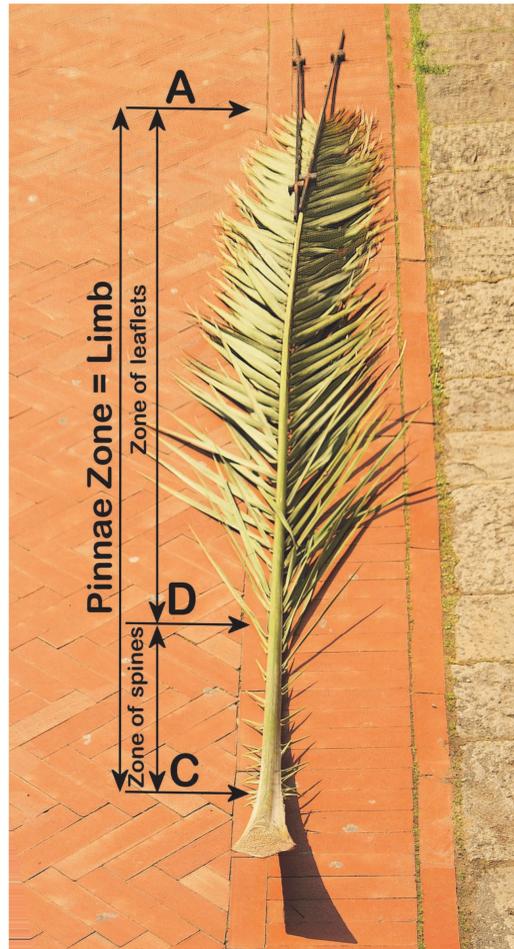


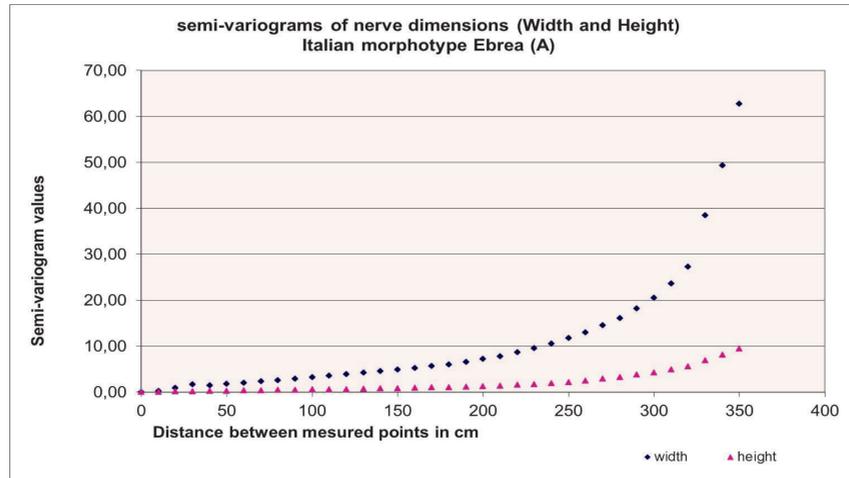
Estimation of useful minimum sample for measurements of an *Arecaceae*'s frond components, *Phoenix dactylifera* L. Allometric relationships between these components.

H. El Masoudy, H. S. Tirichine, S. Gammoudi, S. Memadji-le-Allah, C. Littardi, H. Rey, N. Bouguedoura, M. Ben Salah, M. Bennaceur, M. A. Elhoumaizi and R. Lecoustre *
*rene.lecoustre@cirad.fr

Measurements of characteristic dimensions of the frond components were taken on various morphotypes and cultivars of *Phoenix dactylifera* L. in the Mediterranean countries members of a Euro-Mediterranean Research Consortium involved in the architecture modeling of the date palm. These measurement purpose was to feed a discrete model used by the existing date palm architecture simulation software. It is necessary to estimate the useful minimum sample in order to lighten the quantity of needed measurements. The aim of this study was to find the sample size and to try finding varietal and specific parameters but also to improve the architecture simulation software by introducing continuous models for the characteristic size parameters. In this poster the characteristic dimensions of the nerve shape are taken as a demonstration of the used experimental and statistical methods.



Point C, location of the first pinnae, is taken as **reference point** for measuring length both for the limb or pinnate zone (AC) than for the petiole length (from C to stipe). **Height** and **width** of the nerve are measured at regular intervals all along the nerve from C to A, the values of these parameters at point C location are taken as standard values.

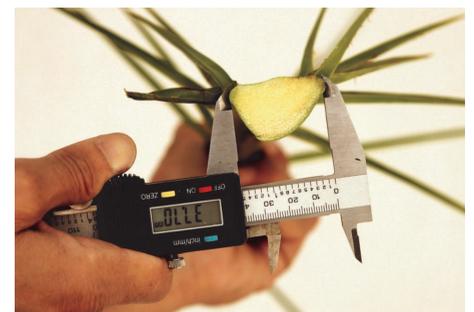


The structure of biological variables, which is not independent of their spatial position (**regionalized variables**), can be characterized with the methods used in geostatistics, particularly thanks to the **semi-variogram**.

The observed regularity, for all the measured palms' nerves suggest that these are regionalized variables describing the height and width of the nerve as a **function of the location of the measurements along axis** formed by the nerve itself.



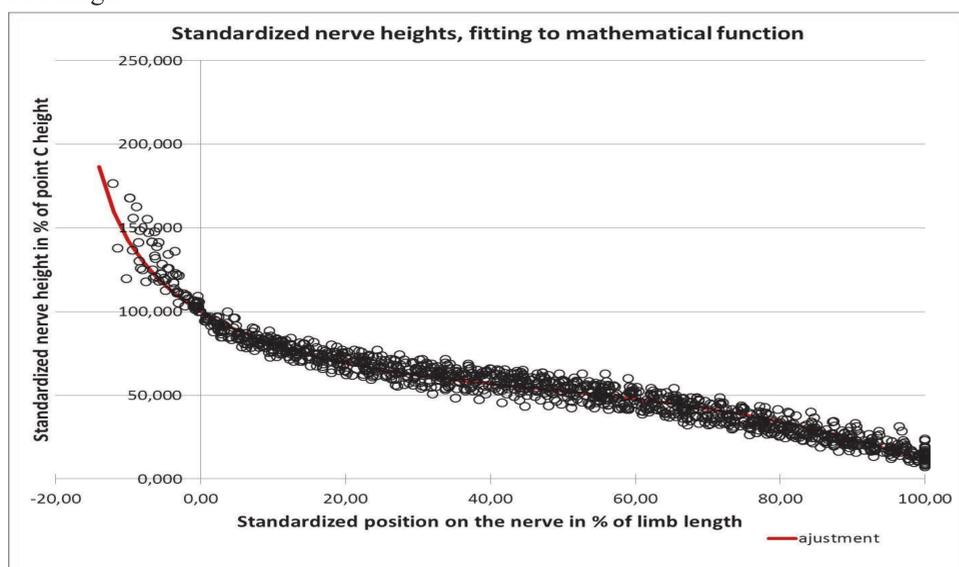
Measurements of frond nerve shape dimensions: **height** (above) and **width** (under).



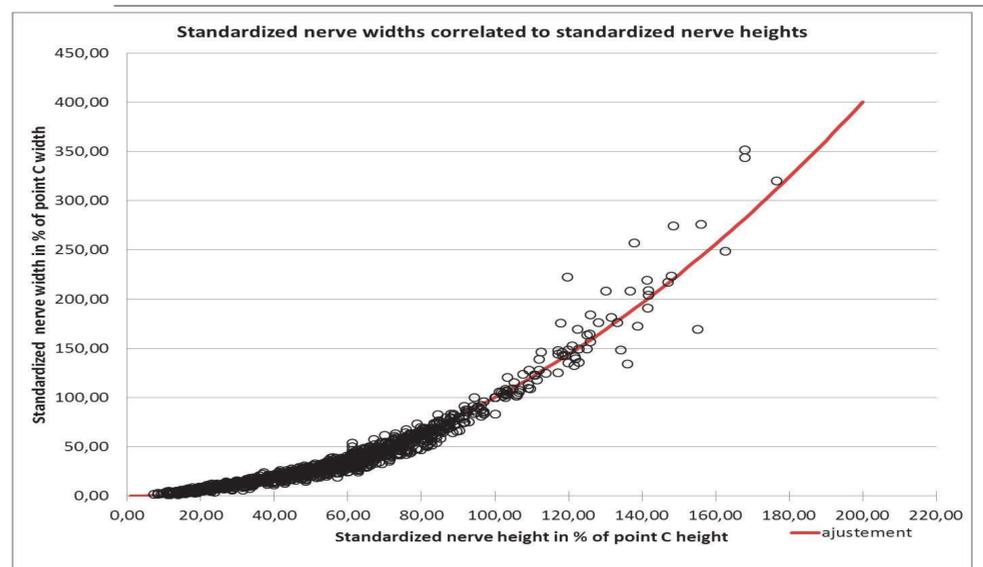
According by Aubry (2000) we computed the crossed covariances which allowed us to calculate the variance of r for each cultivar or morphotypes and, hence, the size of the **theoretical useful minimum sample**. The results are summarized in the table just hereby right for calculations performed on two fronds of different palms of the same cultivar, but of the same age, on 8 North African cultivars.

Grouping the data collected on the 37 fronds measured in the 4 countries (1292 pairs of measures) we obtained the graphic above which scatter plots of height as function of their relative position on the nerve (point C is 0, point A is 100) and evolution of nerve width as function of its height.

	Width of nerve			Height of nerve		
	Covariance (x,y)	Variance of r(x,y)	Minimum useful sample	Covariance (x,y)	Variance of r(x,y)	Minimum useful sample
'Rochdi'	2096.59	0.4585	3.181	181.68	0.5278	2.895
'Barhi'	3886.36	0.5272	2.897	489.79	0.5601	2.785
'Kenta'	4065.56	0.3611	3.769	382.78	0.4350	3.299
'Asian'	6165.51	0.2733	4.660	506.31	0.4409	3.268
'Aziza'	22082.3	0.3202	4.123	1484.6	0.4763	3.099
'Boufgous'	10174.4	0.2520	4.968	367.01	0.4481	3.232
'Ghars'	15566.5	0.2947	4.393	745.75	0.6170	2.621
'Deglet Nur'	6432.03	0.2182	5.584	255.42	0.1913	4.433



The standardized height (H_s) of the nerve is a function of the standardized position on the nerve (X) which equation is : $H_s = 100 * \arctanh(-0.0111 * X + 0.000173 * X^2 - 0.00000128 * X^3 + \tanh(1))$ with the fit coefficient $R^2 = 0.964$ for 1,289 d.o.f.



Considering the standardized width as W_s and standardized height as H_s the function shown on figure just hereby above is : $W_s = H_s^2 / 100$, the fit coefficient $R^2 = 0.965$ for 1,291 d.o.f.

This is the first report of using geostatistics for sampling height and width of *Arecaceae* nerve shape. All the metric shape of the nerve, including petiole and rachis is determined by the limb length, height and width of the nerve at the first pinnae. Further experimentations show that it gives relationships between leaflet location, height of the nerve at this location and width and aperture of the leaflets, relations between characteristic radial and rotation insertion angles of leaflets were also found.



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