 5	90	10	30	2,5	50	low:16;middle:14,5;top:7	150
AZROU 1	65	10	10	2,5	33	low:12;middle:10;top:7	
Chaf3i 1	160	19		4	52		
HASAN 1	90	11	50	4	37	low:13;middle:10;top:13	88
KARI 1	110	10	80	4	48	low:13;middle:17;top:7	312
KARI 3	80	15	46	4	43	low:17;middle:18;top:8	231
KASSOU 1					37	low:14;middle:8;top:4	
MJID 1	160	14	50	4	44	low:12;middle:12;top:8	208



The network is supported by a PHC-Maghreb program from Campus France who provides a mobility support to PhD students and reinforces the ‘Euro-Mediterranean 3+3’ consortium founded.