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FRAGMENTA PALYNOLOGICA (11)

11. PALYNOLOGICAL STUDY OF ENDEMIC TAXA FROM SICILY AND CENTRAL-SOUTHERN ITALY.

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Key words. Palynology, endemisms, Sicily, Central-Southern Italy.

Parole chiave: Palinologia, endemismi, Sicilia, Italia Centro Meridionale.

This survey of the pollen morphobiometry of twenty-two endemic taxa from Sicily and Central-Southern Italy provides a further contribution to the knowledge of the Sicilian pollen flora (Accorsi *et al.* 1984; De Leonardis *et al.* 1984a, 1986a, 1989a).

Pollen was acetolysed according to Erdtman (1960). The measurements by light microscope were made using a Zeiss compound microscope with 100x (N.A.1,30) in oil immersion and 10x eyepieces. For the observations of the sporodermic wall by scanning electron microscope (JSM 35) polliniferous material was acetolysed, washed, progressively dehydrated by alcohol, dried by critical point and coated with gold (100Å).

The terminology adopted was that of Wodehouse (1932), Erdtman (1969), Faegri & Iversen (1975), Punt (1984), De Leonardis *et al.* (1986b).

The polliniferous material was collected from wild taxa and from herbarium specimens. The specimens are deposited in the Catania herbarium (CAT).

The morphobiometry of twenty-two taxa is reported in table 1.

RESULTS AND DISCUSSION

Berberis aetnensis C. Presl

Pollen is characterized by apolar and bilateral monads with colpate apertures whose number varies and by irregular or spiralate arrangement (NPC=803). The exine is of uniform thickness and is tectate psilate with rare perforations. The size of grains confirms data reported by Fernández (1987a) for *B. hispanica* Boiss. & Reuter and by Nowicke & Skvarla (1981) for several *Berberis* species, (fig. 1: 1).

Betula aetnensis Rafin.

The polar outline of this species is goniotreme. Apertures are porate (lalongate 20%, lolongate 70% and circular 10%) with aspis (sensu Wodehouse 1932). The shape of grains is oblate (25%), suboblate (70%) and oblate spheroidal (5%). Exine ornamentation

is of the Betula type described by Lieux (1980). Grain size (PxE=18-25x26-30 µm) confirms data reported by Takeoka & Stix (1963), Birks (1969) and Nilsson et al. (1977) for several species belonging to the genus *Betula*, (fig. 1: 2-3).

Erysimum metlesicsii Polatschek;
Arabis rosea DC.

These species are reticulum finely reticulate at the poles and medium-reticulate at the equator. The shape of grains is oblate spheroidal (47%), spherical (33%), prolate spheroidal (20%) in *E. metlesicsii* whereas in *A. rosea* grains are spherical (20%), prolate spheroidal (67%) and subprolate (13%). Both species are characterized by pollens which have 3 longitudinal colpi with regular edges. Grains of *E. metlesicsii* are distinguished from *E. cheiri* (L.) Crantz for the 2 (5%), 3 (90%) and 4 (5%) colpi with irregular edges (De Leonardis et al. 1982) present in the latter species, (fig. 1: 4-5).

Erucastrum virgatum (J. & C. Presl) C. Presl

Pollen falls within the subtypes equatorial reticulate eu-reticulate and polar finely reticulate medium-reticulate. Grains are spheroidal (93%) and prolate spheroidal (7%) with 3 fusiform colpi, (fig. 1: 6).

Matthiola incana (L.) R. Br. ssp. **rupestris** (Rafin.) Nyman;
M. fruticulosa (L.) Maire

Both taxa have 3 colpi often difficult to distinguish by LM due to the fragility of the sporodermic wall and the very wide lumina (eu-reticulate and hyper-reticulate types). As a result, when the acute apices of the colpi are just visible in polar view (*M. fruticulosa*) the polar outline is ptycotreme subtriangular whereas when the apex colpi are not visible at the poles (*M. incana* ssp. *rupestris*) the polar outline is subcircular, (fig. 2: 1-4).

Euphorbia amygdaloides L. ssp. **arbuscula** Meusel;
E. ceratocarpa Ten.;
E. gasparrinii Boiss. ssp. **gasparrinii**;
E. corallioides L.

The four taxa examined show evident morphological uniformity. The 3 colpi have parallel edges which meet in the median zone due to the presence of two exine expansions (becs sensu Bonnefille 1971) which conceal the ora. Costae and psilate margo are present (fig. 2: 5). The size of grains distinguishes *E. amygdaloides* ssp. *arbuscula* (P=32-38 µm) from *E. ceratocarpa, E. gasparrinii* ssp. *gasparrinii* and *E. corallioides* (P=39-54 µm). The observations with scanning electron microscope of the sporodermic wall in the four taxa illustrate sexine ornamentation formed by funnel-shaped cavities which have perforate base. Ferguson & Strachan (1982) observe a very similar pattern in the *Indigoforeae* (*Leguminosae*) which they define as «pitted-perforate». Examination of sections of the sporoderm shows, from the outside to the inside, three layers: partial tectum having infratectate cavities with perforate base; infratectate columellar layer with columellae which are distally fused; nexine, (fig. 2: 5-6 and fig. 3: 1-2).

Acinos granatensis (Boiss. ex Reuter) Pignatti ssp. **aetnensis** (Strobl) Pignatti

The pollen of this taxon have 6 longitudinal fusiform colpi. Shape is suboblate (43%) and oblate spheroidal (57%). Exine thickness (1,73 µm) is uniform at equator and poles. Ornamentation is finely reticulate with lumina < 0,50 µm. Our data are in agreement with the values reported by Luque & Candau (1987) for *A. alpinus* (L.) Moench ssp. *meridionalis* (Nyman) P.W. Ball, (fig. 3: 3-4).

Astragalus nebrodensis (Guss.) Strobl

The pollen grains have medium-small size (P=24-29 µm). The shape is subprolate (80%) and prolate (20%). Apertures have 3 longitudinal colpi each equipped with os.

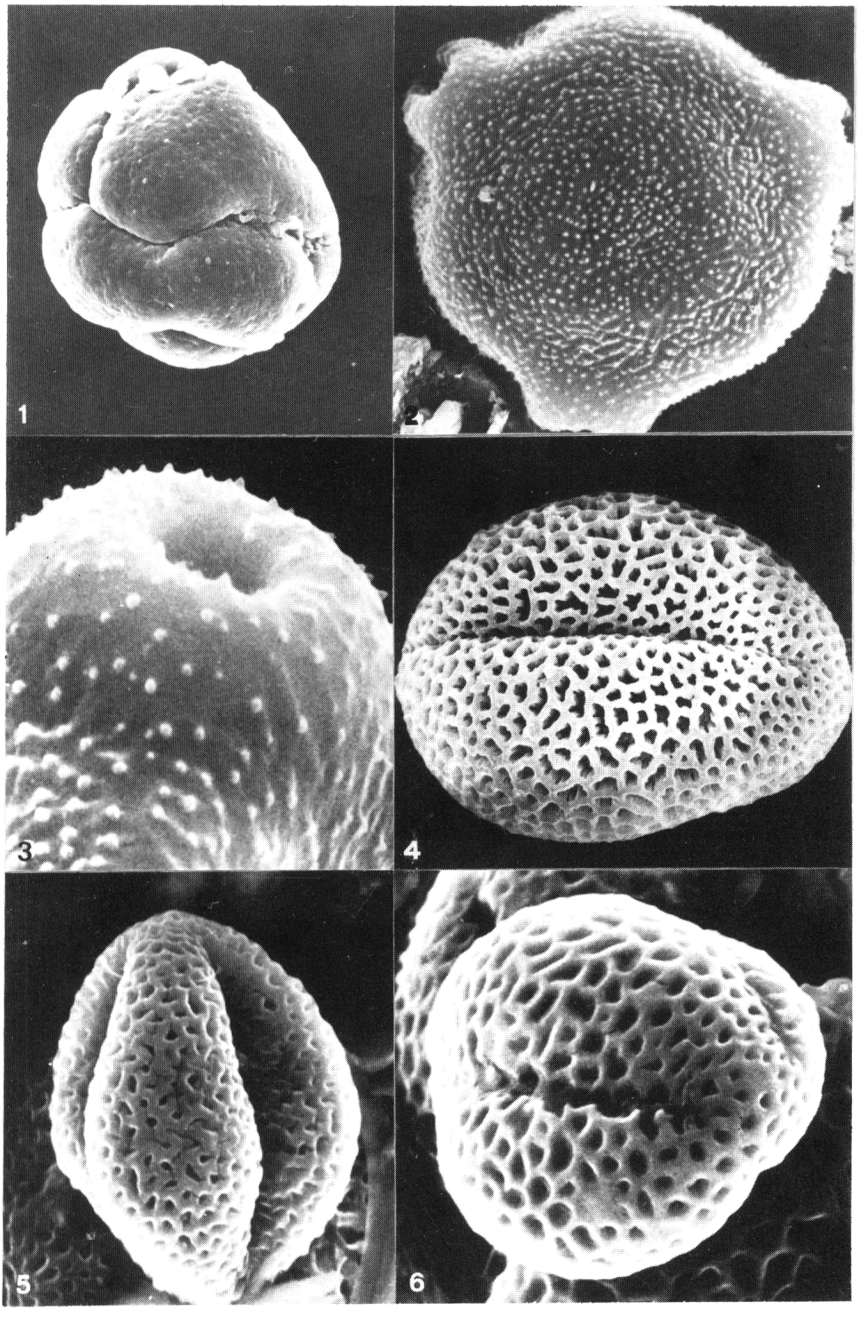

Figure 1: 1, *Berberis aetnensis*: apolar grain with spiralate colpi (1,500x). 2, *Betula aetnensis*, polar view (3,000x). 3, *B. aetnensis*, poral aperture with microspinulate exine (10,000x). 4, *Erysimum metlesicsii*, equatorial view with colpus (4,000x). 5, *Arabis rosea*, equatorial view with medium reticulate mesocolpium (4,000x). 6, *Erucastrum virgatum*, equatorial and polar views (4,400x).

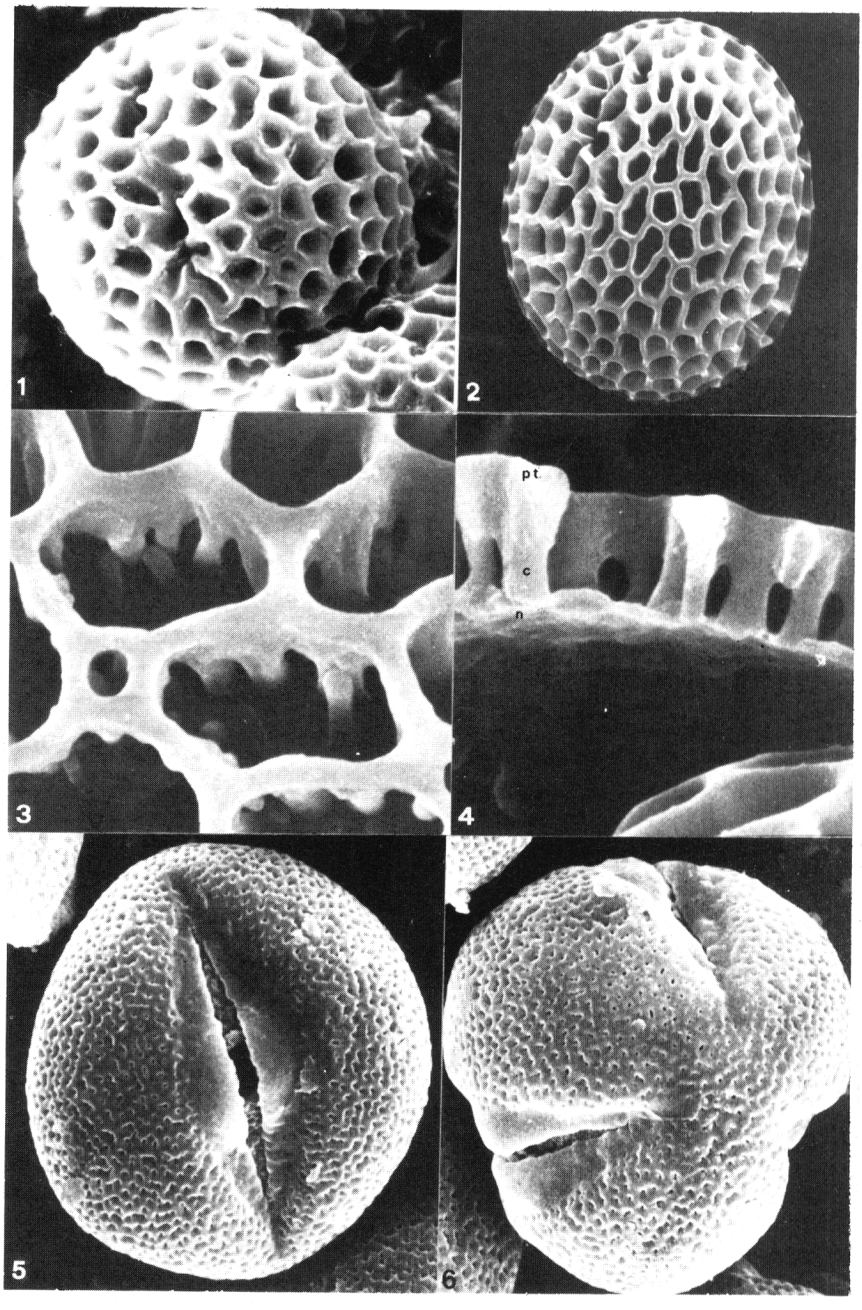

Figure 2: 1, *Matthiola incana* ssp. *rupestris*: equatorial view with colpus (3,000x). 2, *M. fruticulosa*, equatorial view with mesocolpium (3,000x). 3, *M. fruticulosa*, hyper-reticulate reticulum (10,000x). 4, *M. fruticulosa*, exine section with nexine (n), columellae (c) and partial tectum (pt) (9,400x). 5, *Euphorbia amygdaloides* ssp. *arbuscula*, equatorial view with colporate aperture (2,400x). 6, *E. ceratocarpa*, polar view (2,600x).

Nexine thickening (costae) occurs near to the endoaperture while sexine thickening (margo sensu Moore & Webb 1978) is present along colpus edges. Ornamentation is finely reticulate (< 0,50 µm) and consists of psilate muri which surround lumina whose diameter is greater than the thickness of the muri. The lumina have the form of small funnel-shaped cavities with perforate base.

The grains of *A. nebrodensis* are distinguished by *A. siculus* Biv. (P=26-33 µm) in De Leonardis *et al.* (1986a) and by *A. boeticus* L., *A. echinatus* Murray, *A. hamosus* L. (P=31-34 µm) and *A. lusitanicus* Lam (P=18-22 µm) in Fernández (1987b), (fig. 3: 5-6).

Cytisus aeolicus Guss.

Grain size (P=19-23 µm) distinguishes this taxon from *C. moleroi* Fdez. Casas (P=14-19 µm) in Trigo *et al.* (1991), *C. arboreus* (Desf.) DC. ssp. *malacitanus* (Boiss.) Malagarriga (P=25-29 µm) in Bootello *et al.* (1989), *C. scoparius* (L.) Link. and *C. striatus* (Hill) Rothm (P=24-33 µm) in Fernández (1987b). However, some biometric overlapping (P=20-31 µm) occurs with *C. baeticus* (Webb) Steudel, *C. fontanesii* Spach ex Ball and *C. grandiflorus* DC. (Fernández 1987b).

The shape of grains is oblate spheroidal (33%), spherical (20%) and prolate spheroidal (47%). The colpi, lacking margo, have parallel edges and lolongate ora (trizonocolporate). Exine ornamentation is finely reticulate with irregular muri and with funnel-shaped cavities which have perforate base. Fernández (1987b), Bootello *et al.* (1989) and Trigo *et al.* (1991) observe a verruca - or small granulum - like protuberance at the base of each lumen. In *C. aeolicus* we interpret this process as the caput of a columella of the infratectate layer which sometimes protrudes through the basal perforation in the cavity, (fig. 4: 1-2).

Lathyrus odoratus L.

Pollen grains are characterized by prolate shape (100%) and medium-large size (P=42-52 µm). The apertures are formed by narrow colpi with acute apices and lalongate ora. Presence of margo and costae. The exine is tectate suprareticulate with luminoid depressions of the hyper-reticulate type (> 2,0 µm). The size of lumina is greater than data reported by Fernández (1987b) for nine *Lathyrus* species included in the Trifolium arvense type, (fig. 4: 3-4).

Retama raetam (Forsskàl) Webb ssp. **gussonei** (Webb) Greuter

Pollen grains are medium-small size (P=21-30 µm). Shape is suboblate (3%), oblate spheroidal (37%), spherical (17%), prolate spheroidal (23%), subprolate (7%) and prolate (10%). The colpi, equipped with margo, can have parallel edges and visible lolongate ora (50% trizonocolporate) or edges which meet in the median zone and conceal the ora (50% trizonocolporoidate). Exine ornamentation of the mesocolpium and apocolpium is medium reticulate.

Both biometric and morphological data support observations by Fernández (1987b) for *R. monosperma* (L.) Boiss. and *R. sphaerocarpa* (L.) Boiss. included in the Cytisus scoparius type, (fig. 4: 5-6)

Verbascum rotundifolium Ten. ssp. **rotundifolium**

Pollen grains have 3 colpi with parallel edges and lalongate (7%) or lolongate (93%) ora. The shape is suboblate (13%) and oblate spheroidal (87%). Sexine ornamentation is medium reticulate in agreement with Godoy & Diez (1987) who place in the *V. pulverulentum* type *V. rotundifolium* Ten. *V. pulverulentum* Vill., *V. simplex* Hoffmanns., *V. sinuatum* L., *V. virgatum* Stokes, (fig. 5: 1-2).

Odontites bocconei (Guss.) Walpers

The morphological features of this species permitted the definition of a fourth pollen type

with respect to the three types reported by Inceoglu (1982) for taxa of the genus *Odontites*. We describe the mesocolpium as having reticulum from finely reticulate to medium reticulate and lumina which become progressively wider in the apocolpia. Apertures are formed by 3 fusiform colpi equipped with membrane. Shape is suboblate (27%), oblate spheroidal (60%) and spherical (13%). The size of grains (P=19-24 µm) is an additional distinguishing character as compared to the taxa examined by Inceoglu (1982), (fig. 5: 3-4).

Celtis aetnensis Strobl

The pollen exhibit distinct dimorphism in both the size of grains and the distribution of poral apertures. Grains can have annulate or operculate pores located in the equatorial zone (3-zonoporate 44% and 4-zonoporate 56%) in which P=21-30 µm or they can have 4-6 pores uniformly distributed over the surface of the polypantoporate grains with DM=31-46 µm. Both morphotypes present 2-3 additional small pores, randomly scattered over the grain surface, which frequently converge. The shape of polar grains is suboblate (80%) and oblate spheroidal (20%) while apolar grains are spherical°(10%), prolate spheroidal°(80%) and subprolate° (10%). Exine is tectate microspinulate and slightly undulate. The size of grains confirms measurements reported by Bonnefille (1971) for *C. kraussiana* Bernh., by Lieux (1980) for *C. laevigata* Willd. and by Diez (1987) for *C. australis*, (fig. 5: 5-6).

Seseli bocconi Guss. ssp. **bocconi**

The pollen grains are characterized by slight columellar hypertrophy in the equatorial zone. It may sometimes be absent. The polar outline ranges from pleurotreme subtriangular with protruding apices to pleurotreme subtriangular with non-protruding apices (lobate outline). The 3 colpi are short and narrow, ora are lalongate. The shape of grains is always subrectangular and exine is rugulate. Grain size (P=22-28 µm) confirms data reported by Pardo (1982) for several taxa of the genus *Seseli* L. (fig. 6: 1-2).

Bonannia graeca (L.) Halacsy

Hypertrophy is absent. The polar outline is pleurotreme subtriangular with non-protruding apices. Shape is subrectangular. The apertures have 3 narrow colpi with acute apices and lalongate (95%) or circular (5%) ora. Exine ornamentation is irregularly rugulate at the equator and rugulostriate at poles. The size of grains (P=29-36 µm) confirms data reported by De Leonardis *et al.* (1984b, 1988) for taxa of the same tribe (*Peucedaneae*), namely *Ferula communis* L., *Opoponax chironium* (L.) Koch, *Tordylium apulum* L. Grain size (P=50-57 µm) differs only in *Heracleum pyrenaicum* Lam. ssp. *cordatum* (Presl) Pedrotti et Pignatti due to the presence of columellar hypertrophy in the polar zone, (fig. 6: 3-4).

Petagnia saniculifolia Guss.

Hypertrophy does not occur. The polar outline is pleurotreme subtriangular with non-protruding apices. Shape is subrectangular with 3 narrow longitudinal colpi equipped with acute apices. Ora are lalongate (93%) and circular (7%). Exine is rugulate. The size of grains is a distinct distinguishing character within the three taxa: P=22-28 µm in *Seseli bocconi* ssp. *bocconi*, P=29-36 µm in *Bonannia graeca* and P=48-56 µm in *P. saniculifolia*, (fig. 6: 5-6).

MATERIAL EXAMINED:

Acinos granatensis (Boiss. ex Reuter) Pignatti ssp. *aetnensis* (Strobl) Pignatti: Piano Provenzana-Etna (Catania), A. Zizza. (CAT 92052015).

Arabis rosea DC.: Fornazzo (Catania), W. De Leonardis & A. Zizza. (CAT 92042205).

Astragalus nebrodensis (Guss.) Strobl: Piano della Battaglia-Madonie (Palermo), W. De Leonardis & A. Zizza. (CAT 92062518).

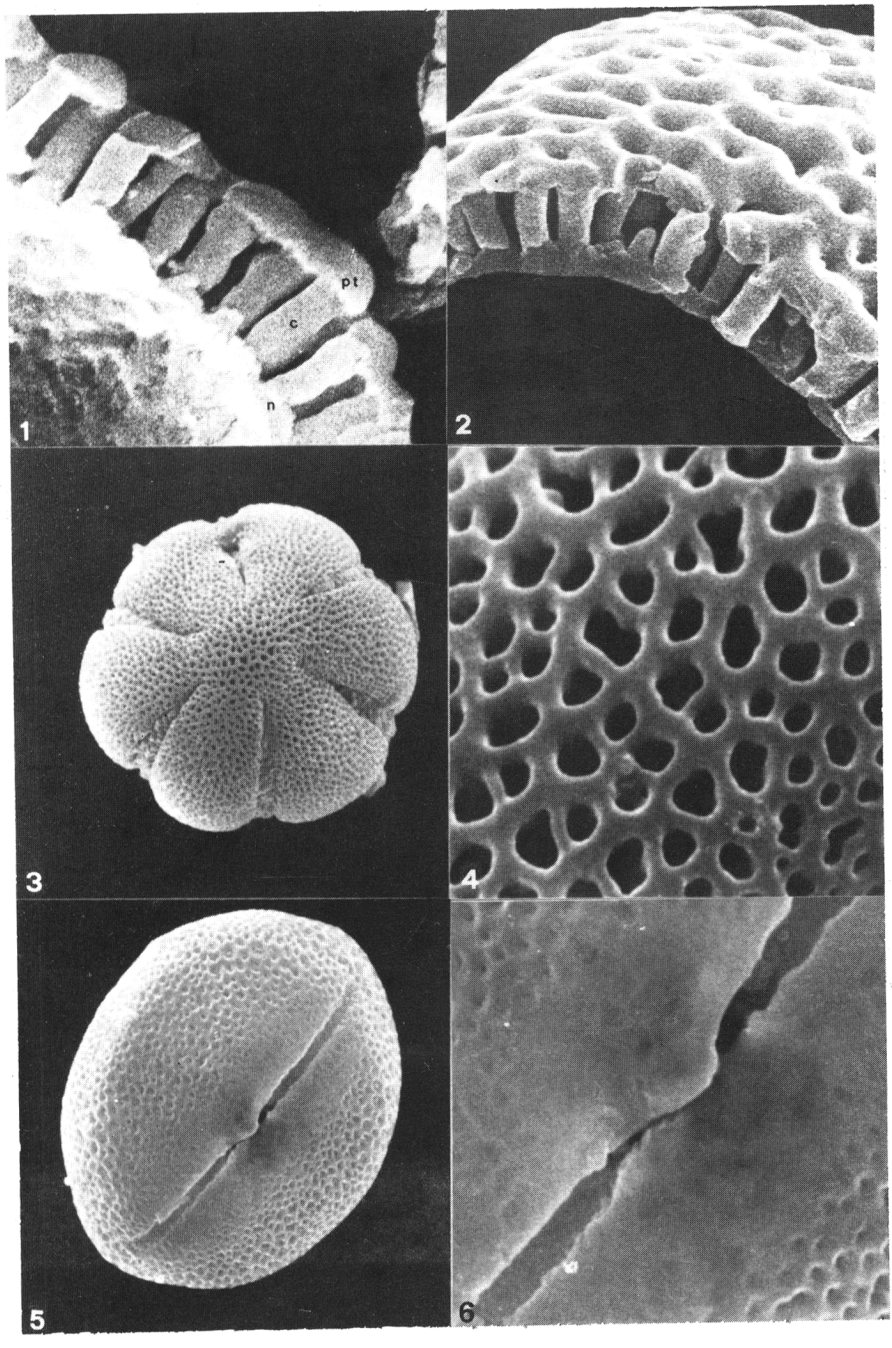

Figure 3: 1, *Euphorbia gasparrinii* ssp. *gasparrinii*: exine section with nexine (n), columellae (c) and partial tectum (pt) (10,000x). 2, *E. corallioides*, sexine with funnel-shaped cavities (9,000x). 3, *Acinos granatensis* ssp. *aetnensis*, polar view (2,800x). 4, *A. granatensis* ssp. *aetnensis*, reticulum (10,000x). 5, *Astragalus nebrodensis*, equatorial view (2,400x). 6, *A. nebrodensis*, colpus with margo (m) (10,000x).

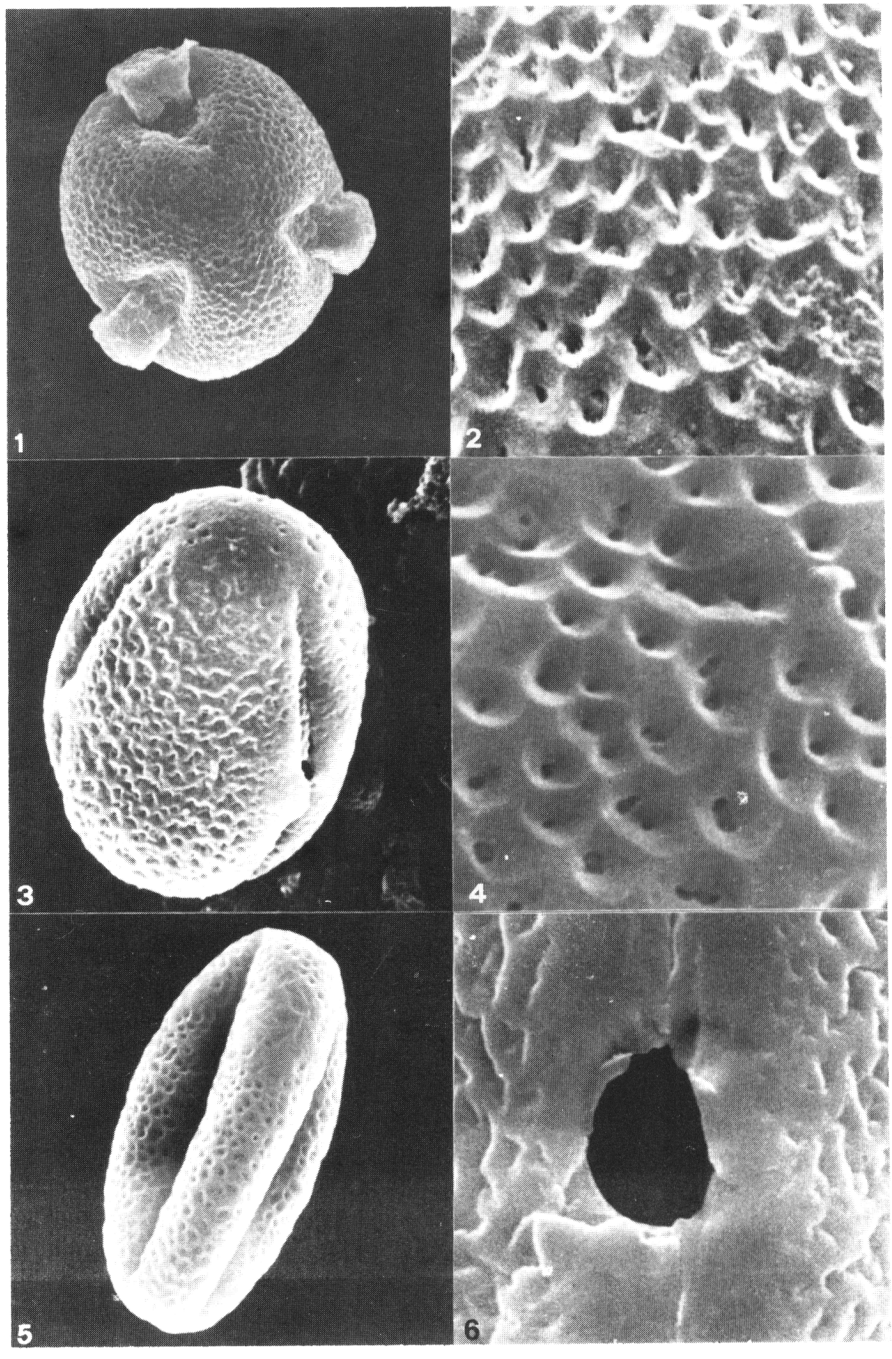

Figure 4: 1, *Cytisus aeolicus*: polar view (2,400x). 2, *C. aeolicus*, sexine with funnel-shaped cavities (10,000x). 3, *Lathyrus odoratus*, equatorial view (3,200x). 4, *L. odoratus*, sexine with funnel-shaped cavities (10,000x). 5, *Retama raetam* ssp. *gussonei*, equatorial view (2,200x). 6, *R. raetam* ssp. *gussonei*, colpus and os (4,800x).

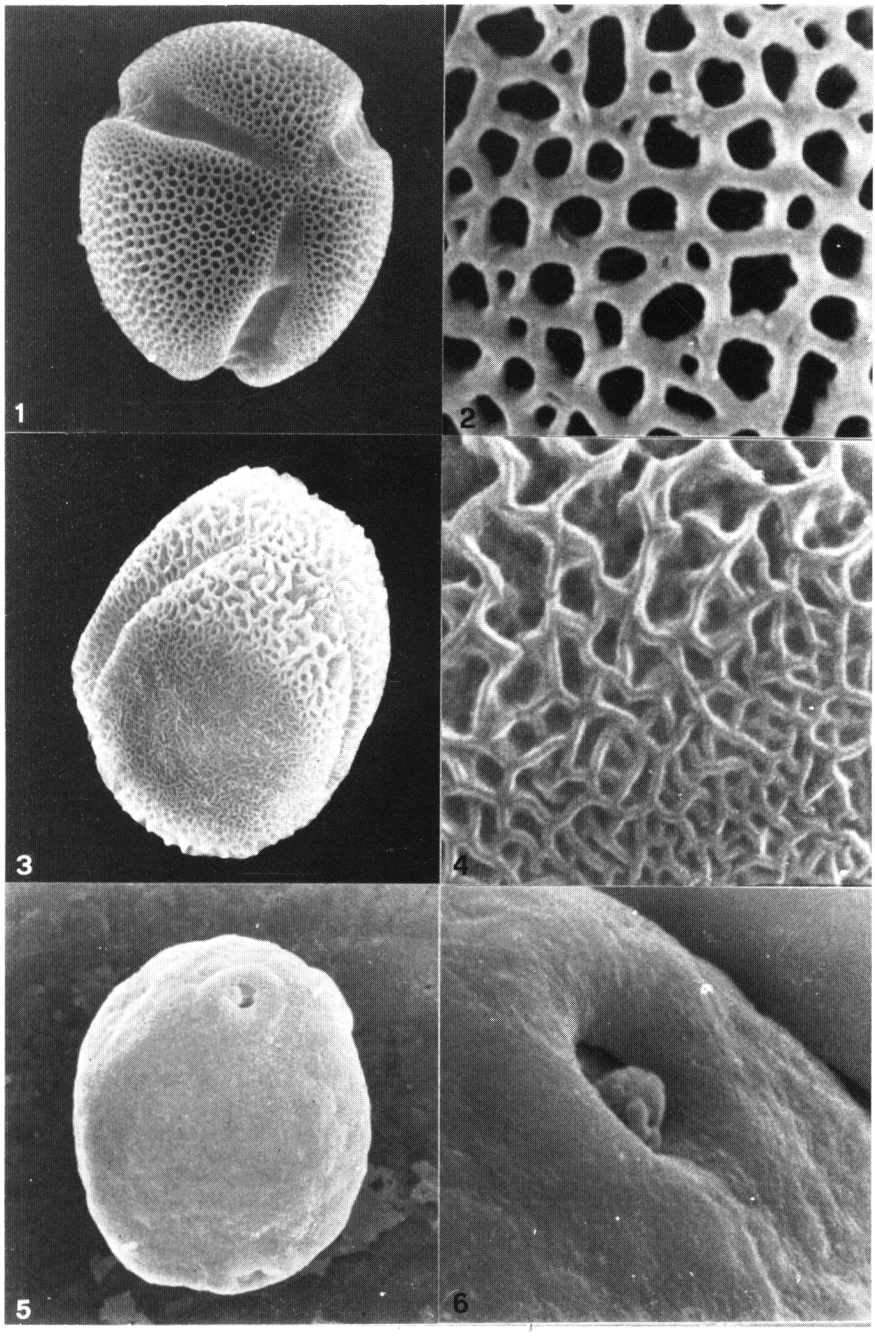

Figure 5: 1, *Verbascum rotundifolium*: polar view (2,600x). 2, *V. rotundifolium*, reticulum (10,000x). 3, *Odontites bocconei*, equatorial and polar views (3,000x). 4, *O. bocconei*, ornamentation with lumina from small to large (10,000x). 5, *Celtis aetnensis*, apolar grain (1,600x). 6, *C. aetnensis*, porus with operculum and annulus (7,200x).

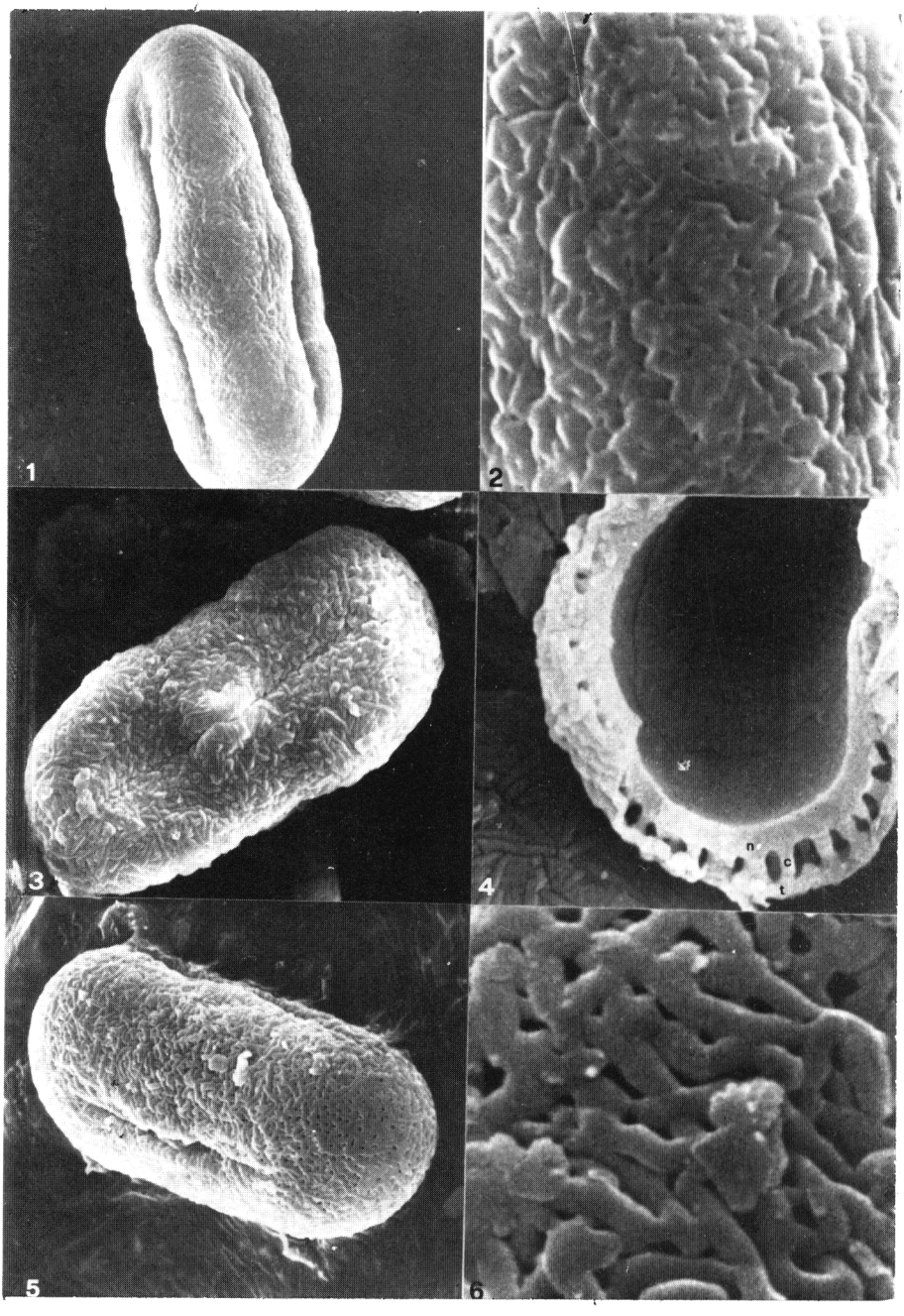

Figure 6: 1, *Seseli bocconi* ssp. *bocconi*: equatorial view with mesocolpium (3,000x). 2, *S. bocconi* ssp. *bocconi*, rugulate ornamentation (10,000x). 3, *Bonannia graeca*, equatorial view with colporate aperture (3,000x). 4, *B. graeca*, exine section with nexine (n), columellae (c) and tectum (t) (5,400x). 5, *Petagnia saniculifolia*, equatorial view with mesocolpium (2,200x). 6, *P. saniculifolia*, rugulae (10,000x).

Taxa	P	E	NPC
Acinos granatensis ssp. *aetnensis*	24(28)33	26(32)37	643
Arabis rosea	26(29)32	26(27)29	343
Astragalus nebrodensis	25(27)30	20(21)22	345
Berberis aetnensis	32(42)50*	31(40)48**	803
Betula aetnensis	17(22)25	26(27)30	344
Bonannia graeca	30(33)36	14(15)18	345
Celtis aetnensis	22(25)30	25(30)31	344 (34%) 444 (44%) 764 (20%)
Cytisus aeolicus	19(21)23	20(21)22	345
Erysimum metlesicsii	17(18)20	18(19)20	343
Erucastrum virgatum	22(23)24	22(23)24	343
Euphorbia amygdaloides ssp. *arbuscula*	32(34)38	34(36)39	345
E. ceratocarpa	39(48)54	34(39)43	345
E. corallioides	40(47)53	30(40)48	345
E. gasparrinii ssp. *gasparrinii*	36(42)50	33(36)40	345
Lathyrus odoratus	46(49)52	29(32)34	345
Matthiola incana ssp. *rupestris*	22(23)26	22(23)25	343
M. fruticulosa	22(24)26	22(23)25	343
Odontites bocconei	19(22)24	9(24)26	343
Petagnia saniculifolia	48(52)56	22(24)26	345
Retama raetam ssp. *gussonei*	21(25)30	19(24)30	345
Seseli bocconi ssp. *bocconi*	23(27)28	14(15)16	345
Verbascum rotundifolium	21(23)25	24(25)27	345

Table 1 - Measurements expressed in μm in endemic taxa from Sicily and Central-Southern Italy. Abbreviations adopted for measurements: **P**= polar axis; **E**= equatorial axis; **DM**= longest diameter; **Dm**= shortest diameter; **NPC** (sensu Erdtman 1969)= number, position, character of the apertures.* refered to **DM**; ** refered to **Dm**.

Betula aetnensis Rafin.: Rifugio Citelli-Etna (Catania), W. De Leonardis & A. Zizza. (CAT 91043013).

Berberis aetnensis C. Presl: Piano Provenzana-Etna (Catania), W. De Leonardis & A. Zizza. (CAT 92052014).

Bonannia graeca (L.) Halacsy: Mt. Quacella-Madonie (Palermo), W. De Leonardis & A. Zizza. (CAT 92062523).

Celtis aetnensis Strobl: Bronte (Catania), W. De Leonardis & A. Zizza. (CAT 92041915).

Cytisus aeolicus Guss.: O.B. Catania, (CAT 88032801).

Erucastrum virgatum (J.& C. Presl) C. Presl: Milazzo (Messina), W. De Leonardis & A. Zizza. (CAT 92042205).

Erysimum metlesicsii Polatschek: O.B. Catania, (CAT 92050701).

Euphorbia amygdaloides L. ssp. *arbuscula* Meusel: Portella Miraglia-Nebrodi (Messina), W. De Leonardis & A. Zizza. (CAT 92053022).

Euphorbia ceratocarpa Ten.: Maniace-Bronte (Catania), W. De Leonardis & A. Zizza. (CAT 91050504).

Euphorbia corallioides L.: Portella Mandrazzi (Messina), W. De Leonardis & A. Zizza. (CAT 91061051).

Euphorbia gasparrinii Boiss. ssp. *gasparrinii*: Mt.

Soro-Nebrodi (Messina), W. De Leonardis & A. Zizza. (CAT 91061532).

Lathyrus odoratus L.: Enna, W. De Leonardis & A. Zizza. (CAT 91052116).

Matthiola fruticulosa (L.) Maire: Mt. Capodarso (Enna), W. De Leonardis & A. Zizza. (CAT 92041008).

Matthiola incana (L.) R. Br. ssp. *rupestris* (Rafin.) Nyman: Salina (Isole Eolie), W. De Leonardis & A. Zizza. (CAT 90053006).

Odontites bocconei (Guss.) Walpers: Mt. Quacella-Madonie (Palermo), W. De Leonardis & A. Zizza. (CAT 92100817).

Petagnia saniculifolia Guss.: Tortorici (Messina), W. De Leonardis & A. Zizza. (CAT 91041820).

Retama raetam (Forsskàl) Webb ssp. *gussonei* (Webb) Greuter: Gela (Caltanissetta), W. De Leonardis & A. Zizza. (CAT 92031612).

Seseli bocconi Guss. ssp. *bocconi*: Capo Grosso (Palermo), W. De Leonardis & A. Zizza. (CAT 91101506).

Verbascum rotundifolium Ten. ssp. *rotundifolium*: Petralia Soprana (Palermo), W. De Leonardis & A. Zizza. (CAT 92062520).

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