

4.6 = MORPHOLOGICAL ANALYSIS OF ANCIENT GRAPE SEEDS FROM A SINK IN THE MIDDLE-AGED TOWN OF PALERMO

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The archaeological excavations in Piazza della Vittoria, in the Roman-Middle Age town of Palermo (Sicily) put in light a sink 3.20 mt. deep and 1 squared mt. large, partially filled by thin organic sediments. Grape seeds (grape-stones), fish scales and few vertebrate bones have been found in specific strata sealed under a stratum chronologically attributed to Islamic Middle-Age period (a *post-quem* limit). The finding of well preserved grape seeds is peculiar and their study opens the opportunity to improve the actual knowledge about evolution, cultivation, use and trade of *Vitis L.* in the Mediterranean area.

AIM: This preliminary work focuses on morphologic and morphometric analysis of the ancient grape seeds with two aims: *i*) systematically describe the remains collection and, *ii*) define seeds typology and a consequent morphotaxonomic attribution.

MATERIAL AND METHODS: Over 200 seeds have been carefully dry cleaned (soft brush), photographed and analyzed for total breadth (B), total length (L) and length of stalk (LS) parameters (Fig. 1), the most efficient for typological attribution (1, 2); Stummer index has been also calculated (1). Apical notch length (AN) has been for the first time evaluated (Fig. 1). Measurements on digital images have been performed using ImageJ 1.31 platform; morphological parameters have been assembled in a dedicated database. Descriptive analysis and linear correlations have been performed using SYSTAT 10. Analysis of variance (ANOVA) and Tukey's HSD (5% level of significance, $\alpha = 0.05$) have been applied.

RESULTS: All the parameters approximate a normal distribution. Major variation has been observed in LS (c.v. = 35.6%) and AN (c.v. = 35.6%), while B and L showed a c.v. of 9.5% and 12.6% respectively (Tab. 1). All the analyzed parameters behave as independent variables with the exception of a significant correlation between Stummer index and L ($R^2 = 0.45$; $Y = 8.17 - 0.047x$ with $y = L$ and $x = \text{Stummer index}$) (Fig. 2). This correlation reveals that Stummer index depends more from the L and not from the B parameter. On the base of LS measures three subgroups (Fig. 3) have been arbitrarily created in relationship with the LS: LS1 < 0.50 mm (45 seeds), LS2 from 0.51 to 0.89 mm (109 seeds), LS3 > 0.90 mm (35 seeds). Analyzing together the LS groups toward AN, we have found a proportional and significant correlation ($p = 0.05$) between the extremes LS1 and LS3 (Fig. 4). In the entire collection, Stummer index varies from 55.76 to 100.86 (Tab. 1); in the LS groups, the range is 68.38-97.87 in LS1, 61.02-100.86 in LS2 and 55.76-81.70 in LS3. A small group (17) of seeds has been excluded for the impossibility to measure the stalk.

CONCLUSIONS: The analyzed ancient grape seeds show a wide range of variability for all the considered parameters, revealing a polymorphic collection. In general, the seeds have a rounded heart-like shape, with a noticeable pointy stalk and a very invaginated apical notch. This typical shape is more marked in LS3 group (Fig. 3). On the base of LS measures, LS1 is ascribable to wild grapevines, while LS2 and LS3 seem to be ascribable neither to wild nor to cultivated autoctonous *Vitis* (3). Furthermore, these seeds differ from those already described in other archaeological horizons in Italy (4) and in France (2). The Stummer index varies highly, exceeding the known range of wild *Vitis vinifera* (5), although values close to 100 have been already found in wild grapevines in Spain (6) and values above 80 have been also described in Extra-European *Vitis* species (7). A deep evaluation of the sample, including isotopic analysis and aDNA studies, is in progress.

References

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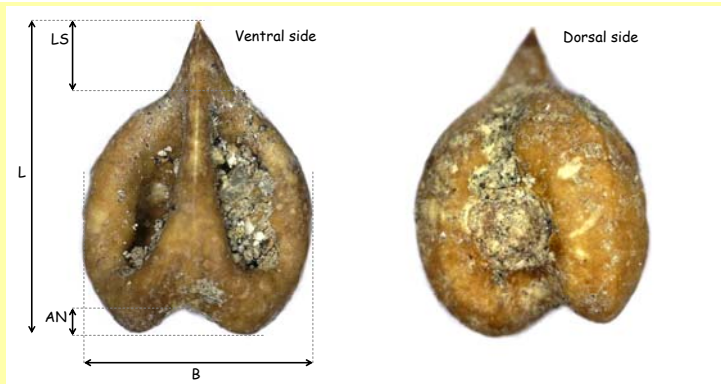


Fig. 1 - Ventral and dorsal sides of ancient *Vitis* seed and the measured parameters. AN = apical notch length; B = breadth; L = total length; LS = length of stalk.

	B	L	LS	AN	Stummer index
No. of cases	194	197	181	168	190
Minimum	2.73	3.19	0.24	0.08	55.76
Maximum	4.55	6.45	1.79	0.98	100.86
Range	1.82	3.26	1.55	0.90	45.10
Median	3.45	4.53	0.64	0.37	75.18
Mean ± St. Err	3.46 ± 0.02	4.63 ± 0.04	0.68 ± 0.02	0.39 ± 0.01	75.62 ± 0.61
Variance	0.11	0.34	0.06	0.02	70.08
C.V.	0.09	0.13	0.36	0.36	0.11

Tab. 1 - Descriptive analysis of the considered parameters.

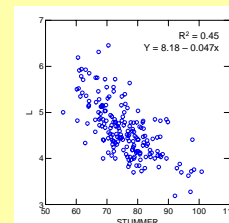


Fig. 2 - Correlation between Stummer index (X) and length (Y). Stummer index = breadth / length · 100

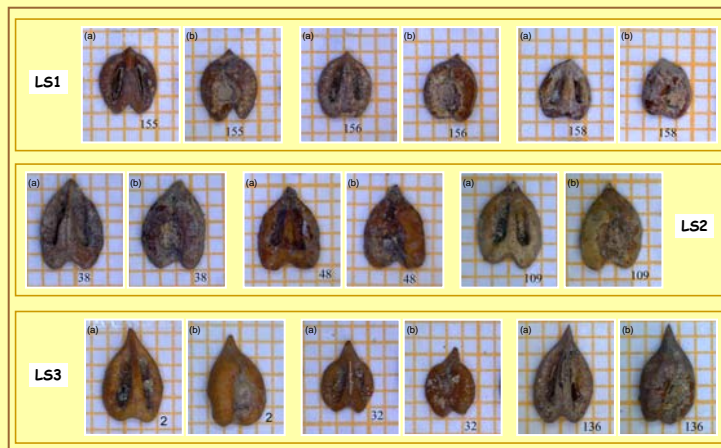


Fig. 3 - Shapes of the three LS groups in relationship with the length of the stalk: LS1 < 0.50 mm; LS2 from 0.51 to 0.89 mm; LS3 > 0.90 mm. (a) ventral side; (b) dorsal side.

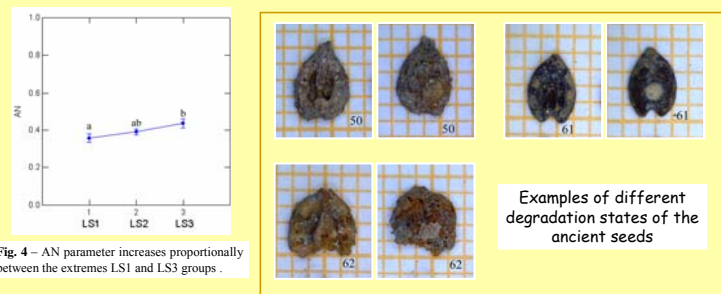


Fig. 4 - AN parameter increases proportionally between the extremes LS1 and LS3 groups.

Examples of different degradation states of the ancient seeds