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Variation in seed morphology in the genus *Erica* L. (Ericaceae)

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Abstract: Seed morphology was studied in 136 species of *Erica*, including 123 from South Africa (Cape Floristic Region), 5 from tropical Africa, and 8 from Europe. Seed anatomy was studied in 13 selected species by light and scanning electron microscopy. Seed morphology of each species was described and documented by SEM micrographs. Ten major diagnostic features were selected, concerning seed shape, primary sculpture, and fine relief. On the basis of these features, the species were divided into 14 groups. Within them, 40 morphologically homogeneous subgroups were distinguished, which could possibly be used in future revisions of the genus. A key to species identification has been developed on the basis of seed characteristics. A very close similarity was observed between seeds of some *Erica* species from distant parts of the distribution range of this genus.

Key words: *Erica*, carpology, seed sculpture, fine relief, seed coat, cluster analysis, Cape Floristic Region

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1. Introduction

Erica is one of the major genera of the family Ericaceae. The number and rank of taxa distinguished within this genus vary depending on classification. Currently about 865 species are included in this genus (Oliver 2000). According to this classification, it is the largest genus of the Ericaceae, larger even than the genus *Rhododendron* (Stevens *et al*. 2004), which is commonly believed to include the largest number of species.

The generic name *Erica* comes from the Old Greek word *ereika*, which was used by Theophrastus. Carl Linnaeus, in his fundamental work *Species Plantarum* (1753), described this genus on the basis of 23 species, including 12 from South Africa. Intensive research in the Cape Region resulted in the description of new *Erica* spp. Carl Thunberg greatly contributed to the knowledge of this genus. On the basis of field research and a rich herbarium collection, he described many new species (Thunberg 1785). Another major step in research on this genus was a work written by Richard Salisbury (1802), which presented results of his analysis of herbarium specimens from numerous collectors. On the basis of a revision of all the available material, he recognised 236 species. He created the basis for the division of the genus into sections and subsections, which were later used by Don (1834) and Bentham (1839). In the 1820s, German collectors also started field research in South Africa, and supplied numerous herbarium specimens, e.g. to Berlin. These collections formed a basis for research on the Ericaceae conducted by Klotzsch (1838). He included *Erica* spp. and closely related species in a taxonomic group called Ericearum, and within it he distinguished tribes and numerous genera. At the same time, this plant family was studied also by George Bentham (1839). In contrast to Klotzsch's classification, Bentham's (1839) concept of the genus *Erica* was very clear, based on well-defined principles, primarily on stamen structure. He divided the genus into 4 subgenera and 49 sections. Another important step in research on *Erica* spp. was Guthrie and Bolus's (1905) work. They suggested a new classification of the genus, based on corolla and calyx structure, and distinguished 5 subgenera divided into 41 sections. This publication for many years was the basis of the classification of this genus. It should be noted, however, that it is concerned only with taxa from the former Cape Province, so it does not cover the whole genus. Salter's (1950) flora of Cape Peninsula included 100 species of *Erica*. For the whole Cape Province, the genus was next revised by Dulfer (1965), who verified many synonyms and added species described after 1905. In total, he listed 605 species of *Erica* but generally preserved the classification and numbering of species by Guthrie & Bolus (1905). In the last few decades, intensive research on South African *Erica* spp. and related genera was conducted by E. G. H. Oliver and I. M. Oliver. On the basis of herbarium specimens and field research, they described a few dozen new species (Oliver 1967, 1984, 1985, 1986, 1990, 1993b; Oliver & Oliver 1991, 1995a, 1995b, 1996a, 1996b, 1997, 1999a, 1999b, 1999c, 2000a, 2000b, 2000c, 2000d, 2001a, 2001b, 2002b, 2002c, 2004; Oliver *et al*. 1997; Turner & Oliver 2006). Those studies formed a basis for numerous revisions of *Erica* spp. and of allied genera, so-called minor genera (Oliver 1976, 1980, 1987a, 1987b, 1988, 1993a, 1994). E.G.H. Oliver finally suggested that all minor genera should be included in the large genus *Erica* (Oliver 2000). One of the major effects of the research is yet another complete revision of this genus, presented in parts (Oliver & Oliver 2002a, 2005). Those authors, in general, preserve Guthrie and Bolus's (1905) division into sections, but they emphasize that the presented classification of this genus is still far from satisfactory. They note also that the available morphological characters are not sufficient to determine a natural system of classification and that this requires a molecular phylogeny.

As shown by examples of research conducted in other systematic groups, fruits and seeds provide good diagnostic features (Barthlott & Voit 1979; Barthlott 1981). However, in spite of great progress in carpological studies and general recognition of the high value of carpological characters, the family Ericaceae has not been sufficiently investigated in this respect (Stevens 1971; Oliver 1991, 2000). Earlier studies concerned, as a rule, only single taxa or small groups of species (Artopoeus 1903; Beijerinck 1940; Gleisberg 1922; Niedenzu 1890; Winton 1902), which could not give a full picture of fruit and seed diversity.

Plants of the genus *Erica*, like other members of the Ericaceae, have ovules with a single integument, i.e. both their ovules and seeds are unitegmic (Artopoeus 1903; Netolitzky 1926; Peltrisot 1904; Corner 1976; Takhtajan 1992). The nucellus, lying under the integument, is used up during embryo-sac development, so the seeds are described as tenuinucellate. The endosperm is composed of thin-walled cells. It is nuclear in this plant family, except for the genus *Rhododendron*, where endosperm is cellular (Corner 1976). It contains well-defined haustoria, both micropylar and chalazal; in ripe seeds they are inactive, lignified and deformed (Takhtajan 1992). The embryo is relatively large, straight, composed of 2 cotyledons, hypocotyl, and radicle. It is located at the centre of the endosperm oriented longitudinally, occupying ¼ to ½ of its length. Its radicle is oriented towards the micropyle (Corner 1976; Takhtajan 1992; Szkudlarz 2001). The thin integument is composed of only 4-10 layers of cells (Netolitzky 1926; Corner 1976; Takhtajan 1992). The seed coat develops from the outer part of the integument, i.e. from its epi-

dermis, so the seeds are described as exotestal. During seed development, other layers of the testa are resorbed or compressed. As a result, mature seeds of *Erica* are surrounded by a seed coat composed of only a single layer of cells as a rule (Szkudlarz 2001, 2006).

In recent decades, scanning electron microscopy (SEM) has gained particular importance in research on seed morphology, showing that seed characters have a great diagnostic value (Huckerby *et al.* 1972; Barthlott & Voit 1979; Kuźniewska 1980; Barthlott 1981; Minuto *et al*. 2006; Oh *et al*. 2008). Moreover, because of their durability, they can be used for identification of fossil materials (Huckerby *et al*. 1972). Oliver (1991) mentioned the great morphological diversity of seeds in the genus *Erica* and included some SEM micrographs. In his numerous works on new species he includes information about the size of seed and character of seed coat (Oliver 1986, 1987, 1990; Oliver & Oliver 1991, 1995, 1997, 1999a, 1999b, 1999c, 2000a, 2000b, 2000c, 2000d, 2001a, 2001b, 2001c, 2001d, 2002a, 2002b, 2004; Oliver *et al*. 1997; Turner & Oliver 2006; Dorr & Oliver 1999). Moreover, also Fraga (1984) and Fagúndez & Izco (2003a, 2003b, 2004a, 2004b) made attempts to use morphological features of seeds for taxonomic analysis of selected European species of *Erica*. Results of my preliminary research on 30 South African species of *Erica* (Szkudlarz 2006) encouraged me to continue these investigations.

The basic aims of this study were: (1) to investigate as thoroughly as possible the morphological diversity

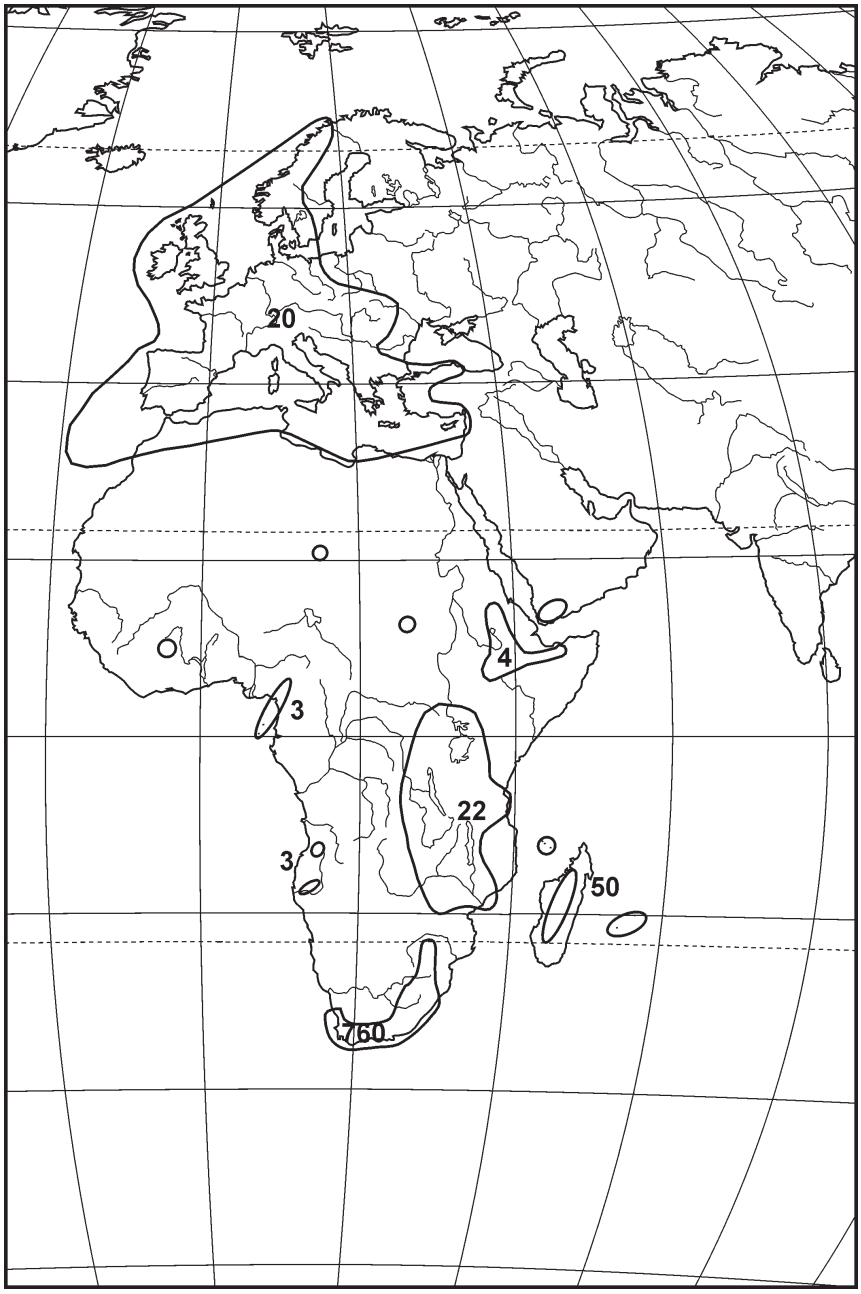


Fig. 1. Geographic distribution of the genus *Erica* (after Oliver 2000, modified)

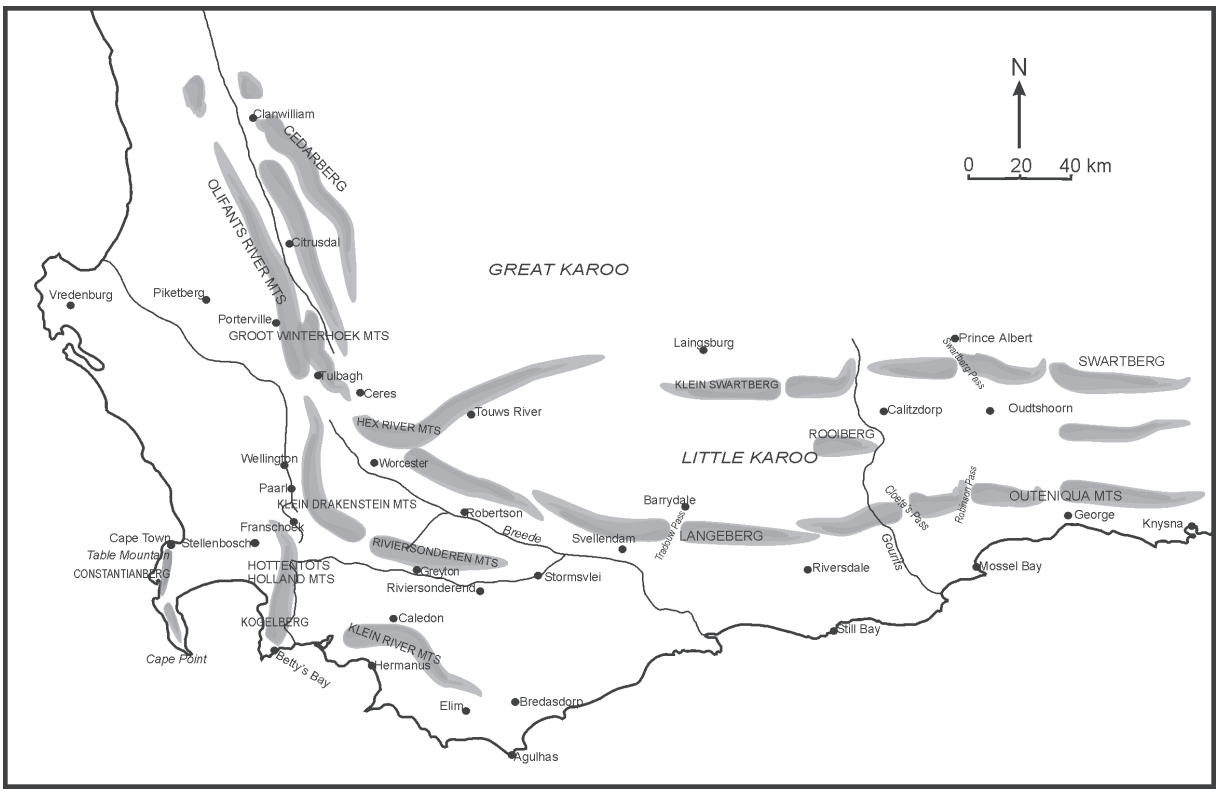


Fig. 2. Western part of the Cape Floristic Region, the centre of diversity of *Erica* spp. (after Schumann & Kirsten 1992, modified)

of seeds of the genus *Erica*; and (2) to determine to what extent their morphology is linked with the current systematics of the genus.

For this purpose, with the use of light and scanning electron microscopy, seed morphology was analysed in species from all distinguished subgenera and nearly all sections, to represent the genus properly. Next, seeds of all the studied species were described in a similar, comparable way. Well-defined diagnostic characters of seeds were selected, and on their basis morphological groups were distinguished and compared with the taxonomic subdivision of the genus. As a result of this study, a key to species identification has been developed on the basis of selected seed characters.

2. Morphology and geographic range of the genus

Plants of the genus *Erica* generally have many features in common, and thanks to this they form a quite homogeneous group with respect to morphology. However, on the other hand, they show a great variation of individual features, so it is difficult to compile a uniform, complete description of this genus. On the basis of numerous publications (Hansen 1950; Phillips 1951; Baker & Oliver 1967; Webb & Rix 1972; Schumann & Kirsten 1992; Bayer 1993; Oliver & Oliver 2000; Stevens *et al*. 2004), the genus can be generally described as follows. *Erica* spp. are woody plants, usually dwarf shrubs or small shrubs, rarely large shrubs

Fig. 3. *Erica* spp. in a patch of fynbos (i.e. South African heathland), on slopes of Pilaarkop near Riviersonderend
Explanations: a – *Erica trichophylla*, b – *E. tenuifolia*, c – *E. sessiliflora*, d – *E. hispidula* (Photo by P. Szkudlarz)

or small trees. Leaves are ericoid, evergreen, as a rule with revolute margins, either opposite or whorled. Flowers usually tetramerous, sepals free, green or coloured; petals partly fused, variable in shape. Stamens usually 8; anthers opening with oval pores and often bearing characteristic basal appendages. Filaments straight or S-like curved. Pollen generally in tetrads, rarely single pollen grains (monads). Pistil single, ovary superior, usually composed of 4 carpels. Style very long, ending with a simple, truncate, or rarely capitate or peltate stigma. Ovary with 4 locules; ovules several to over 50 per carpel. Fruit is a loculicidal capsule, or rarely indehiscent. It must be emphasized that in this description there are exceptions from the rule in nearly each feature.

The geographic range of this genus is rather peculiar. It extends in the north-south direction from the northernmost parts of Europe to southern limits of Africa. In East Africa, *Erica* spp. reach to southwestern part of the Arabian Peninsula, as well as Madagascar. Distribution of taxa within this range is very uneven. Some parts are lacking any heaths, while others are centres of diversity of this genus (Fig. 1). Undoubtedly, the Cape Floristic Region is the richest of them, as 760 species have been recorded there within a relatively small area. On the Cape Peninsula alone, as many as 104 species have been found (Oliver & Oliver 2000). The largest concentration of taxa of *Erica* was observed near the town of Caledon, where 235 species coexist within an area of 4500 km^2 (Schumann & Kirsten 1992) (Fig. 2).

In some types of fynbos (i.e. natural South African heathland) in that region, as many as 4 species per 1 m^2 can be found (Oliver & Oliver 2002a) (Fig. 3). Europe and North Africa are another centre of diversity, much larger but also much poorer (only about 20 species) (McClintock 1989). Besides, large numbers of *Erica* spp. are found in Central Eastern Africa (22 species) and Madagascar (50 species) (Oliver 2000). However, in the last two centres, mostly members of the so-called minor genera (*Ericinella*, *Philippia*, *Mitrastylus*) are found, i.e. the species that have been included in the genus *Erica* after revision by Oliver (2000).

3. Material and methods

Seeds of 136 species of *Erica* were studied: 123 from the Cape Floristic Region, 5 from tropical Africa, and 8 from Europe. The examined specimens originated mostly from the Compton Herbarium (South African National Biodiversity Institute, Claremont), and to a lesser extent, from my own collection made during field research. All species and collection sites are listed in Table 1. Each sample included at least 30 seeds. The

Table 1. List of species included in this study

No.	Name of species	No section*	Sampling station	Date	Collector; Specimen no; herbarium
1	*E. coccinea*	1	Constantiaberg	-	Oliver E.G.H.; 11357; NBG
2	*E. intermedia*	1	Robinson Pass	02.06.1951	Taylor; -; NBG
3	*E. plukenetii*	1	Bottelary	12.02.1956	Maguire; 2587; NBG
4	*E. banksii*	2	Stanford	-	Oliver E.G.H.; 11275; NBG
5	*E. viridiflora*	2	Robinson Pass	04.1994	Oliver E.G.H.; -; NBG
6	*E. mammosa*	3	Porterville	12.03.1994	Oliver E.G.H.; -; NBG
7	*E. sessiliflora*	3	-	-	-; -; NBG
8	*E. abietina*	3	Clovelly	30.04.1997	Berry M.; -; NBG
9	*E. vestita*	3	Jonaskop		Oliver E.G.H.; -; NBG
10	*E. patersonii*	4	Betty's Bay	02.1995	Oliver E.G.H., Oliver I.; -; NBG
11	*E. sacciflora*	4	French Hoek	06.08.1958	Lewis; 5280; NBG
12	*E. maximilianii*	4	7 weeks Poort	-	-; -; NBG
13	*E. kogelbergensis*	4	Kogelberg	13.09.1969	Baker; 2971; NBG
14	*E. unicolor*	4	-	-	-; -; NBG
15	*E. versicolor*	4	Bergfontein	08.1994	Oliver E.G.H.; -; NBG
16	*E. cruenta*	4	Korente River	-	Oliver E.G.H.; -; NBG
17	*E. strigilifolia*	5	Besemfontein	-	Oliver E.G.H.; -; NBG
18	*E. sparrmanii*	5	Kareedouw	13.10.1928	Gillett; 1525 B; NBG
19	*E. doliiformis*	5	Wemmershoek	05.1994	-; -; NBG
20	*E. phillipsii*	5	Piketberg	02.2002	Turner R.; 320; NBG
21	*E. oatesii*	5	Cathkin Pk	10.1890	Thode; 8502; NBG
22	*E. cerinthoides*	5	Jonaskop	03.2005	Oliver E.G.H.; -; NBG
23	*E. fascicularis*	7	Sunny Seas	-	Oliver E.G.H.; -; NBG
24	*E. retorta*	8	Betty's Bay	01.1995	Oliver I.; -; NBG
25	*E. jasminiflora*	8	Shaw's Pass	-	Oliver E.G.H.; -; NBG
26	*E. shannonii*	8	Paardeberg – Boskloof	01.04.1993	Oliver E.G.H.; -; NBG
27	*E. cristata*	8	Paardeberg/Kogelberg	20.04.1992	Oliver E.G.H.; -; NBG
28	*E. rhodopis*	8	Bot River	-	-; -; NBG
29	*E. praecox*	9	Kromriver vlakte	02.1998	Oliver E.G.H.; -; NBG
30	*E. atrovinosa*	9	Hex River	-	Esterhuysen; 31677; NBG
31	*E. fastigiata*	10	Kogelberg	-	Kruger; 1048; NBG

32	*E. transparens*	10	Jonaskop	-	Oliver E.G.H.; -; NBG
33	*E. vallis-gratiae*	10	Galgeberg	14.12.1981	Jaarsveld van.; 6394; NBG
34	*E. albens*	11	Garcias Pass	08.04.1983	Bohnen P.; 8455; NBG
35	*E. tetragona*	11	Skurweberg/Robinson Pass	05.04.1994	Oliver E.G.H.; -; NBG
36	*E. glutinosa*	12	Jonaskop	03.2005	Oliver E.G.H.; -; NBG
37	*E. umbrosa*	12	Stettynsberg	09.08.1997	Oliver E.G.H.; 10848; NBG
38	*E. peziza*	13	Stormsvlei	10.1993	Oliver E.G.H.; -; NBG
39	*E. ovina*	13	Appels Kraal	10.1947	Stokoe; -; NBG
40	*E. tomentosa*	13	Greyton	12.02.1992	Oliver I.; 30; NBG
41	*E. sicifolia*	13	Genadendal	21.02.1966	Thompson M.F.; 139; NBG
42	*E. algida*	13	Elliott	19.04.1994	S.P. Bester; 2753; NBG
43	*E. oresigena*	13	Matroosberg	02.1997	Ashton; -; NBG
44	*E. setosa*	13	Kogelberg	06.12.1993	Kruger I.; 1228; NBG
45	*E. oreophila*	14	Jonkershoek	01.1965	Kerfoot; 5059; NBG
46	*E. brachycentra*	14	Atlagaaskloof	06.1997	Oliver E.G.H.; -; NBG
47	*E. petrophila*	14	Jonaskop	-	Oliver E.G.H.; -; NBG
48	*E. amicorum*	14	Langeberg/Rivenrsdale	-	Oliver E.G.H.; -; NBG
49	*E. strigosa*	14	Table Mountain	11.1949	Pillans; 10581; NBG
50	*E. grata*	14	-	-	McDonald D.; 1531; NBG
51	*E. filialis*	14	Matrosberg	08.1999	-; -; NBG
52	*E. conferta*	15	-	-	Stokoe; 2105; NBG
53	*E. obtusata*	15	Jonaskop	09.04.1994	Frech; -; NBG
54	*E. rubiginosa*	16	Rietfontein	09.1994	Oliver E.G.H. s.n.; -; NBG
55	*E. scytophylla*	16	Die Poort	-	-; -; NBG
56	*E. nudiflora*	16	Bainskloof/Witelsrivier	06.1994	Mc Dowell; -; NBG
57	*E. paniculata*	17	Anysberg		Rebelo T.; -; NBG
58	*E. bicolor*	17	Paarl Mtn	30.09.1999	Raimondo; 5566; NBG
59	*E. scabriuscula*	18	Hansmei	04.1973	Blake R.E.; -; NBG
60	*E. rubens*	18	Klein Swartberg	-	-; -; NBG
61	*E. sitiens*	18	Landroskop	20.08.1996	Fregs; -; NBG
62	*E. rehmii*	18	Wolseley	26.09.1996	Oliver E.G.H.; 10715; NBG
63	*E. tenella*	18	Hermanus	28.04.1974	Orchard; 131; NBG
64	*E. pageana*	19	Kogelberg	-	Oliver E.G.H.; -; NBG
65	*E. schlechteri*	20	Beddgelett	-	Oliver E.G.H.; -; NBG
66	*E. nubigena*	20	Seweweekspoort Berg	03.02.1992	Oliver E.G.H.; -; NBG
67	*E. umbelliflora*	20	Baviaansmountain	17.09.1973	Oliver E.G.H.; -; NBG
68	*E. physodes*	20	Swartkop/Cape Peninsula	13.08.1998	Helme N.; -; NBG
69	*E. odorata*	20	Groenlandberg	11.1994	Oliver E.G.H. s.n.; -; NBG
70	*E. juniperina*	20	Skurweberg/Robinson Pass	04.1994	Oliver E.G.H.; 10333; NBG
71	*E. carduifolia*	20	Greyton	29.11.1992	Oliver I. s.n.; -; NBG
72	*E. pyxidiflora*	21	Silver Mine (entrance)	07.11.1999	Oliver I.; -; NBG
73	*E. columnaris*	21	Pilaarkop	10.1997	Oliver E.G.H.; -; NBG
74	*E. parilis*	21	-	-	Morley; 499; NBG
75	*E. axilliflora*	21	Rietfontein	02.09.1994	Oliver E.G.H.; 10557; NBG
76	*E. woodii*	22	-	26.05.1993	Bester; 641; NBG
77	*E. coarctata*	22	Arieskraal, Palmiet River	10.09.1993	Rode E.; -; NBG
78	*E. hispidula*	23	Kouga	16.12.1991	Oliver E.G.H.; 9929; NBG
79	*E. karooica*	23	Klaasvoogds	1824	Mc Donald; -; NBG
80	*E. tenuis*	23	Bokkeveld	13.02.1992	Klennvley Icone; -; NBG
81	*E. setacea*	23	Jonaskop	09.1993	Oliver E.G.H.; -; NBG
82	*E. sphaerocephala*	24	Rietgarsolii	14.10.1995	Hanck; 2798; NBG
83	*E. cooperi*	24	Ugie	04.1994	Sangster s.n.; -; NBG
84	*E. stylaris*	25	Outeniqua Pass	-	-; -; NBG
85	*E. senilis*	26	Gideonskop	28.04.1995	Oliver E.G.H., Oliver I.; -; NBG
86	*E. genistifolia*	27	Betty's Bay Mtn	01.1995	Oliver I.; -; NBG
87	*E. cumuliflora*	27	-	-	-; -; NBG
88	*E. bruniades*	28	Hartbeeskloof	13.11.1993	Oliver E.G.H.; 10407; NBG
89	*E. desmantha*	30	Platberg Kogelberg	28.06.1968	Boucher C.; 134; NBG
90	*E. physantha*	30	Riversdale	-	Kirsten; -; NBG
91	*E. lasciva*	31	Stanford	-	Oliver E.G.H.; -; NBG
92	*E. accommodata*	31	Jonaskop	03.10.1999	Oliver E.G.H.; -; NBG
93	*E. borboniifolia*	33	Pilaarkop	26.02.1999	Oliver E.G.H.; -; NBG
94	*E. lutea*	33	Jonaskop	-	Oliver E.G.H.; -; NBG
95	*E. alfredii*	33	Pilaarkop	26.02.1999	Oliver E.G.H.; -; NBG
96	*E. taxifolia*	33	Jonaskop	-	Oliver E.G.H.; -; NBG
97	*E. palliiflora*	33	-	-	Schumann; 157; NBG
98	*E. lanuginosa*	34	Klein River Mtns	-	Turner; 1087; NBG
99	*E. monsoniana*	34	Cedarberg	16.12.1979	Forsyth; 55; NBG
100	*E. kirstenii*	34	Swartberg	-	Oliver E.G.H.; 10369; NBG
101	*E. nabea*	35	Prince Alfreds Pass	19.09.2005	Szkudlarz, Wiland-Szymańska, Oliver E.G.H.; 207; POZ

102	*E. insignis*	35	Anysberg	1990	Oliver E.G.H.; -; NBG
103	*E. tegulifolia*	36	Landdroskop	-	Oliver E.G.H.; Pl 47; NBG
104	*E. baccans*	36	ex Hort. Hermanus, *Woodvine s.n.* & Hout Bay	10.01.1970	-; -; NBG
105	*E. selaginifolia*	36	Touwsberg	06.10.1993	McDonald; 2415; NBG
106	*E. brevifolia*	36	Garcia Forest Stacion	22.11.1991	McDonald; 2111; NBG
107	*E. sparsa*	37	Plettenberg Bay airport	04.09.1997	-; -; NBG
108	*E. rhodantha*	37	Langeberg	28.10.1992	Oliver E.G.H., Oliver I.; 242; NBG
109	*E. peltata*	37	Robinson Pass	08.04.1994	Oliver E.G.H.; -; NBG
110	*E. argentea*	38	Porterville	12.03.1994	Oliver E.G.H.; -; NBG
111	*E. calycina*	38	Kouga mtns	16.12.1991	Oliver E.G.H.; 9918; NBG
112	*E. pseudocalycina*	38	Langeberg	26.11.1987	McDonald; 1489; NBG
113	*E. floccifera*	38	Greyton	12.11.1992	Oliver I.; 32; NBG
114	*E. jacksoniana*	38	Landroskop	20.08.1996	Oliver E.G.H.; 10706; NBG
115	*E. uysii*	38	De Hoop	19.02.1983	Schumann; 159; NBG
116	*E. oakesiorum*	38	Genadendal	03.09.1996	Fritz Volk; -; NBG
117	*E. seriphiifolia*	39	Kouga	09.04.1993	Euston-Brown D.; 101/1; NBG
118	*E. cristiflora*	39	Cedarberg	-	Taylor; 10830; NBG
119	*E. gillii*	39	Attakwaskloof	22.02.1972	Oliver E.G.H.; 4127; NBG
120	*E. melanthera*	40	Tradouw Pass	10.12.1959	Oliver E.G.H.; 337; NBG
121	*E. newdigatea*	40	Smutskop	09.1977	Rebelo; -; NBG
122	*E. canaliculata*	40	Humansdorp Distr.	-	Thode A.; 2558; NBG
123	*E. thunbergii*	41	Maltese Cross	-	Taylor; -; NBG
124	*E. benguelensis*	TA	-	-	Chapman; 592; NBG
125	*E. microdonta*	TA	Mt Mulan	-	Oliver E.G.H.; 9816; NBG
126	*E. nyassana*	TA	Mt Mulan	-	Oliver E.G.H.; -; NBG
127	*E. trimera*	TA	Malawi	-	-; -; NBG
128	*E. whyteana*	TA	Mt Mulan Mulanya	-	-; -; NBG
129	*E. arborea*	E	Spain, Cap de Creus	07.1999	Szkudlarz; -; POZ
130	*E. carnea*	E	Poland, BG	06.2004	Szkudlarz; -; POZ
131	*E. cinerea*	E	Spain, Navarra	22.09.1996	Boratyński, Didukh; -; KOR
132	*E. erigena*	E	Ireland, Carrowmore	07.2004	Nelson Ch.; -; -;
133	*E. multiflora*	E	Spain, Rampola	07.1999	Szkudlarz; -; POZ
134	*E. scoparia*	E	Spain, Cap de Creus	07.1999	Szkudlarz; -; POZ
135	*E. tetralix*	E	Poland, Smołdzino	08.1997	Szkudlarz; -; POZ
136	*E. vagans*	E	Spain, Navarra	12.09.1999	Boratyński, Didukh; -; KOR

Explanations: the specimen number (if known follows the collector's name; herbarium abbreviations, NBG – Compton Herbarium, POZ – Department of Plant Taxonomy, Adam Mickiewicz University in Poznań, KOR – Institute of Dendrology in Kórnik; * – the section number is given for South African species, otherwise, region symbols, TA – tropical Africa, E – Europe

morphology was examined in dry seeds, with the use of a stereomicroscope and scanning electron microscope (SEM). Five seeds from each sample were used for SEM analysis. The material examined in the SEM was observed using the standard protocols, under a scanning electron microscope (Philips SEM-515) in the Electron Microscopy Laboratory, Faculty of Biology, Adam Mickiewicz University, Poznań. Prior to observation, the dry seeds were mounted on metal stubs using double-sided sticky tape and were sputtered with gold using an SCB 050 ion sputter. The length and width measurements were taken for all seeds in the sample. On the basis of the SEM image, there was determined the number of seed coat cells along the seed's longer axis, the type of border between seed coat cells and the type of microsculpture (secondary sculpture or fine relief).

For the selected species, representing various types of seed morphology, anatomical structure was studied. For this purpose, dry seeds were soaked in 70% alcohol for at least one day, and next transverse sections of the central part of the seed were made. The sections were mounted on glass slides and observed under a light microscope (LM). All measurements were made by using software for digital analysis of LM images (Lucia Screen Measurement).

This study has lead to distinguishing many features that enabled original description of seeds of each species. These selected morphological traits were quantitative (character 1 and 2) or qualitative: binary (3, 4, 5, 8) or multistate (6, 7, 9, 10). To each qualitative trait a distinct value (1-3) was ascribed (Table 2).

The features were also used for constructing a key to seed identification and for taxonomic analysis. The analysis was carried out by two methods. The first one involved grouping of species according to their features considered *a priori* as particularly important (Barthlott 1981). That is why the studied seeds were classified first of all depending on the relief of cell boundaries.

Table 2. List of analysed seed characters

No	Feature
1	Seed length (mm x 10)
2	Number of cells along the long axis of the seed
3	Seed shape in outline: spherical or nearly spherical – 1; elongated – 2
4	Seed shapes in cross-section: nearly round – 1; flattened – 2
5	Hilum position: terminal – 1; lateral – 2
6	Seed coat cell shape : isodiametric, up to 2 times longer than wide – 1; elongate, 2-5 times longer than wide – 2; markedly elongate, more than 5 times longer than wide – 3
7	Seed coat cell anticlinal walls: slightly undulate– 1; markedly undulate – 2; straight – 3
8	Relief of cell boundaries in seed coats: channelled – 1; raised – 2
9	Structure of outer periclinal walls: collapsed – 1; flat – 2; convex – 3
10	Secondary sculpture: absent (surface of outer walls is completely smooth) – 1; micropapillate – 2; striate or undulate – 3

Next, within these sets of species, several subsets were distinguished on the basis of anticlinal walls: with strongly undulated walls, with slightly or irregularly undulated walls, and with straight walls. At the next level, the classification was based on cell outline: isodiametric (up to twice as long as wide), elongate (2-5 times as long as wide), and strongly elongate (more than 5 times as long as wide). The further subgroups were distinguished on the basis of still other features of lower taxonomic value.

The second method was based on 10 selected characters, assuming that all of them are equally important. Similarity between the seeds of the studied taxa was evaluated by the method of cluster analysis (Statistica 7 software). To obtain as small clusters as possible, Ward's agglomerative clustering method (Ward 1963) with the Manhattan distance was used. Before the analysis, because of the different types of characters, the data were standardized (Statistica 7 software).

The morphological description of species preceding seed description is based on earlier publications (Alm & Fries 1927; Baker & Oliver 1967; Schumann & Kirsten 1992; Webb & Rix 1972). South African species are presented in the same order as in *Flora Capensis* (Guthrie & Bolus 1905) with later changes (Dulfer 1965; Oliver & Oliver 2002a, 2005), while species from tropical Africa and Europe are arranged in alphabetical order. Species names follow Dulfer (1965) with later changes (Oliver 1992; Oliver & Oliver 2002a, 2005) and Webb & Rix (1972). Section names follow Guthrie & Bolus (1905) for South Africa species and Hansen (1950) for European species.

4. Results

4.1. Seed structure in the genus *Erica*

The observed great morphological variation of *Erica* seeds is associated, to a large extent, with the anatomical structure of this single layer of cells (testa epidermis). Thickenings of cell walls are particularly important in this case. Most typical for the whole family Ericaceae are the cells whose inner periclinal and anticlinal (radial) walls are thickened, while outer periclinal walls remain thin (Takhtajan 1992; Szkudlarz 2001, 2006). However, the thickenings vary greatly, particularly in radial walls. Those walls are unevenly thickened, usually more strongly at the base and less strongly near the junction with the outer wall, and consequently they are triangular in cross-section. Only rarely are they most strongly thickened in the middle or upper part, so that they become elliptic or club-shaped in cross-section, or are evenly thickened and appear straight in cross-section (Fig. 4). If radial walls are more strongly thickened at the base, the outer periclinal walls are slightly sunken.

In cells of the testa epidermis of some species, only the inner periclinal wall is strongly thickened, while the radial walls are then hardly visible. The thickenings are nearly even in all cells of the seed coat, forming a uniform layer. Seed surface is then smooth or nearly smooth (Fig. 4a, 4f, 4g, 4h, 4k). Very rarely, the outer periclinal walls are thickened. In the thickened cell walls, some pores are easily visible under a light microscope, sometimes referred to as pits. If the thin outer periclinal wall collapses on the pitted inner or radial walls, impressions of the underlying pits are sometimes visible in SEM images.

Seed morphology can be described by features that can be divided into groups concerned with various levels of structure: size and shape, sculpture, and fine relief (also known as secondary sculpture).

Seed length in the studied group varies widely, from less than 0.3 mm to 2 mm. Seed shape is also highly variable. Their outline is usually elliptic or ovate, with one end narrower; rarely round or angular. Often one side is more or less flat, so the shape is somewhat semicircular (Fig. 5). In cross-section they are round (seed

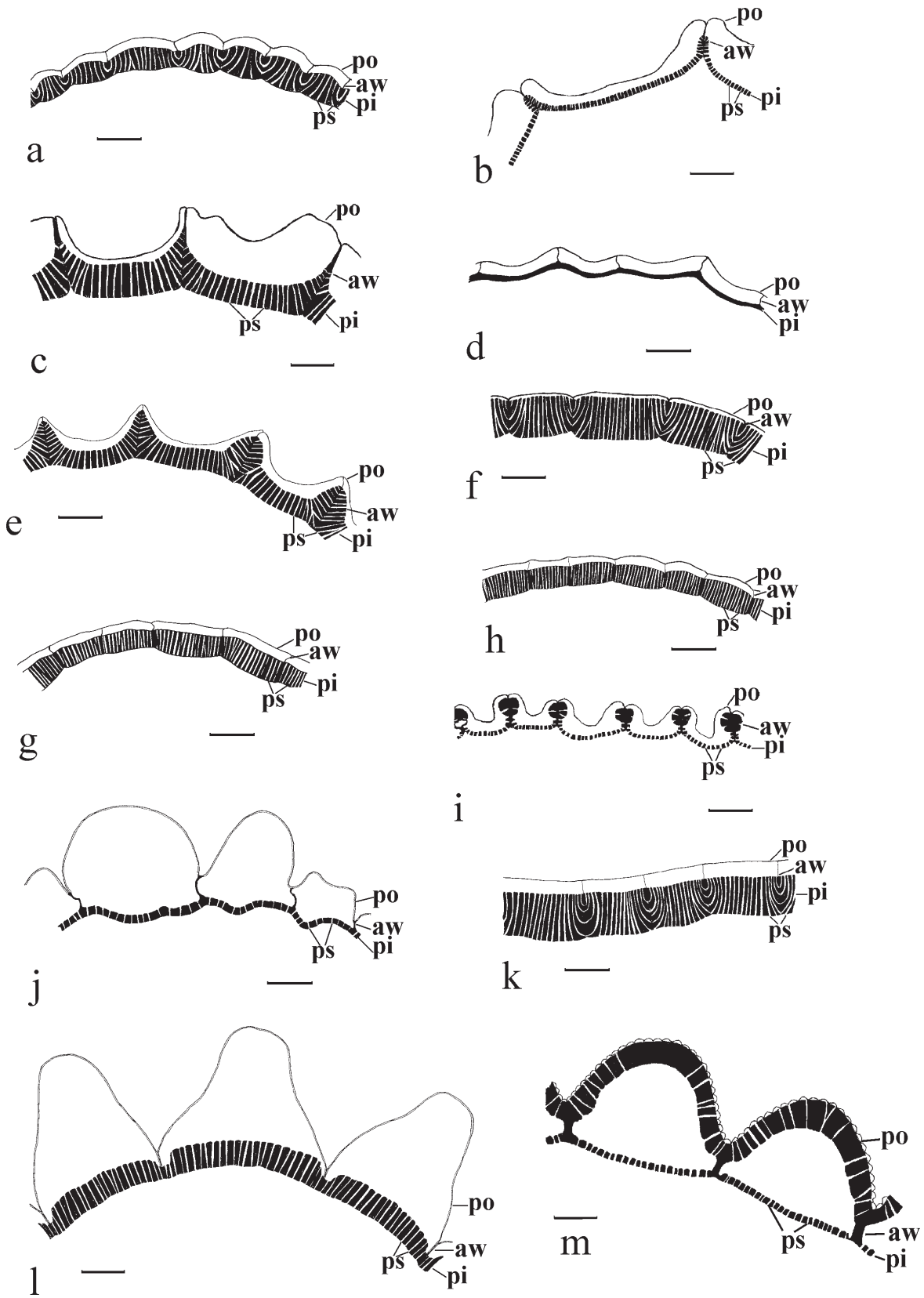


Fig. 4. Seed coat, cross section
Explanations: a – *Erica albens*, b – *E. alfredii*, c – *E. altiphila*, d – *E. argentea*, e – *E. baccans*, f – *E. banksii*, g – *E. bicolor*, h – *E. bruniades*, i – *E. fuscescens*, j – *E. mammosa*, k – *E. monsoniana*, l – *E. odorata*, m – *E. juniperina*, ps – pores, pi – inner periclinal wall, po – outer periclinal wall, aw – anticlinal wall. Scale bar: 20 µm

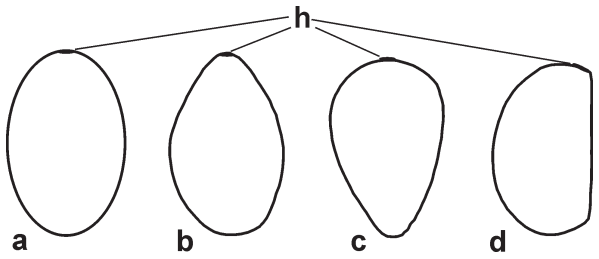


Fig. 5. Outline of seed shapes
Explanations: a – elliptic, b – ovate (hilum on a narrower end), c – obovate (hilum on a broader end), d – semicircular (one side is flat), h – hilum

not flattened) or elliptic (seed slightly flattened), or oblong-elliptic (seed strongly flattened). Sometimes only the ventral surface is flattened, so the seed is nearly semicircular in cross section.

Some seeds are flattened bilaterally, wedge-shaped in cross section (Fig. 6). However, seeds of one species, from one sample, are often variable in shape. This is due to the fact that large numbers of seeds are produced in the capsule, so they are crowded and deform one another during development. This sometimes makes it difficult to describe seed shape.

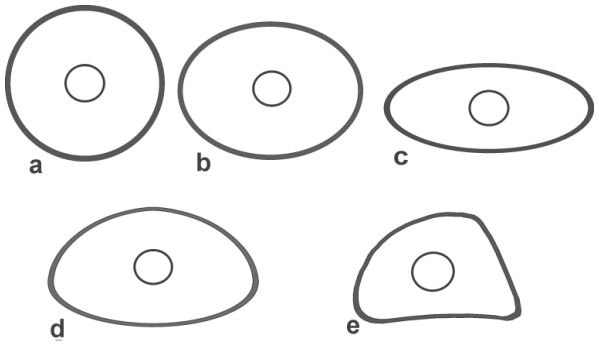


Fig. 6. Seed shapes in cross section
Explanations: a – round (seed not flattened), b – elliptic (seed slightly flattened), c – oblong-elliptic (seed strongly flattened), d – semicircular (ventrally flattened), e – wedge-shaped (flattened bilaterally)

Seed sculpture depends mostly on the size and shape of epidermal cells. Epidermal cell size was highly variable (Fig. 7). The outline of testa cells in surface view ranges from isodiametric to markedly elongate (Fig. 7). Cells up to twice as long as wide were considered isodiametric. Cells more than 5 times as long as wide, were considered markedly elongate. As a rule, cells are smaller and shorter at the ends of the seed, so observations and comparisons can be made only in the central part of the seed.

An important feature of sculpture is also the pattern of anticlinal walls. They can be straight, slightly undulated, or markedly undulated. If the waves were as at least as deep as wide, or if they were small but crowded,

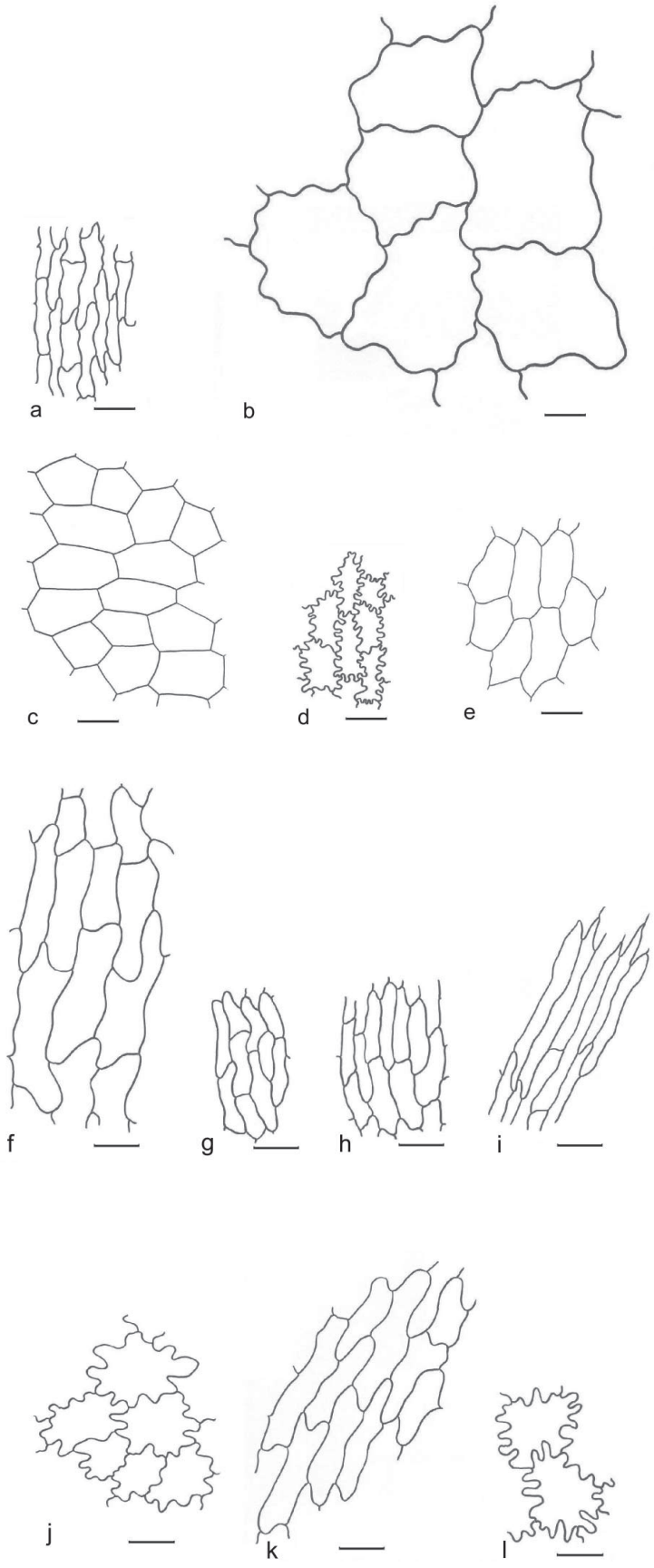


Fig. 7. Seed coat cells, surface view
Explanations: a – *Erica albens*, b – *E. alfredii*, c – *E. altiphila*, d – *E. argentea*, e – *E. baccans*, f – *E. banksii*, g – *E. bicolor*, h – *E. bruniades*, i – *E. fuscescens*, j – *E. mammosa*, k – *E. monsoniana*, l – *E. odorata*. Scale bar: 50 µm

the walls were considered markedly undulated. If the waves resulted from S-shaped curvature of walls, or were flat and irregular, the walls were considered slightly undulated.

Another element of seed sculpture was the structure of outer walls. Most common in *Erica* spp. and other Ericaceae, are collapsed outer walls in mature seed coat cells. Such cells are U-shaped in cross section, while radial walls are prominent and seed surface is reticulate. Sometimes the outer periclinal walls are initially elevated, but with a sunken central part, so that folds of various size are formed at the edges. The reticulate surface is then specific, and can be described as cup-like. Outer periclinal cell walls of the seed coat can be also flat, so that sometimes anticlinal walls are invisible. The seed surface is then very smooth and shiny, particularly under a light microscope. In some cases, outer walls are convex, forming various papillae (Fig. 4).

Another feature, very important one, is relief of cell boundaries in seed coats of adjacent cells. The boundaries can be convex or channelled. In some cases, folds of the outer periclinal wall are formed at cell edges and mask the true cell boundaries.

The third level of seed morphology is secondary sculpture or fine relief. In seeds of *Erica* spp. the surface can be micropapillate (i.e. granulate, verrucate, tuberculate), undulate, or striate. If the fine relief is striate, the striae can be more or less regular, or irregular, sometimes anastomosing. The surface of outer walls can be also completely smooth, with no fine relief, both in smooth seeds and in those with sunken outer walls.

Seeds of a few species have around the hilum a structure described as caruncle. This feature is present in only a few species, and is structurally variable, so it was not used in the statistical analysis but only mentioned in species descriptions and in the key.

On the basis of the above criteria, diagnostic features were selected and used to describe seed morphology in each species.

4.2. Seed morphology and general characteristics of the species

1. *Erica coccinea* L., Sp. Pl. ed. I, 1: 355 (1753)
   Sect. 1 *Gigandra*

Densely branched shrub, up to 1.2 m high, with short, stiff, curved leaves. Flowers with elongate corollas and strongly constricted throats, up to 17 mm long; red, yellow, green, pink, or orange. Stamens protruding. Anthers without appendages. Flowering in various periods, depending on location.

Widely distributed throughout the Cape Floristic Region.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened; 0.62-0.73 mm long, 0.41-0.50 mm wide. Seed surface smooth and shiny (Fig. 8a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 2-5 times longer than wide, with ca. 11 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 8b). In SEM observations seeds smooth, cells poorly defined; under a light microscope seeds smooth, with a hardly visible network of seed coat cells.

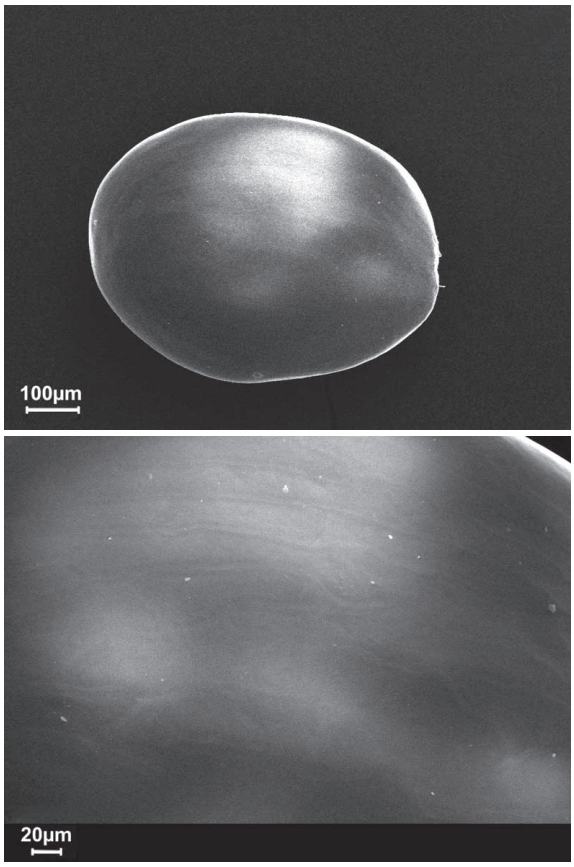


Fig. 8. *Erica coccinea* L. (SEM), seed (a) and surface of seed coat (b)

2. *Erica intermedia* Klotzsch ex Benth., DC. Prodr. 7: 621 (1839) [*E. petiveri* var. *intermedia* (Klotzsch ex Benth.) Bolus (1905), *E. coccinea* var. *intermedia* (Klotzsch ex Benth.) Dulfer (1965)]
Sect. 1 *Gigandra*

Similar to *E. coccinea*, corolla clearly longer than calyx, 6-11 mm long, green or yellow-green, sometimes white (subsp. *albiflora*), anthers pointed apically, but without appendages. Flowering in various periods, depending on location.

Found in the Swellendam, along the Langeberg and Outeniqua Mtns.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened; 0.47-0.60 mm long, 0.36-0.42 mm wide. Seed surface smooth and shiny (Fig. 9a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 2-6 times longer than wide; ca. 12 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, surface of outer periclinal walls smooth (Fig. 9b). In SEM observations the seeds smooth, cells very poorly defined; under a light microscope seeds smooth, with a hardly visible network of seed coat cells.

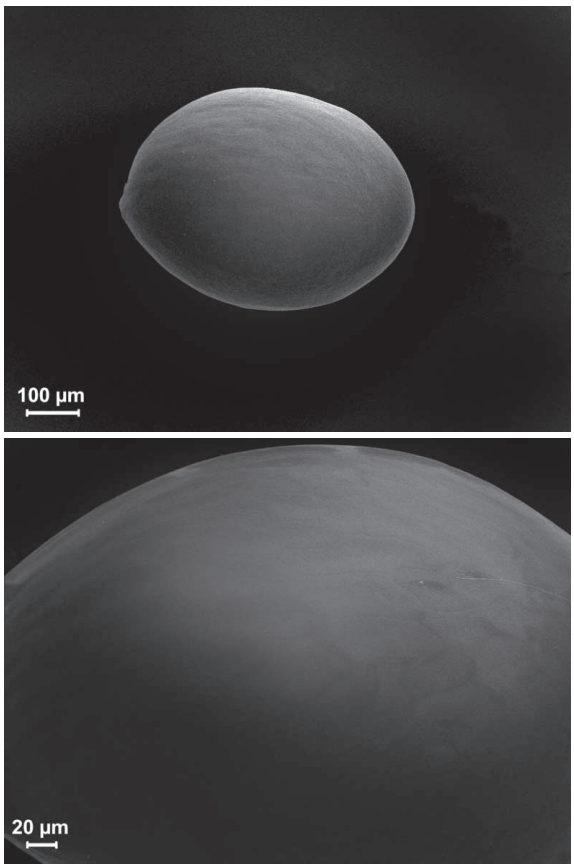


Fig. 9. *Erica intermedia* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

3. *Erica plukenetii* L., Sp. Pl. ed. I, 1: 356 (1753)
Sect. 1 *Gigandra*

Shrub with erect shoots, reaching 60-90 cm in height (sometimes 120 cm). Shoots densely covered with delicate leaves, flowers with corollas 13-18 (28) mm long, variously coloured, from white to red. A highly variable species, with 4 subspecies and numerous varieties. Stamens protruding. Anthers without appendages. Flowering in various periods, depending on location.

Species with a wide geographic range.

Seed shape variable, elliptic to ovate in outline, nearly round in cross-section, slightly flattened, often with a slightly curved chalazal end. Seed 0.80-0.92 mm long, 0.48-0.57 mm wide. Seed sculpture reticulate (Fig. 10a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, 5-7-gonal; ca. 12 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture verrucate (Fig. 10b).

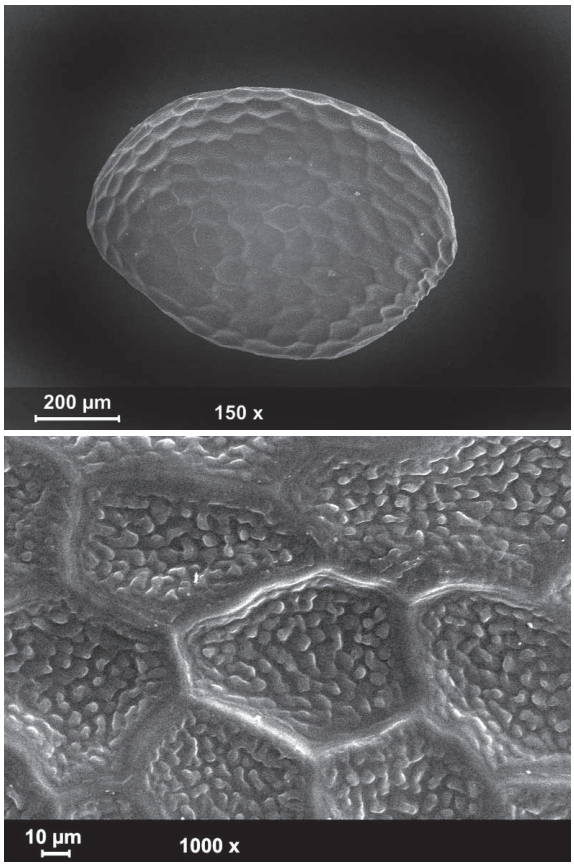


Fig. 10. *Erica plukenetii* L. (SEM), seed (a) and surface of seed coat (b)

4. *Erica banksii* Andrews, Col. Heaths t. 5 (1797), [*E. banksia* Willd. (1799)]
Sect. 2 *Didymanthera*

Straggly shrub growing among rocks, forming large clumps, flowers pendent, in bunches, flowers with corollas 14-20 mm long, their tubes whitish, pinkish or yellowish, with contrasting corolla lobes, and protruding stamens. Anthers without appendages.

Found at lower altitudes in mountains, from Sir Lowry's Pass in the south to Quoin Point.

Seeds ovate in outline, nearly round in cross-section, slightly flattened. Seed 0.57-0.68 mm long, 0.36-0.42 mm wide. Seed sculpture in the SEM observations delicately reticulate (Fig. 11a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells narrow, markedly elongate, 4-7 times longer than wide; 10-13 cells along the long axis of the seed. Cell boundaries raised, radial (anticlinal) walls somewhat protruding, slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 11b). The visible delicate hollows are impressions of pits of the inner periclinal wall on the thin outer wall. Under a light microscope, seeds smooth and shiny.

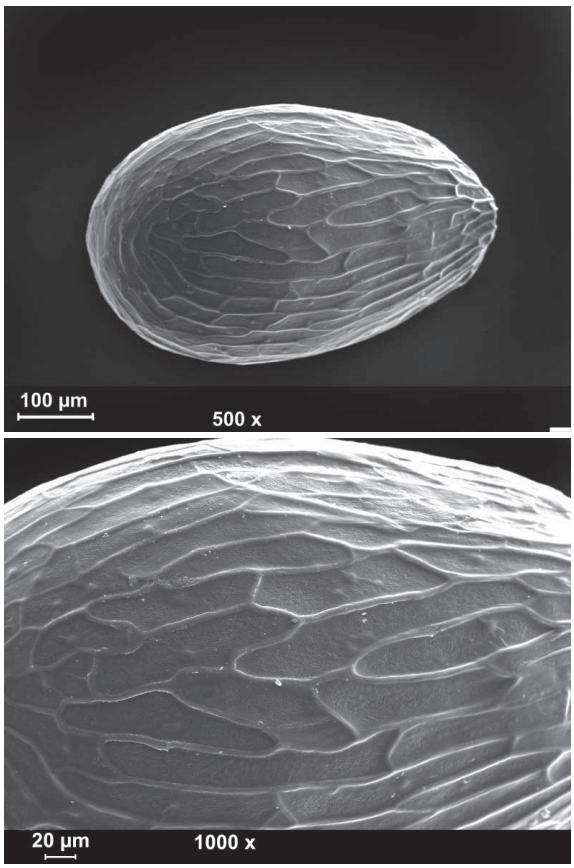


Fig. 11. *Erica banksii* Andrews (SEM), seed (a) and surface of seed coat (b)

5. *Erica viridiflora* Andrews, Heath. t. 299 (1812)
Sect. 2 *Didymanthera*

Erect, irregular, profusely branched shrubs, up to 1 m high. Flowers usually in groups of 3, corollas 22-26 mm long, with short and straight, or spreading lobes, greenish, sticky, stamens hidden in corolla tubes or somewhat protruding. Anthers with small appendages. Flowering in late autumn-winter

Found on roadsides on Robinson and Outeniqua Passes.

Seeds nearly rectangular in outline, flattened, with rounded angles, and a head-like caruncle on one end. The 'head' clearly separated from the rest of the seed by a constriction. Two deep furrows along both sides of the seed, divid its surface into 3 elongate areas. The central area slightly convex bilaterally. Seed (excluding the 'head') 1.10-1.37 mm long, 0.60-0.76 mm wide. Seed surface reticulate (Fig. 12a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, or somewhat elongate, 2-3 times longer than wide, polygonal; ca. 14 cells along the long axis of the seed (to the 'head'). Cell boundaries raised, radial walls straight. Secondary sculpturing verrucate (Fig. 12b).

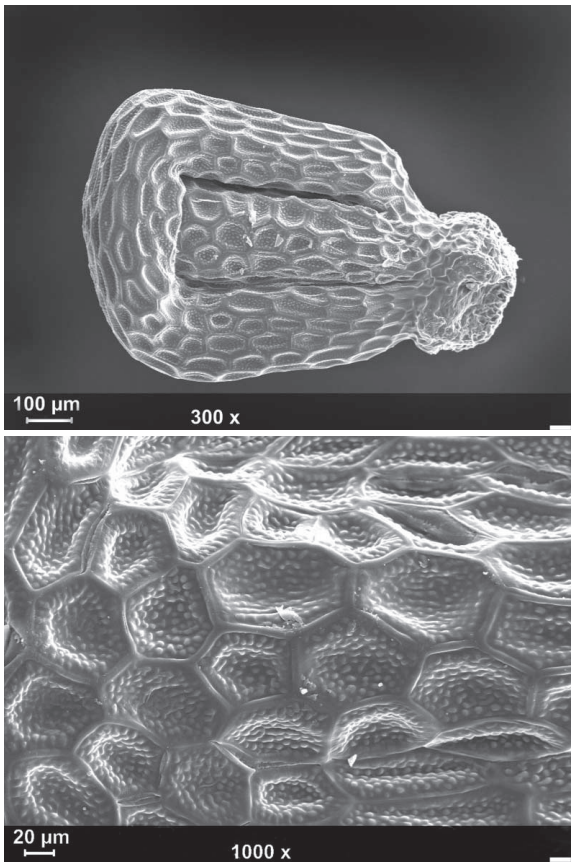


Fig. 12. *Erica viridiflora* Andrews (SEM), seed (a) and surface of seed coat (b)

6. *Erica mammosa* L., Mantiss. alt. 234 (1771), [*E. gilva* J.C.Wendl. (1798)]
Sect. 3 *Pleurocallis*

Densely branched when mature, up to 1.8 m high. Flower colour variable, red, pink, green, cream-white to white, corolla tubular, ending with 4 lobes, rugose at base, 24-25 mm long, stamens hidden, anthers with appendages. Flowering: Dec-Apr.

Widespread, distributed from Cedarberg to the Cape Peninsula, in the east to Stellenbosch, Hermanus, and Celadon.

Seeds elliptic to ovate in outline, nearly round in cross-section, flattened ventrally and on one side, with a well-defined ridge (raphe) on one side. Hilum apical. Seed length 0.92-1.09 mm, width 0.58-0.68 mm. Seed surface tuberculate-alveolate (Fig. 13a). Outer periclinal cell walls of the seed coat are convex, forming hemispherical tubercles, and only some of them are slightly concave. Seed coat cells are isodiametric, nearly stellate; ca. 15-17 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls markedly undulate, nearly stellate. Secondary sculpture striate, with mostly parallel striae. Outer periclinal walls vesicle-like convex, forming tubercles on the surface, often slightly concave apically (Fig. 13b).

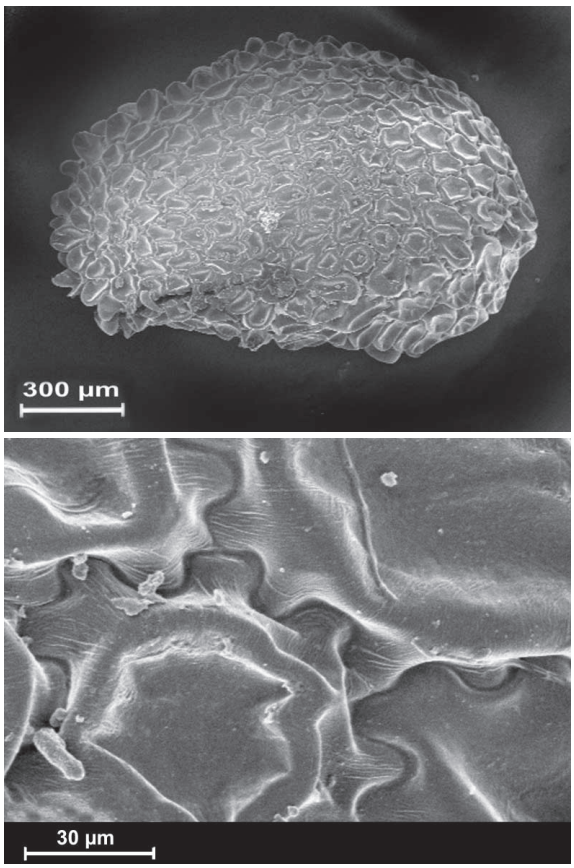


Fig. 13. *Erica mammosa* L. (SEM), seed (a) and surface of seed coat (b)

7. *Erica sessiliflora* L.f., Suppl. Pl. 222 (1782) [*E. clavaeflora* Salisb. (1802), *E. sceptriformi*s Salisb. (1802)]
Sect. 3 *Pleurocallis*

Erect shrub, up to 2 m high. Greenish-yellow flowers in dense apical inflorescences, corolla tubular, 16-30 mm long, ending with 4 lobes, stamens hidden, anthers with appendages. After flowering, sepals form a characteristic hard cover around the ovary. Flowering: Apr-Sep.

Common in southern Cape, to Humansdorp in the east.

Seed shape variable, elliptic in outline, nearly round in cross-section, one end blunt, obliquely truncate, often also bilaterally flattened. Seed 0.91-1.14 mm long, 0.60-0.78 mm wide. Seed surface reticulate (Fig. 14a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, 5-7-gonal; 14-15 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture striate, with partly parallel striae, mostly at seed edges (Fig. 14b).

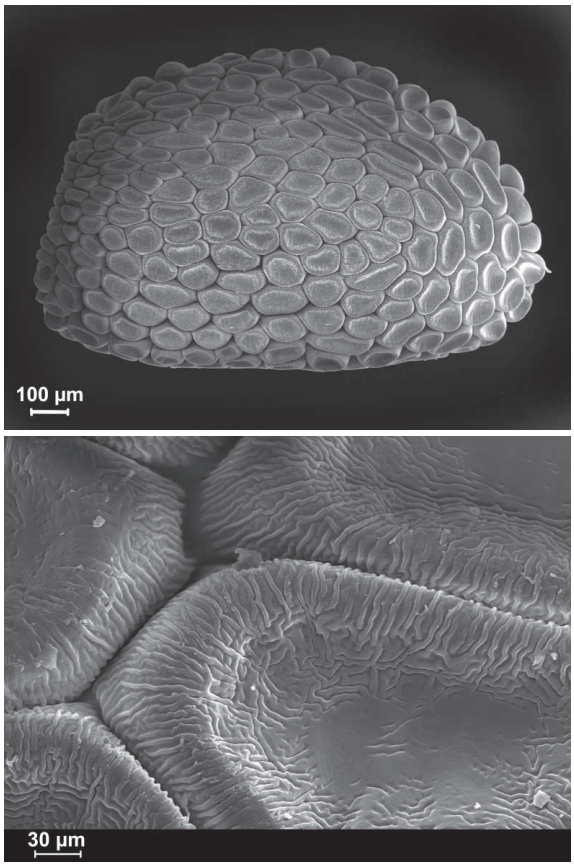


Fig. 14. *Erica sessiliflora* L.f. (SEM), seed (a) and surface of seed coat (b)

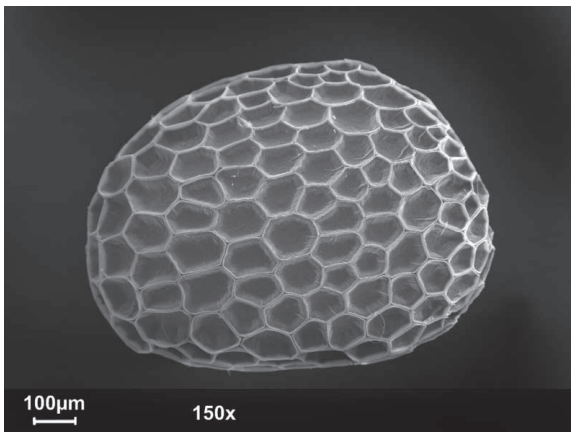
8. *Erica abietina* L., Sp. Pl. ed. I, 1: 355 (1753)
Sect. 3 *Pleurocallis*

Shrub, up to 90 cm high. Flowers in dense apical clusters. Corolla tubular, ending with 4 lobes, 20-23 mm long, pale red, slightly sticky, stamens hidden in corolla tubes. Anthers without appendages. Flowering: Aug-Sep.

Found on northern slopes of Table Mountain and Devil's Peak.

Seeds obovate-elliptic in outline, round in cross-section, sometimes slightly flattened ventrally. Hilum on a somewhat broader end. Seed 0.66-0.79 mm long, 0.52-0.59 mm wide. Seed surface reticulate (Fig. 15a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells polygonal, isodiametric; 10-12 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture delicately striate (Fig. 15b).

a



b

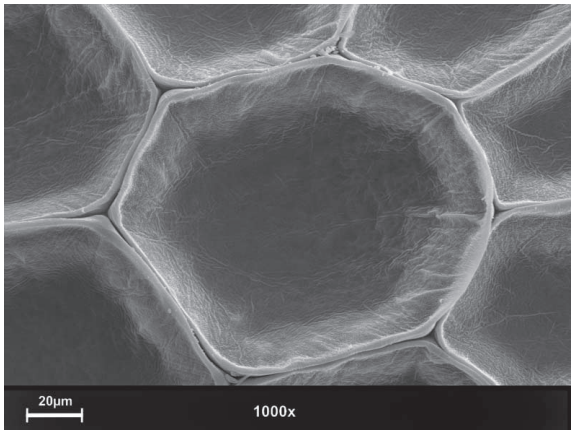


Fig. 15. *Erica abietina* L. (SEM), seed (a) and surface of seed coat (b)

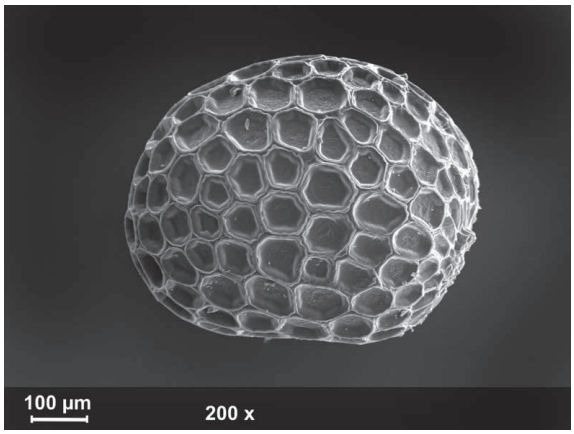
9. *Erica vestita* Thunb., Diss. Eric 22 (1785)
Sect. 3 *Pleurocallis*

Dense shrub with erect branches, up to 90 cm high, shoots densely covered with long, thin leaves. Flower colour variable, from dark red through pink to white. Corolla tubular, ending with 4 lobes, 17-25 mm long, pale red, slightly sticky, stamens hidden, rarely slightly protruding, anthers without appendages. Flowering: Aug-May.

Found on lower slopes, from Worcester in the south to Bredasdorp, and to Riversdalena in the east.

Seeds broadly elliptic to obovate in outline, round in cross-section. One end markedly broader, blunt, with a hilum. Seed 0.56-0.72 mm long, 0.44-0.53 mm wide. Seed surface reticulate, alveolate (Fig. 16a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells isodiametric; ca. 10 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls markedly undulate. Secondary sculpture delicately undulate (Fig. 16b).

a



b

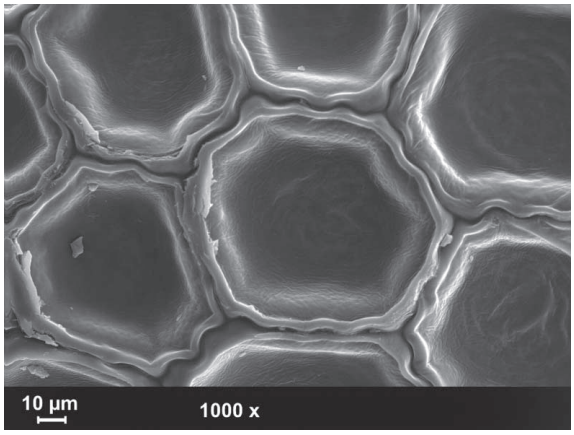


Fig. 16. *Erica vestita* Thunb. (SEM), seed (a) and surface of seed coat (b)

10. *Erica patersonii* Andrews, Col. Heaths t. 43 (1795)
Sect. 4 *Evanthe*

Shrubs with many erect, long branches, up to 90 cm high. Shoots densely covered with thin leaves. Flower yellow, forming dense, long inflorescences, resembling cobs. Corolla tubular, ending with 4 lobes, 14-18 mm long, stamens hidden in corolla tubes. Anthers with appendages. Flowering: Apr-Aug.

Found close to the sea, on Cape Point, Betty's Bay, and Kleinmond, also close to Hermanus, and on slopes of Boskop, in the Klein River Mts.

Seeds elliptic in outline, round in cross-section. One end slightly broader, with a hilum. Seed 0.69-0.83 mm long, 0.49-0.61 mm wide. Seed surface reticulate (Fig. 17a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric; 9-10 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture striate, striae partly oriented (near cell edges), partly stellate (Fig. 17b). Dull under a light microscope.

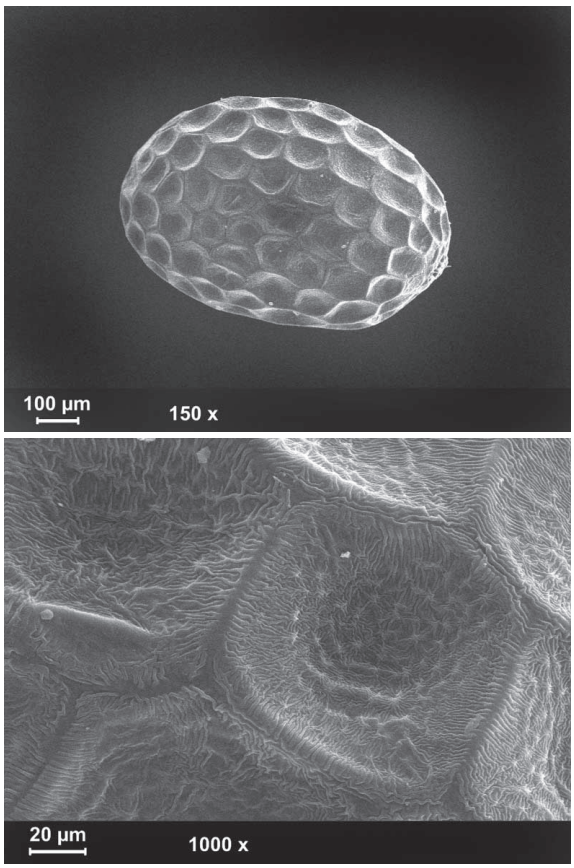


Fig. 17. *Erica patersonii* Andrews (SEM), seed (a) and surface of seed coat (b)

11. *Erica sacciflora* Salisb., Trans. L. S. 6: 355 (1802)
Sect. 4 *Evanthe*

Shrub with stiff, erect shoots, up to 1.2 m high. Flower yellow, forming apical racemes, corolla tubular, 16-20 mm long, stamens hidden in corolla tubes. Anthers with appendages. Flowering: Apr-Aug.

Rare, found only near Franschhoek.

Seeds elliptic to somewhat obovate in outline, round in cross-section. One end slightly broader, with a hilum. Seed 0.83-0.95 mm long, 0.62-0.66 mm wide. Seed surface reticulate (Fig. 18a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric; 9-11 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture striate, striae partly oriented (near cell edges), partly stellate (Fig. 18b). Usually dull under a light microscope.

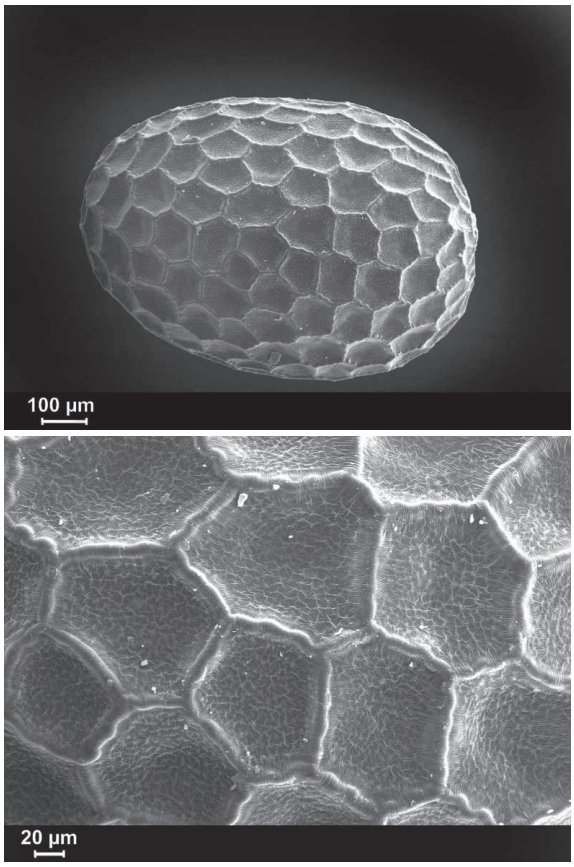


Fig. 18. *Erica sacciflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

12. *Erica maximilianii* Guthrie & Bolus, Engl. Bot. Jahrb. 27: 173 (1900)

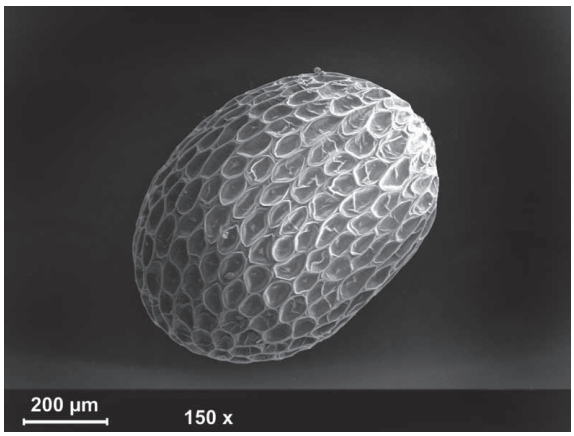
Sect. 4 *Evanthe*

Plants forming erect, profusely branched shrubs. Flowers pale green to sulphur yellow, with tubular corollas. Corolla tube 28-33 mm long, ending with 4 lobes, stamens hidden. Anthers with appendages. Flowering: Sep-Dec.

Montane species, whose range reaches from Cedaberg in the north-west, through Koue Bokkeveld to Wittenberg in the south, to Great Karoo and Littre Karoo. Found on Klein Swartberg near Ladismith, and further east in Swartberg near Oudtshoorn, also in Langeberg near Tradouw Pass in the south.

Seeds broad elliptic in outline, round in cross-section. Hilum apical. Seed 0.57-0.68 mm long, 0.36-0.42 mm wide. Seed surface reticulate (Fig. 19a). Outer periclinal cell walls of the seed coat initially elevated and next steeply concave, forming a narrow oval margin around the cell. Seed coat cells slightly elongate, 2.5-4 × longer than wide; 10-12 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls straight. Secondary sculpture striate, irregular (Fig. 19b).

a



b

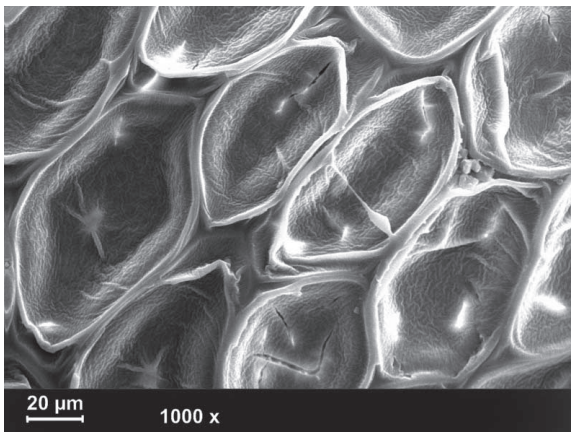


Fig. 19. *Erica maximilianii* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

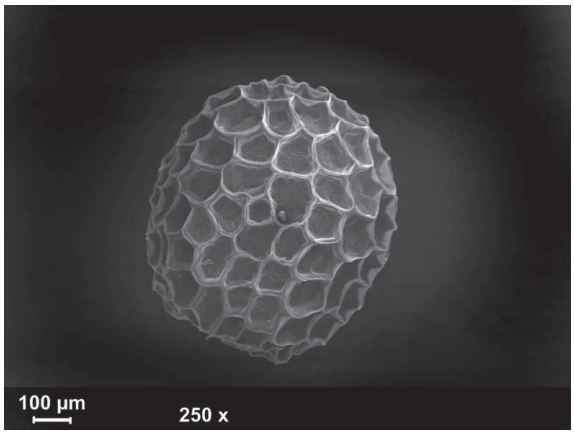
13. *Erica kogelbergensis* E.G.H.Oliv., Yb. Heather Soc. 1996: 3 (1996)

Sect. 4 *Evanthe*

Flowers on lateral, short branches, forming compact, spike-like inflorescences. Corolla delicately hairy, pale yellow, or with red lobes. Anthers with small appendages. Found in mountains between Caledon and Hermanus. Flowering: May-Sep.

Seeds broadly ovate to elliptic in outline, round in cross-section. Sometimes the narrower end blunt, with a hilum. Seed 0.69-0.83 mm long, 0.55-0.70 mm wide. Seed surface reticulate, alveolate (Fig. 20a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells isodiametric; 8-9 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls straight. No secondary sculpture, the surface of outer periclinal walls generally smooth, very thin, when lying on the inner walls they reflect their sculpture, and hence apparently vermiculate sometimes (Fig. 20b). Shiny under a light microscope.

a



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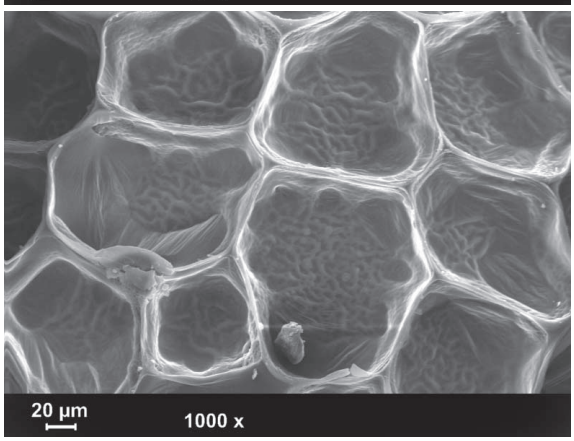


Fig. 20. *Erica kogelbergensis* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

14. *Erica unicolor* J.C.Wendl., Eric. Ic. f. 25: 7 t. 3 (1819)

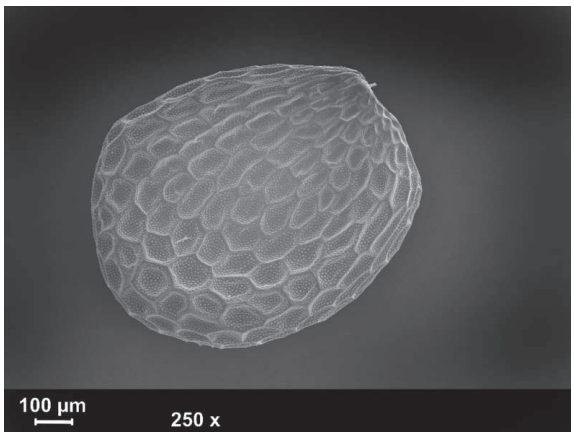
Sect. 4 *Evanthe*

Robust, profusely branched shrubs, up to 1.2 m high. Flowers in small racemes. Corollas tubular, 16-22 mm long, greenish-yellow, sticky. Stamens hidden in corolla tubes. Anthers with appendages. Flowering: Jul-Nov.

Found in Langeberg from Herbertsdale to George, and on Robinson Pass.

Seeds roundish-ovate in outline, flattened dorsoventrally, somewhat curved. Hilum at a slightly narrowed end. Seed 0.75-0.86 mm long, 0.63-0.75 mm wide. Seed surface reticulate (Fig. 21a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric or slightly elongate; 9-11 cells along the long axis of the seed. Cell boundaries convex, radial walls straight. Secondary sculpture tuberculate (Fig. 21b). Semi-dull under a light microscope.

a



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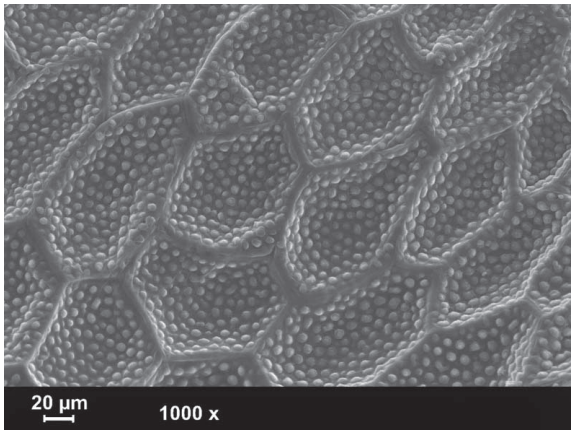


Fig. 21. *Erica unicolor* J.C.Wendl. (SEM), seed (a) and surface of seed coat (b)

15. *Erica versicolor* Andrews, Col. Engr. H. t. 67 (1796)

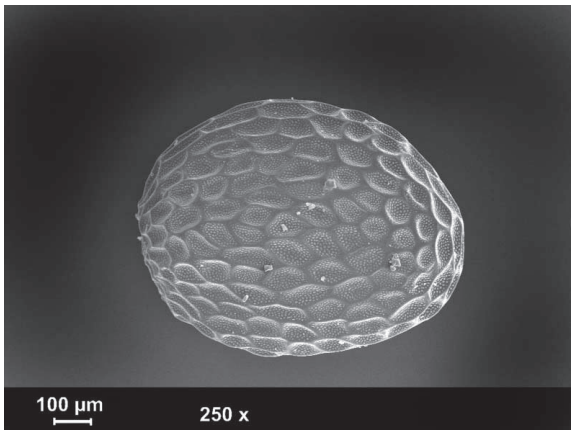
Sect. 4 *Evanthe*

Robust shrubs, up to 3 m high. Flowers in small bunches. Corollas tubular, 22-28 mm long, usually red at base and greenish-yellow or whitish at apex. Stamens hidden in corolla tubes. Anthers without appendages. Flowering: Apr-Jun.

Found on low mountain slopes, from Worcester in the west to Mossel Bay in the east.

Seeds ovate in outline, slightly flattened ventrally, rarely somewhat curved. Sometimes one end slightly elongate, narrowed with a hilum. Seed 0.82-1.00 mm long, 0.64-0.74 mm wide. Seed surface reticulate (Fig. 22a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric; 10-11 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture tuberculate (Fig. 22b). Dull or semi-dull under a light microscope.

a



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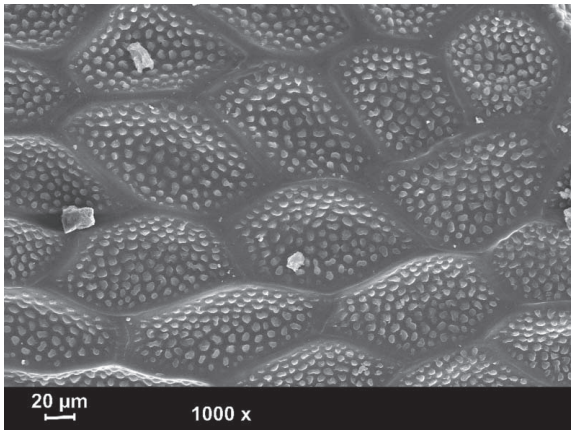


Fig. 22. *Erica versicolor* Andrews (SEM), seed (a) and surface of seed coat (b)

16. *Erica cruenta* Soland., Ait. Hort. Kew. ed. I, 2: 16 (1789)

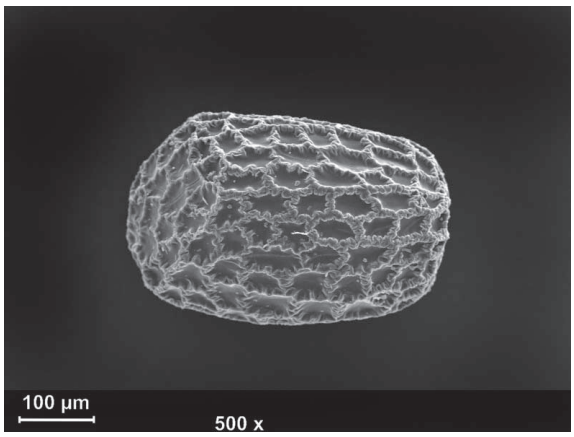
Sect. 4 *Evanthe*

Erect, loosely branched shrubs, up to 1.2 m high. Flowers in small racemes at shoot tips. Corollas tubular, 20-22 mm long, blood-red, stamens hidden in corolla tubes. Anthers with appendages. Flowering: Mar-Sep.

Found at low altitudes, from Worcester in the west through Celadon and along the southern shore to Riversdale.

Seeds rectangular to ovate in outline, angular, somewhat elongate, often with a slightly curved and narrowed chalazal end and a blunt micropylar end with a hilum. Seed 0.46-0.60 mm long, 0.32-0.40 mm wide. Seed surface reticulate, alveolate (Fig. 23a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells isodiametric, irregular; 10-11 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. No secondary sculpture, the surface of outer periclinal walls is smooth (Fig. 23b).

a



b

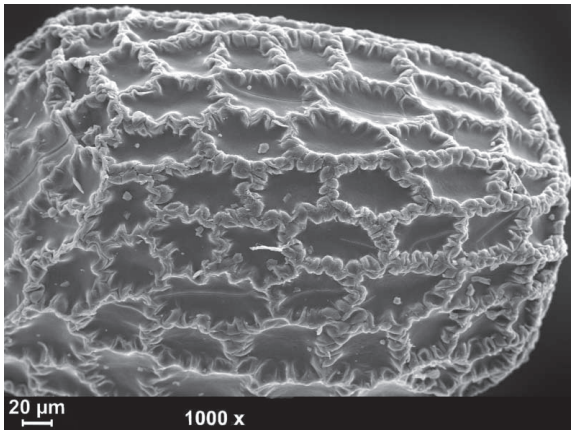


Fig. 23. *Erica cruenta* Soland. (SEM), seed (a) and surface of seed coat (b)

17. *Erica strigilifolia* Salisb., Trans. Linn. Soc. 6: 367 (1802)

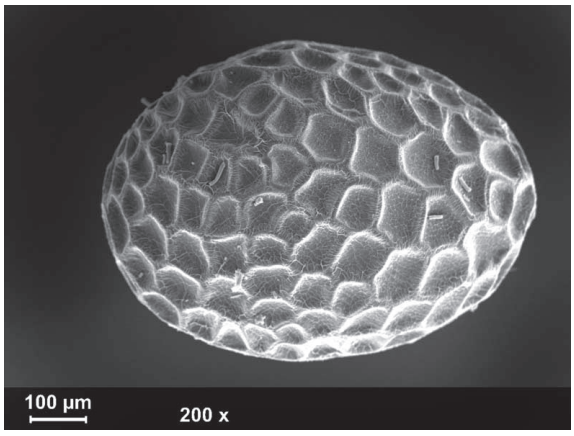
Sect. 5 *Dasyanthes*

Erect, profusely branched shrubs, up to 60 cm high. Flowers on apical parts of lateral branches, usually in groups of 4 flowers. Corolla tubular, red, pink or whitish, 14-18 mm long, covered with short hairs, particularly in the upper part. Stamens hidden, anthers with appendages.

Species found inland, usually at lower altitudes, from Ladismith in the west to Uniondale and Willowmore in the east, in the south in the Kouga Mts in Upper Langkloof.

Seeds broadly obovate in outline, nearly round in cross-section, slightly flattened bilaterally, triangular-ovate in cross-section. Hilum on a slightly broader end, somewhat laterally. Seed 0.70-0.82 mm long, 0.51-0.61 mm wide. Seed surface reticulate (Fig. 24a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric; 10-12 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture striate, oriented at edges, anastomosing at centre (Fig. 24b). Slightly shiny under a light microscope.

a



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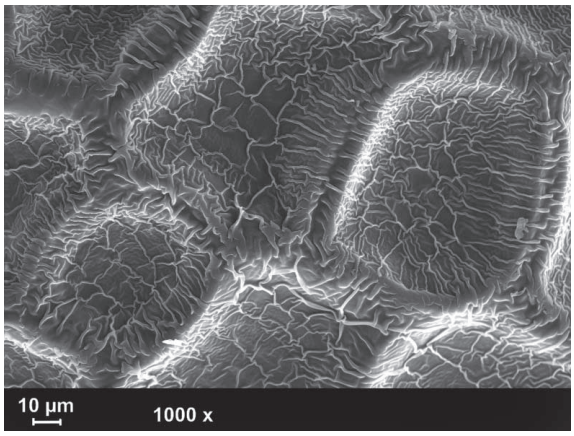


Fig. 24. *Erica strigilifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

18. *Erica sparrmanii* L.f., Vet. Acad. Handl. Stockh. 1778: 21 t. 2 (1778)

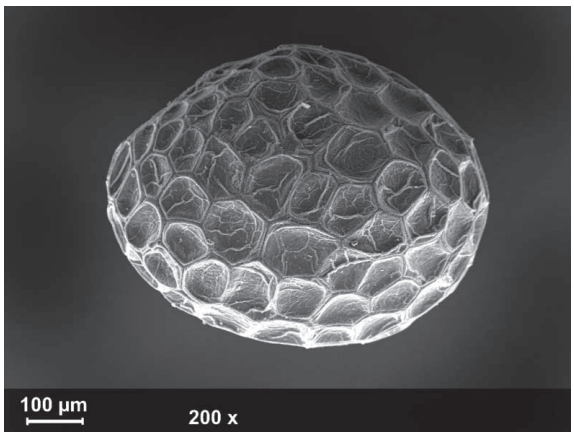
Sect. 5 *Dasyanthes*

Erect, narrow, irregularly branched shrubs, up to 1.9 m high. Flowers in small apical racemes. Corolla tubular, 12-18 mm long, yellow, densely covered with bristle-like hairs, stamens hidden in corolla tubes. Anthers without appendages. Flowering: Jul-Jan.

Found on nearly flat and low slopes, from Uniondale to Humansdorp, forming large populations.

Seeds elliptic in outline, with blunt ends. Hilum apical. Seed 0.59-0.69 mm long, 0.45-0.56 mm wide. Seed surface reticulate (Fig. 25a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, 10-11 cells along the long axis of the seed. Cell boundaries convex, although in some places the outer periclinal walls form folds at cell edges, covering proper cell borders, so the borders resemble the channelled ones, radial walls straight. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 25b). Dull or semi-dull under a light microscope.

a



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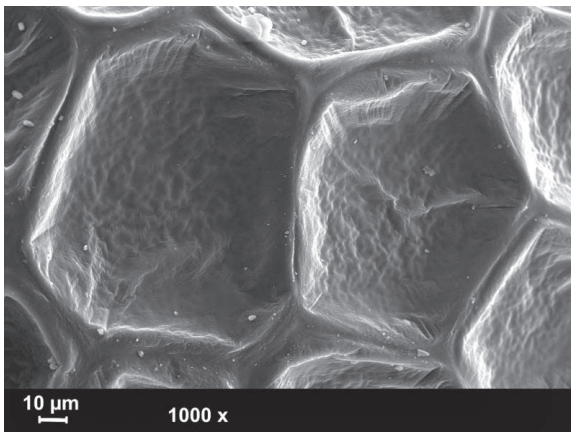


Fig. 25. *Erica sparrmanii* L.f. (SEM), seed (a) and surface of seed coat (b)

19. *Erica doliiformis* Salisb., Trans. Linn. Soc. 6: 368 (1802)

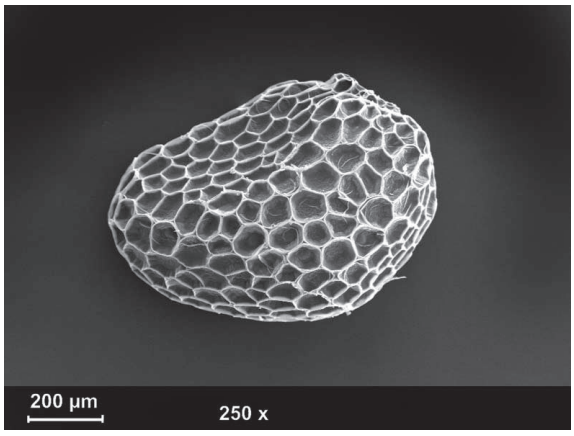
Sect. 5 *Dasyanthes*

Erect, sparse shrubs, up to 80 cm high. Flowers pale to dark pink, corollas barrel-like, 10-14 mm long, stamens hidden, anthers with appendages. Flowering: Sep-Apr.

Found in the Klein Drakenstein Mts.

Seeds broadly obovate in outline, nearly round in cross-section, slightly flattened bilaterally, triangular-ovate in cross-section. Hilum on a somewhat broader end, somewhat laterally. Seed 0.78-0.87 mm long, 0.54-0.69 mm wide. Seed surface reticulate, alveolate (Fig. 26a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells isodiametric; 14-16 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Nearly no secondary sculpture, outer periclinal walls smooth, very thin, when lying on inner walls they reflect their sculpture, and hence are apparently vermiculate (Fig. 26b). Shiny under a light microscope.

a



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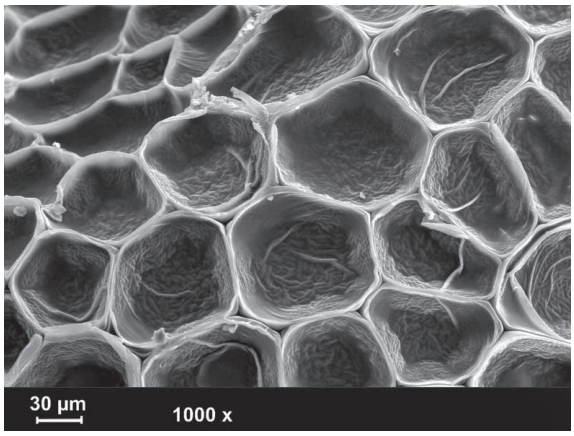


Fig. 26. *Erica doliiformis* Salisb. (SEM), seed (a) and surface of seed coat (b)

20. *Erica phillipsii* L.Bolus, Journ. of Bot. 67: 138 (1929)

Sect. 5 *Dasyanthes*

Very similar to *E. doliiformis*.

Seeds obovate in outline, round in cross-section. Hilum on a broader end. Seed 0.58-0.70 mm long, 0.44-0.51 mm wide. Seed surface reticulate (Fig. 27a). Outer periclinal cell walls of the seed coat steeply, but shallowly concave. Seed coat cells isodiametric, 10-14 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. Secondary sculpture striate, irregular (Fig. 27b). Semi-dull under a light microscope.

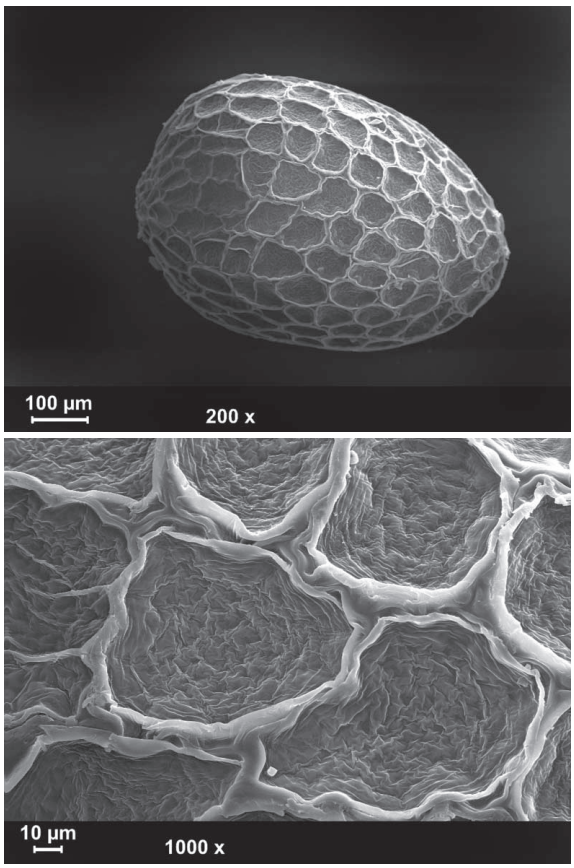


Fig. 27. *Erica phillipsii* L.Bolus (SEM), seed (a) and surface of seed coat (b)

21. *Erica oatesii* Rolfe, Oates, Matabeleland ed. 2, 402 t. 11 (1889)

Sect. 5 *Dasyanthes*

Erect shrubs, up to 1.2 m high. Flowers in small apical umbels, purple or pink. Corolla tubular, swollen, 10-13 mm long, stamens hidden. Anthers with appendages. Flowering: Mar-Aug.

Found in areas with rainy summers, usually along streams in mountains: Transvaal, Swaziland, Natal, Orange Free State, and Lesotho.

Seeds broadly obovate in outline, often roundish, slightly flattened bilaterally, triangular-ovate in cross-section. Hilum on a somewhat wider end. Seed 0.55-0.64 mm long, 0.39-0.48 mm wide. Seed surface reticulate (Fig. 28a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, 10-12 cells along the long axis of the seed. Cell boundaries raised, radial walls straight or somewhat curved. Secondary sculpture irregularly undulate (Fig. 28b). Semi-dull under a light microscope.

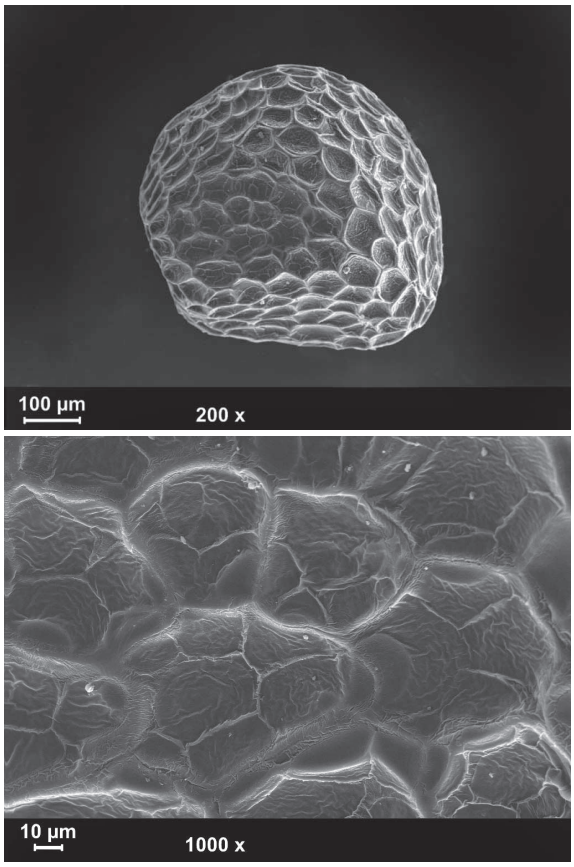


Fig. 28. *Erica oatesii* Rolfe (SEM), seed (a) and surface of seed coat (b)

22. *Erica cerinthoides* L., Sp. Pl. ed. 2: 505 (1762)

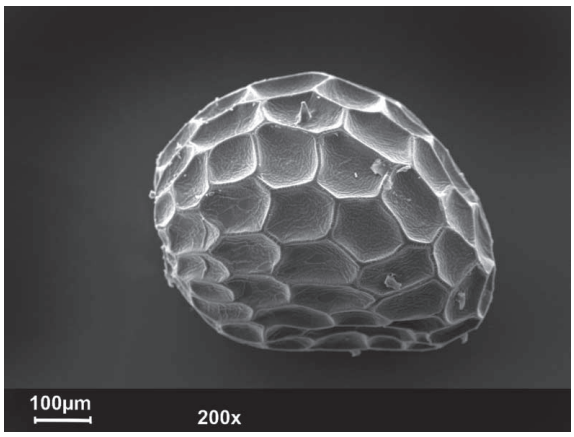
Sect. 5 *Dasyanthes*

Sparse, tall shrubs with long shoots, up to 1.8 m high. Flowers dark red or pink-red, forming compact apical racemes. Corollas long, 25-35 mm, tubular, slightly swollen, with constricted throats, stamens hidden. Anthers without appendages. Flowering: summer months, depending on fires

Widespread, its range extending from Cape through all 4 former provinces of South Africa, to Soutpansberg in northern Transvaal, also in Lesotho and Swaziland.

Seeds broadly obovate to elliptic in outline, round in cross-section. In ovate seeds, hilum on a broader end. Seed 0.58-0.68 mm long, 0.46-0.50 mm wide. Seed surface reticulate (Fig. 29a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, 5-7-gonal; 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture striate (Fig. 29b). Shiny under a light microscope.

a



b

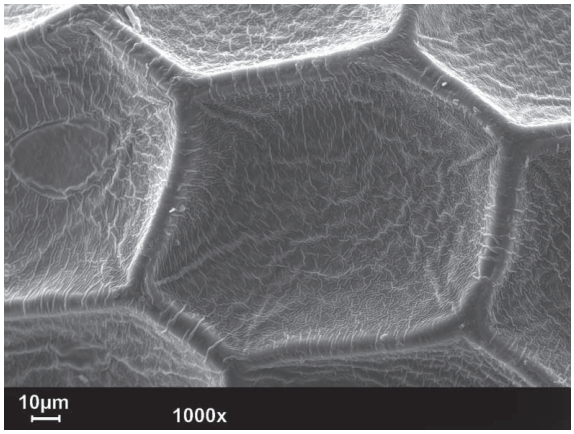


Fig. 29. *Erica cerinthoides* L. (SEM), seed (a) and surface of seed coat (b)

23. *Erica fascicularis* L.f., Suppl. 219 (1782)

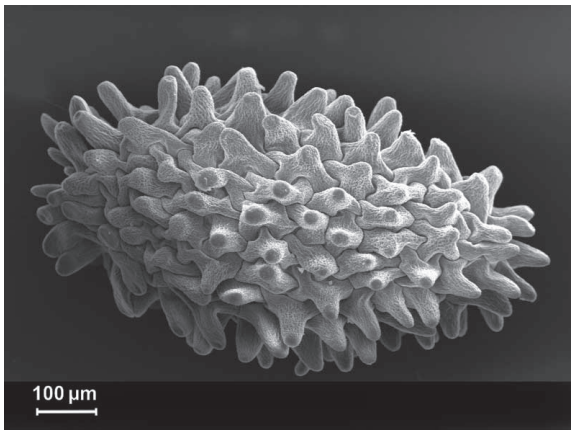
Sect. 7 *Bactridium*

Tall and slender shrubs; represented by 2 forms: typical, up to 2 m high, and var. *imperialis*, up to 90 cm in height. Flowers in whorls at shoot apices. Corolla tubular, 25-30 mm long, pink, with a green apex, stamens hidden. Anthers with appendages. Flowering: Dec-Feb.

Found in mountains, near Somerset West, Celadon, Betty's Bay, Hermanus, Bredasdorp, and Agulhas.

Seeds elliptic to ovate in outline, round in cross-section. One end blunt, with a hilum. Seed 0.81-1.0 (1.05) mm long, 0.52-0.67 mm wide. Seed surface densely papillate (Fig. 30a). Outer periclinal cell walls of the seed coat markedly convex, forming the papillae. Seed coat cells isodiametric, 11-13 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate, nearly stellate. Secondary sculpture reticulate-rugulose (Fig. 30b). Under a light microscope very dark, covered with lighter papillae.

a



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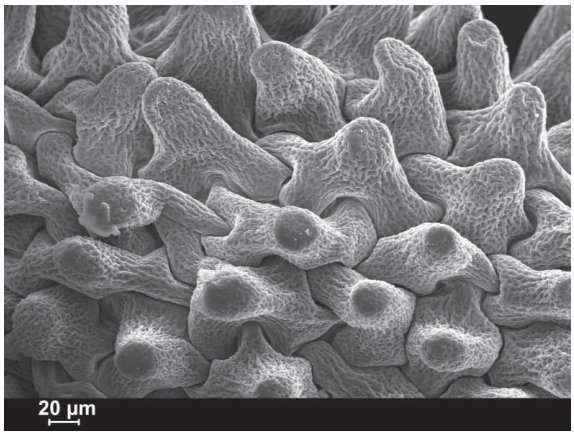


Fig. 30. *Erica fascicularis* L.f. (SEM), seed (a) and surface of seed coat (b)

24. *Erica retorta* Montin, Kongl. Vet. Acad. Handl. 1774: 297, t. 7 (1774)

Sect. 8 *Euryloma*

Small, but profusely branched shrubs, up to 60-70 cm in height. Flowers in small apical umbels. Flower size highly variable, 10-20 mm long, corolla tubular, swollen at base, with markedly constricted throats, with flat, spreading lobes, red, pink or whitish. Corolla sticky, stamens hidden. Anthers without appendages, hairy. Flowering: Oct-Apr.

Found on plains and hills, in Karwyderskraal, slightly north of Onrust, in the region of Kleinmond and Betty's Bay.

Seeds broadly ovate in outline, nearly spherical. Seed 0.63-0.76 mm long, 0.52-0.64 mm wide. Seed surface densely covered with fragile, partly sunken papillae (Fig. 31a). Outer periclinal cell walls of the seed coat convex, each cell forming one papilla. Seed coat cells isodiametric; 15-17 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate, nearly stellate. Secondary sculpture delicately rugulose (Fig. 31b). Dull under a light microscope.

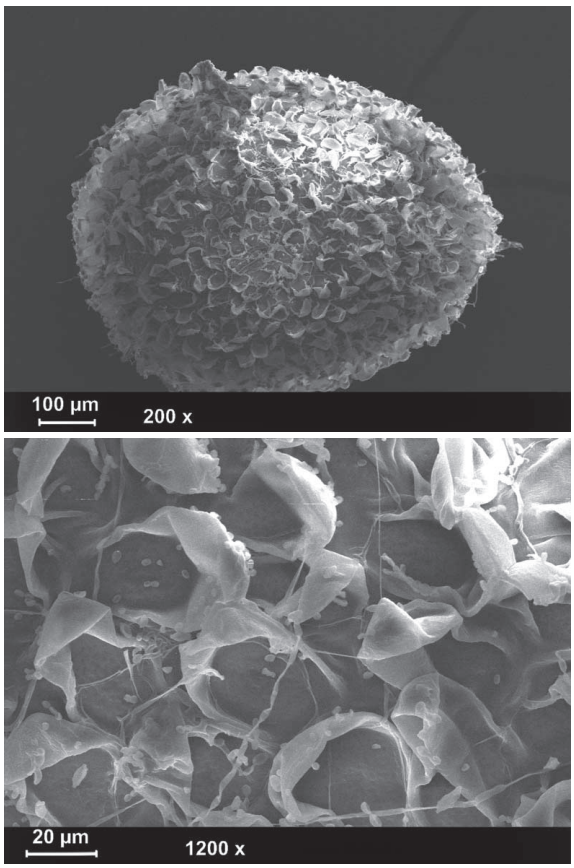


Fig. 31. *Erica retorta* Montin (SEM), seed (a) and surface of seed coat (b)

25. *Erica jasminiflora* Salisb., Prodr. 293 (1796)

Sect. 8 *Euryloma*

Erect, small shrubs, up to 60 cm in height, with thin shoots; lateral branches nearly horizontal, spreading. Flowers in apical clusters of 3-4. Corolla pale pink, 30-32 mm long, with a narrow, long tube, ending with flat, broad, spreading lobes. Stamens hidden in corolla tubes. Anthers without appendages. Flowering: Nov-Dec and Feb-Mar.

Found near Celadon, threatened with extinction.

Seeds nearly spherical. Seed 0.70-0.80 mm long, 0.66-0.72 mm wide. Seed surface covered with fragile papillae, formed by convex outer periclinal cell walls of the seed coat. Papilla surface irregularly rugulose and unevenly sunken (Fig. 32a). Seed coat cells isodiametric; ca. 15 cells along the long axis of the seed. Each cell forming one papilla. Cell boundaries channelled, anticlinal walls markedly undulate, nearly stellate. Secondary sculpture delicately striate and irregularly rugulose (Fig. 32b). Papillae dull under a light microscope, but the seed surface under papillae shiny, apparently sticky.

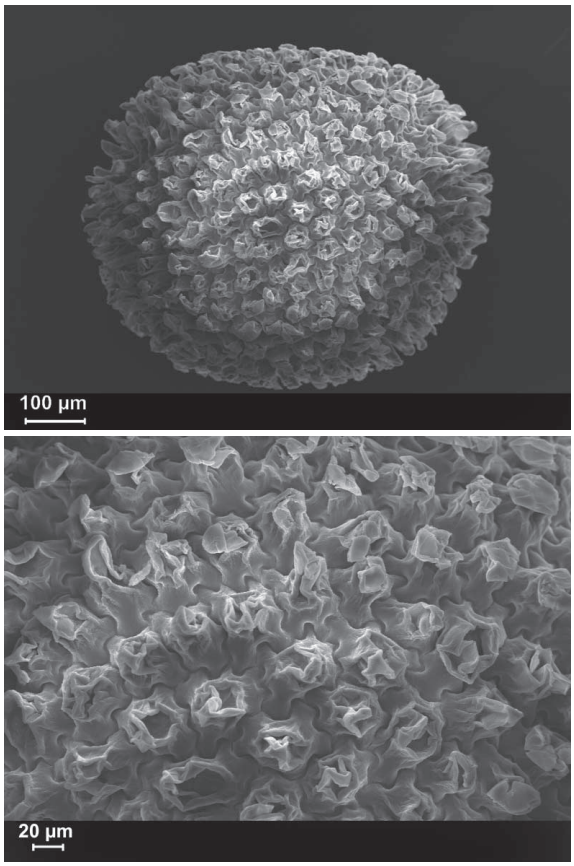


Fig. 32. *Erica jasminiflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

26. *Erica shannonii* Andrews, Heath. t. 239 (1809)
Sect. 8 *Euryloma*

Small, roundish shrubs, ca. 45 cm high, with thin twigs. Flowers in small apical umbels of 8-10. Flowers white, shiny, with tubular corollas, 20-30 mm long, swollen at base, with markedly constricted throats, with star-like spreading lobes. Stamens hidden in corolla tubes. Anthers without appendages. Flowering: Dec-Jan.

Found at lower altitudes in mountains, between Stanford and Bredasdorp, and also on Akkedisberg, Perdeberg and Tafelberg.

Seeds broadly elliptic in outline, nearly spherical. Seed 0.64-0.72 mm long, 0.50-0.58 mm wide. Seed surface densely covered with fragile papillae, formed by the convex outer periclinal cell walls of the seed coat. Papilla surface irregularly rugulose, and unevenly sunken (Fig. 33a). Seed coat cells isodiametric, 16-18 cells along the long axis of the seed. Each cell forming one papilla. Cell boundaries channelled, anticlinal walls markedly undulate, nearly stellate. Secondary sculpture very delicately papillate, granulate, and additionally papilla surface rugulose (Fig. 33b). Papillae dull under a light microscope, but the seed surface under papillae shiny, apparently sticky.

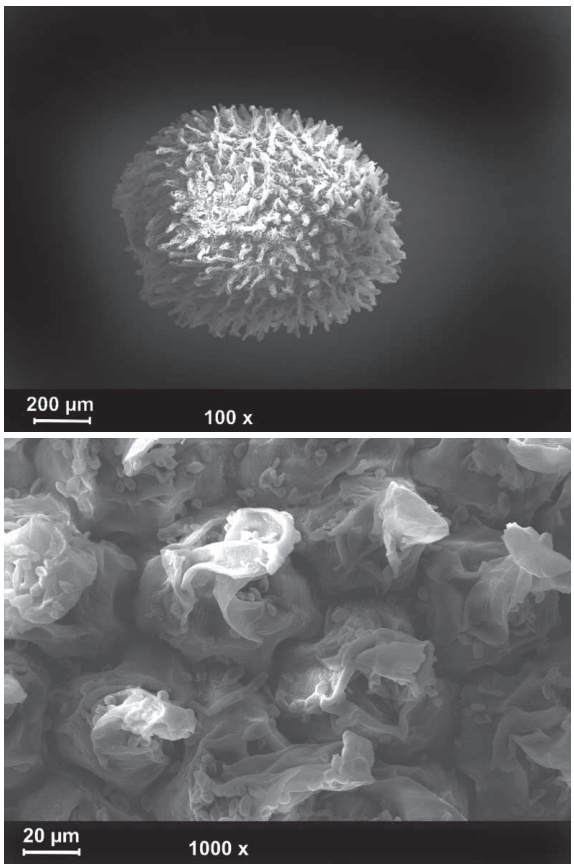


Fig. 33. *Erica shannonii* Andrews (SEM), seed (a) and surface of seed coat (b)

27. *Erica cristata* Dulfer, Ann. Naturhist. Mus. Wien 67: 84 (1964)
Sect. 8 *Euryloma*

Small, slender shrub, up to 50 cm high, with long, slender twigs, and appressed leaves. Flowers red, in small apical racemes, slightly sticky, covered with small, stiff hairs. Corolla tubular, slightly swollen, ca. 10 mm long, ending with star-like spreading lobes. Anthers with appendages. Flowering: Dec-Jun.

Found from Sir Lowry's Pass to Betty's Bay in the south, also in the Klein River Mts.

Seeds elliptic to ovate in outline, round in cross-section. Hilum apical. Seed 0.75-0.77 mm long, 0.42-0.52 mm wide. Seed surface covered with fragile papillae, formed by the convex outer periclinal cell walls of the seed coat (Fig. 34a). Seed coat cells isodiametric, 15-17 cells along the long axis of the seed. Each cell forming one papilla. Cell boundaries channelled, anticlinal walls markedly undulate. No secondary sculpture, the surface of outer periclinal walls is generally smooth, irregularly rugulose (Fig. 34b). Papillae dull under a light microscope.

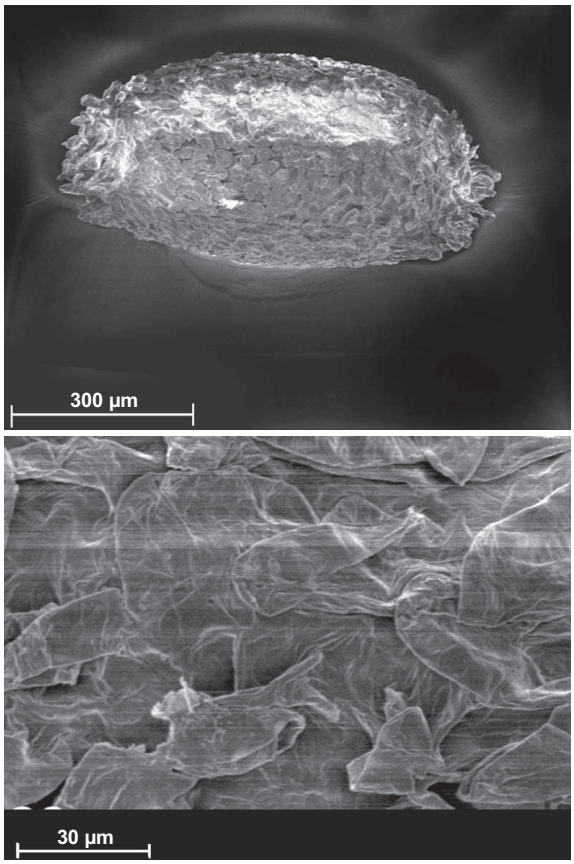


Fig. 34. *Erica cristata* Dulfer SEM), seed (a) and surface of seed coat (b)

28. *Erica rhodopis* (Bolus) Bolus, Fl. Cap. 97 (1905)

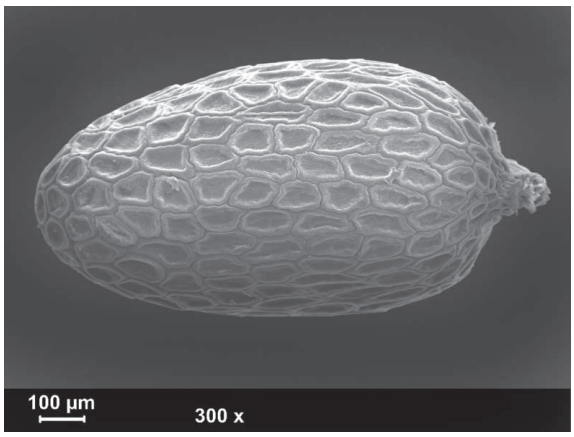
Sect. 8 *Euryloma*

Small, roundish, clump-like dwarf shrubs, up to 15 cm high, with thin, stiff shoots emerging near the base. Leaves very small, appressed to shoots. Flowers small, with corollas up to 5 mm long, pink, oval. Stamens hidden. Anthers with appendages. Flowering: Dec-Mar.

Found in the valley of Bot River, between Houhoek and Babilonstoring.

Seeds obovate in outline, round in cross-section, sometimes flattened ventrally. Hilum on a broader end, often markedly prominent, frequently accompanied by a prominent ridge (raphe). Seed 0.64-0.86 mm long, 0.38-0.47 mm wide. Seed surface reticulate (Fig. 35a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric to slightly elongate; 10-12 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls markedly undulate. Secondary sculpture striate, regular near seed edges, but anastomosing elsewhere (Fig. 35b). Semi-dull under a light microscope.

a



b

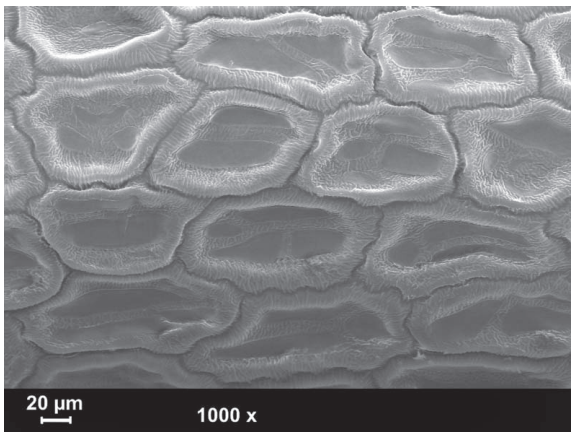


Fig. 35. *Erica rhodopis* (Bolus) Bolus (SEM), seed (a) and surface of seed coat (b)

29. *Erica praecox* Klotzsch, Linnnaea 12: 517 (1838)

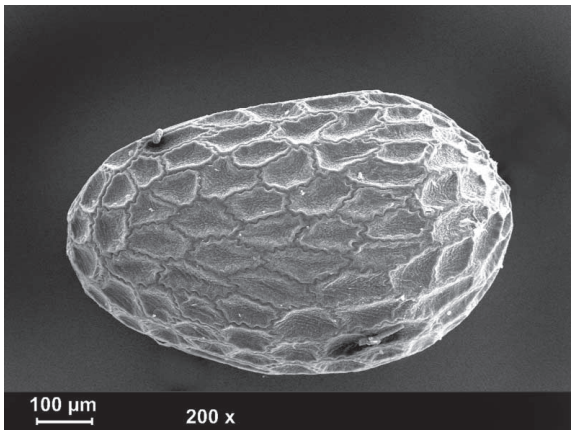
Sect. 9 *Ceramus*

Erect, profusely branched shrubs, 90-120 cm high. Flowers dark pink to red, forming bunches at shoot apices. Corolla tube 8-10 mm long, ending with spreading lobes (lobes of fresh flowers are rolled). Anthers without appendages. Flowering: Dec-Feb.

Found in mountains, at altitudes of 600-900 m, near Worcester, Paarl and Franschhoek, as well as near Villiersdorp.

Seeds obovate in outline, round in cross-section, sometimes flattened bilaterally, so that they are triangular-ovate in cross-section. Hilum on a broader end. Seed 0.69-0.85 mm long, 0.43-0.54 mm wide. Seed surface reticulate (Fig. 36a). Outer periclinal cell walls of the seed coat very slightly sunken. Seed coat cells isodiametric or slightly elongate, 9-10 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls undulate. Secondary sculpture striate, striae partly regular, but anastomosing elsewhere; and additionally the surface is irregularly rugulose (Fig. 36b). Dull under a light microscope.

a



b

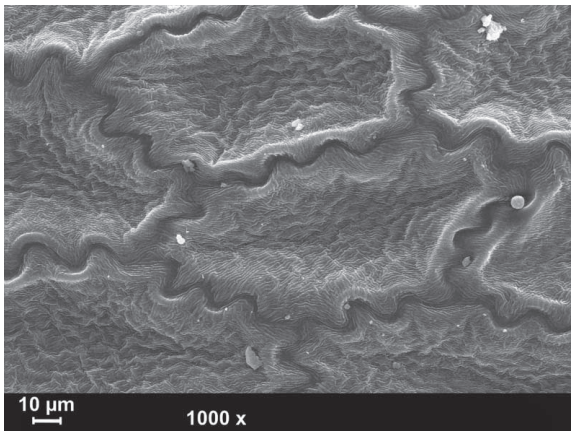


Fig. 36. *Erica praecox* Klotzsch(SEM), seed (a) and surface of seed coat (b)

30. *Erica atrovinosa* E.G.H.Oliv., Journ. S. Afr. Bot. 33: pt. 3 (1967)

Sect. 9 *Ceramus*

Shrub, reaching up to 60-70 cm in height, at base with a single, erect stem, which is profusely branched at the height of ca. 30 cm. Shoots covered with long, thin leaves. Flowers in small apical umbels of up to 36 flowers each, usually red at base, purplish-red at apex. Corolla swollen, nearly spherical, its apical part constricted into a narrow 'beak', ca. 10 mm long. Stamens hidden in corolla tubes. Anthers with appendages. Flowering: Dec-Feb.

Found in the Hex River Mts, and in Skurweberg, S and SE of Ceres, where it is found at higher altitudes, ca. 1500 m.

Seeds obovate in outline, round in cross-section, sometimes flattened bilaterally, somewhat triangular-ovate in cross-section. Hilum on a broader end. Seed 0.76-0.85 mm long, 0.44-0.51 mm wide. Seed surface reticulate (Fig. 37a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells slightly elongate, up to 3 times longer than wide; 9-10 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls markedly undulate. Secondary sculpture undulate, folds irregular, anastomosing (Fig. 37b). Under a light microscope seeds dark and shiny.

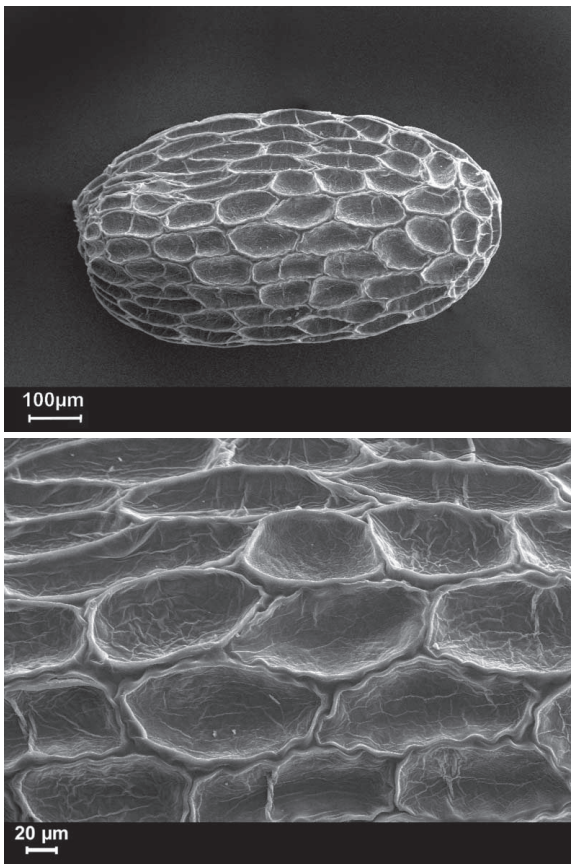


Fig. 37. *Erica atrovinosa* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

31. *Erica fastigiata* L., Mant. 66 (1771)

Sect. 10 *Callista*

Erect shrubs, up to 1.2 m high. Shoots loosely covered with long, narrow leaves. Flowers in groups of 4, at shoot apices, dark red to purple. Corolla round, tube ca. 10 mm long, ending with flat, spreading lobes. Dark green or pink ring around the throat. Stamens hidden in corolla tubes. Species variable, divided into 3 varieties; the best known is var. *coventryana*, with a slightly longer corolla. Anthers without appendages. Flowering: Aug-Jan.

Distributed from Bain's Kloof in the SE to the area of Caledon, and particularly common in the Highlands and Kogelberg Reserves.

Seeds narrowly obovate in outline, close to elliptic, round in cross-section. Hilum on a broader end. Seed 0.62-0.73 mm long, 0.34-0.41 mm wide. Seed surface reticulate (Fig. 38a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells somewhat elongate, up to 3 times longer than wide; 9-11 cells along the long axis of the seed. Cell boundaries channelled, anticlinal walls slightly undulate. Nearly no secondary sculpture, the surface of outer periclinal walls smooth (Fig. 38b). Shiny under a light microscope.

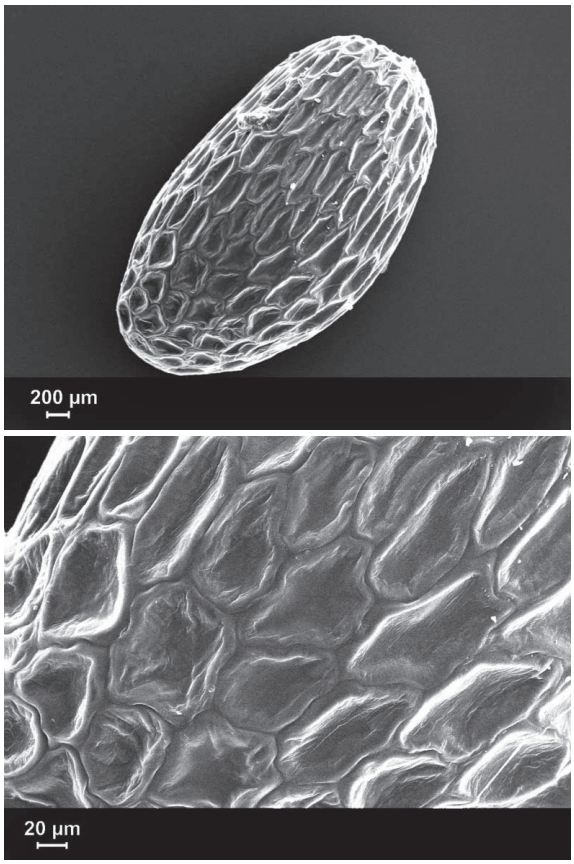


Fig. 38. *Erica fastigiata* L. (SEM), seed (a) and surface of seed coat (b)

32. *Erica transparens* P.J.Bergius, Descr. Pl. Cap. 108 (1767)

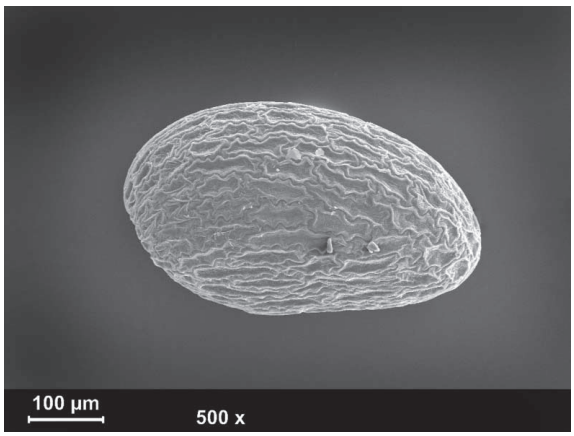
Sect. 10 *Callista*

Dwarf shrubs, rarely up to 30 cm high, roundish, twigs densely covered with minute leaves. Flowers small, rather crowded at shoot apices, white, red or (most often) pink. Corolla tube 4-5 mm long, slightly swollen, ending with spreading lobes, stamens hidden. Anthers with appendages. Flowering: Dec-Mar.

Widespread, distributed from the Cape Peninsula to Uniondale in the east, and inland to the Swartberg range, reaching altitudes of up to 1500 m.

Seeds obovate in outline, round in cross-section, sometimes flattened bilaterally, so that they are somewhat triangular-ovate in cross-section. Hilum on a broader, obliquely truncate end. Seed 0.47-0.54 mm long, 0.26-0.31 mm wide. Seed surface reticulate (Fig. 39a). Outer periclinal cell walls of the seed coat quite steeply concave, forming a convex margin around the cell. The cells elongate, up to 4 times longer than wide; 7-8 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture striate, with irregular striae (Fig. 39b). Shiny under a light microscope.

a



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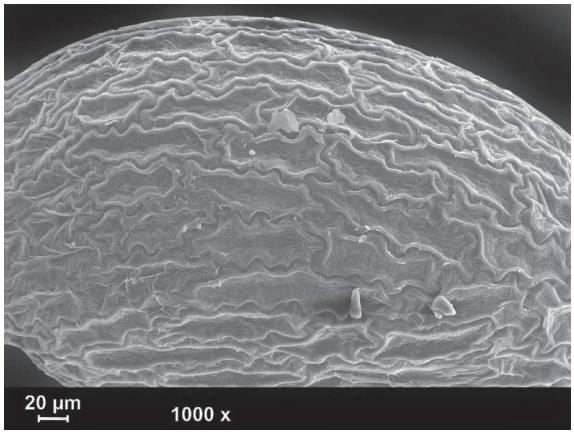


Fig. 39. *Erica transparens* P.J.Bergius (SEM), seed (a) and surface of seed coat (b)

33. *Erica vallis-gratiae* Guthrie & Bolus, Fl. Cap. 4: 103 (1905)

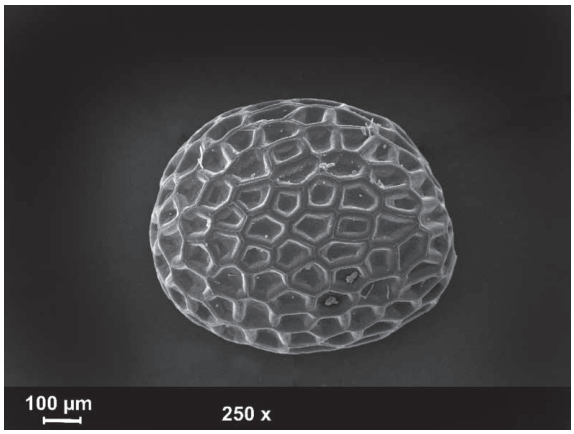
Sect. 10 *Callista*

Robust, erect shrubs, up to 60 cm high, profusely branched, with a roundish, leafy crown. Flowers in groups of 4, at shoot apices; twigs with flowers are crowded. Tubular corollas 10-14 mm long, their outer surface dark red or purple, ending with white, spreading lobes, stamens hidden. Anthers with appendages. Flowering: Aug-Oct.

Alpine, found on peaks of Riviersonderend, at altitudes of 1200-1800 m, preferring southern, humid slopes.

Seeds roundish in outline, nearly spherical. Hilum apical. Seed 0.75-0.84 mm long, 0.62-0.70 mm wide. Seed surface reticulate-foveate (Fig. 40a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells isodiametric; 8-9 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture very delicately striate, striae oriented (parallel), additionally small pits visible on the thin sunken outer wall (surface foveate), but they are impressions of pits in the inner periclinal wall, (Fig. 40b). Slightly shiny under a light microscope.

a



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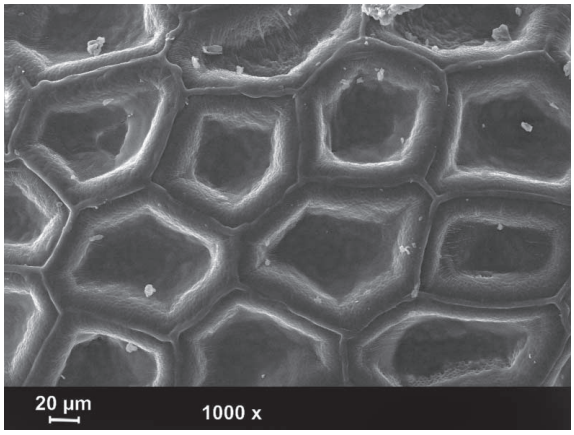


Fig. 40. *Erica vallis-gratiae* Guthrie & Bolus SEM), seed (a) and surface of seed coat (b)

34. *Erica albens* L., Mant. alt. 231 (1771)

Sect. 11 *Platyspora*

Shrub reaching over 1 m in height, with long branches. Twigs densely covered with white, yellowish, or pinkish flowers. Corolla ca. 6 mm long, tubular, swollen, ending with star-like spreading lobes. Stamens hidden. Anthers with appendages. Flowering: Apr-Dec.

Distributed from Swellendam to George, at higher altitudes on slopes of Langeberg, Outeniqua and Swartberg.

Seeds ovate in outline, flattened, surrounded by a wing. Seed 1.5 mm long, 0.8 mm wide. Seed surface delicately reticulate (Fig. 41a). Outer periclinal cell walls of the seed coat flat. The cells narrow, markedly elongate, 5-7 times longer than wide; ca. 15-20 cells along the long axis of the seed (excluding the wing). Cell boundaries raised, radial walls slightly undulate. Secondary sculpture delicately striate, striae oriented (parallel) (Fig. 41b). Slightly shiny under a light microscope.

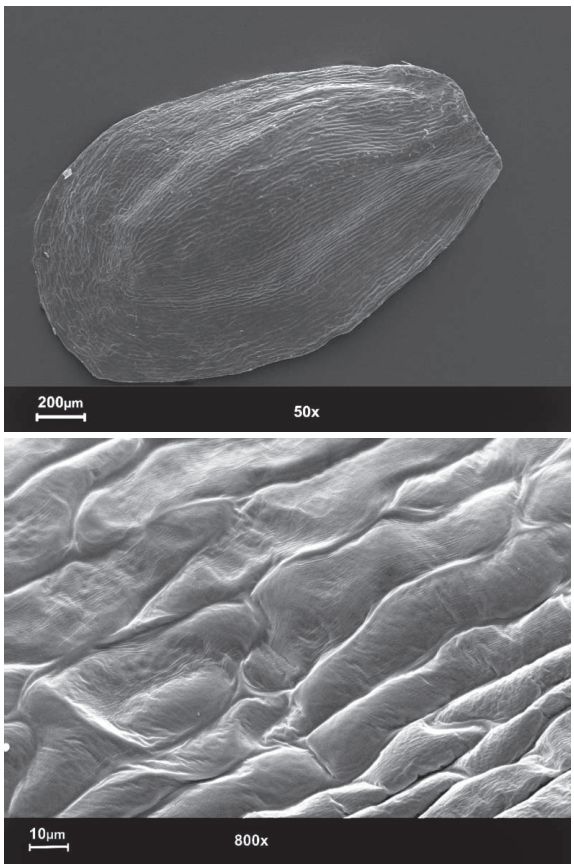


Fig. 41. *Erica albens* L. (SEM), seed (a) and surface of seed coat (b)

35. *Erica tetragona* L.f., Suppl. 223 (1782)

Sect. 11 *Platyspora*

Up to 60 cm high, forming erect or procumbent shrubs with slender, long twigs. Flowers pale yellow, located in leaf axils, forming long leafy inflorescences (spikes). Tubular corollas 6-8 mm long, slender, swollen at base, ending with star-like spreading lobes, stamens hidden. Anthers without appendages. Flowering: Sep-Mar.

Distributed from Swellendam to Uitenhage, on humid slopes with southern exposure.

Seeds elliptic to narrowly ovate in outline, flattened, surrounded by a wing. Seed 1.40-1.80 mm long, 0.60-0.75 mm wide. Hilum on a narrower, blunt end. Seed surface delicately, longitudinally reticulate (Fig. 42a). Outer periclinal cell walls of the seed coat flat or slightly convex. The cells narrow, markedly elongate, 5-7 times longer than wide; ca. 15-20 cells along the long axis of the seed (excluding the wing). Cell boundaries raised, radial walls slightly undulate or near straight. No secondary sculpture, the surface of outer periclinal walls generally smooth (Fig. 42b). Slightly shiny under a light microscope.

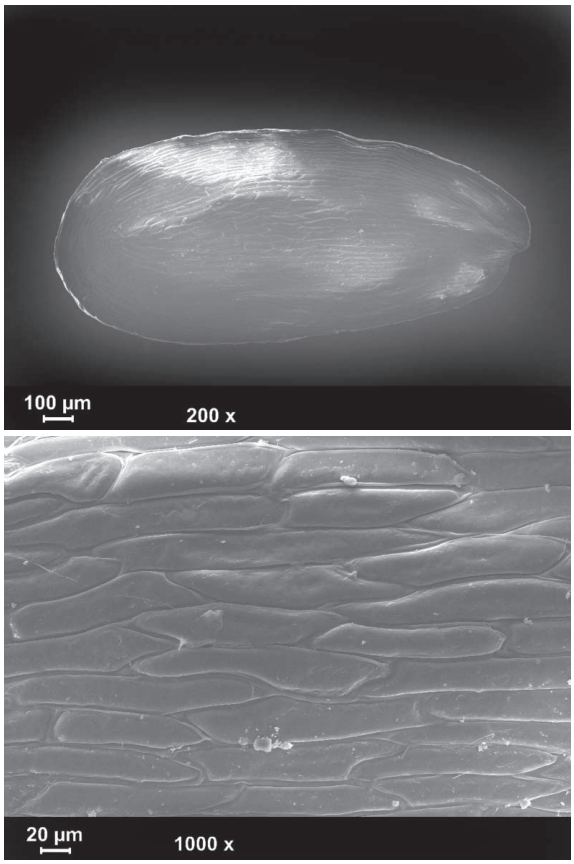


Fig. 42. *Erica tetragona* L.f. (SEM), seed (a) and surface of seed coat (b)

36. *Erica glutinosa* P.J.Bergius, Descr. Pl. Cap. 98 (1767)

Sect. 12 *Myra*

Dwarf shrubs, up to 30 cm high. The whole plant, twigs, leaves and flowers are covered with sticky, glandular hairs. Flowers pink, in small apical umbels. Corollas tubular, 8-10 mm long, swollen, with constricted throats, ending with short, roundish, recurved lobes, stamens hidden. Anthers with appendages. Flowering: Oct-Mar.

Widespread, from the Cape Peninsula (to Nordhoek in the south) to mountainous regions between Ceres and Celadon.

Seeds elliptic in outline, round in cross-section. Seed 0.47-0.55 (0.60) mm long, 0.26-0.34 mm wide. Hilum on a slightly more obtuse apex, somewhat protruding. Seed surface reticulate (Fig. 43a). Outer periclinal cell walls of the seed coat slightly sunken. The cells elongate, up to 4 times longer than wide; ca. 7 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Nearly no secondary sculpture, outer periclinal walls smooth, in some parts irregularly rugulose (Fig. 43b). Shiny under a light microscope.

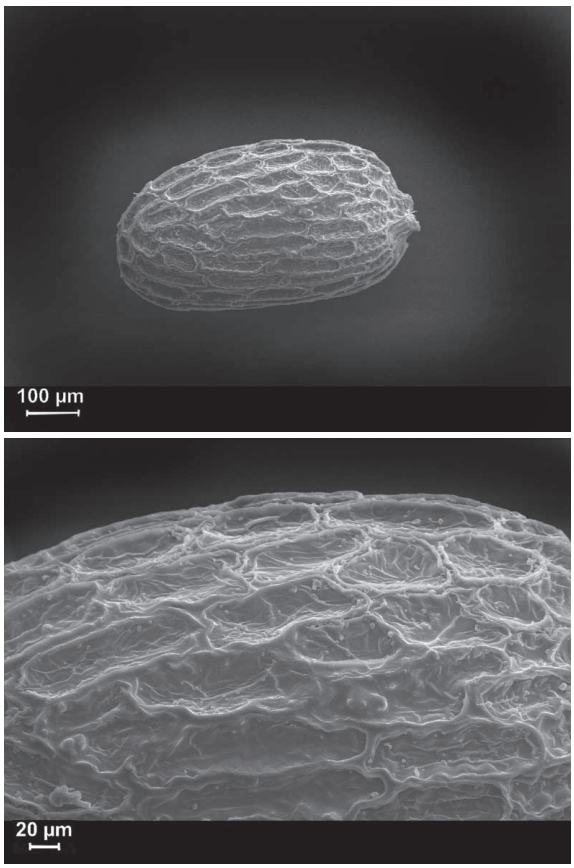


Fig. 43. *Erica glutinosa* P.J.Bergius(SEM), seed (a) and surface of seed coat (b)

37. *Erica umbrosa* H.A.Baker, J. S. African Bot. 27: 267 (1961) (*E. armata* Klotzsch ex Bentham)

Sect. 12 *Myra*

Up to 40 cm high, forming erect, profusely branched, roundish shrubs. Densely covered with leaves in the lower part, while in the upper, particularly within the inflorescence, leaves less crowded, in groups. Twigs and leaves covered with stiff, white, glandular hairs. Flowers pink or red, forming bunches at shoot apices. Corolla 6-10 mm long, urn-shaped or tubular, swollen, ending with small simple teeth. Anthers at the tube margin, with appendages. Flowering: Jan-Mar.

Found in mountains, between Worcester and Celadon, at altitudes of 900-1500 m, preferring cold, humid, grassy slopes.

Seeds obovate in outline, round in cross-section. Seed 0.64-0.75 mm long, 0.37-0.44 mm wide. Hilum on a broader, blunt end. Seed surface reticulate (Fig. 44a). Outer periclinal cell walls of the seed coat quite steeply concave. The cells elongate, up to 4 times longer than wide; ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture irregularly rugulose (Fig. 44b). Semi-dull under a light microscope.

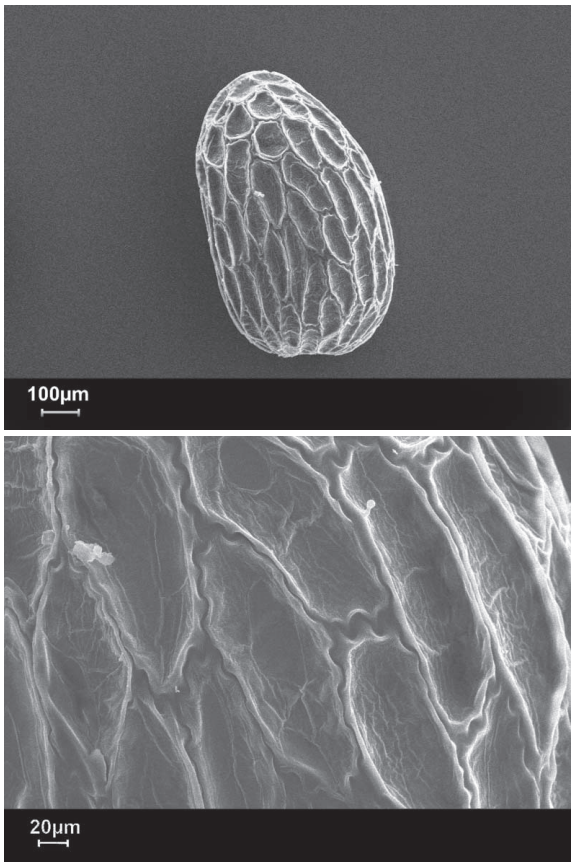


Fig. 44. *Erica umbrosa* H.A.Baker (SEM), seed (a) and surface of seed coat (b)

38. *Erica peziza* Lodd., Bot. Cab. t. 265 (1818)

Sect. 13 *Ephebus*

Erect, profusely branched shrubs, up to 60 cm high. Twigs densely covered with white flowers. Corolla 5 mm long, cup-shaped, fused at basal half, densely covered with white woolly hairs. Anthers with appendages. Flowering: Aug-Sep.

Quite common, sometimes forming dense patches, found near Montagu, Robertson, Celadon, Riviersonderend, and Swellendam.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Seed 0.40-0.47 mm long, 0.27-0.31 mm wide. Hilum apical. Seed surface delicately reticulate (Fig. 45a). Outer periclinal cell walls of the seed coat gently and shallowly sunken. The cells elongate, 3-4 times longer than wide; ca. 7-9 cells along the long axis of the seed. Cell boundaries convex, radial walls markedly undulate. No secondary sculpture, the surface of outer periclinal walls is smooth (Fig. 45b). Shiny under a light microscope.

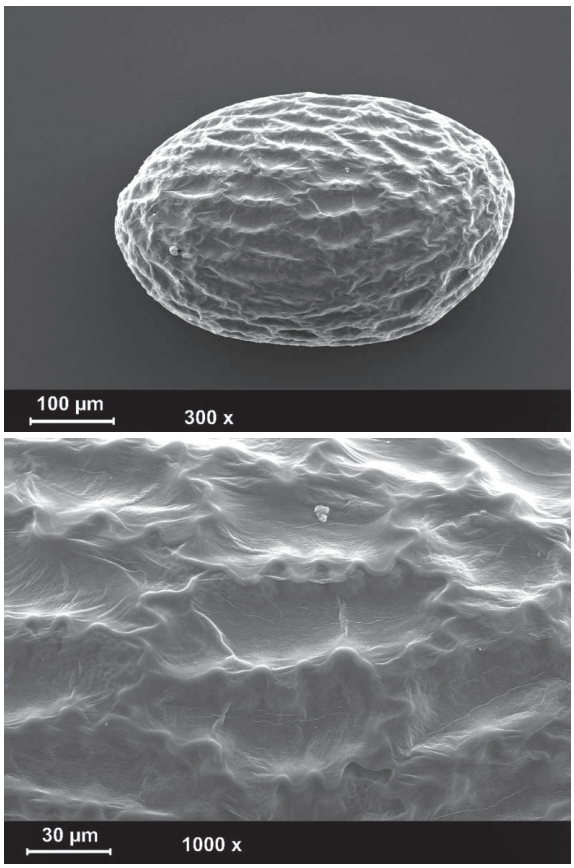


Fig. 45. *Erica peziza* Lodd. (SEM), seed (a) and surface of seed coat (b)

39. *Erica ovina* Klotzsch ex Bentham, DC. Prodr. 7: 674 (1839)

Sect. 13 *Ephebus*

Like *E. peziza*, it forms erect, profusely branched shrubs, up to 90 cm high. Twigs densely covered with white or pinkish flowers. Corolla 6 mm long, ovoid, densely covered with woolly hairs. Anthers with appendages. Flowering: Aug-Dec.

Found in colder and humid, more elevated areas, up to 1200 m in altitude.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Seed 0.43-0.46 mm long, 0.28-0.32 mm wide. Hilum apical. Seed surface delicately reticulate (Fig. 46a). Outer periclinal cell walls of the seed coat gently and shallowly sunken. The cells elongate, up to 5 times longer than wide; ca. 7 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 46b). Shiny under a light microscope.

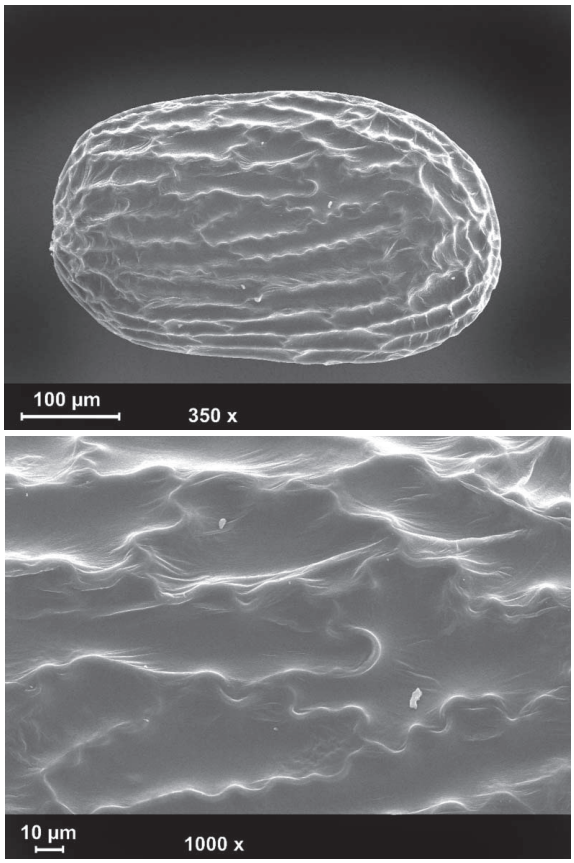


Fig. 46. *Erica ovina* Klotzsch ex Bentham (SEM), seed (a) and surface of seed coat (b)

40. *Erica tomentosa* Salisb., Trans. Linn. Soc. 6: 327 (1802)

Sect. 13 *Ephebus*

Erect shrubs, 30-40 cm high, with numerous branches. Flowers in dense inflorescences, brownish-red to lilac. Corollas cup-shaped, with slightly constricted throats, tomentose, 3-4 mm long. Stamens hidden, Anthers with appendages.

Found at lower altitudes in mountains (300-600 m in altitude) near Stellenbosch, Celadon, Hottentots Holland, Baviaans Kloof, and Genadendal.

Seeds obovate in outline, rarely elliptic, round in cross-section. Seed (0.51) 0.55-0.60 mm long, 0.38-0.48 mm wide. Hilum near a broader end, slightly lateral. Seed surface reticulate (Fig. 47a). Outer periclinal cell walls of the seed coat gently and shallowly sunken. Seed coat cells isodiametric, up to 2 times longer than wide; ca. 10-11 cells along the long axis of the seed. Cell boundaries raised, radial walls undulate, at least is some parts markedly undulate. Secondary sculpture very delicately striate, partly oriented (Fig. 47b). Semi-dull under a light microscope.

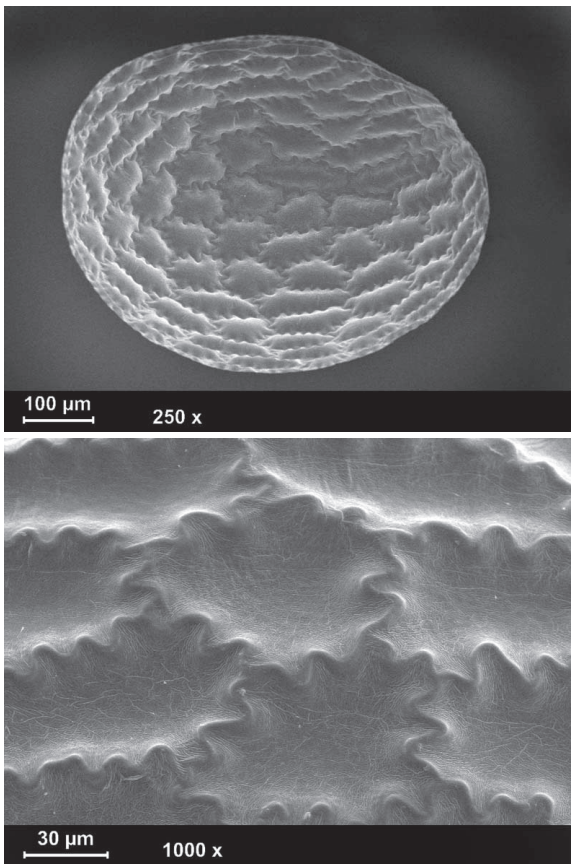


Fig. 47. *Erica tomentosa* Salisb. (SEM), seed (a) and surface of seed coat (b)

41. *Erica sicifolia* Salisb., Trans. Linn. Soc. 6: 326 (1802)

Sect. 13 *Ephebus*

Lax dwarf shrubs, up to 25 cm high. The sparse, easily broken shoots are covered with narrow, recurved leaves. Flowers small, dark red to purple, forming small groups at shoot apices. Corollas ca. 4 mm long, cup-shaped, widely open, covered with minute hairs. Sepals sticky, because of glandular hairs. Anthers not protruding, with appendages. Flowering: Dec-Feb.

Distributed mostly in the Riviersonderend Mts, near Genadendal, found on grassy southern slopes, at altitudes lower than 700 m.

Seeds ovate in outline, nearly round in cross-section, slightly flattened ventrally and laterally. Seed 0.48-0.53 mm long, 0.31-0.37 mm wide. Hilum on a narrower end. Seed surface reticulate (Fig. 48a). Outer periclinal cell walls of the seed coat quite steeply concave. The cells elongate, up to 3 times longer than wide; ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture very delicately striate, partly oriented (Fig. 48b). Shiny under a light microscope.

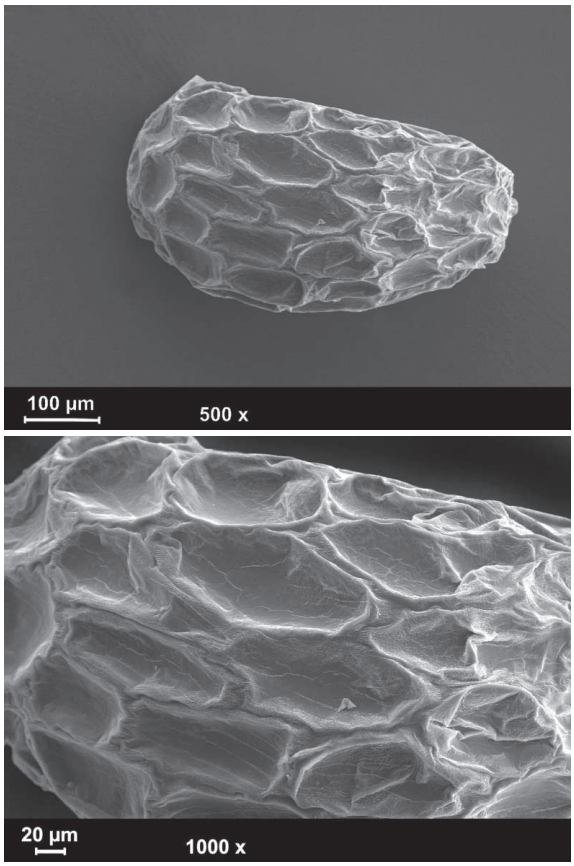


Fig. 48. *Erica sicifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

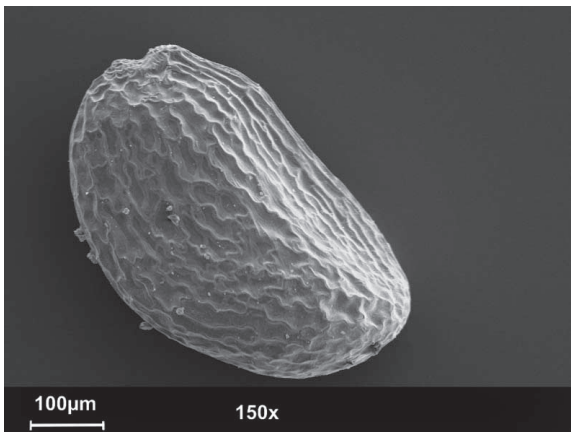
42. *Erica algida* Bolus, Journ. of Bot. 1894: 238 (1894)
Sect. 13 *Ephebus*

Erect shrubs with stiff branches, reaching 40-60 cm in height. Flowers pink or red, in groups of 4, at branch apices. Corolla ca. 4 mm long, ovoid, hairy, calyx slightly sticky. Anthers with appendages. Flowering: Oct-Dec.

Distributed at higher altitudes in mountains, in the eastern part of South Africa, in the range Drakensberg in Natal, Lesotho, also on Mont Curie in Griqoaland East. Found at altitudes higher than 2500 m, along streams.

Seeds obovate in outline, nearly round in cross-section, slightly flattened ventrally and laterally. Seed 0.45-0.54 mm long, 0.32-0.40 mm wide. Hilum on a broader end. Seed surface reticulate (Fig. 49a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells elongate, undulate, up to 4 times longer than wide; ca. 8-10 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate (Fig. 49b). Shiny under a light microscope.

a



b

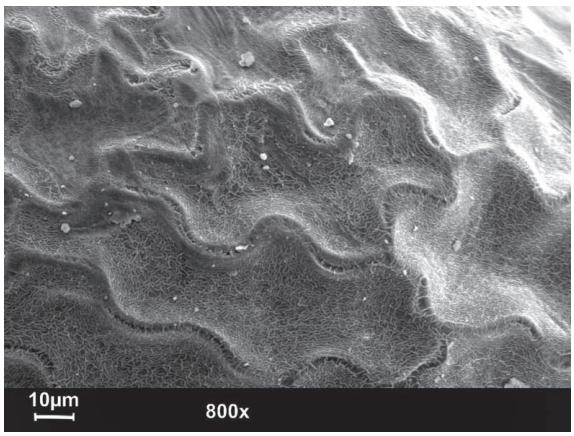


Fig. 49. *Erica algida* Bolus (SEM), seed (a) and surface of seed coat (b)

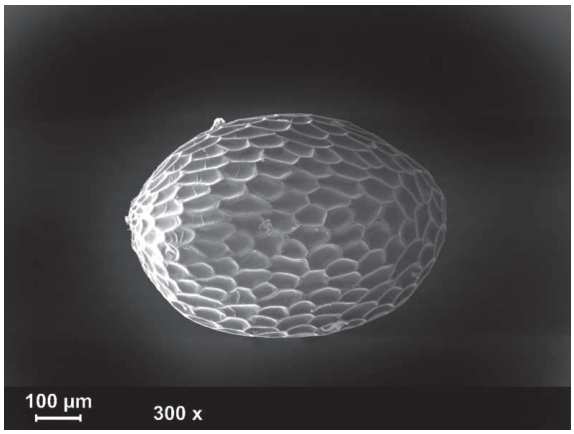
43. *Erica oresigena* Bolus, Journ. of Bot. 1894: 238 (1894)
Sect. 13 *Ephebus*

Large shrubs, up to 1.8 m high, with widely spreading branches, up to 3 m wide. Flowers pale pink to reddish, in groups of 4, at shoot apices, they cover the whole plant. Corolla 5-8 mm long, urn-shaped, covered with sparse hairs, giving it a grey appearance. Anthers with appendages. Flowering: Sep-Nov.

Highly variable. Found at higher altitudes in mountains, rarely below 1000 m. Distributed in the mountainous region between Worcester and Ceres, also further north, towards Cederberg.

Seeds elliptic in outline, rarely ovate, nearly round in cross-section or slightly flattened laterally. Seed 0.68-0.79 mm long, 0.42-0.51 (0.55) mm wide. Hilum apical. Seed surface reticulate (Fig. 50a). Outer periclinal cell walls of the seed coat are slightly sunken. Seed coat cells isodiametric, polygonal; ca. 12-15 cells along the long axis of the seed. Cell boundaries raised, radial walls straight (rarely somewhat curved). No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 50b). Shiny under a light microscope.

a



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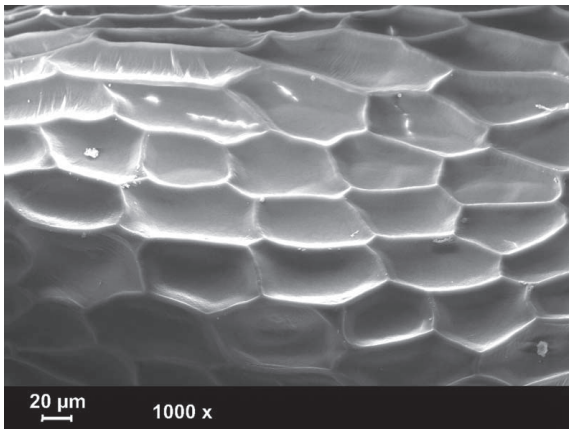


Fig. 50. *Erica oresigena* Bolus (SEM), seed (a) and surface of seed coat (b)

44. *Erica setosa* Bartl., Linnaea 7: 646 (1832)

Sect. 13 *Ephebus*

Small shrubs; twigs and leaves covered with long hairs.

Flowers white or dark pink, in small apical umbels or racemes. Corolla ca. 3 mm long, bell-shaped, sticky. Anthers with appendages. Flowering: Sep-Nov.

Rare, found in cold, humid areas, at lower altitudes in mountains, near Paarl, Somerset West and Caledon, and on Kogelberg.

Seeds elliptic in outline, round in cross-section. Seed 0.30-0.39 mm long, 0.20-0.25 mm wide. Hilum apical. Seed surface reticulate (Fig. 51a). Outer periclinal cell walls of the seed coat rather steeply but not deeply concave, forming a marked margin around cells. The cells elongate, rectangular in outline, 2-3 times longer than wide; ca. 7-8 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture delicately striate, irregular (Fig. 51b). Semi-dull under a light microscope.

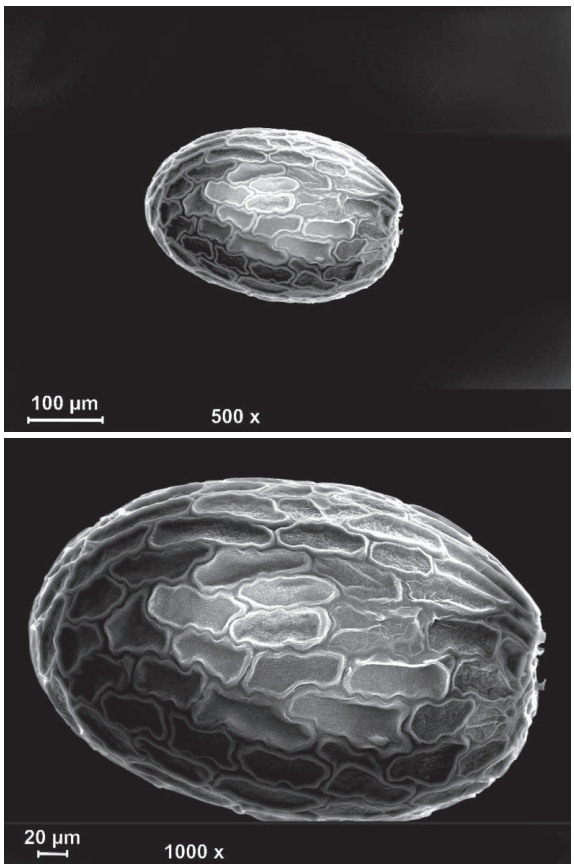


Fig. 51. *Erica setosa* Bartl. (SEM), seed (a) and surface of seed coat (b)

45. *Erica oreophila* Guthrie & Bolus, Fl. Cap. 4: 141 (1905)

Sect. 14 *Ceramia*

Straggly dwarf shrubs, up to 15 cm high, with a strong main stem and flexible, ascending lateral shoots. Leaves in whorls of 3. Flowers pale pink at base, but upper part dark, in groups of 3, at shoot apices, stalks sticky. Corolla slightly flattened, cup-shaped, sticky, 2-2.5 mm long. Anthers with appendages. Flowering: Sep-Dec.

Found on the coast, near Paarl, and in mountains, near Franschhoek.

Seeds ovate in outline, slightly flattened dorsoventrally. Seed 0.34-0.40 mm long, 0.20-0.23 mm wide. Hilum on a narrower end. Seed surface smooth (Fig. 52a). Outer periclinal cell walls of the seed coat flat. Seed coat cells very elongate, 6-8 times longer than wide; ca. 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 52b). Shiny under a light microscope, with a visible very delicate network of cells.

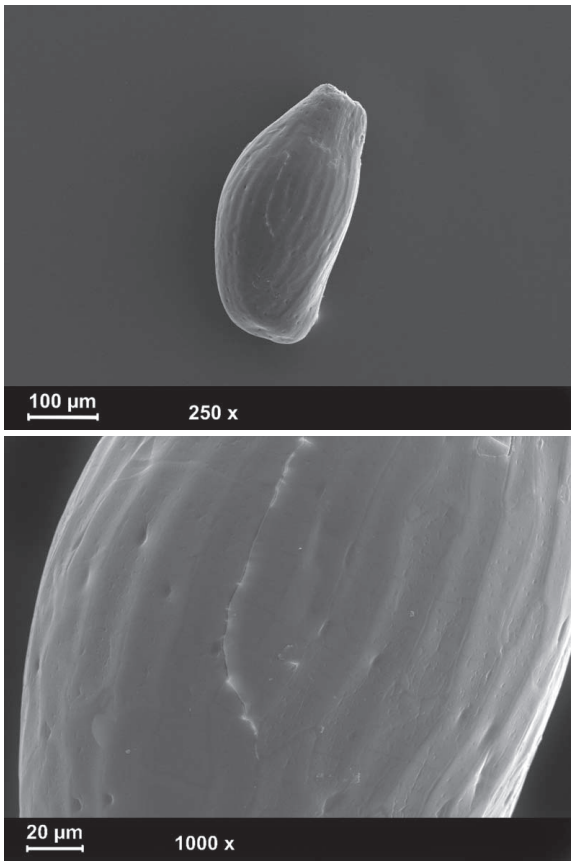


Fig. 52. *Erica oreophila* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

46. *Erica brachycentra* Benth., DC. Prodr. 7: 688 (1839)
Sect. 14 *Ceramia*

Dwarf shrubs, forming small clumps, with flexible twigs, covered with extremely small leaves. Flowers also very small, corolla pink, cup-shaped or nearly spherical, anthers and stigma protruding. Anthers with appendages. Flowering: Mar-May.

Found in mountains of the southern part of Cape, in coastal regions, from Mossel Bay to Knysna. Preferring humid and cold sites, mostly on eastern slopes.

Seeds broadly elliptic to ovate in outline, nearly roundish, nearly round in cross-section, slightly flattened ventrally. Seed 0.57-0.65 mm long, 0.47-0.52 mm wide. Hilum apical. Seed surface reticulate (Fig. 53a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells isodiametric, polygonal; ca. 7 cells along the long axis of the seed. Cell boundaries raised, radial walls straight, sometimes curved. Secondary sculpture tuberculate (Fig. 53b). Slightly shiny under a light microscope.

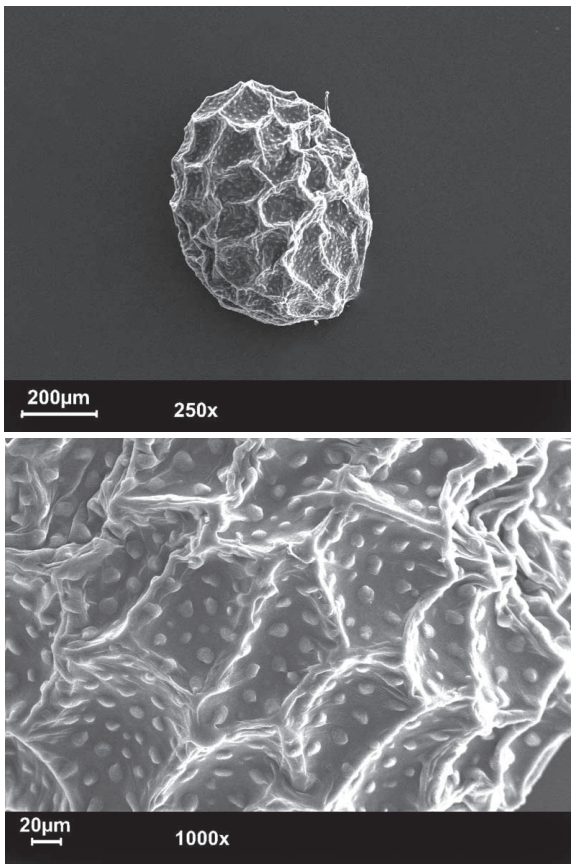


Fig. 53. *Erica brachycentra* Benth. (SEM), seed (a) and surface of seed coat (b)

47. *Erica petrophila* L.Bolus, Ann. Bol. Herb. 4: 133, PL 13E (1928)
Sect. 14 *Ceramia*

Dwarf shrubs, up to 25 cm wide, with flat, prostrate, thin, but strong shoots. Leaves, sepals and corolla covered with glandular hairs. Flower white, corolla cup-shaped, ca. 2 mm long, with a protruding, large, flat, and red stigma,. Stamens hidden, anthers without appendages. Flowering: Jan.

Distributed at higher altitudes, in the Drakenstein and Hottentots-Holland Mts, and on Jonaskop in the Riviersonderend Mts. Found in dry rock crevices.

Seeds ovate-elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Seed 0.53-0.59 mm long, 0.32-0.38 mm wide. Hilum on a blunt, flat end. Seed surface reticulate (Fig. 54a). Outer periclinal cell walls of the seed coat slightly raised initially, and next gently sunken, forming marginal folds that overlap neighbouring cells. The cells somewhat elongate, up to 3 times longer than wide, oval on the surface; ca. 9-10 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture granulate (Fig. 54b). Slightly shiny under a light microscope.

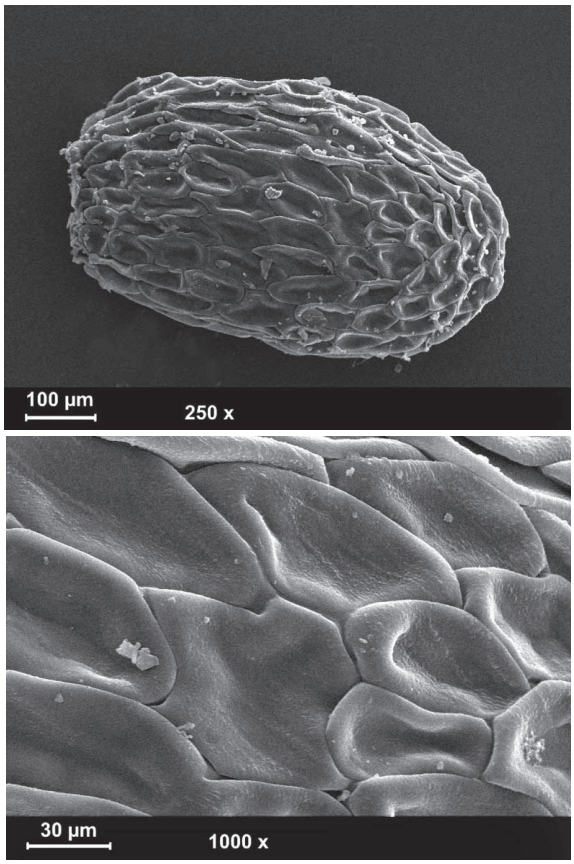


Fig. 54. *Erica petrophila* L.Bolus (SEM), seed (a) and surface of seed coat (b)

48. *Erica amicorum* E.G.H.Oliv., Bothalia 20, 1: 41 (1990)

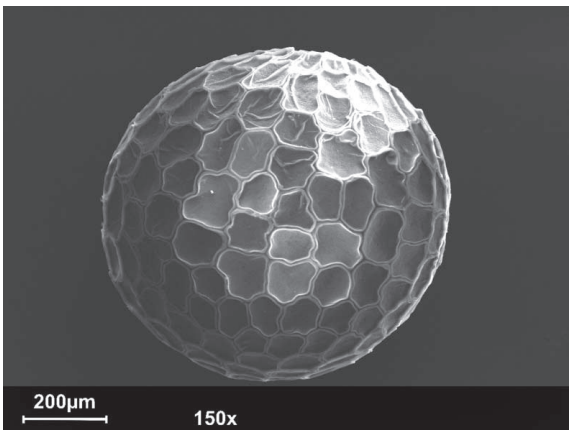
Sect. 14 *Ceramia*

Its shoots are thin, ascending, with sparse, open leaves; sometimes forming clumps ca. 20 cm high. Flowers very untypical, corolla open, with nearly completely free, widely recurved lobes, stamens also recurved, anthers without appendages. Outer corolla surface dark red, inner surface pink. Flowering: Dec-Jan.

Found in Langeberg, east of Riversdale, at altitudes of 600-1000 m, on waterlogged sites.

Seeds roundish in outline, spherical. Seed 0.45-0.54 mm long, 0.43-0.50 mm wide. Hilum conspicuous. Seed surface reticulate (Fig. 55a). Outer periclinal cell walls of the seed coat steeply but shallowly concave. Seed coat cells isodiametric, rectangular in outline, rarely up to 2 times longer than wide; ca. 8-10 cells along the long axis of the seed. Cell boundaries channelled, radial walls undulate. No secondary sculpture, the surface of outer periclinal walls smooth; the visible delicate pits on the thin sunken outer wall are impressions of hollows in the inner periclinal wall, (Fig. 55b). Semi-dull under a light microscope.

a



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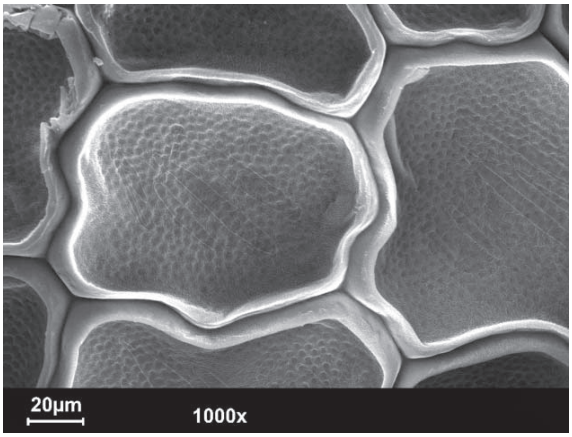


Fig. 55. *Erica amicorum* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

49. *Erica strigosa* Soland., Ait. Hort. Kew. ed. 1: 2: 17 (1789)

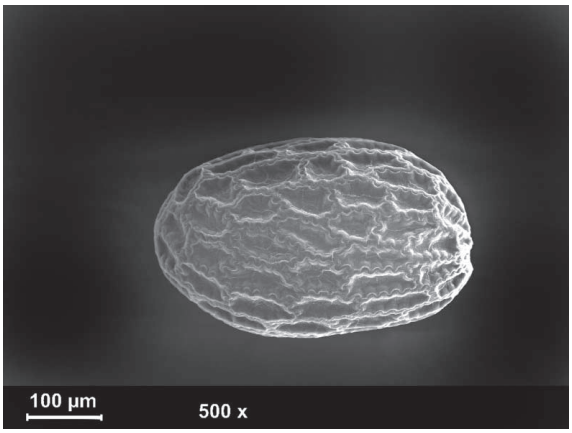
Sect. 14 *Ceramia*

Quite large, robust shrubs, up to 90 cm high, usually profusely branched; leaves sparsely covered with bristle-like hairs. Flowers small, pink or red, corolla ca. 3 mm long, roundish to urn-shaped, wide open, anthers in the throat, with appendages. Flowering: Sep-Oct.

Found mostly at altitudes of 400-600 m, in the Klein Drakenstein Mts near Paarl and Stellenbosch, and on Table Mountain, particularly on Devil's Peak.

Seeds ovate-elliptic in outline, round in cross-section. Seed 0.36-0.43 mm long, 0.23-0.28 mm wide. Hilum on a somewhat wider, blunt end. Seed surface reticulate (Fig. 56a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells elongate, up to 3 times longer than wide; ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture rugulose, anastomosing (Fig. 56b). Slightly shiny under a light microscope.

a



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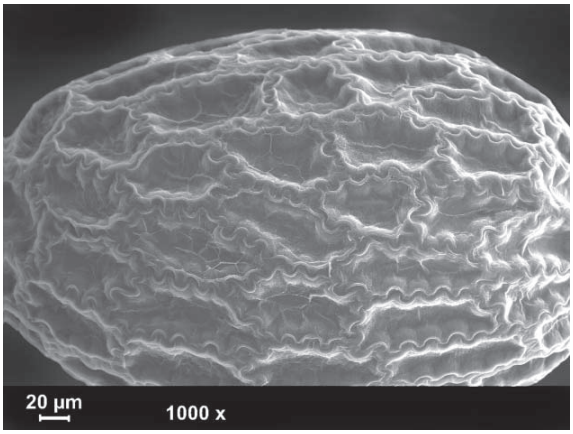


Fig. 56. *Erica strigosa* Soland. (SEM), seed (a) and surface of seed coat (b)

50. *Erica grata* Guthrie & Bolus, Fl. Cap. 4: 153 (1905)
Sect. 14 *Ceramia*

Shoots erect or decumbent, forming robust, branched shrubs, up to 30-50 cm in height. Flowers in groups of 3, on apical parts of short twigs. Corollas widely cup-shaped, with slightly constricted throats, up to 4 mm long.

Found in coastal regions, near Riversdale and Garcias Pass.

Seeds elliptic in outline, round in cross-section. Seed 0.36-0.44 mm long, 0.27-0.32 mm wide. Hilum apical. Seed surface delicately reticulate (Fig. 57a). Outer periclinal cell walls of the seed coat flat, rarely forming thick folds. Seed coat cells elongate, up to 4 times longer than wide; ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture rugulose, anastomosing, but additionally also thicker striae visible, forming stellate patterns, or peripheral, arranged around the cell; these are folds of the outer periclinal wall (Fig. 57b). Dull under a light microscope.

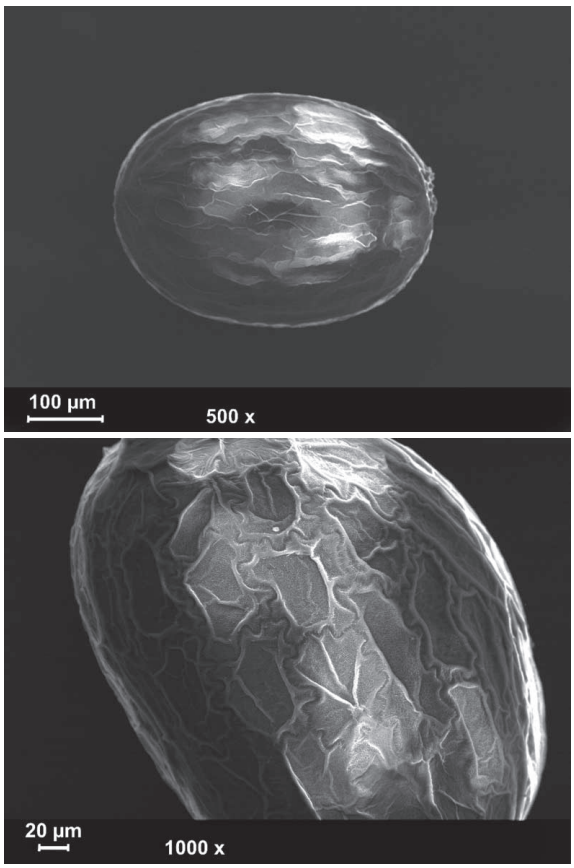


Fig. 57. *Erica grata* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

51. *Erica filialis* E.G.H.Oliv. & I.M.Oliv., Yb. Heather Soc. 2001: 12 (2001)
Sect. 14 *Ceramia*

Compact shrub with ascending shoots, rarely less compact and erect, reaching 15-25 cm in height. Twigs numerous, ending with inflorescences. Short primary lateral branches on main shoots (up to 10 mm long); flowers in groups of 4 are located at their apices. Corolla dark purple, up to 2 mm long, ending with 4 lobes, slightly recurved, sticky. Stamens hidden, anthers with appendages. Pistil protruding, ending with a peltate stigma. Flowering in winter.

Observed on Matroosberg in the Hex River Mts.

Seed shape irregular, obovate in outline, nearly round in cross-section, flattened ventrally and laterally. Seed 0.65-0.73 (0.79) mm long, 0.40-0.50 mm wide. Hilum near a broader end, somewhat laterally. Seed surface reticulate (Fig. 58a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric or somewhat elongate, 1.5-2 times longer than wide; ca. 7-9 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture striate, partly oriented, additionally thicker folds of the outer periclinal wall visible (Fig. 58b). Slightly shiny under a light microscope.

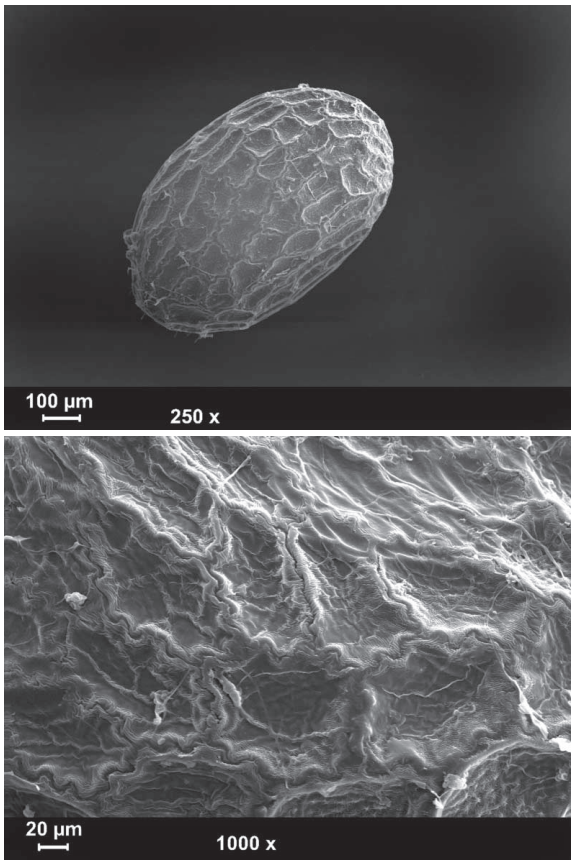


Fig. 58. *Erica filialis* E.G.H.Oliv. & I.M.Oliv. (SEM), seed (a) and surface of seed coat (b)

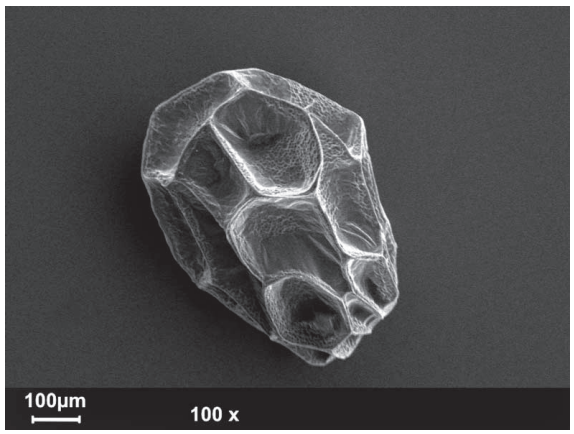
52. *Erica conferta* Andrews, Heath. t. 59 (1805)
Sect. 15 *Desmia*

Erect shrubs, ca. 60 cm high, with flexible, spreading branches. Flowers small, forming dense, compact flower heads, composed of up to 20 flowers, at shoot apices. Corolla 2-3 mm long, nearly spherically urn-shaped, with a constricted throat; stamens somewhat protruding, anthers without appendages. Flowering: Feb-Apr.

Found in mountains on the southern coasts of Cape, from the Riviersonderend in the east to Uniondale and Plettenberg Bay, usually at altitudes higher than 1000 m.

Seeds ovate in outline, round in cross-section. Seed 0.54-0.71 mm long, 0.37-0.53 mm wide. Hilum on a narrower end. Seed surface reticulate, with very large cells (Fig. 59a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells isodiametric or somewhat elongate, up to 2 times longer than wide, cells very large, deeply collapsed; ca. 4-5 cells along the long axis of the seed. Cell boundaries raised, radial walls straight or somewhat curved. Secondary sculpture rugulose, with irregular folds, additionally with irregular pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 59b). Slightly shiny under a light microscope.

a



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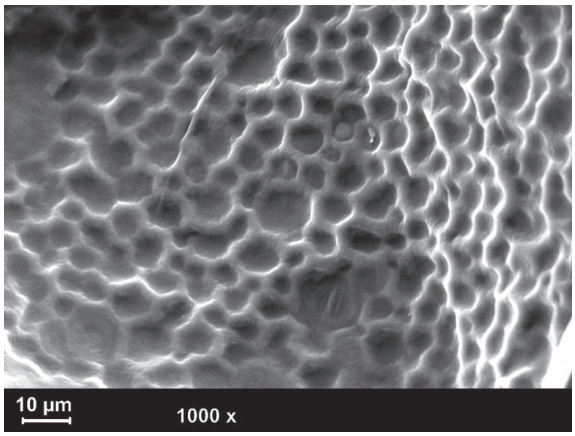


Fig. 59. *Erica conferta* Andrews (SEM), seed (a) and surface of seed coat (b)

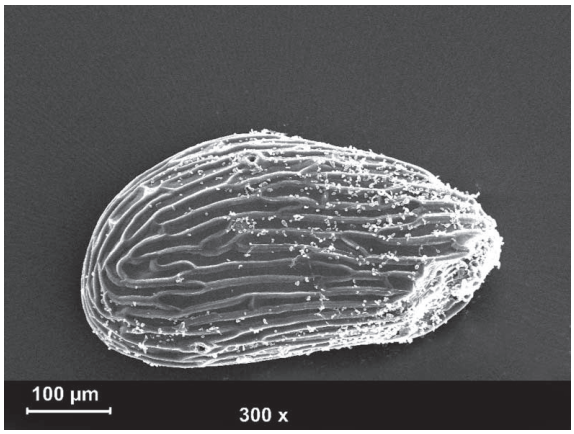
53. *Erica obtusata* Klotzsch ex Benth., DC. Prodr. 7: 615 (1839)
Sect. 15 *Desmia*

Dwarf shrubs, with flat, prostrate twigs, resembling moss clumps, sometimes in open habitats can reach up to 30 cm in height. Flowers small, white, forming small umbels at shoot apices. Corolla 3 mm long, urn-shaped, with spreading lobes, style and stamens protruding. Anthers without appendages. Flowering: Oct-Nov.

Found at humid, shaded sites, on rock outcrops and steep slopes with southern exposure, on the Cape Peninsula, SE of Grabouw, and on Kogelberg.

Seeds ovate-elliptic in outline, round in cross-section. The slightly wider end is obliquely truncate, with a hilum. Seed 0.48-0.53 mm long, 0.23-0.26 mm wide. Seed surface reticulate (Fig. 60a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells very elongate, more than 5 times longer than wide; ca. 5-6 cells along the long axis of the seed. Cell boundaries raised, radial walls straight or somewhat curved. Nearly no secondary sculpture, outer periclinal walls smooth, additionally with crowded, irregular pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 60b). Slightly shiny under a light microscope, apparently sticky.

a



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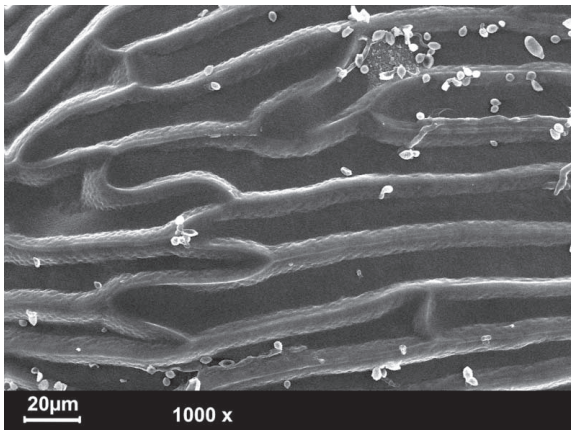


Fig. 60. *Erica obtusata* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

54. *Erica rubiginosa* Dulfer, Ann. Naturhist. Mus. Wien 67: 85 (1964)

Sect. 16 *Gypsocallis*

Up to 30 cm high, with numerous lateral branches. Flowers small, white or pink, on long stalks, forming long apical racemes. Corolla 2-3 mm long, cup-shaped with a wide throat, style and anthers somewhat protruding. Anthers without appendages. Flowering: Nov-Dec.

Found in lowlands, on clay slopes or on dry gravel soils, from Houhoek near Grabouw in the SE to Bredasdorp and Elim.

Seed shape irregular, ovate in outline, nearly round in cross-section, sometimes slightly flattened ventrally. Hilum on a narrower end. Seed 0.48-0.56 mm long, 0.26-0.32 mm wide. Seed surface reticulate (Fig. 61a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric or somewhat elongate, up to 3 times longer than wide, ca. 6-8 cells along the long axis of the seed. Cell boundaries raised, radial walls straight or undulate. Secondary sculpture tuberculate (Fig. 61b).

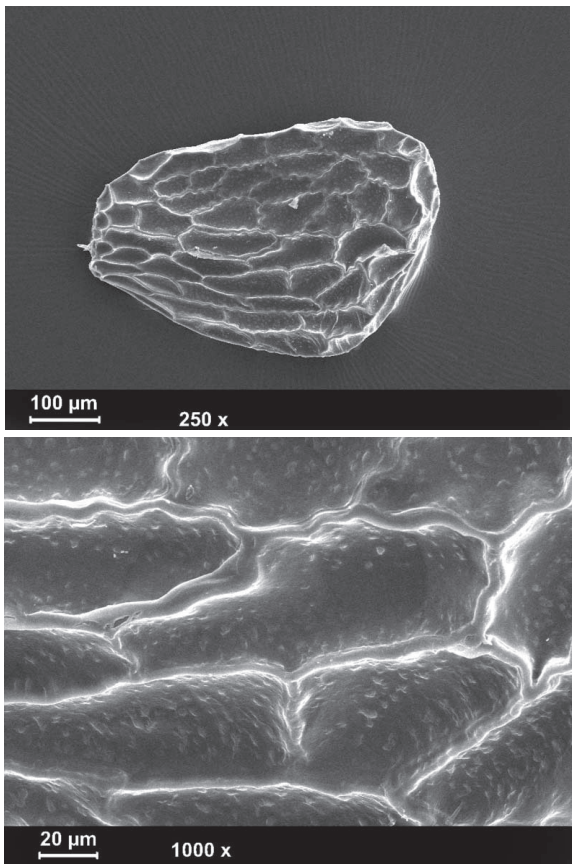


Fig. 61. *Erica rubiginosa* Dulfer (SEM), seed (a) and surface of seed coat (b)

55. *Erica scytophylla* Guthrie & Bolus, Fl. Cap. 4: 162 (1905)

Sect. 16 *Gypsocallis*

Erect shrubs, up to 1.5 m high, leaves thick, densely covering whole shoots. Flowers white or pink, corolla open, urn-shaped or bell-shaped, 3 mm long, style and stamens protruding, anthers with a small tooth at base. A very robust, white-flowered form is found in sandy lowlands of De Hop. Flowering: Sep-Dec.

Found mostly on limestone formations, between Bredasdorp and Cap Infanta.

Seeds elliptic in outline, round in cross-section, sometimes slightly flattened ventrally. Hilum apical. Seed 0.50-0.56 mm long, 0.33-0.43 mm wide. Seed surface reticulate (Fig. 62a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells polygonal, isodiametric, ca. 9-10 cells along the long axis of the seed. Cell boundaries channelled, radial walls undulate. Secondary sculpture irregular striate (Fig. 62b). Semi-dull under a light microscope.

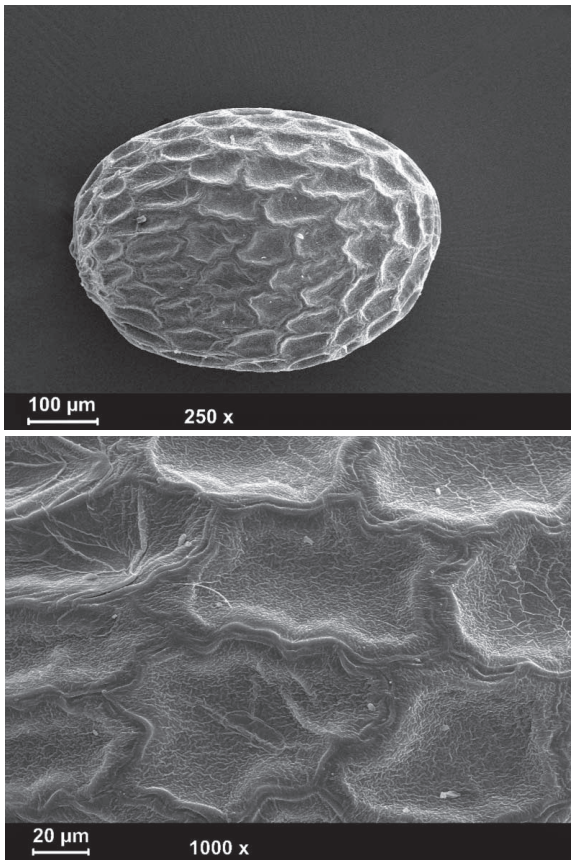


Fig. 62. *Erica scytophylla* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

56. *Erica nudiflora* L., Mant. Alt. 229 (1771)

Sect. 16 *Gypsocallis*

Widespread, highly variable, usually very hairy. Flowers smooth, pale red or pinkish white. Corolla tubular or narrowly ovoid, 3-5 mm long, style and stamens protruding. Anthers without appendages. Flowering: Feb-Apr.

Widespread, in SW Cape. Found on dry, rocky slopes, from Clanwilliam in the north to the Cape Peninsula and to Bredasdorp in the east.

Seed shape often irregular, elliptic in outline, round in cross-section, sometimes slightly flattened ventrally and laterally. Hilum apical. Seed 0.53-0.66 mm long, 0.34-0.43 mm wide. Seed surface reticulate (Fig. 63a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells polygonal, isodiametric or somewhat elongate, up to 3 times longer than wide; ca. 9-10 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture striate, partly regular (Fig. 63b). Semi-dull under a light microscope.

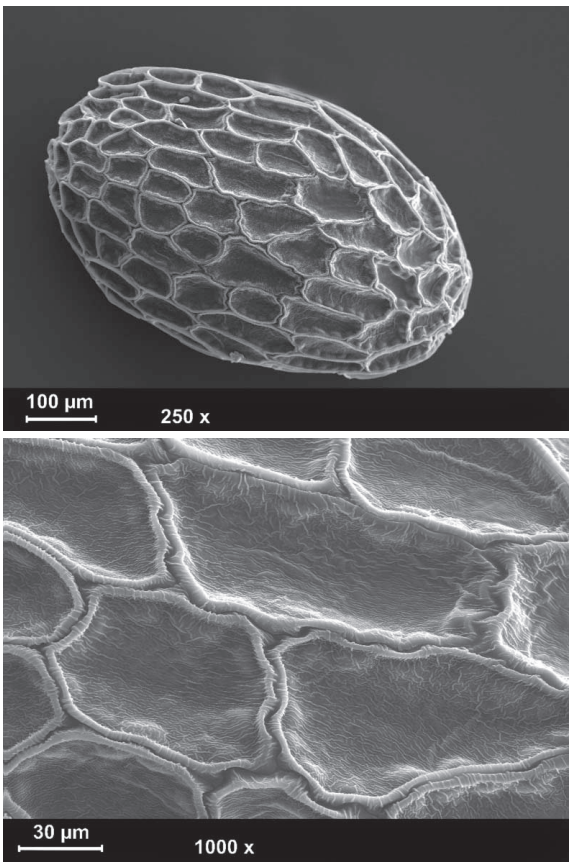


Fig. 63. *Erica nudiflora* L. (SEM), seed (a) and surface of seed coat (b)

57. *Erica paniculata* L., Sp. Pl. ed. 2: 508 (1762)

Sect. 17 *Pyronium*

Robust, erect shrubs. Flowers small, white or pink, forming dense, long inflorescences. Corolla 2-3 mm long, cup-shaped, open, ending with flat, spreading lobes. Style very long, protruding, stamens slightly protruding. Anthers with appendages. Flowering: Sep-Dec.

Found on low mountain slopes, on the Cape Peninsula and in the Hottentots-Holland Mts and near Tulbagh, Wellington, and Paarl.

Seeds elliptic in outline, nearly round in cross-section, flattened ventrally, with a conspicuous ridge along the flattened edge. Hilum apical. Seed 0.53-0.63 mm long, 0.30-0.42 mm wide. Seed surface nearly smooth, delicately reticulate (Fig. 64a). Outer periclinal cell walls of the seed coat flat. The cells are very elongate, often more than 5 times longer than wide; ca. 10-12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 64b). Under a light microscope smooth, shiny, with a visible very delicate network of cells.

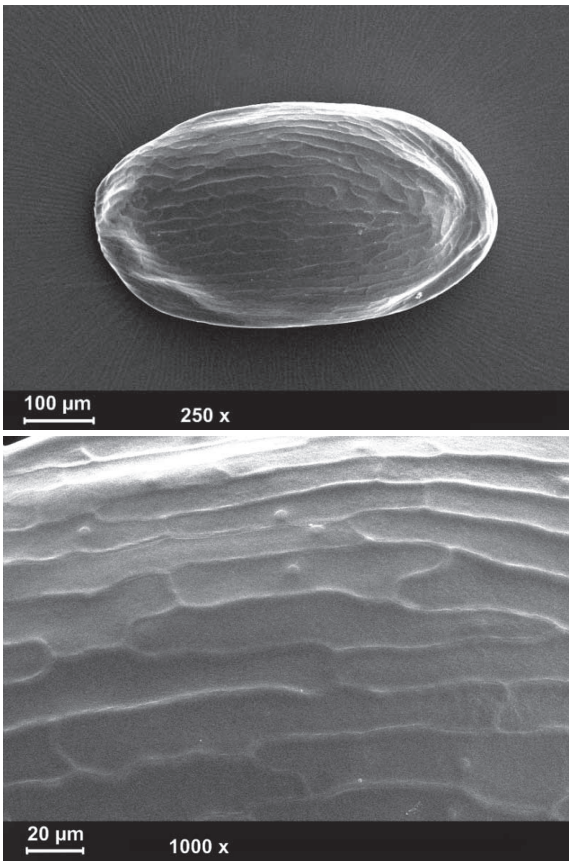


Fig. 64. *Erica paniculata* L. (SEM), seed (a) and surface of seed coat (b)

58. *Erica bicolor* Thunb., Diss. Erica 36 (1785)

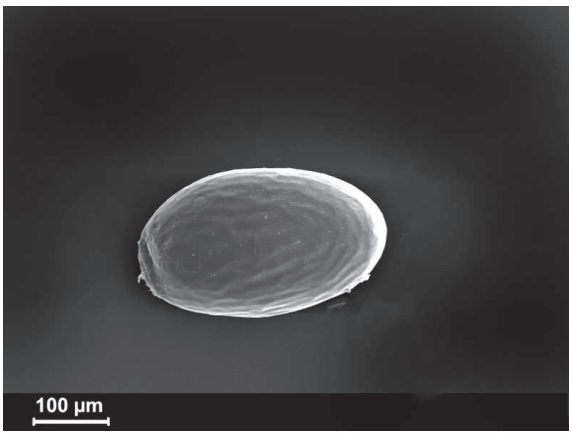
Sect. 17 *Pyronium*

Usually robust, erect shrubs, 60-90 cm high, with 2-3 slender, straight branches, whole covered with flowers during the flowering period. Flower colour variable, pink or red, corolla 3 mm long, cup-shaped, anthers protruding, brown, with bristle-like appendages. Flowering: Aug-Dec.

Distributed from Clanwilliam in the north to Celadon in the south, in mountains on slopes near Tulbagh, Ceres, Paarl, and Stellenbosch.

Seeds elliptic in outline, sometimes ovate, nearly round in cross-section, flattened ventrally. Hilum inconspicuous, on a narrower end. Seed 0.35-0.42 mm long, 0.22-0.26 mm wide. Seed surface smooth and shiny, with a visible very delicate network of cells (Fig. 65a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 3-5 times longer than wide; ca. 12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 65b). Under a light microscope smooth, shiny, with a visible very delicate network of cells.

a



b

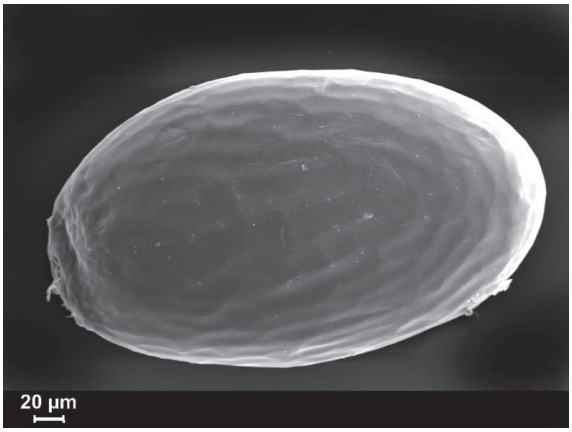


Fig. 65. *Erica bicolor* Thunb. (SEM), seed (a) and surface of seed coat (b)

59. *Erica scabriuscula* Lodd., Bot. Cab. t. 517 (1821)

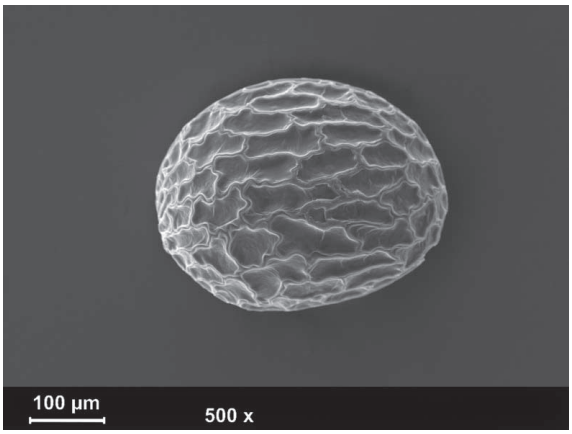
Sect. 18 *Orophanes*

Large shrubs, 90-120 cm high, leaves large, dark green, covered with glandular hairs. Flowers white or pink, corolla ca. 4 mm long, roundish or urn-shaped, anthers with bristle-like appendages. Flowering: Jan-Apr.

Found in the south of Cape Province, near Langeberg, Outeniqua and Tsitsikamma, and to Humansdorp in the east.

Seeds elliptic in outline, round in cross-section. Hilum apical. Seed 0.36-0.42 mm long, 0.28-0.33 mm wide. Seed surface reticulate (Fig. 66a). Outer periclinal cell walls of the seed coat steeply, but shallowly concave. Seed coat cells irregular in shape, elongate, 3-4 times longer than wide; ca. 5-6 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture delicately striate (Fig. 66b). Slightly shiny under a light microscope.

a



b

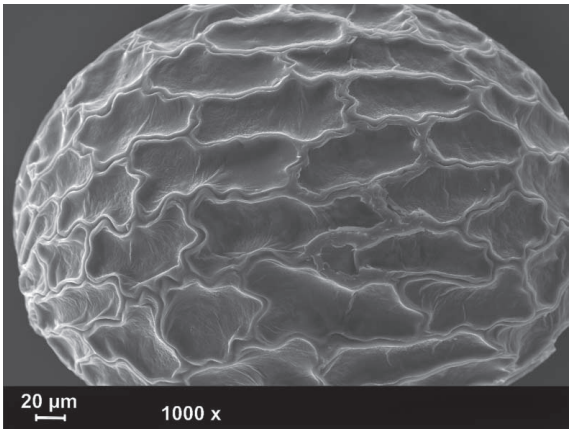


Fig. 66. *Erica scabriuscula* Lodd. (SEM), seed (a) and surface of seed coat (b)

60. *Erica rubens* Thunb., Diss. Erica 49 (1785)

Sect. 18 *Orophanes*

Erect shrubs, reaching 30-40 cm in height, with numerous, slender, reddish twigs. Flowers in small umbels of 3-6. Sepals dark red, corolla intermediate between ovoid and cup-shaped, with a markedly constricted throat, pale red, 5-7 mm long. Stamens hidden, anthers with appendages.

Found near Clanwilliam, Ceres, in the Cederberg Mts and Cold Bokkeveld.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.45-0.57 mm long, 0.27-0.38 mm wide. Seed surface reticulate (Fig. 67a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells isodiametric or somewhat elongate, up to 3 times longer than wide; ca. 8 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. No secondary sculpture, outer periclinal walls smooth, or irregular folds on depressed outer periclinal walls (Fig. 67b). Slightly shiny under a light microscope.

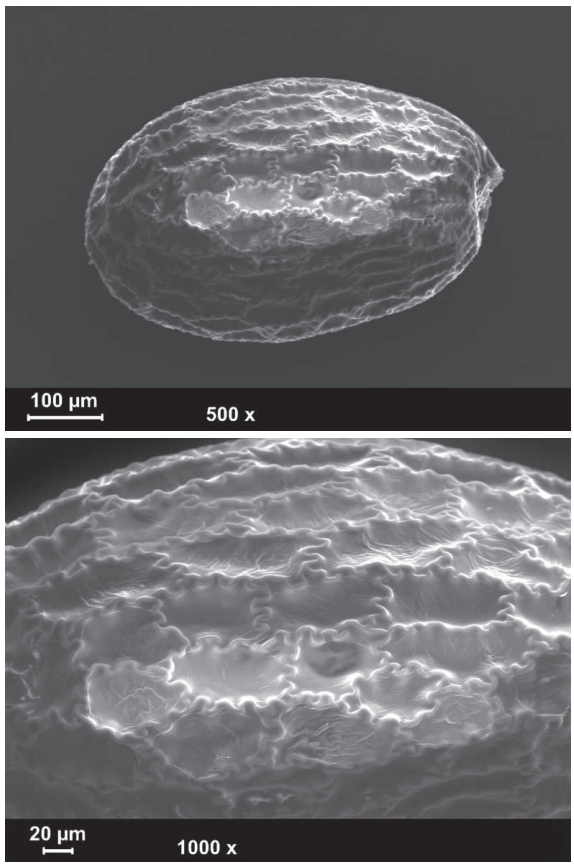


Fig. 67. *Erica rubens* Thunb. (SEM), seed (a) and surface of seed coat (b)

61. *Erica sitiens* Klotzsch, Linnaea 12: 505 (1838)

Sect. 18 *Orophanes*

Shrubs varying in size and shape, small, straggly or robust, erect, reaching 90 cm in height. At the time of flowering, the shrubs are covered with abundant small flowers. Corollas 6-8 mm long, tubular, swollen asymmetrically, pink, red or white, or red with white lobes; stamens hidden in corolla tubes. Anthers with appendages. Flowering: Oct-Apr.

Found between Stellenbosch and Hermanus, at altitudes of 300-1000 m.

Seeds spherical. Seed 0.53-0.73 mm long, 0.46-0.58 mm wide. Hilum conspicuous. Seed surface reticulate (Fig. 68a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells polygonal, isodiametric, rarely up to 2 times longer than wide; ca. 7-9 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture delicately striate, partly oriented (Fig. 68b). Slightly shiny under a light microscope.

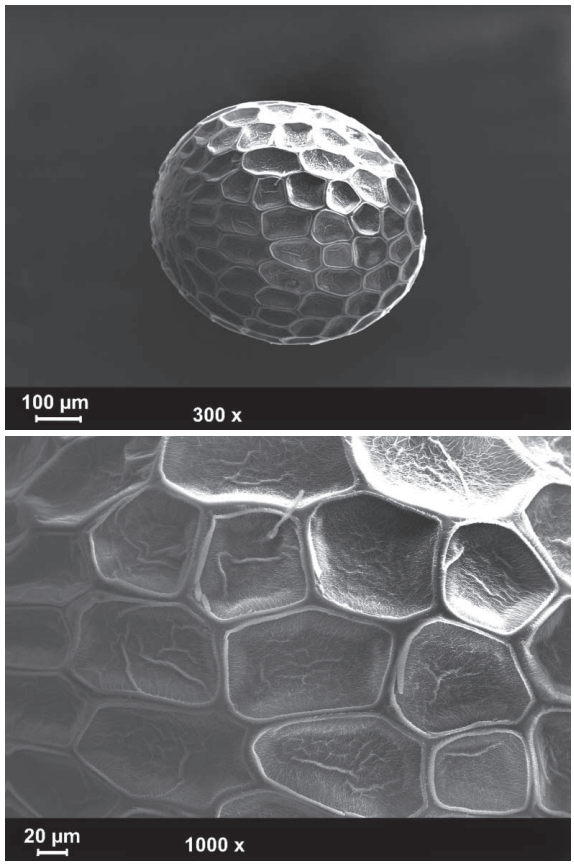


Fig. 68. *Erica sitiens* Klotzsch (SEM), seed (a) and surface of seed coat (b)

62. *Erica rehmii* Dulfer, Ann. Nat. Hist. Mus. Wien 66: 28, Fig. 11 (1963)

Sect. 18 *Orophanes*

Perennial shrub up to 1.5 m height. Stem and leafs non-hairy. Corolla yellow, bell-shaped.

Found in the south west Cape Prowince, near Elandskloof.

Anthers without appendages.

Seeds obovate-elliptic in outline, round in cross-section, sometimes slightly flattened ventrally. Seed 0.52-0.58 mm long, 0.35-0.49 mm wide. Hilum on a broader end. Seed surface reticulate (Fig. 69a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells polygonal, isodiametric or up to 3 times longer than wide, deeply collapsed; ca. 6-8 cells along the long axis of the seed. Cell boundaries raised, radial walls undulate. No secondary sculpture, the surface of outer periclinal walls generally smooth, with crowded, irregular pits (surface foveate, pitted) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall (Fig. 69b). Slightly shiny under a light microscope.

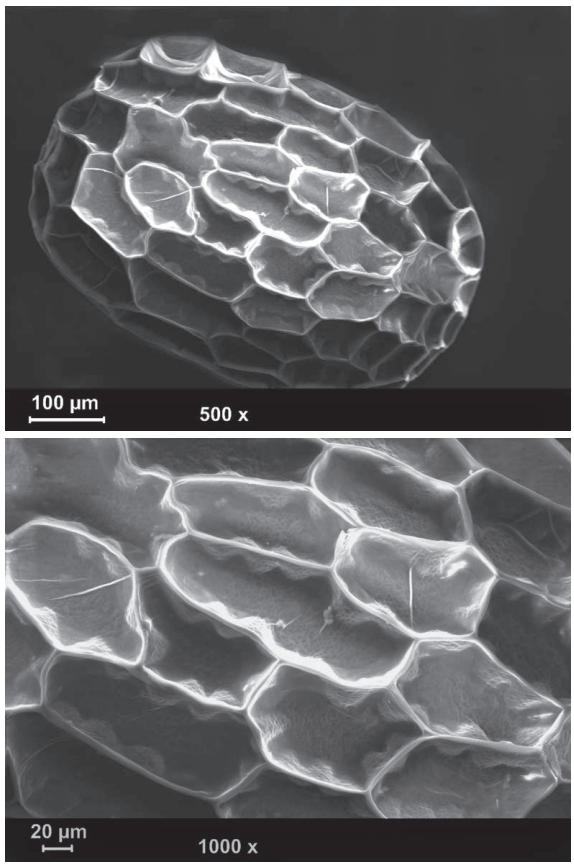


Fig. 69. *Erica rehmii* Dulfer (SEM), seed (a) and surface of seed coat (b)

63. *Erica tenella* Andrews, Heathery t. 94 (1805)

Sect. 18 *Orophanes*

Erect shrub, up to 45 cm high, with grey, pubescent twigs. Flowers numerous, at shoot apices, forming raceme-like inflorescences, dark or pale pink. Corolla 4-6 mm long, vase-shaped, white or pale pink. Stamens hidden in corolla tubes, anthers with appendages. Flowering: Sep-Mar.

Distributed on southern coasts of the Cape, from near Celadon and Riviersonderend to Hermanus and Bredasdorp. Found at altitudes of 100-900 m, on cold, shaded slopes.

Seeds broadly elliptic in outline, nearly spherical. Hilum apical. Seed 0.57-0.63 mm long, 0.42-0.55 mm wide. Seed surface reticulate (Fig. 70a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells polygonal, isodiametric, ca. 10-11 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate or sometimes straight. No secondary sculpture, the surface of outer periclinal walls generally smooth, additionally with crowded, irregular pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall (Fig. 70b). Shiny under a light microscope.

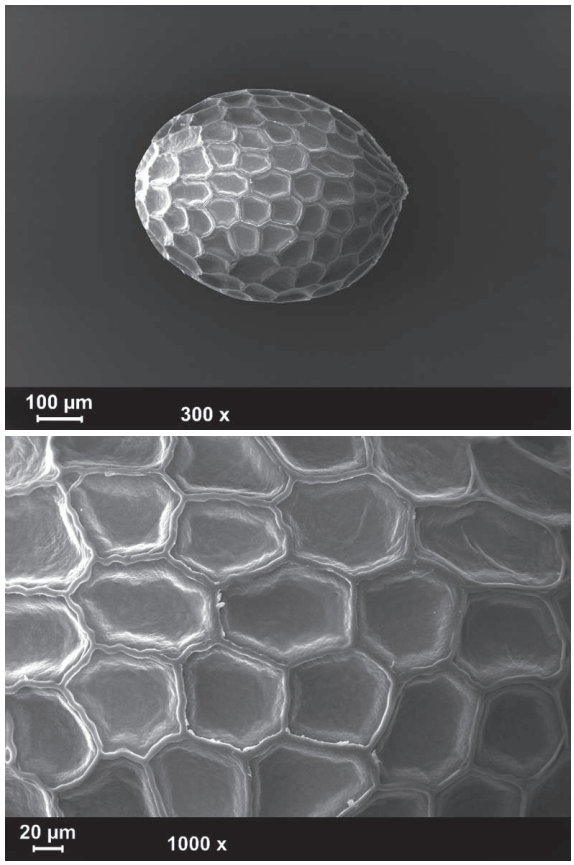


Fig. 70. *Erica tenella* Andrews (SEM), seed (a) and surface of seed coat (b)

64. *Erica pageana* L.Bolus, Ann. Bol. Herb. 4: 133, Pl. 12 A (1928)

Sect. 19 *Leptodendron*

Robust, erect shrubs, ca. 60 cm high. Flowers yellow, forming dense inflorescences, on short lateral branches near shoot apices. Corolla 8-10 mm long, stamens hidden, anthers with no appendages. Flowering: Aug-Oct.

Found only on Kogelberg, at an altitude of 1000 m.

Seeds broadly elliptic or broadly obovate in outline, round in cross-section, nearly spherical. Hilum on a somewhat wider end. Seed 0.58-0.70 mm long, 0.46-0.61 mm wide. Seed surface reticulate (Fig. 71a). Seed coat cells isodiametric, with deeply concave outer periclinal walls; ca. 10 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. No secondary sculpture, the surface of outer periclinal walls generally smooth, with crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall (Fig. 71b). Slightly shiny under a light microscope; the high margins of seed coat cells are pale, hence whole seeds appear pale.

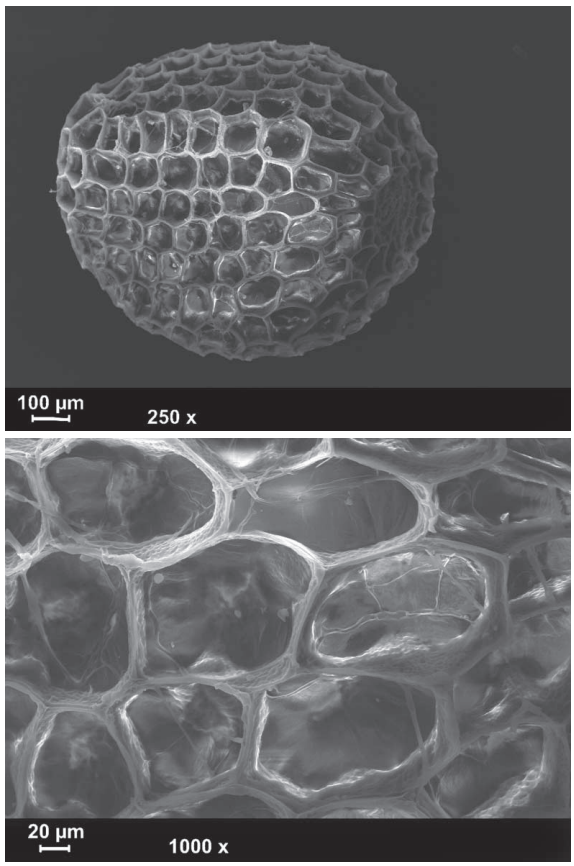


Fig. 71. *Erica pageana* L.Bolus (SEM), seed (a) and surface of seed coat (b)

65. *Erica schlechteri* Bolus, Journ. of Bot. 32: 325 (1894)

Sect. 20 *Pachysa*

Flowers pink, in groups of 3-4, at apices of long, curved twigs; sepals and bracts sticky. Corolla sticky, 5-7 mm long, bell-shaped or urn-shaped, with a slightly constricted throat, stamens hidden. Anthers with appendages. Flowering: Mar-Jun.

Alpine, found in the eastern part of the Cape (from Hangklip Mountain in the NE to Montaux-Sources) and in Natal.

Seed shape irregular, ovate in outline, nearly round in cross-section, slightly flattened laterally and ventrally. Hilum on a narrower end. Seed 0.50-0.60 mm long, 0.35-0.45 mm wide. Seed surface reticulate (Fig. 72a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric or slightly elongate, up to 2-3 times longer than wide; ca. 10 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. No secondary sculpture, outer periclinal walls smooth, additionally with crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 72b). Slightly shiny under a light microscope.

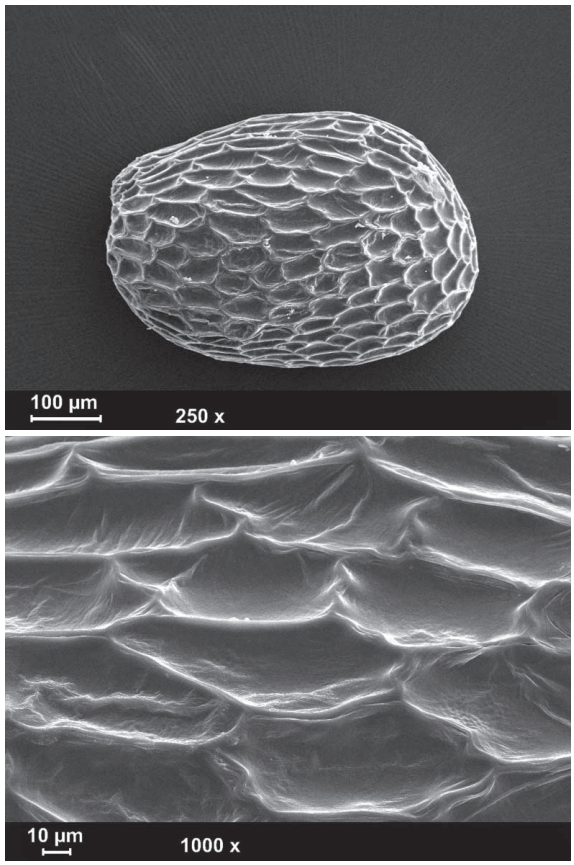


Fig. 72. *Erica schlechteri* Bolus (SEM), seed (a) and surface of seed coat (b)

66. *Erica nubigena* Bolus, Journ. of Bot. 32: 236 (1894)
Sect. 20 *Pachysa*

Flowers sticky, pinkish red to purple, in groups of several flowers at shoot apices, Corolla 6-7 mm long, ovoid to urn-shaped, anthers hidden, with bristle-like appendages. Flowering: Dec-Feb.

Found in rock crevices, usually with pendent twigs. Found in high mountains, at altitudes of 1500-2000 m, near Tulbagh, Worcester, Ladismith, and Oudtshoorn.

Seeds broadly elliptic to obovate in outline, round in cross-section. Hilum on a somewhat wider end. Seed 0.46-0.55 mm long, 0.35-0.42 mm wide. Seed surface reticulate (Fig. 73a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells irregular, elongate, 2-3 times longer than wide; ca. 8-10 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture irregular striate (Fig. 73b). Semi-dull under a light microscope.

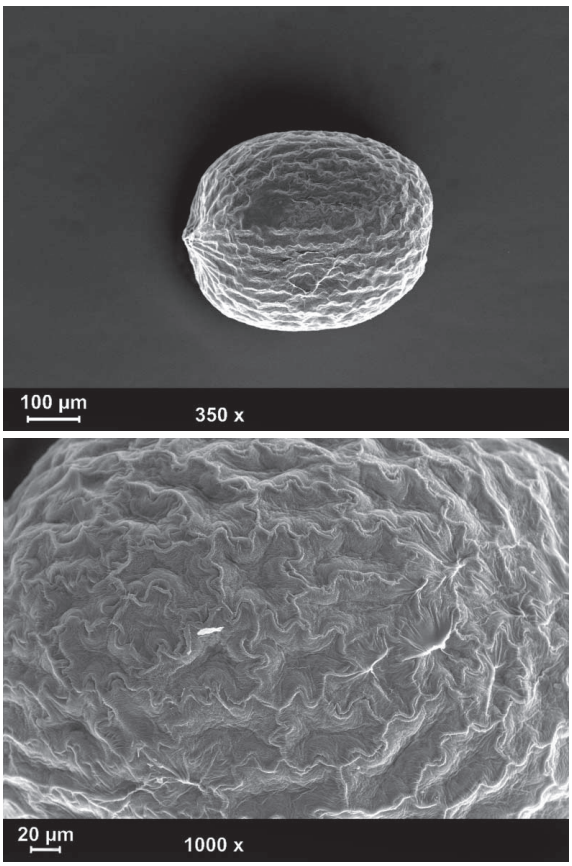


Fig. 73. *Erica nubigena* Bolus (SEM), seed (a) and surface of seed coat (b)

67. *Erica umbelliflora* Klotzsch ex Benth., DC. Prodr. 7: 659 (1838)
Sect. 20 *Pachysa*

Twigs pubescent, flowers in small umbels, sticky. Corolla nearly spherical, up to 4 mm long, stamens hidden.

Found near Mossel Bay, Attaquas Kloof, Humansdorp, Prince Albert, and Great Zwartberg.

Seeds roundish in outline, flattened bilaterally, cuneiform in cross section. Hilum on a flat side. Seed 1.00-1.20 mm long, 0.80-1.20 mm wide. Seed surface reticulate (Fig. 74a). Outer periclinal cell walls of the seed coat usually slightly sunken, sometimes convex with only its central part sunken. Seed coat cells isodiametric or somewhat elongate; ca. 15 cells along the long axis of the seed. Cell boundaries generally raised, although apparently separated to some extent, radial walls straight. Secondary sculpture tuberculate (Fig. 74b). Semi-dull under a light microscope.

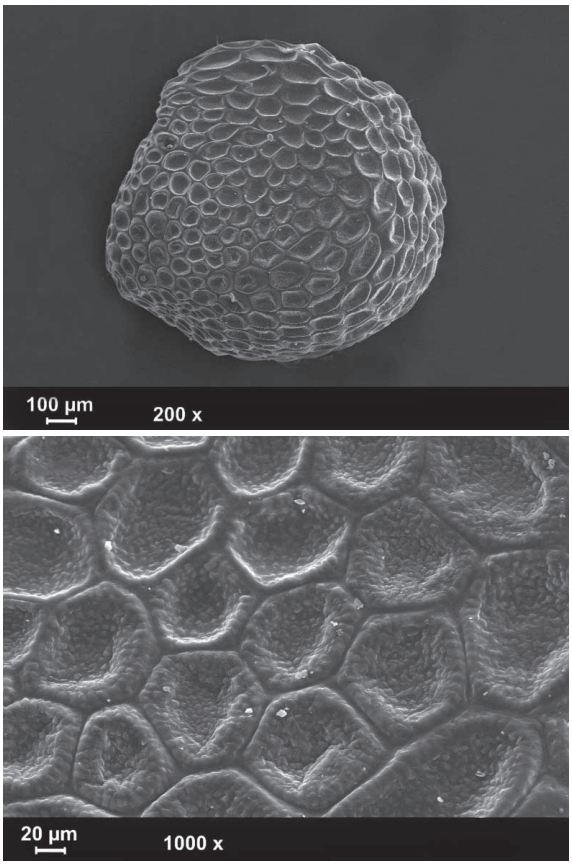


Fig. 74. *Erica umbelliflora* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

68. *Erica physodes* L., Syst. Nat. ed. 10: 1002 (1759)

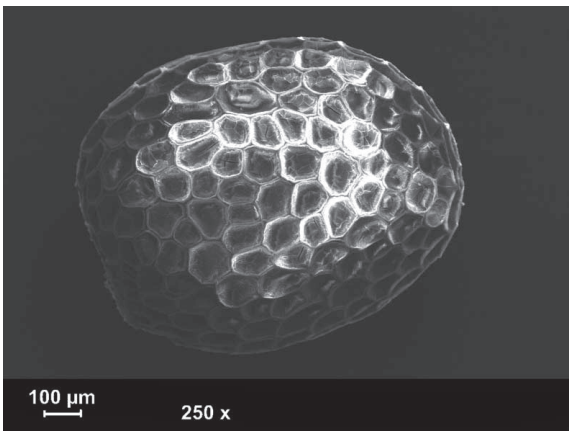
Sect. 20 *Pachysa*

Robust, erect shrubs, up to 70 cm high. Flowers sticky, white. Corolla 6-8 mm long, urn-shaped, ending with straight lobes, stamens hidden. Anthers with appendages. Flowering: Feb-May.

Found only on the Cape Peninsula, between Constantiaberg and Noordhoek, on humid, southern slopes.

Seeds broadly elliptic to obovate in outline, round in cross-section. Hilum on a somewhat wider end. Seed 0.67-0.76 mm long, 0.52-0.61 mm wide. Seed surface reticulate (Fig. 75a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells polygonal, isodiametric; ca. 12 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate or straight. Secondary sculpture irregular striate, anastomosing (Fig. 75b). Semi-dull under a light microscope.

a



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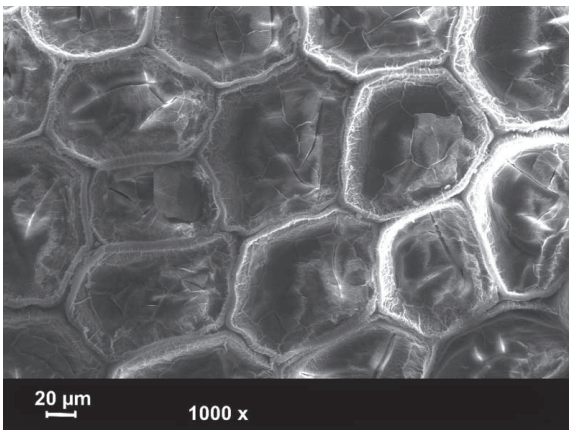


Fig. 75. *Erica physodes* L. (SEM), seed (a) and surface of seed coat (b)

69. *Erica odorata* Andrews, Heathery t. 177 (1807)

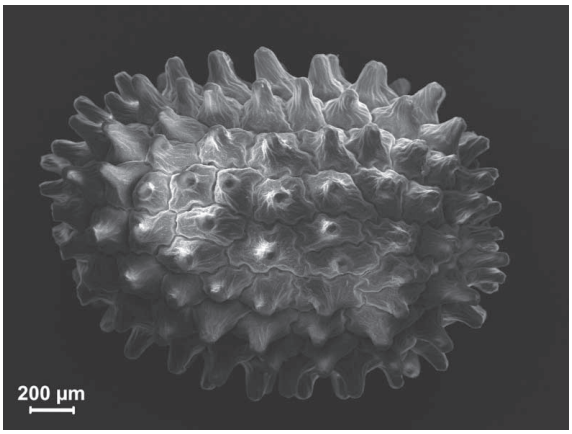
Sect 20 *Pachysa*

Small erect shrubs, reaching 60 cm in height, with few decumbent branches. Flowers white, in small apical umbels. Corolla roundish, open, ending with recurved lobes. Stamens hidden. Anthers without appendages. Flowering: Sep-Nov.

Distributed on higher mountain slopes, from Hottentots-Holland to Riviersonderend Mts; found on cold, humid rock shelves, and among grassy vegetation.

Seeds broadly elliptic to roundish in outline, nearly spherical. Hilum on a somewhat wider end. Seed 0.56-0.61 mm long, 0.46-0.57 mm wide. Outer periclinal cell walls of the seed coat markedly convex, forming rigid, conical appendages, seed surface papillate (Fig. 76a). Seed coat cells isodiametric, markedly undulate, nearly stellate; ca. 8-9 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture irregular striate (Fig. 76b). Semi-dull under a light microscope.

a



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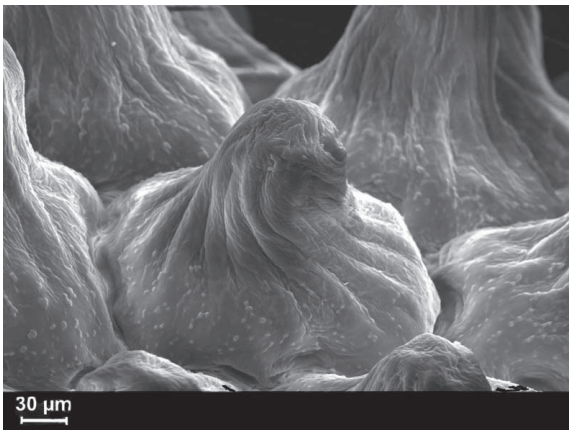


Fig. 76. *Erica odorata* Andrews (SEM), seed (a) and surface of seed coat (b)

70. *Erica juniperina* E.G.H.Oliv., Feddes Repertorium 106, 5-8: 350 (1995)
Sect. 20 *Pachysa*

Erect shrub, up to 50 cm high, twigs sparsely pubescent, covered with nearly appressed, broadly elliptic leaves. Flowers in groups of 3, at apices of secondary lateral branches. Corolla pink, sticky, spherically vase-shaped, up to 4.5 mm long. Stamens protruding. Anthers with appendages. Flowering: Mar-May.

Found on Outeniqua Mountain, near Robinson Pass.

Seeds elliptic to obovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum on a broader end, somewhat laterally. Seed 0.74-0.80 mm long, 0.41-0.53 mm wide. Outer periclinal cell walls of the seed coat markedly convex, dome-shaped, so seed surface is covered with hemispherical papillae (Fig. 77a). Seed coat cells isodiametric, markedly undulate, nearly stellate; ca. 11-13 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture granulate, as the papillae covered by hemispherical protuberances (Fig. 77b). Dull under a light microscope.

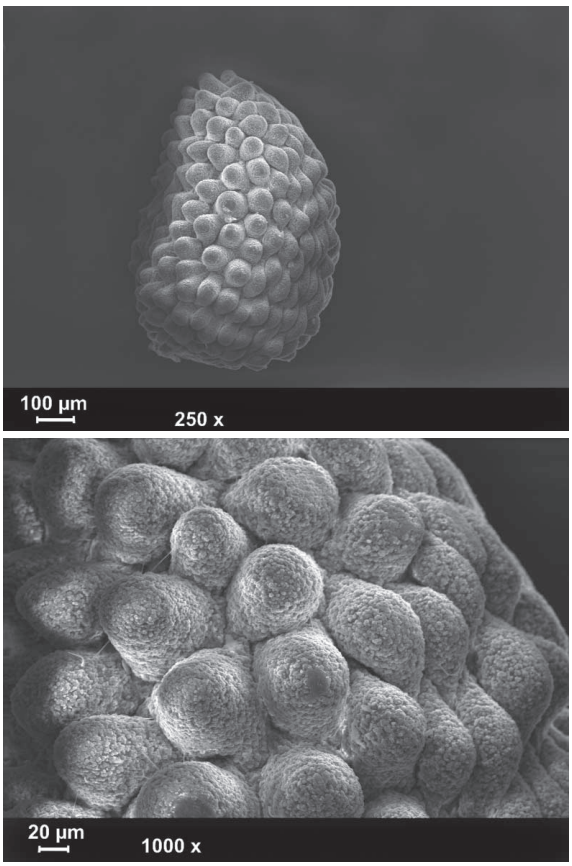


Fig. 77. *Erica juniperina* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

71. *Erica carduifolia* Salisb., Trans. Linn. Soc. 6: 330 (1802)
Sect. 20 *Pachysa*

Small, roundish and straggly shrubs, reaching 30-40 cm in height. Flowers pinkish-lilac, pendent, on long stalks. Corolla 6-7 mm long, urn-shaped, stamens hidden. Anthers with appendages. Flowering: Sep-Apr.

Widespread, found in mountains near Stellenbosch, Paarl, Ceres, Worcester, Celadon, Riviersonderend, Robertson, Oudtshoorn, and Uniondale, on humid slopes, at altitudes higher than 1000 m.

Seeds cuneate-obovate in outline, nearly round in cross-section, slightly flattened bilaterally and ventrally. Hilum on a broader end. Seed (0.48) 0.50-0.54 mm long, 0.24-0.32 mm wide. Seed surface reticulate (Fig. 78a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric or somewhat elongate; ca. 8-10 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture densely, irregularly wrinkled (Fig. 78b). Under a light microscope very dark, shiny.

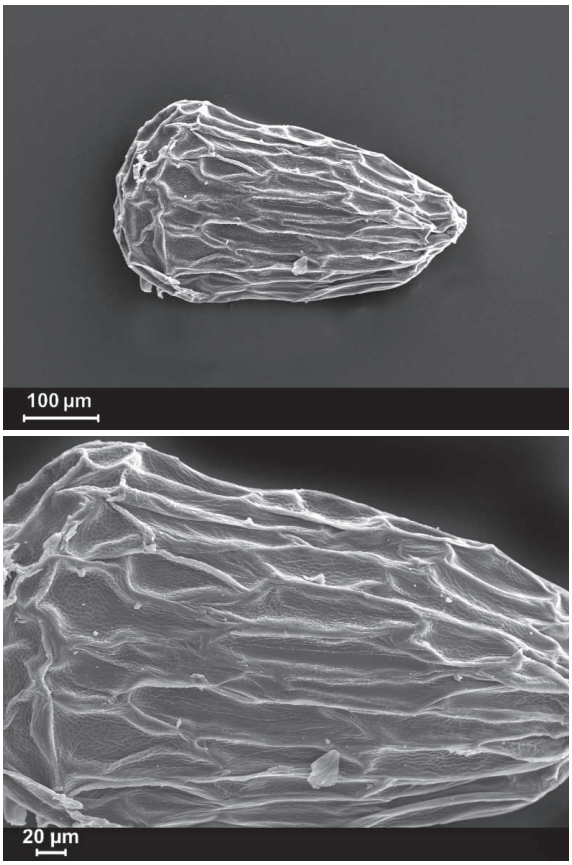


Fig. 78. *Erica carduifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

72. *Erica pyxidiflora* Salisb., Trans. Linn. Soc. 6: 371 (1802)

Sect. 21 *Hermes*

Rigid, erect shrubs, up to 60 cm high, with loose branches, which are not numerous. Flowers white or pink, forming very dense, straight, apical spikes. Corolla ca. 4 mm long, bell-shaped, open, stamens hidden. Anthers with appendages. Flowering: May-Dec.

Found on waterlogged sites, on Steinberg plateau, in Silvermine Nature Reserve.

Seeds elliptic in outline, round in cross-section. Hilum apical. Seed 0.37-0.45 mm long, 0.25-0.33 mm wide. Seed surface reticulate (Fig. 79a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells polygonal, elongate, 2-5 times longer than wide; ca. 9 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. Secondary sculpture irregular striate, anastomosing (Fig. 79b). Slightly shiny under a light microscope.

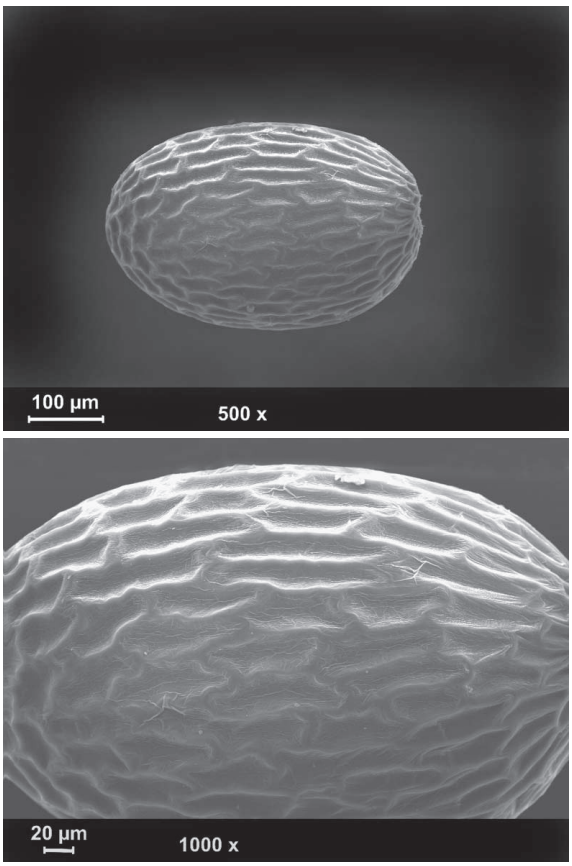


Fig. 79. *Erica pyxidiflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

73. *Erica columnaris* E.G.H.Oliv., Bothalia 30, 1: 50 (2000)

Sect. 21 *Hermes*

Robust, erect shrubs, reaching 0.5 (1) m in height, with a single stem. Flowers singly or in pairs, on reduced lateral branches, resembling a compact, spike-like, columnar inflorescence. Corolla up to 3 mm long, ending with 4 lobes, cup-shaped, whitish at base. Stamens hidden. Anthers with appendages. Flowering: Sep-Oct.

Found at the summit of Pilaarkop, in the Riviersonderend Mts.

Seeds broadly elliptic in outline, nearly spherical. Hilum on an inconspicuous apex. Seed 0.51-0.65 mm long, 0.43-0.52 mm wide. Seed surface reticulate (Fig. 80a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells polygonal, isodiametric; ca. 9-10 cells along the long axis of the seed. Cell boundaries raised, radial walls undulate. No secondary sculpture, the surface of outer periclinal walls generally smooth, with crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 80b). Semi-dull under a light microscope.

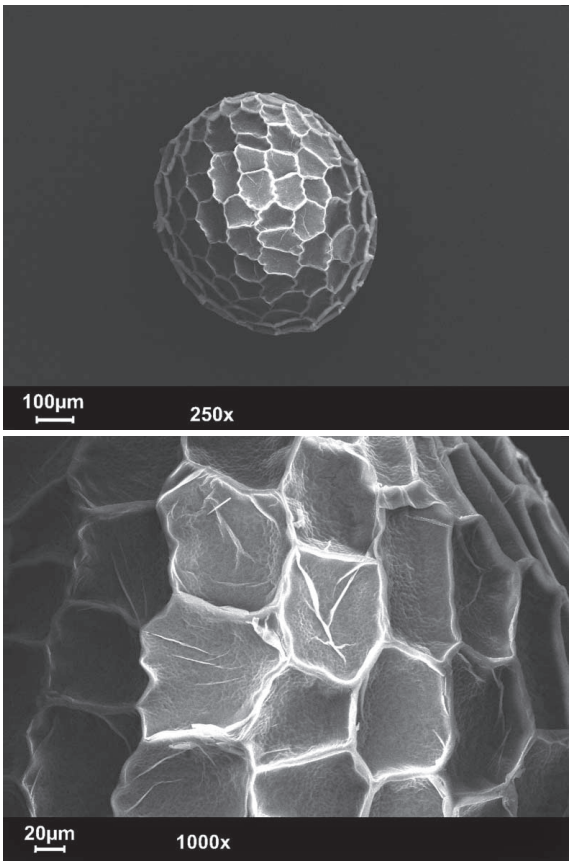


Fig. 80. *Erica columnaris* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

74. *Erica parilis* Salisb., Trans. Linn. Soc. 6: 371 (1802)
Sect. 21 *Hermes*

Rigid, erect shrubs, reaching 60-70 cm in height, with 2-3 strong branches, bearing yellow flowers on apical parts. Corolla 4-6 mm long, tubular to somewhat bell-shaped, usually ending with lobes, slightly recurved, slightly sticky. Stamens somewhat protruding. Anthers without appendages. Flowering: Dec-Mar.

Found on dry, rocky sites at higher altitudes in mountains, near Clanwilliam, Ceres, Worcester, Paarl and in the Montagu district.

Seeds elliptic to obovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum on a somewhat wider end, subapical. Seed 0.60-0.73 mm long, 0.42-0.52 mm wide. Seed surface reticulate (Fig. 81a). Outer periclinal cell walls of the seed coat quite steeply, but shallowly concave. Seed coat cells polygonal, isodiametric; 10-11 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, partly regular, apart from crowded minute striae, additionally some thicker folds, anastomosing (Fig. 81b). Semi-dull under a light microscope.

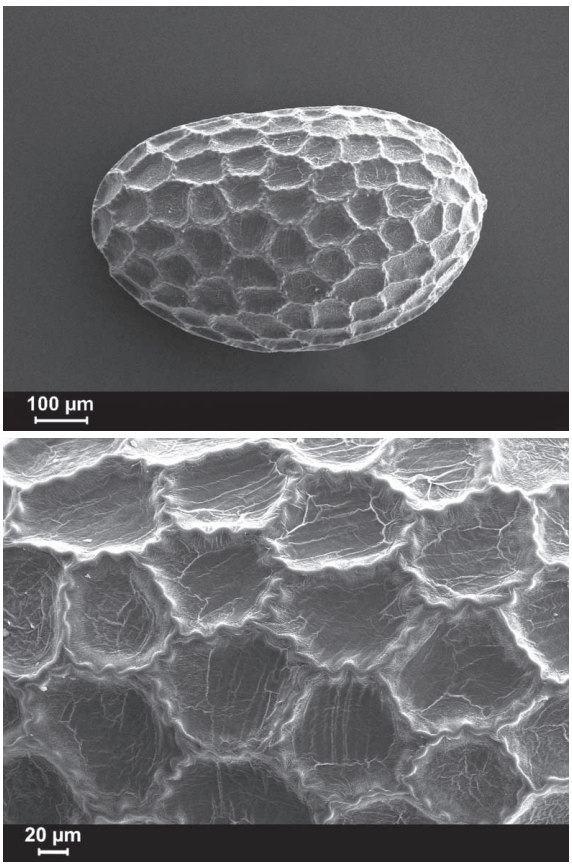


Fig. 81. *Erica parilis* Salisb. (SEM), seed (a) and surface of seed coat (b)

75. *Erica axilliflora* Bartl., Linnaea 7: 640 (1832)
Sect. 21 *Hermes*

Erect shrubs, reaching 30-40 cm in height. Twigs numerous, erect. Seeds broadly ovate in outline, red, up to 3 mm long, corolla dark red, bell-shaped, sticky, up to 7 mm long. Stamens hidden, anthers without appendages.

Found near Bredasdorp, Zoetendals Vlei, and Elim.

Seeds elliptic to obovate in outline, round in cross-section. Hilum on a broader end. Seed 0.48-0.54 mm long, 0.35-0.42 mm wide. Seed surface reticulate (Fig. 82a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric, 8-9 cells along the long axis of the seed. Cell boundaries raised, radial walls undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 82b). Shiny under a light microscope.

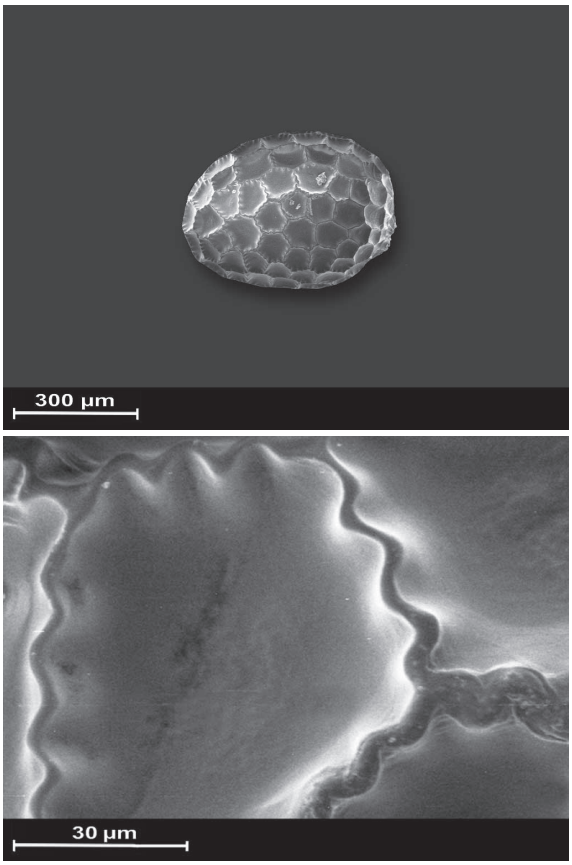


Fig. 82. *Erica axilliflora* Bartl. (SEM), seed (a) and surface of seed coat (b)

76. *Erica woodii* Bolus, Journ. of Bot. 32: 237 (1894)
Sect. 22 *Chlorocodon*

Small, erect shrubs, reaching ca. 60 cm in height. Flowers small, delicate, white or pale pink, forming dense inflorescences, on apical parts of lateral branches. Corolla bell-shaped to cup-shaped. Stamens hidden or partly visible, anthers with appendages. Flowering: Jan-Jul.

Widely distributed in the eastern part of South Africa, particularly in Transvaal; found in Soutpansberg, Magaliesberg, and in Transvaal in Drakensberg, to eastern Zimbabwe.

Seed shape irregular, obovate in outline, bilaterally flattened at an angle, so that they are triangular-ovate in cross-section. Hilum on a broader end. Seed 0.33-0.42 mm long, 0.25-0.34 mm wide. Seed surface reticulate (Fig. 83a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells irregular in shape, isodiametric or slightly elongate, ca. 8-9 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate (Fig. 83b). Shiny under a light microscope.

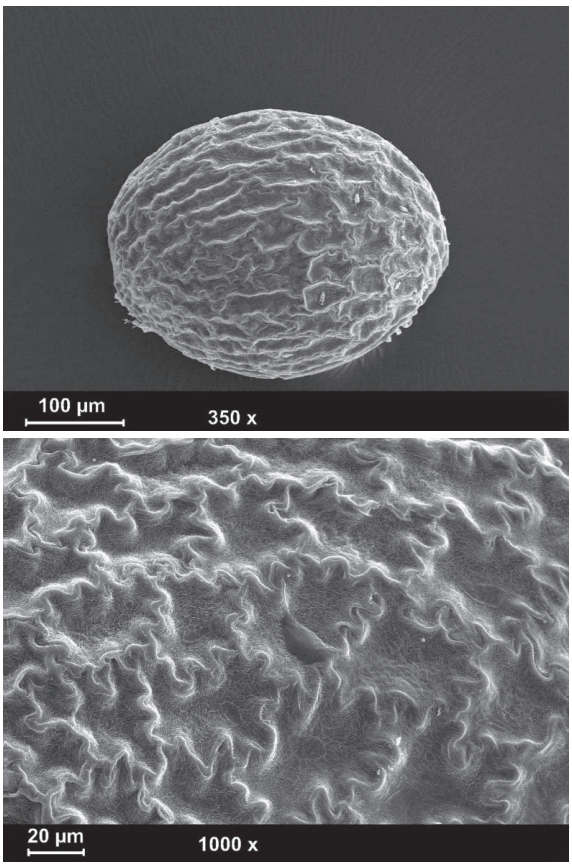


Fig. 83. *Erica woodii* Bolus(SEM), seed (a) and surface of seed coat (b)

77. *Erica coarctata* J.C.Wendl., Eric. 19: 99, t. 37 (1809)
Sect. 22 *Chlorocodon*

Shrubs up to ca. 60 cm high, flowers small, pink, hidden among leaves, abundant on vertical branches. Corolla bell-shaped to cup-shaped, 1.5 mm long. Stamens hidden, stigma protruding, flat. Anthers with appendages. Flowering: Feb-Apr.

Widespread, from Clanwilliam to Tulbagh, Bredasdorp, Riversdale, and Littre Karoo to Uitenhage. Found on sandy sites, on the Cape Peninsula usually associated with limestone.

Seed shape variable, ovate in outline, nearly round in cross-section, flattened ventrally, sometimes also laterally. Hilum on a narrower end. Seed 0.55-0.65 mm long, 0.41-0.49 mm wide. Seed surface reticulate (Fig. 84a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric or elongate (2-3 times longer than wide); 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture verrucate (Fig. 84b). Slightly shiny under a light microscope.

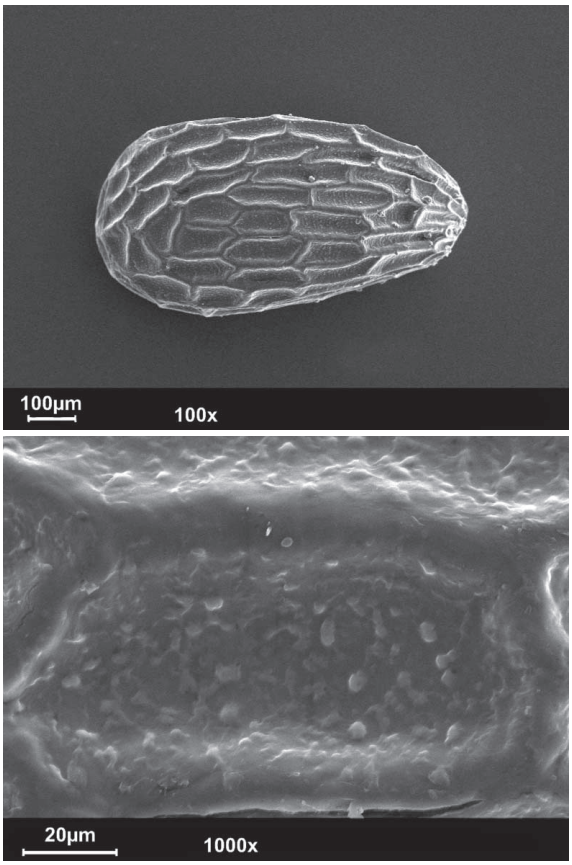


Fig. 84. *Erica coarctata* J.C.Wendl. (SEM), seed (a) and surface of seed coat (b)

78. *Erica hispidula* L., Sp. Pl. ed. 2 (1763)

Sect. 23 *Arsace*

Robust, erect shrubs, up to 1.8 m high. Flowers small, pale pink to red, slightly sticky. corolla cup-shaped or bell-shaped, up to 1 mm long, stamens hidden, anthers without appendages, style markedly protruding, ending with a peltate stigma. Flowering in various periods.

Very widespread, usually on dry slopes. Distributed from Clanwilliam in the north, along the SW and S coasts, to the east and inland to Swartberg.

Seeds elliptic to ovate in outline, round in cross-section. Hilum apical, if one end is wider, then hilum is on this end. Seed 0.33-0.40 mm long, 0.22-0.28 mm wide. Seed surface delicately reticulate (Fig. 85a). Outer periclinal cell walls of the seed coat gently and shallowly sunken. The cells elongate, ca. 5 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture striate, anastomosing (Fig. 85b). Slightly shiny under a light microscope.

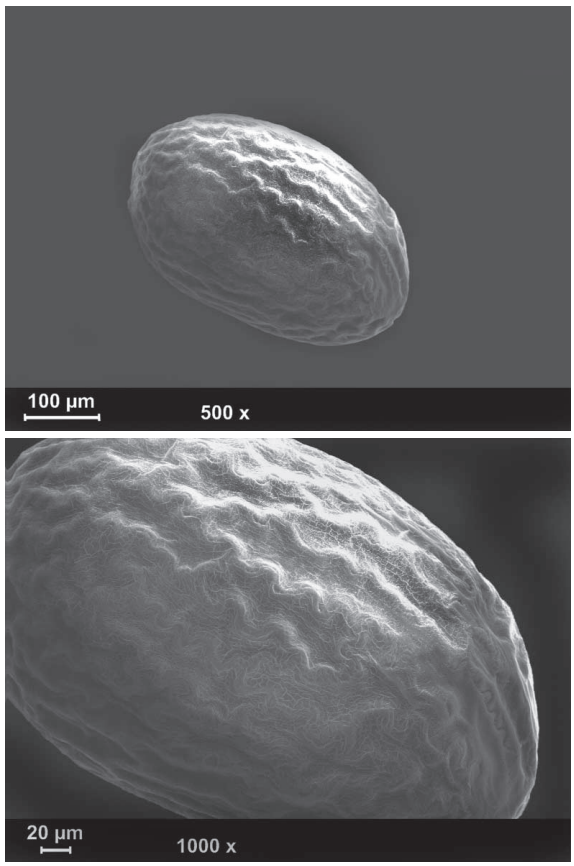


Fig. 85. *Erica hispidula* L. (SEM), seed (a) and surface of seed coat (b)

79. *Erica karooica* E.G.H.Oliv., Bothalia 25(2): 242 (1995)

Sect. 23 *Arsace*

Erect shrubs, up to 1,5 m tall. Anthers without appendages.

Found in the Southern Cape: Ladismith District; on the dry stony on the Southern foothills of Great Swartberg.

Seeds elliptic to ovate in outline, nearly round in cross-section, flattened ventrally. Hilum apical, with a rudimentary caruncle. Seed 0.41-0.56 mm long, 0.20-0.27 mm wide. Seed surface smooth (Fig. 86a). Outer periclinal cell walls of the seed coat flat. Seed coat cells poorly visible, markedly elongate, 4-7 times longer than wide; ca. 8 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls generally smooth, with crowded pits (surface foveate) on the thin adhering outer wall which are impressions of pits in the inner periclinal wall (Fig. 86b). Under a light microscope, the seeds smooth and shiny.

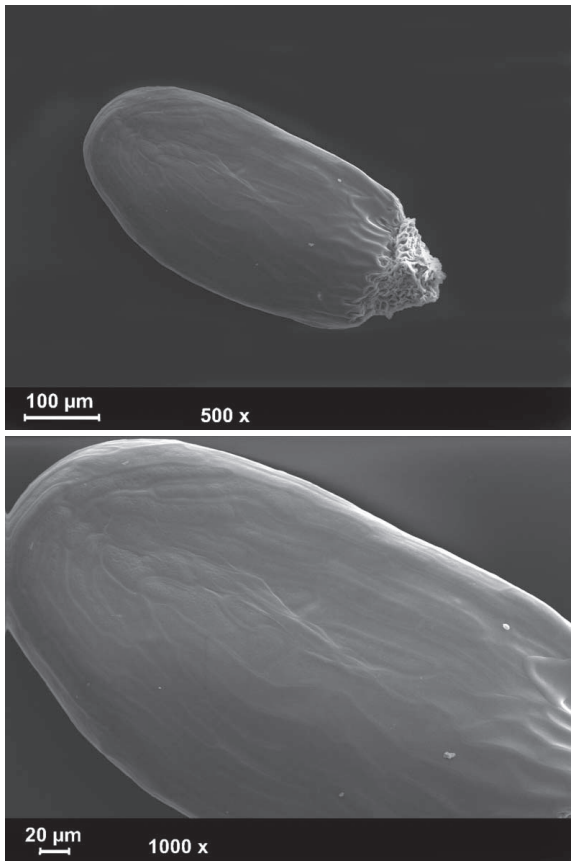


Fig. 86. *Erica karooica* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

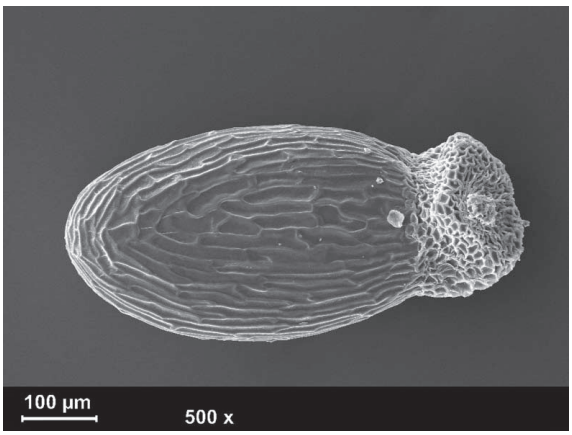
80. *Erica tenuis* Salisb., Trans. Linn. Soc. 6: 329 (1802)
Sect. 23 *Arsace*

A highly variable species; on rock shelves it forms dwarf shrubs with ascending shoots, with relatively few flowers; in open, rocky habitats, it may form large shrubs, up to 1.5 m high, flowering abundantly. Flowers small, white. Corolla cup-shaped or bell-shaped, 2 mm long, with separate lobes. Stamens hidden, anthers with appendages. Flowering: Jul-Nov.

Widespread, but infrequent, distributed from Clanwilliam through Ceres to Humansdorp.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally, ending with a head-like caruncle. Hilum apical, surrounded with the caruncle. Seed 0.50-0.61 mm long, 0.24-0.30 mm wide. Seed surface delicately reticulate (Fig. 87a). Outer periclinal cell walls of the seed coat quite steeply, but shallowly concave. Seed coat cells irregular, elongate, 3-6 times longer than wide; ca. 12-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. Secondary sculpture striate, anastomosing (Fig. 87b). Under a light microscope shiny, with a visible network of cells.

a



b

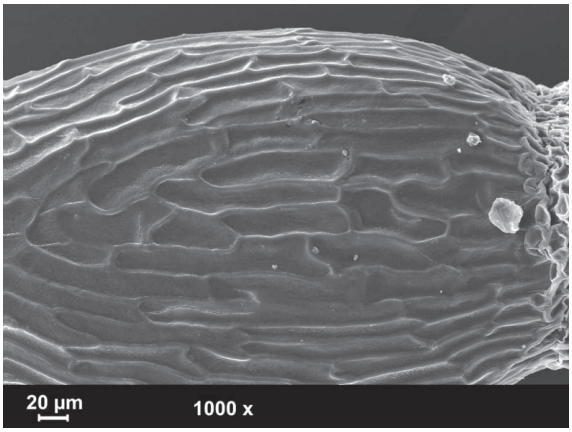


Fig. 87. *Erica tenuis* Salisb (SEM), seed (a) and surface of seed coat (b)

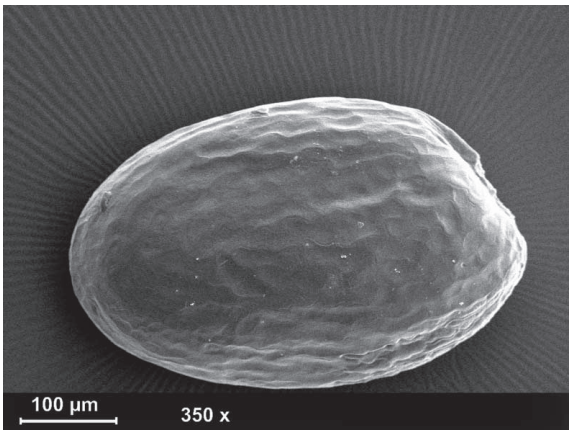
81. *Erica setacea* Andrews, Col. H. t. 59 (1800)
Sect. 23 *Arsace*

Profusely branched shrubs, up to 40 cm high. Dark green leaves and twigs with white, bristle-like hairs. Flowers small, whitish or pink, abundant. Corolla 1-3 mm long, cup-shaped, ending with conspicuous lobes, anthers hidden. Flowering: Aug-Nov.

Distributed from Paarl in the east to Oudtshoorn. Found on dry sites, at lower altitudes in mountains.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.42-0.49 mm long, 0.25-0.30 mm wide. Seed surface nearly smooth (Fig. 88a). Outer periclinal cell walls of the seed coat flat, with a visible delicate network of cells. Seed coat cells irregular, elongate, 3-5 times longer than wide, ca. 10 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries channelled, radial walls undulate. Secondary sculpture very delicately striate, nearly smooth (Fig. 88b). Shiny under a light microscope.

a



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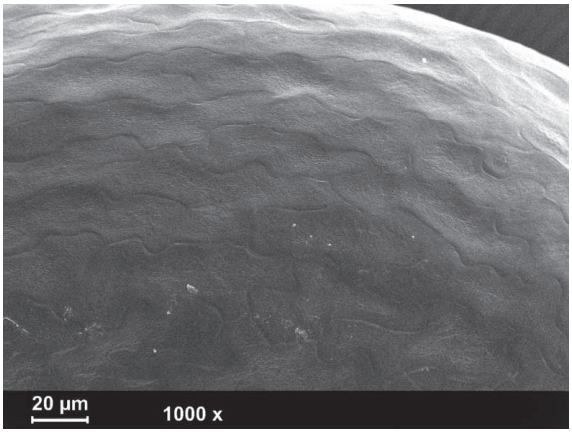


Fig. 88. *Erica setacea* Andrews(SEM), seed (a) and surface of seed coat (b)

82. *Erica sphaerocephala* J.C.Wendl. ex Benth., DC. Prodr. 7: 658 (1839)

Sect. 24 *Pseuderemia*

Erect shrubs, reaching ca. 60 cm in height, branches loose, slender. Flowers pale pink to dark pink, or even red, forming apical flower heads, of 25-30 flowers each. Corolla 4-6 mm long, urn-shaped, stamens hidden. Anthers with appendages. Flowering: Sep-Mar.

Distributed in the northern part of Capensis Mts, in Cederberg, Skurweberg and Koue Bokkeveld near Ceres, also in Piketberg and Olifants River Mts near Porterville, in the south to Hex River Mts. Found on dry, sandy sites on wetlands, and along streams.

Seeds elliptic in outline, round in cross-section. Hilum on a blunt end. Seed 0.40-0.48 mm long, 0.30-0.36 mm wide. Seed surface reticulate (Fig. 89a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells elongate, 3-5 times longer than wide, ca. 7-8 cells along the long axis of the seed. Cell boundaries channelled, radial walls markedly undulate. Secondary sculpture irregularly rugose (Fig. 89b). Semidull under a light microscope.

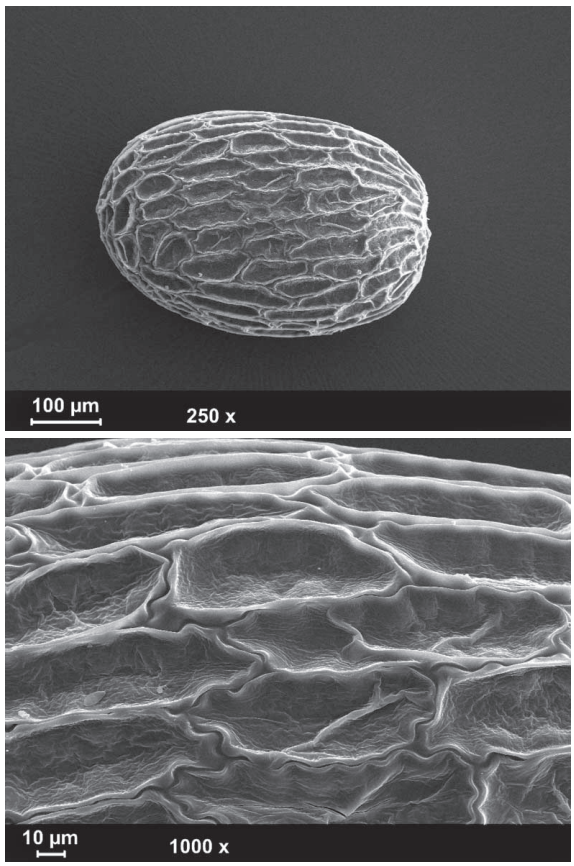


Fig. 89. *Erica sphaerocephala* J.C.Wendl. ex Benth. (SEM), seed (a) and surface of seed coat (b)

83. *Erica cooperi* Bolus, Journ. Linn. Soc. 24: 179 (1888)

Sect. 24 *Pseuderemia*

Shrubs 30-40 cm high, with easily broken twigs. Stem and leaves softly pubescent. Flowers white or pink, forming groups of 4 at shoot apices, pendent. Corolla 4-5 mm long, urn-shaped, stamens hidden, anthers with appendages. Flowering: Feb-May.

Found in Drakensberg in Natal, at altitudes of 800-2000 m.

Seeds elliptic to obovate in outline, nearly round in cross-section, flattened bilaterally, so that they are somewhat triangular-ovate at cross-section. Hilum on a broader, obliquely truncate end, somewhat laterally. Seed 0.61-0.73 mm long, 0.42-0.52 mm wide. Seed surface reticulate (Fig. 90a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal or somewhat elongate (up to 2.5 times longer than wide); 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls undulate. Secondary sculpture striate, with irregular striae (Fig. 90b). Under a light microscope dark, dull.

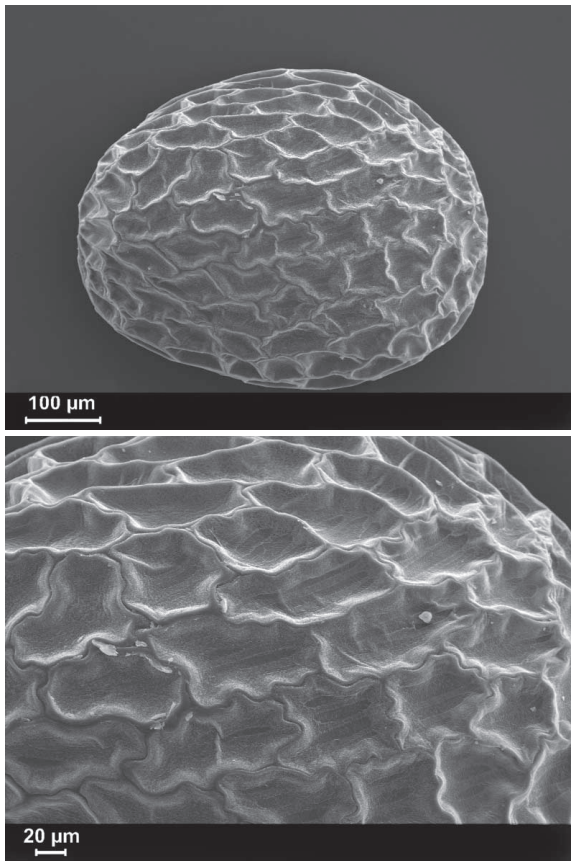


Fig. 90. *Erica cooperi* Bolus (SEM), seed (a) and surface of seed coat (b)

84. *Erica stylaris* Spreng., Syst. 2: 198 (1825)

Sect. 25 *Polydesmia*

Erect dwarf shrubs, ca. 15 cm high, twigs thin, straggly, frond-like. Flowers white, forming head-like groups of many flowers at shoot apices. Sepals nearly as long as corolla, which is 4-5 mm long, bell-shaped or urn-shaped, open, stamens somewhat protruding, anthers without appendages. Flowering: Nov-Dec.

Very rare, in mountains, near Uniondale, George and Knysna, and in the Humansdorp region.

Seeds narrowly elliptic to ovate in outline, nearly round in cross-section, flattened ventrally, sometimes also slightly laterally. Hilum on a slightly obtuse apex. Seed 0.87-1.02 mm long, 0.38-0.52 mm wide. Outer periclinal cell walls of the seed coat finger-like convex, the seed surface covered with papillae; some papillae sunken, on the flat ventral side they completely flattened, but at the margin around the ventral side they stick out (Fig. 91a). Seed coat cells elongate (3-4 times longer than wide), ca. 15 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. Secondary sculpture irregular striate and wrinkled (Fig. 91b). Under a light microscope they are pale, silver-dusted, dull.

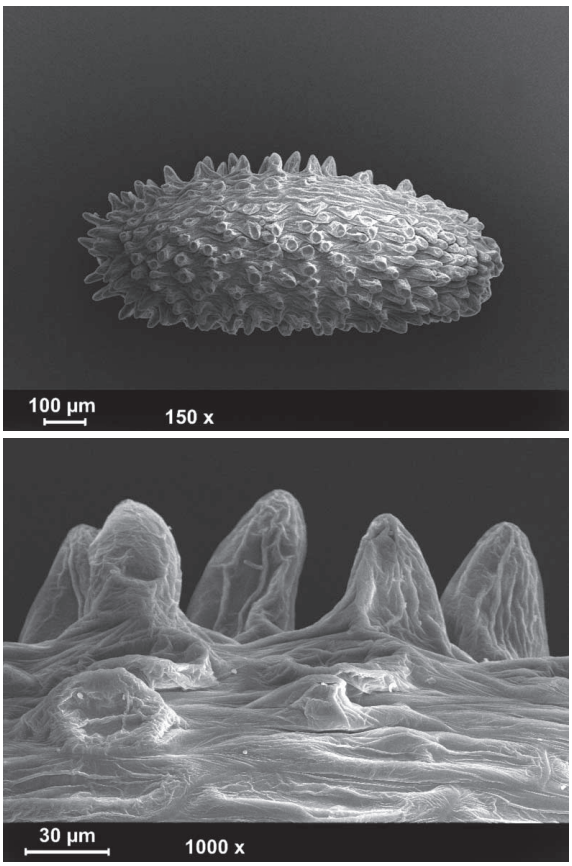


Fig. 91. *Erica stylaris* Spreng. (SEM), seed (a) and surface of seed coat (b)

85. *Erica senilis* Klotzsch ex Benth., DC. Prodr. 7: 617 (1839)

Sect. 26 *Chromostegia*

Low shrubs, usually with ascending shoots. All plant parts except flowers are covered with white hairs. Flowers cream-white, forming groups of 4 at shoot apices. Corolla 3 mm long, broadly ovoid to spherical, with large rounded lobes. Anthers hidden. Flowering: Oct-Nov.

Found in Cederberg, near Clanwilliam, and in northern Koue Bokkeweld.

Seeds roundish in outline, nearly spherical. Hilum apical, somewhat protruding. Seed 0.69-0.77 mm long, 0.60-0.71 mm wide. Seed surface reticulate (Fig. 92a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric; ca. 13 cells along the long axis of the seed. Cell boundaries raised (at least partly), radial walls straight. Secondary sculpture irregular striate (Fig. 92b). Shiny under a light microscope.

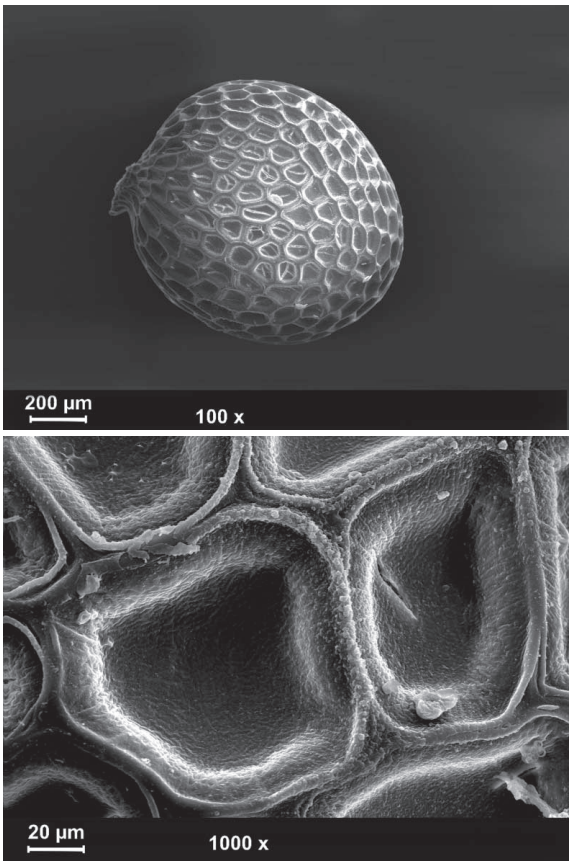


Fig. 92. *Erica senilis* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

86. *Erica genistifolia* Salisb., Trans. Linn. Soc. 6: 337 (1802)

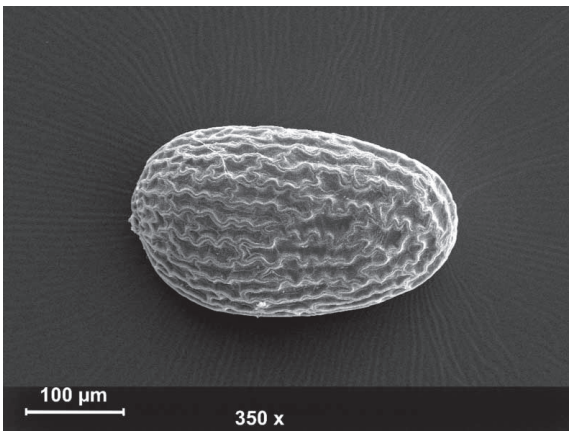
Sect. 27 *Oxyloma*

Erect dwarf shrubs, reaching 25 cm in height, with flexible straight or spreading twigs. Flowers white or pale pink, forming small head-like groups at apices of small twigs. Corolla 4-5 mm long, tubular or somewhat swollen, ending with brown triangular lobes. Stamens hidden. Anthers without appendages. Flowering: Nov-Dec.

Found on Muizenberg Mountain, on Table Mountain near Constantia Nek and near Betty's Bay.

Seeds elliptic to obovate in outline, round in cross-section. Hilum on a somewhat wider end. Seed 0.30-0.43 mm long, 0.19-0.23 mm wide. Seed surface reticulate (Fig. 93a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells irregular, elongate (3-5 times longer than wide); ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, walls markedly undulate. Secondary sculpture densely but irregular striate (Fig. 93b). Shiny under a light microscope.

a



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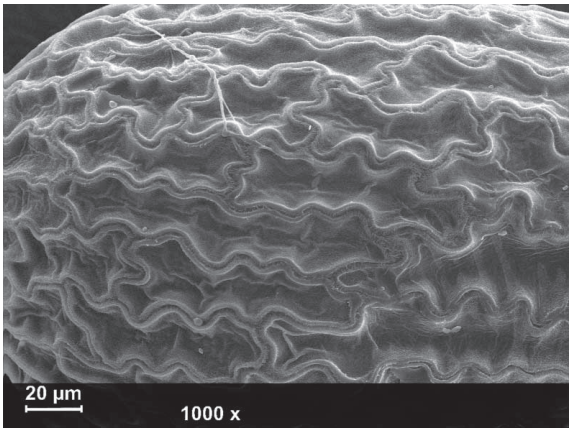


Fig. 93. *Erica genistifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

87. *Erica cumuliflora* Salisb., Trans. Linn. Soc. 6: 336 (1802)

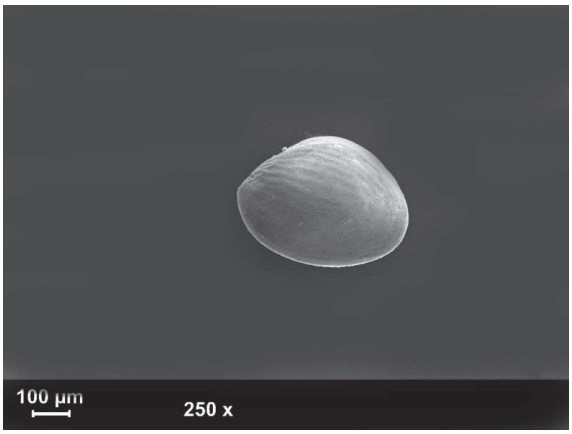
Sect. 27 *Oxyloma*

Robust shrubs, widely branching or decumbent, up to 50 cm high. Flowers white, forming very dense, head-like groups of 5-12 flowers, at shoot apices. Corolla 4-5 mm long, tubular, ending with brown triangular lobes, dry. Stamens hidden, anthers without appendages. Flowering: Sep-Nov.

Distributed in the regions Celadon, Bredasdorp, Babilonstoring, in the Klein River Mts, in Paardeberg. Found mostly on dry slopes.

Seeds elliptic to ovate in outline, slightly flattened dorsoventrally. Hilum apical. Seed 0.40-0.50 mm long, 0.29-0.37 mm wide. Seed surface smooth (Fig. 94a). Outer periclinal cell walls of the seed coat flat. Seed coat cells very poorly visible, up to 5 times longer than wide; ca. 10 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 94b). Smooth and shiny under a light microscope.

a



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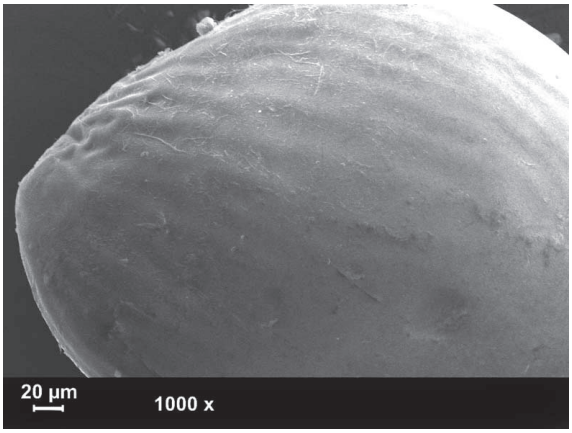


Fig. 94. *Erica cumuliflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

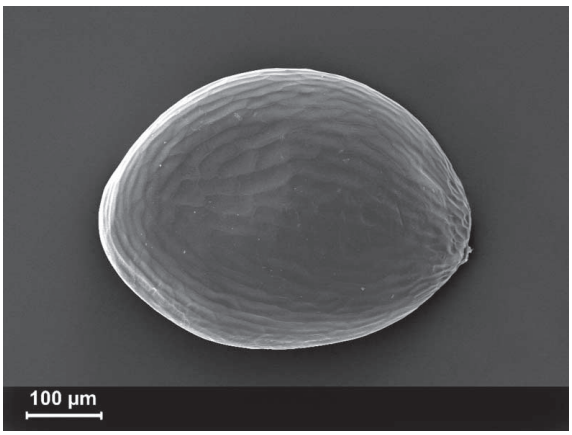
88. *Erica bruniades* L., Sp. Pl. ed. 1: 354 (1753)
Sect. 28 *Eriodesmia*

Sparse shrubs with flexible, spreading twigs, up to 45 cm high. Flowers pale pink or pink, on noticeable stalks, forming small apical umbels. Corolla 3-4 mm long, urn-shaped, completely covered with long white or pink hairs, stamens protruding, anthers without appendages. Flowering: Jul-Jan.

Widespread, from Vanrhynsdorp to the Cape Peninsula in the south, and to Bredasdorp in the east. Found on wet, sandy or peaty sites, but not along streams.

Seeds elliptic to ovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum on a slightly narrower end. Seed 0.44-0.50 (0.53) mm long, 0.28-0.36 mm wide. Seed surface smooth (Fig. 95a). Outer periclinal cell walls of the seed coat flat. Seed coat cells very poorly visible, (2) 4-5 times longer than wide; ca. 8-10 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 95b). Under a light microscope, the seeds smooth and shiny, with a very delicate network of cells.

a



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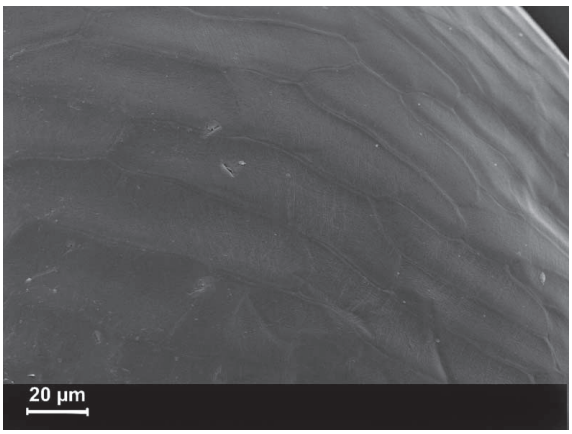


Fig. 95. *Erica bruniades* L. (SEM), seed (a) and surface of seed coat (b

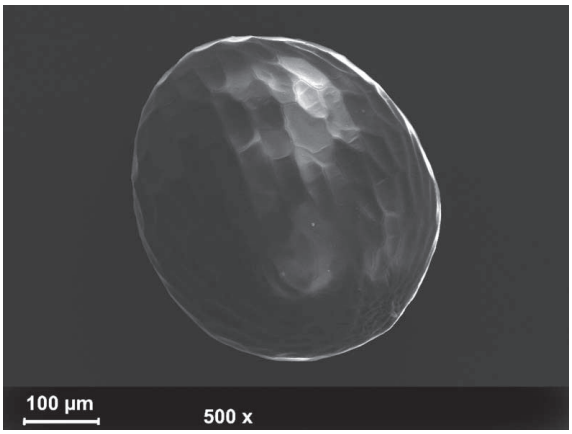
89. *Erica desmantha* Benth., DC. Prodr. 7: 620 (1839)
Sect. 30 *Geissostegia*

Erect, robust shrubs, up to 60 cm high; forming long branches with short, overlapping laterals covered with dense, small, curved leaves. Flowers white, distributed along short twigs, in upper parts of main shoots. Corolla ca. 5 mm long, slightly sticky, tubular, anthers brown or black, protruding, without appendages. Flowering: Jan-May.

Found at higher altitudes in mountains, between Betty's Bay, Celadon and Hermanus.

Seeds broadly elliptic in outline, nearly spherical. Hilum on an inconspicuous apex. Seed 0.41-0.48 mm long, 0.37-0.42 mm wide. Seed surface smooth (Fig. 96a). Outer periclinal cell walls of the seed coat flat. Seed coat cells very poorly visible, 3-4 times longer than wide; ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 96b). Under a light microscope, the seeds smooth and shiny, with a very delicate network of cells.

a



b

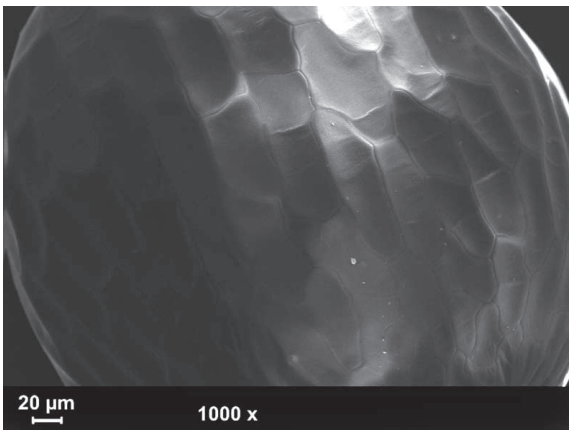


Fig. 96. *Erica desmantha* Benth. (SEM), seed (a) and surface of seed coat (b)

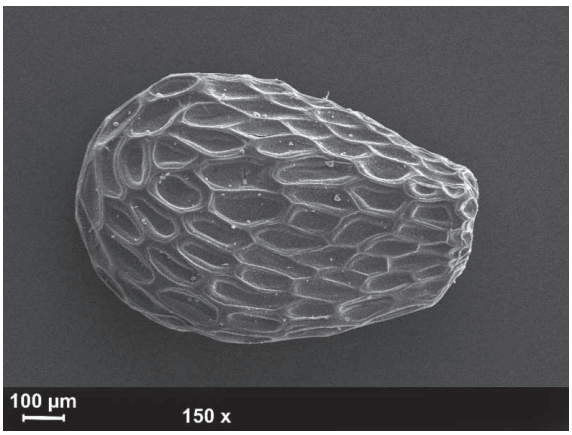
90. *Erica physantha* Benth., DC. Prodr. 7: 619 (1839)
Sect. 30 *Geissostegia*

Straggly dwarf shrubs, reaching 15 cm in height, with long and flexible but strong shoots. Leaves smooth, roundish, light green. Flowers reddish to pink, at apices of small twigs. Corolla ca. 5 mm long, nearly spherical, wide open. Anthers without appendages. Flowering: Oct-Nov.

Very rare, SE of Riversdale.

Seeds ovate in outline, slightly flattened dorsoventrally, rarely somewhat curved. Hilum on a narrower end. Seed 0.80-0.93 mm long, 0.52-0.68 mm wide. Seed surface reticulate-foveate (Fig. 97a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, elongate, 2-3 times longer than wide; ca. 8 cells along the long axis of the seed. Cell boundaries raised, radial walls straight or somewhat curved. Secondary sculpture pusticulate (Fig. 97b). Shiny under a light microscope.

a



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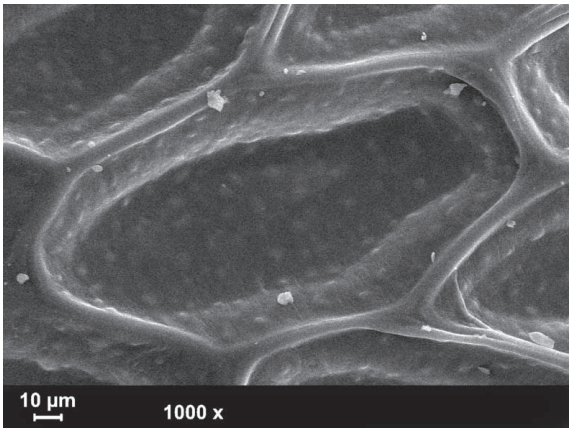


Fig. 97. *Erica physantha* Benth. (SEM), seed (a) and surface of seed coat (b)

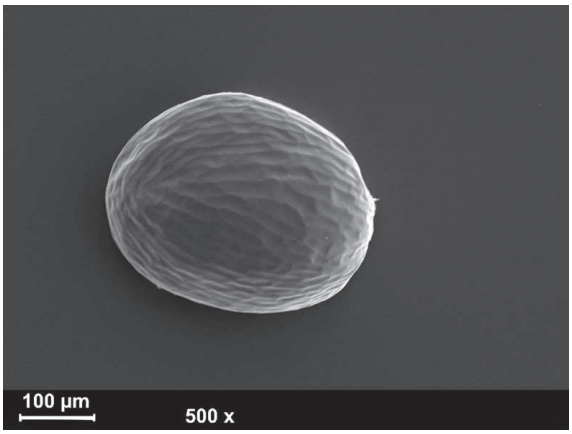
91. *Erica lasciva* Salisb., Trans. Linn. Soc. 6: 349 (1802)
Sect. 31 *Elytrostegia*

Tall shrubs, with short lateral branches. Flowers numerous, greenish to brownish white. Corolla ca. 2 mm long, hidden among sepals. Stigma visible, broad and flat, stamens protruding, anthers without appendages. Flowering: Feb-Jun.

Distributed from the Cape Peninsula to Stellenbosch and Bredasdorp, and in the east to Riversdale.

Seeds broadly elliptic to ovate in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.33-0.45 mm long, 0.21-0.27 mm wide. Seed surface smooth (Fig. 98a). Outer periclinal cell walls of the seed coat flat. Seed coat cells very poorly visible, up to 5 times longer than wide, ca. 8-10 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial (anticlinal) walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 98b). Under a light microscope, the seeds smooth and shiny, with a very delicate network of cells.

a



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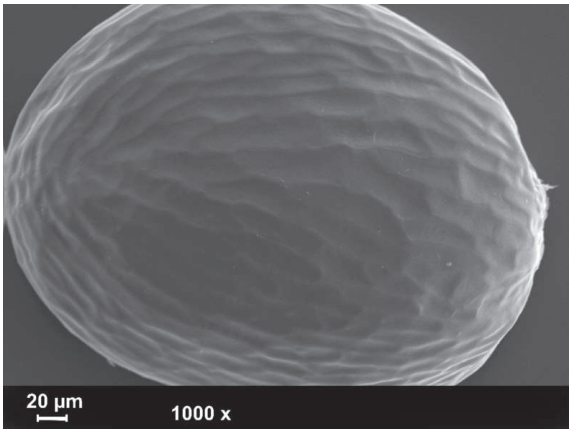


Fig. 98. *Erica lasciva* Salisb. (SEM), seed (a) and surface of seed coat (b)

92. *Erica accommodata* Klotzsch ex Benth., DC. Prodr. 7: 620 (1839)

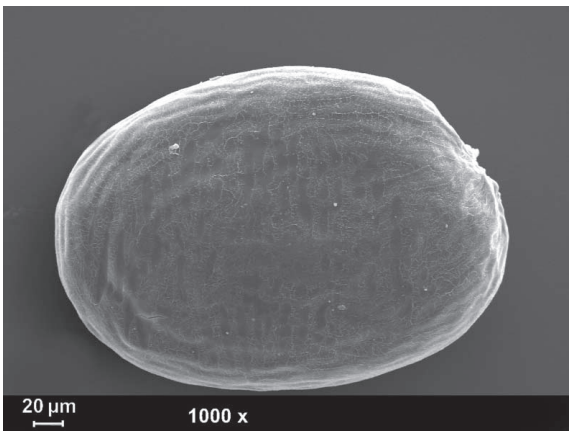
Sect. 31 *Elytrostegia*

Erect shrubs, reaching ca. 40 cm in height, with short branches. Flowers whitish, corolla ca. 2 mm long, urn-shaped. Anthers protruding, with appendages. Flowering: Dec-Apr.

Found among rocks, in the Swartberg Mts near Celadon, and in the Riviersonderend Mts around Genadendal.

Seeds elliptic to ovate in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical; if one end is wider, then hilum is on this end. Seed 0.29-0.36 mm long, 0.23-0.29 mm wide. Seed surface nearly smooth, delicately reticulate (Fig. 99a). Outer periclinal cell walls of the seed coat nearly flat. Seed coat cells 3-6 times longer than wide; ca. 8-10 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. Secondary sculpture striate (anastomosing) (Fig. 99b). Under a light microscope, the seeds smooth and shiny, with a delicate network of cells.

a



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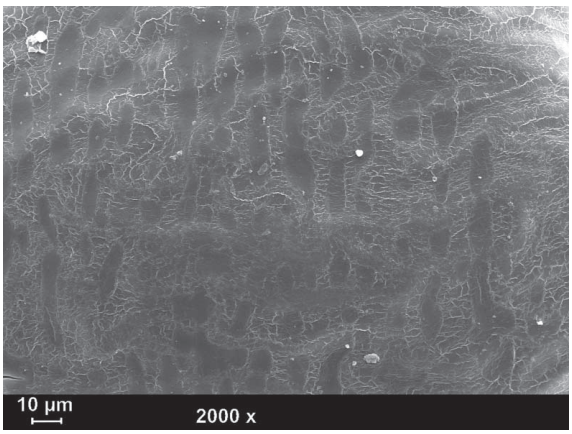


Fig. 99. *Erica accommodata* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

93. *Erica borboniifolia* Salisb., Trans. Linn. Soc. 6: 386 (1802)

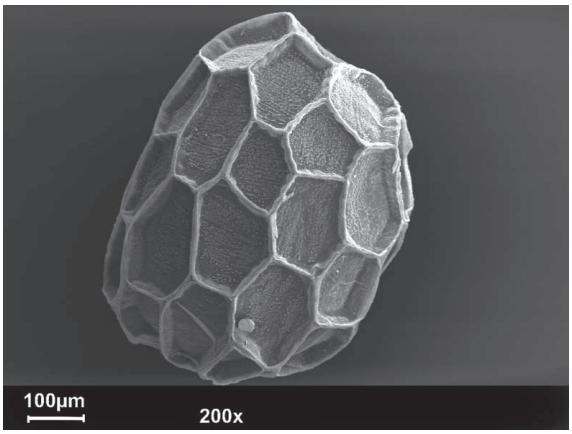
Sect. 33 *Lamprotis*

Roundish, clump-like shrubs, ca. 60 cm high, covered with pink flowers during the flowering period. Corolla 10-12 mm long, tubular, ending with star-like spreading lobes. Sepals large, pink, half as long as corolla. Anthers hidden, with appendages. Flowering: Dec-Jan.

Found in the Riviersonderend Mts around Genadendal, at altitudes of ca. 1500 m, usually on cold, grassy slopes.

Seed shape variable, elliptic to ovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum subapical, on the ventral side. Seed l0.65-0.80 (0.88) mm long, 0.40-0.53 mm wide. Seed surface reticulate (Fig. 100a). Outer periclinal cell walls of the seed coat steeply concave. The cells large, polygonal, isodiametric or somewhat elongate; ca. 5-6 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture verrucate-granulate (Fig. 100b). Dull under a light microscope.

a



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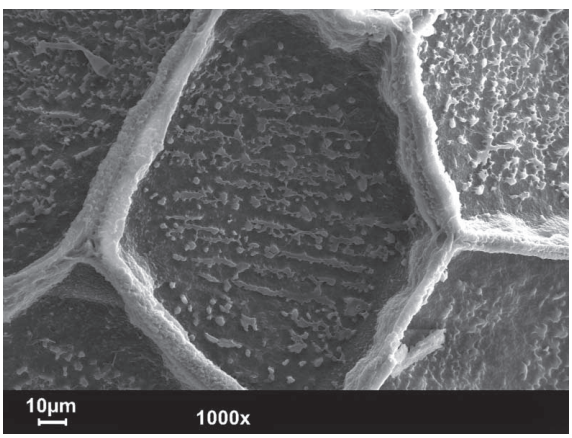


Fig. 100. *Erica borboniifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

94. *Erica lutea* P.J.Bergius, Descr. Pl. Cap. 115 (1767)
Sect. 33 *Lamprotis*

Erect shrubs, with straight but loose twigs; leaves appressed to shoots. Apical parts of twigs covered with yellow or white flowers. Corolla 7-10 mm long, tubular, ending with small, star-like spreading lobes. Stamens hidden, anthers with appendages. Flowering: Dec-Jan, on the Cape Peninsula also Feb-May.

Distributed from Paarl to Celadon, and on the Cape Peninsula.

Seed shape variable, elliptic to ovate in outline, round in cross-section. Hilum subapical, on ventral side. Seed 0.57-0.70 mm long, 0.35-0.43 mm wide. Seed surface reticulate (Fig. 101a). Outer periclinal cell walls of the seed coat quite steeply but shallowly concave. The cells large, polygonal; usually 3-5 times longer than wide, longer on dorsal side; ca. 4-6 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. Secondary sculpture verrucate-granulate (Fig. 101b). Dull under a light microscope.

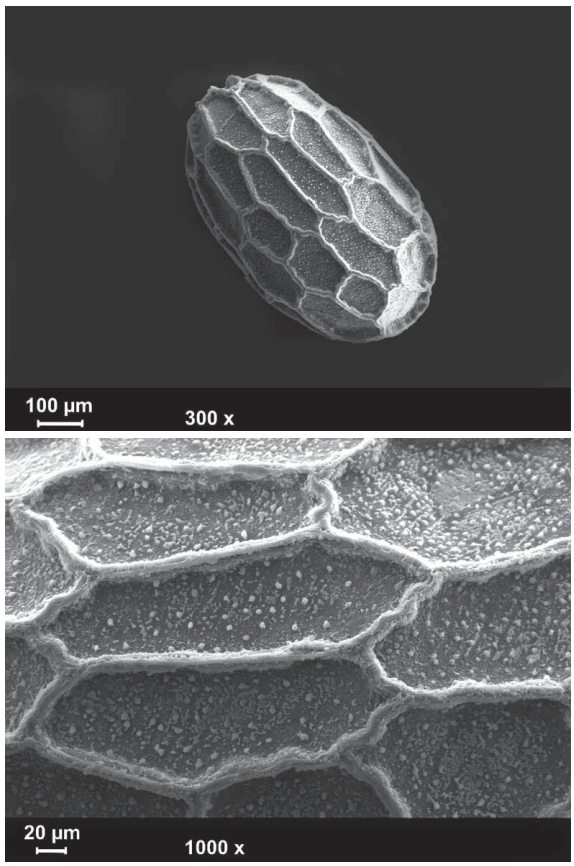


Fig. 101. *Erica lutea* P.J.Bergius (SEM), seed (a) and surface of seed coat (b)

95. *Erica alfredii* Guthrie & Bolus, Fl. Cap. 4: 254 (1905)
Sect. 33 *Lamprotis*

Small, roundish, profusely branched, clump-like shrubs, reaching less than 30 cm in height. Flowers pink, forming small apical umbels of 3-9 flowers. Corolla tubular, 18-20 mm long, ending with star-like spreading lobes. Sepals also pink, clasping the tube, half as long. Stamens hidden, anthers without appendages. Flowering: Jan-Mar.

Very rare, found at altitudes of 1200-1600 m, from Die Galg to Hoëberg.

Seeds broadly elliptic to ovate in outline, round in cross-section. Hilum apical, on a more obtuse end. Seed 0.76-0.87 mm long, 0.55-0.66 mm wide. Seed surface reticulate (Fig. 102a). Outer periclinal cell walls of the seed coat steeply concave, sometimes initially elevated and next sunken, forming irregular folds at cell boundaries, look like scales. The cells large, polygonal, isodiametric; ca. 6 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture granulate (Fig. 102b). Dull under a light microscope.

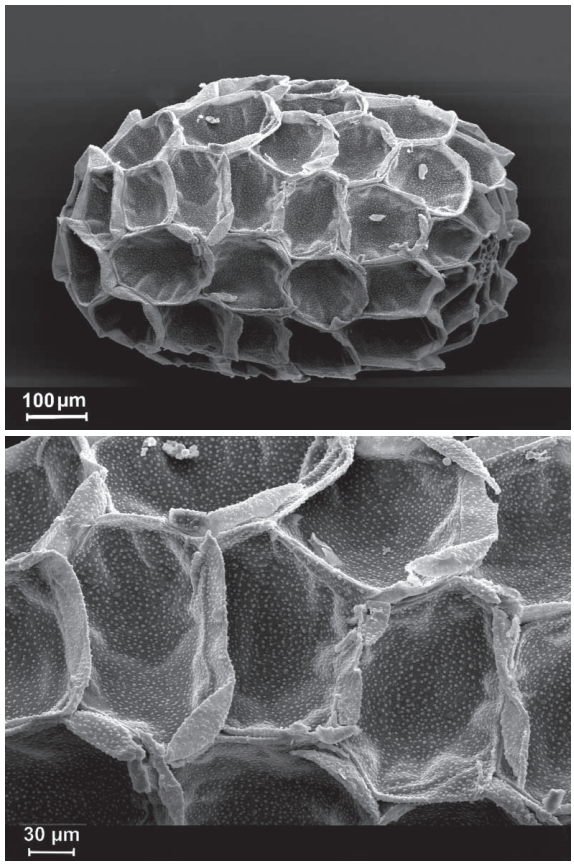


Fig. 102. *Erica alfredii* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

96. *Erica taxifolia* Ait. in Bauer, Exot. Pl. t. 19 (1796)
Sect. 33 *Lamprotis*

Robust, erect shrubs, reaching 50-60 cm in height. Flowers pink, in small umbels or racemes at apices of long, loose twigs. Corolla roundish to urn-shaped, 6-9 mm long, clasped by long sepals, ending with small star-like lobes, which are usually darker. Stamens hidden, anthers with appendages. Flowering: Dec-May.

Distributed in the regions Paarl, Tulbagh, Worcester, Stellenbosch, and Celadon.

Seeds elliptic in outline, round in cross-section. Hilum apical. Seed 0.85-1.01 mm long, 0.44-0.51 mm wide. Seed surface reticulate (Fig. 103a). Outer periclinal cell walls of the seed coat steeply and deeply concave. Seed coat cells large, polygonal; isodiametric, ca. 6-7 cells along the long axis of the seed. Cell boundaries channelled, radial walls slightly undulate. Secondary sculpture granulate (Fig. 103b). Dull or semi-dull under a light microscope.

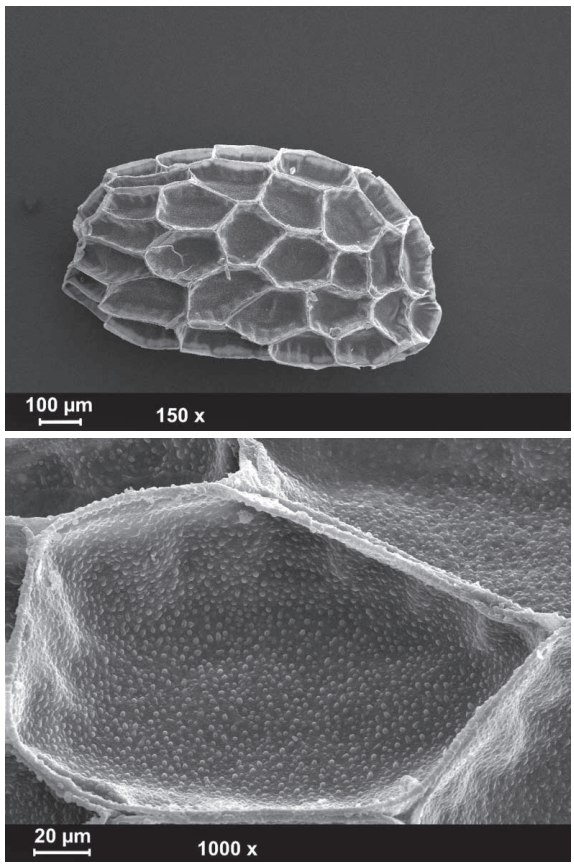


Fig. 103. *Erica taxifolia* Ait. in Bauer (SEM), seed (a) and surface of seed coat (b)

97. *Erica palliiflora* Salisb., Trans. Linn. Soc. 6: 351 (1802)
Sect. 33 *Lamprotis*

Small, erect, profusely branched shrubs, up to 40 cm high. Leaves appressed to twigs. Flowers pink, pale pink or white, in groups at shoot apices. Sepals coloured the same as corolla, and as long as corolla, adhering to it. Corollas 4-5 mm long, bell-shaped or tubular, ending with slightly rounded lobes. Stamens hidden, anthers with appendages. Flowering: Sep-Dec.

Distributed from the Cape Peninsula eastwards to the regions Celadon, Bredasdorp, Swellendam and Riversdale to George.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical, surrounded by protruding, elongate cells, forming a caruncle-like structure. Seed 0.34-0.42 mm long, 0.22-0.28 mm wide. Seed surface smooth (Fig. 104a). Outer periclinal cell walls of the seed coat flat. The cells elongate, 3-5 times longer than wide; ca. 8-10 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls straight or somewhat curved. Secondary sculpture very delicately, regularly striate (partly lineate) (Fig. 104b). Under a light microscope, the seeds smooth and shiny, with a delicate network of cells, and a light, delicate caruncle.

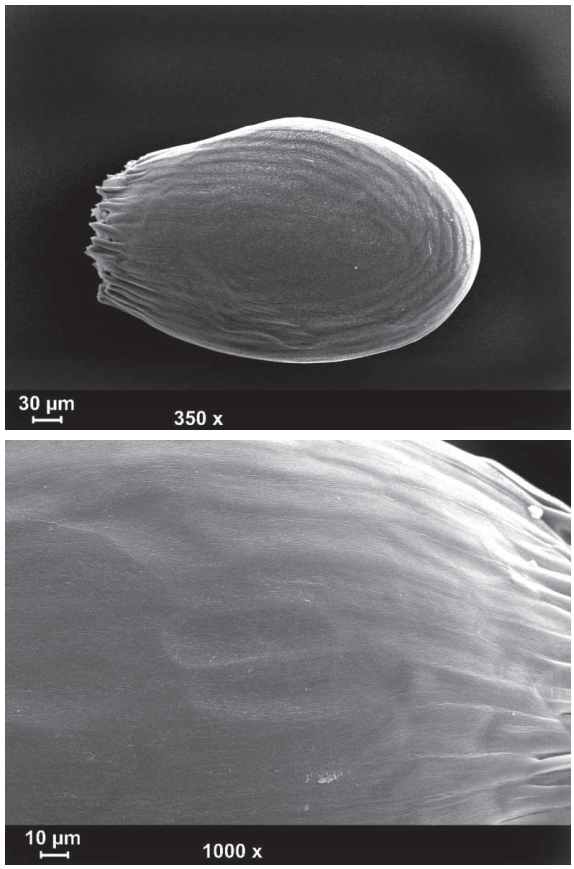


Fig. 104. *Erica palliiflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

98. *Erica lanuginosa* Andrews, Heathery t. 122 (1806)
Sect. 34 *Eurystegia*

Straggly dwarf shrubs among rocks, or erect, with a small number of vertical twigs, up to 35 cm high. Flowers pendent, in small racemes. Corolla 14-18 mm long, conical, its lobes tightly compressed, forming an apical beak. Sepals very wide, greenish at base, reddish-brown in upper part. Corolla and calyx covered with delicate, soft hairs. Stamens hidden, anthers with appendages. Flowering: Jul-Aug.

Distributed in the Klein River Mts, from Hermanus towards Stanford and on Akkedisberg Pass.

Seeds elliptic in outline, round in cross-section, sometimes slightly flattened ventrally. Hilum apical. Seed 0.91-1.03 mm long, 0.50-0.60 (0.66) mm wide. Seed surface reticulate (Fig. 105a). Outer periclinal cell walls of the seed coat quite gently and shallowly sunken, forming a convex margin around each cell. Seed coat cells polygonal, isodiametric, ca. 14-15 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture striate, partly regularly, mostly at seed edges (Fig. 105b). Dull under a light microscope, with a characteristic, brick-red colour.

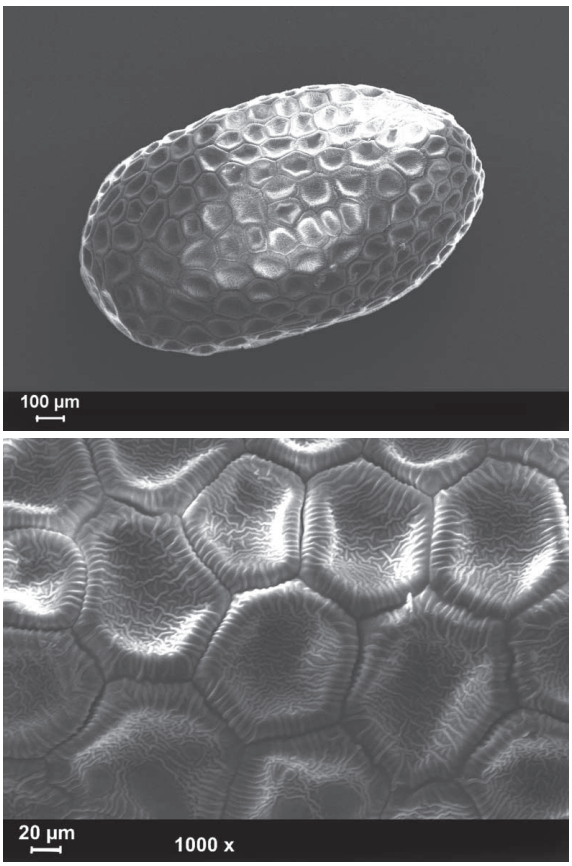


Fig. 105. *Erica lanuginosa* Andrews (SEM), seed (a) and surface of seed coat (b)

99. *Erica monsoniana* L.f., Suppl. Syst. Veg. 223 (1781)
Sect. 34 *Eurystegia*

Robust, erect shrubs, rarely profusely branched, reaching 1.2-1.8 m in height. Flowers white, abundant, in dense racemes. Corolla tubular, 18-22 mm long, with straight or spreading lobes, partly clasped by white, wide, recurved sepals. Flowers subtended by large, white bracts. Stamens hidden, anthers with appendages. Flowering: Oct-Feb.

Widespread, distributed at higher altitudes in mountains, from Cederberg to Langeberg near Riversdale. Near Grabouw and Bredasdorp, found at relatively low altitudes, even at 100 m.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.81-0.92 mm long, 0.57-0.67 mm wide. Seed surface smooth, very delicately reticulate (Fig. 106a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, up to 6 times longer than wide; ca. 10-12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 106b). Under a light microscope, the seeds smooth and shiny.

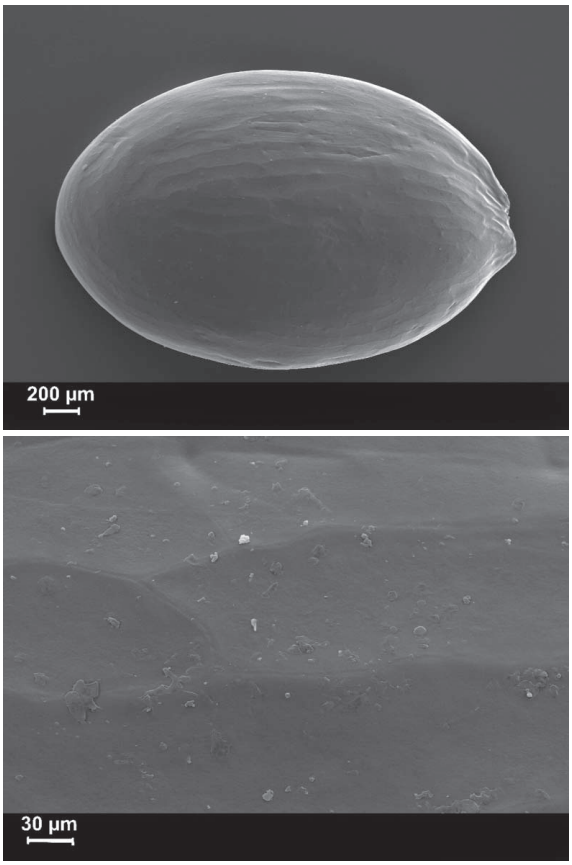


Fig. 106. *Erica monsoniana* L.f. (SEM), seed (a) and surface of seed coat (b)

100. *Erica kirstenii* E.G.H.Oliv., Yb. Heather Soc. 2000: 60 (2000)

Sect. 34 *Eurystegia*

Compact dwarf shrub, reaching 10-25 cm in height. Twigs numerous, with very short secondary lateral branches, densely covered with leaves. Flowers in groups of 3, at apices of twigs. Corolla white, vase-shaped, 7-8 mm long, ending with 4 lobes. Stamens hidden, anthers with appendages.

Distributed north of Ladismith, in the Klein Swartberg Mts.

Seed shape variable, elliptic in outline, nearly round in cross-section, but slightly flattened ventrally and laterally, so that they are triangular-ovate in cross-section. Hilum apical. Seed 0.72-0.95 mm long, 0.46-0.56 mm wide. Seed surface reticulate (Fig. 107a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells slightly elongate, up to 3 times longer than wide; ca. 8-11 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth, sometimes partly irregularly wrinkled (Fig. 107b). Slightly shiny under a light microscope.

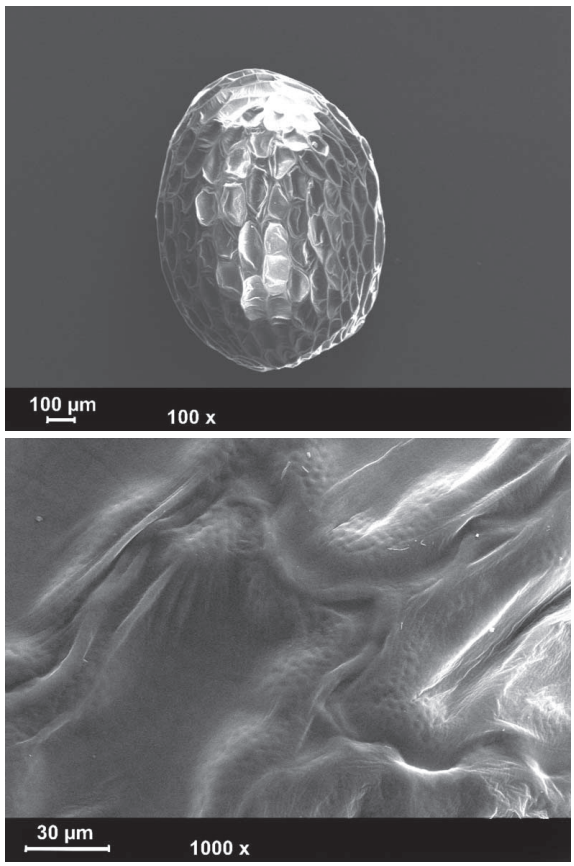


Fig. 107. *Erica kirstenii* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

101. *Erica nabea* Guthrie & Bolus, Fl. Cap. 4: 271 (1905)

Sect. 35 *Adelopetalum*

Erect, sparsely branched shrubs, up to 1.5 m high. Flowers greenish-brown, forming spike-like inflorescences in upper parts of stems. Corolla only 3 mm long, surrounded by sepals, which are up to 16 mm long, constricted into a sharp apical beak. Stamens protruding from corolla, but surrounded by sepals, anthers without appendages. Flowering: May-Aug.

Distributed in mountainous regions, between George and Uitenhage.

Seeds broadly ovate in outline, nearly rounded, markedly flattened dorsoventrally, widely winged. Hilum poorly defined, on a slightly narrower end. Seed 1.56-1.80 mm long, 1.41-1.60 mm wide. Seed surface smooth, very delicately reticulate (Fig. 108a). Outer periclinal cell walls of the seed coat nearly flat. Seed coat cells undulate, slightly elongate, 2-3 times longer than wide; numerous along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture very delicately striate (Fig. 108b). Under a light microscope, the seeds smooth and shiny.

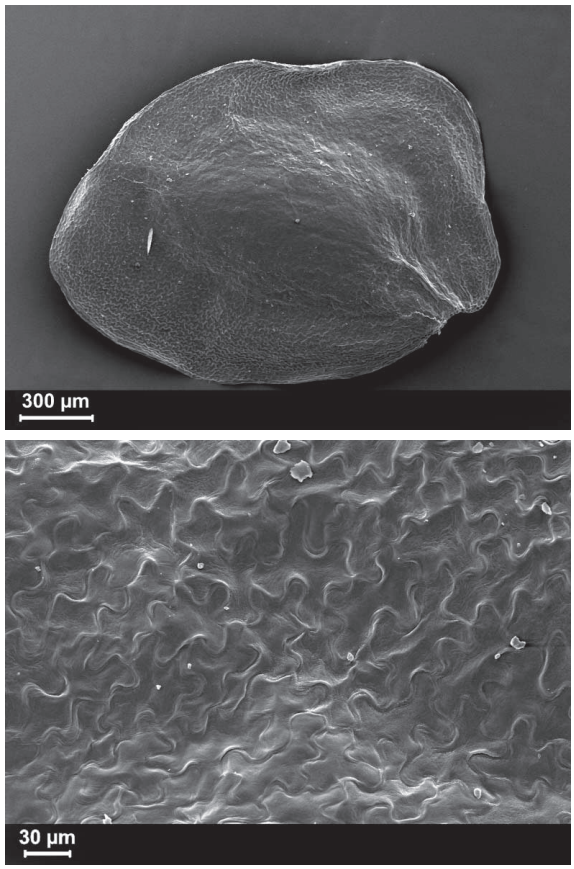


Fig. 108. *Erica nabea* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

102. *Erica insignis* E.G.H.Oliv. Bothalia 13(3-4): 446 (1981)

Sect. 35 *Adelopetalum*

Shrub, reaching 60-90 cm in height, with spreading, highly lignified branches, densely covered with leaves. Corolla cup-shaped, ca. 5 mm long, completely hidden by sepals, which form a narrowing tube, 20-22 mm long. Style and stamens protruding from this tube, anthers without appendages. Calyx initially greenish, but later turning red. Flowering: Oct-Jan.

Found on crystalline rocks, reported from Swartberg, Kangoberg and Anysberg.

Seeds obovate in outline, flattened bilaterally, so that they are triangular-ovate in cross-section. Hilum on a broader, blunt end. Seed 1.06-1.22 mm long, 0.53-0.66 mm wide. Seed surface reticulate-foveate (Fig. 109a). Outer periclinal cell walls of the seed coat steeply and quite deeply concave. Seed coat cells slightly elongate, ca. 2 times longer than wide; apparently oval; ca. 15 cells along the long axis of the seed. Cell boundaries channelled, radial walls straight. Secondary sculpture striate, partly oriented, partly anastomosing (Fig. 109b). Dull under a light microscope.

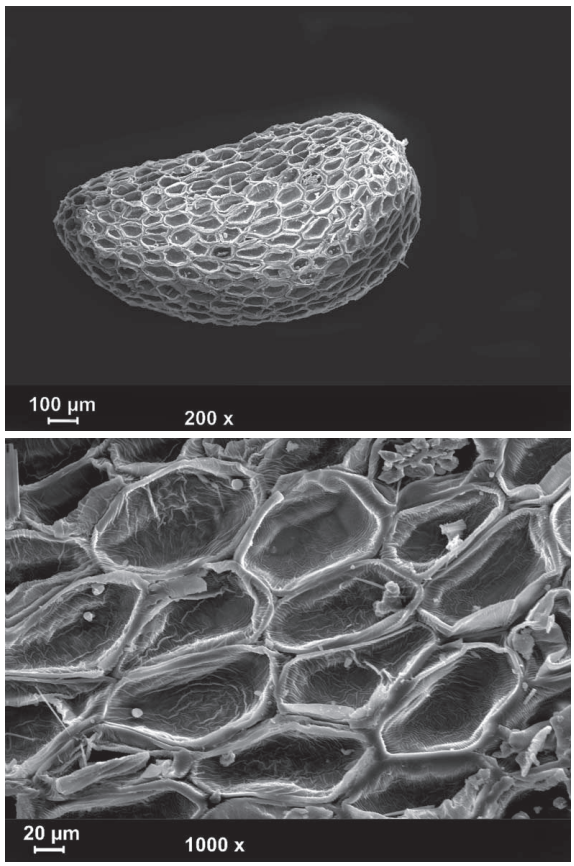


Fig. 109. *Erica insignis* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

103. *Erica tegulifolia* Salisb., Trans. Linn. Soc. 6: 351 (1802)

Sect. 36 *Trigemma*

Erect, sparsely branched shrubs, reaching 60-90 cm in height. Flowers pale pink or dark red, forming racemes on short lateral branches, in upper parts of main shoots. Corolla urn-shaped, 5 mm long, covered with coloured, large, characteristically wrinkled sepals. Stamens hidden, anthers with appendages. Flowering: Oct-Dec.

Distributed in the regions Paarl, Franschhoek and in mountains around Elgin and Grabouw.

Seeds ovate in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum on a narrower end. Seed 0.53-0.60 mm long, 0.35-0.43 mm wide. Seed surface nearly smooth (Fig. 110a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, ca. 5 times longer than wide; ca. 8-10 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate or near straight. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 110b). Under a light microscope, the seeds smooth and shiny, with a delicate network of cells.

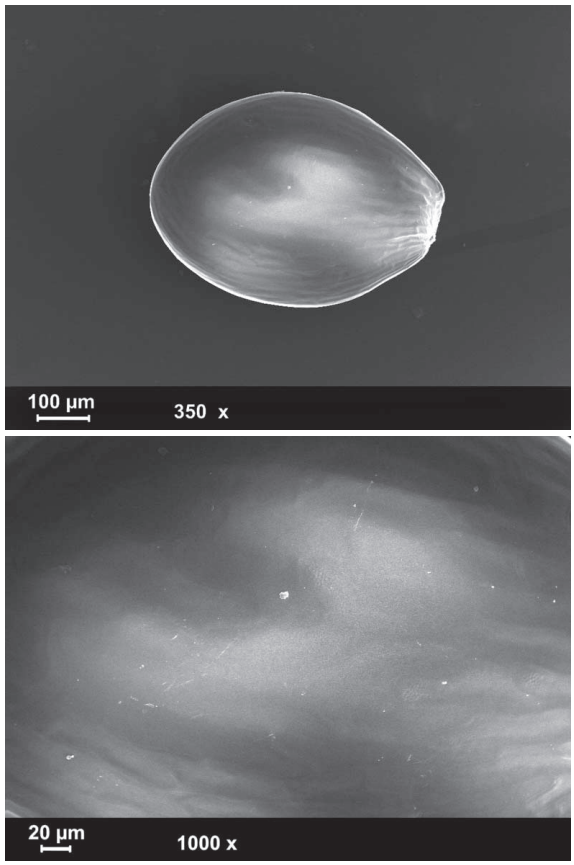


Fig. 110. *Erica tegulifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

104. *Erica baccans* L., Mant. Alt. 233 (1771)

Sect. 36 *Trigemma*

Robust, profusely branched shrubs, with hard, somewhat flexible twigs. They can reach up to 2.5 m in height. Flowers pink. Corolla ca. 5 mm long, roundish urn-shaped, surrounded by adhering, wide, coloured sepals. Stamens hidden, anthers with appendages. Flowering: Sep-Nov.

Found on the Cape Peninsula.

Seeds ovate-elliptic in outline, nearly round in cross-section, but slightly flattened ventrally and laterally. Hilum on a blunt end, sometimes subapical. Seed 0.68-0.79 mm long, 0.40-0.50 mm wide. Seed surface reticulate (Fig. 111a). Outer periclinal cell walls of the seed coat concave. Seed coat cells polygonal, somewhat elongate, 2-3 times longer than wide; ca. 15-16 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate or straight. Secondary sculpture striate, partly regular (Fig. 111b). Semi-dull under a light microscope.

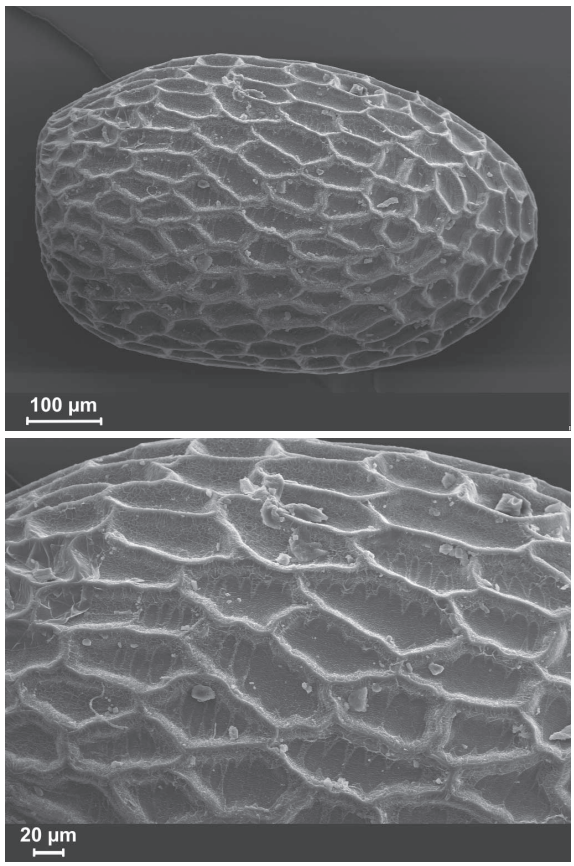


Fig. 111. *Erica baccans* L. (SEM), seed (a) and surface of seed coat (b)

105. *Erica selaginifolia* Salisb., Trans. Linn. Soc. 6: 338 (1802)

Sect. 36 *Trigemma*

Usually erect shrubs, with straight branches, although older specimens can have spreading, curved branches; reaching up to 1.5 m in height. Flowers pink, in groups of 3 at shoot apices. Corolla slightly sticky, ca. 4 mm long, nearly spherically urn-shaped, ending with straight, rounded lobes. Wide, coloured sepals partly clasping corolla. Stamens hidden, anthers with appendages. Flowering: Aug-Nov.

Distributed in western and southern Cape, except the Cape Peninsula, from Cederberg in the north to Langkloof in the east. Preferring cold slopes, old seepage areas, and some inland sites.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.47-0.52 mm long, 0.26-0.31 mm wide. Seed surface nearly smooth (Fig. 112a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, ca. 5 times longer than wide; ca. 13-15 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 112b). Under a light microscope, the seeds smooth and shiny, with a delicate network of cells.

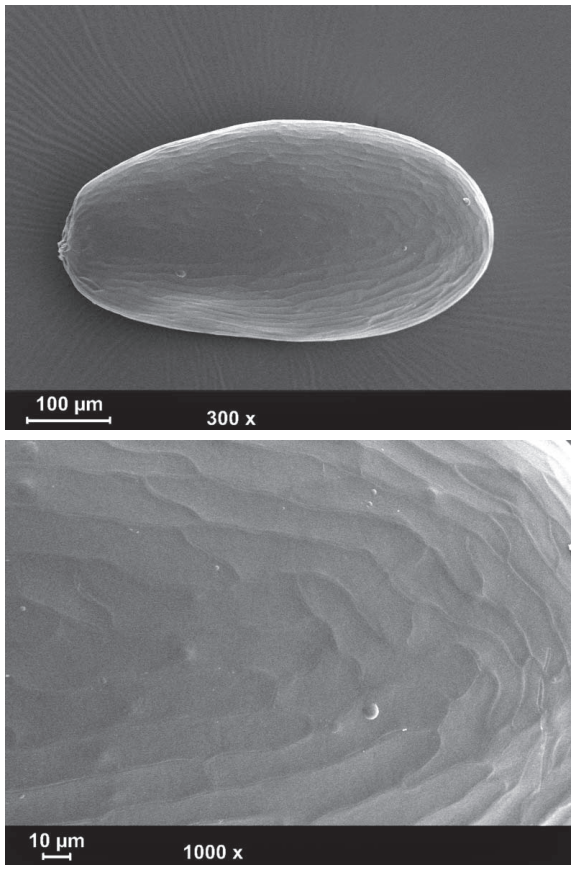


Fig. 112. *Erica selaginifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

106. *Erica brevifolia* Soland. ex Salisb., Trans. Linn. Soc. 6: 338 (1802)

Sect. 36 *Trigemma*

Erect shrubs, reaching 30-40 cm in height, covered with short, dark green leaves. Flowers pale pink to pink-red, in groups of several flowers at shoot apices. Corolla ca. 4 mm long, slightly sticky, cup-shaped to urn-shaped, ending with recurved lobes. Stamens hidden, anthers with small appendages. Flowering: Sep-Nov.

Found in mountains on the Cape Peninsula, near Stellenbosch, Paarl, Celadon, Riviersonderend, Swellendam, and George. Preferring humid sandy sites, at high altitudes.

Seeds narrowly elliptic in outline, dorsoventrally flattened, sometimes slightly curved. Hilum apical, with a rudimentary caruncle. Seed 0.60-0.72 mm long, 0.28-0.35 mm wide. Seed surface longitudinally reticulate (Fig. 113a). Outer periclinal cell walls of the seed coat quite steeply and deeply concave. Seed coat cells very elongate, often more than 10 times longer than wide; ca. 8-10 cells along the long axis of the seed (in the chalazal part of the seed, cells short, perpendicular to the long axis). Cell boundaries channelled, radial walls straight. No secondary sculpture, outer periclinal walls smooth, with delicate, crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 113b). Shiny under a light microscope, with a delicate network of cells.

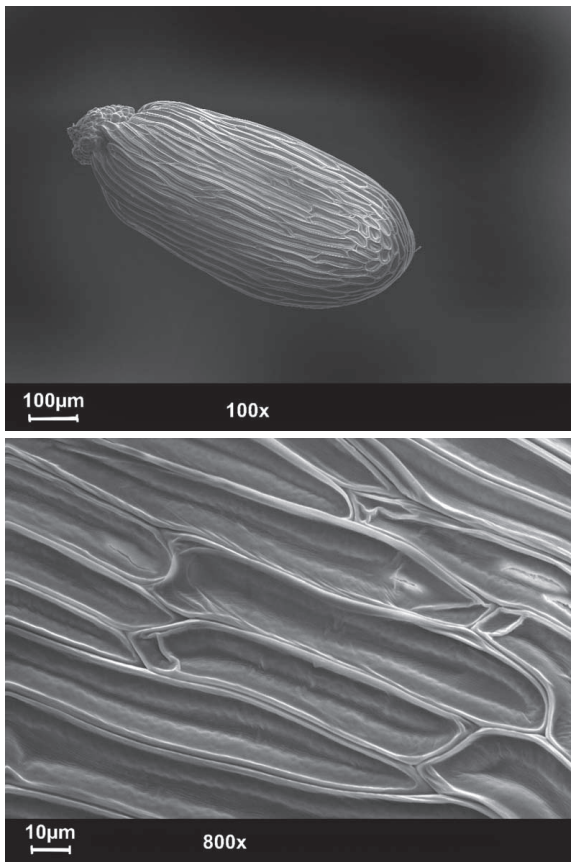


Fig. 113. *Erica brevifolia* Soland. ex Salisb. (SEM), seed (a) and surface of seed coat (b)

107. *Erica sparsa* Lodd., Bot. Cab. t. 1467 (1828)

Sect. 37 *Polycodon*

Erect shrubs, up to 90 cm high. During the flowering period, shoots covered with abundant, pinkish or white flowers. Corolla cup-shaped, ca. 1 mm long, open. Stamens dark, visible, but not protruding, without appendages. Flowering: May-Nov.

Very common on coastal plains, from Mossel Bay to the region Albany, except Port Elizabeth.

Seed shape and size variable, broadly elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.39-0.51 mm long, 0.30-0.38 mm wide. Seed surface reticulate (Fig. 114a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells are irregular, elongate, 2-3 times longer than wide; ca. 9-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls undulate. Secondary sculpture irregular striate (anastomosing) (Fig. 114b). Under a light microscope shiny, with a delicate network of cells.

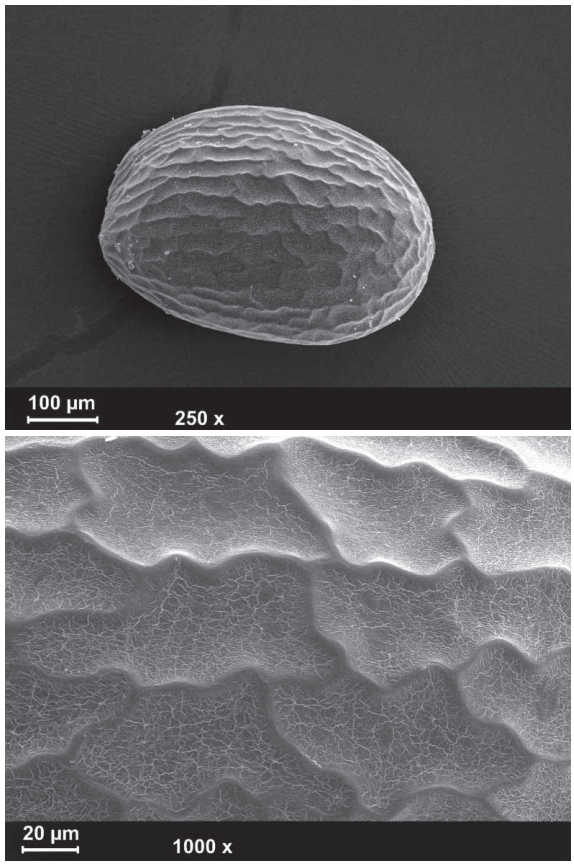


Fig. 114. *Erica sparsa* Lodd. (SEM), seed (a) and surface of seed coat (b)

108. *Erica rhodantha* Guthrie & Bolus, Fl. Cap. 4: 288 (1905)

Sect. 37 *Polycodon*

Erect shrubs, with numerous straight twigs. Branches with numerous short laterals bearing flowers. Corolla cup-shaped, ca. 3 mm long, reddish. Bracts and sepals also coloured. Stamens hidden in corolla, anthers without appendages.

Found near Riversdale, Garcias Pass.

Seeds elliptic in outline, slightly flattened dorsoventrally. Hilum apical. Seed 0.47-0.59 mm long, 0.33-0.42 mm wide. Seed surface very delicately, longitudinally reticulate (Fig. 115a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 2-4 times longer than wide; ca. 11-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, anticlinal walls undulate. No secondary sculpture, or very minutely and delicately striate (Fig. 115b). Under a light microscope smooth, shiny, with a very delicate network of cells.

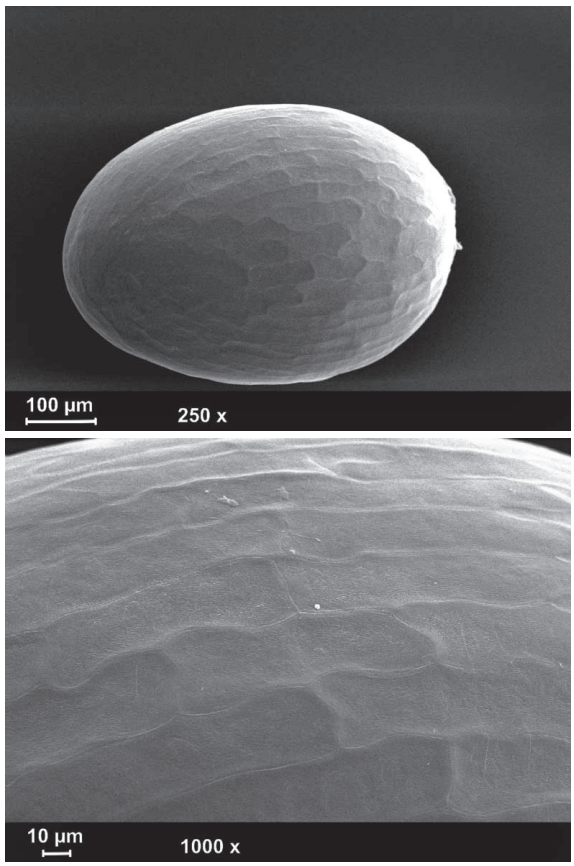


Fig. 115. *Erica rhodantha* Guthrie & Bolus (SEM), seed (a) and surface of seed coat (b)

109. *Erica peltata* Andrews, Heathery t. 276 (1812)

Sect. 37 *Polycodon*

Erect shrubs, up to 90 m high. Flowers small, numerous, pink-red. Corolla wide, cup-shaped, ca. 2 mm long, pistil protruding, stigma broad. Stamens visible, without appendages. Flowering: Dec-Apr.

Found on southern slopes of coastal mountains, between Sir Lowry's Pass and Humansdorp.

Seeds elliptic in outline, sometimes ovate, slightly flattened bilaterally. Hilum apical. Seed 0.42-0.52 mm long, 0.31-0.36 mm wide. Seed surface longitudinally reticulate (Fig. 116a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells irregular in shape, elongate, 3-5 times longer than wide, ca. 10-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls undulate. Secondary sculpture densely, delicately striate, some striae parallel, some anastomosing (Fig. 116b). Semi-dull under a light microscope, with a delicate network of cells.

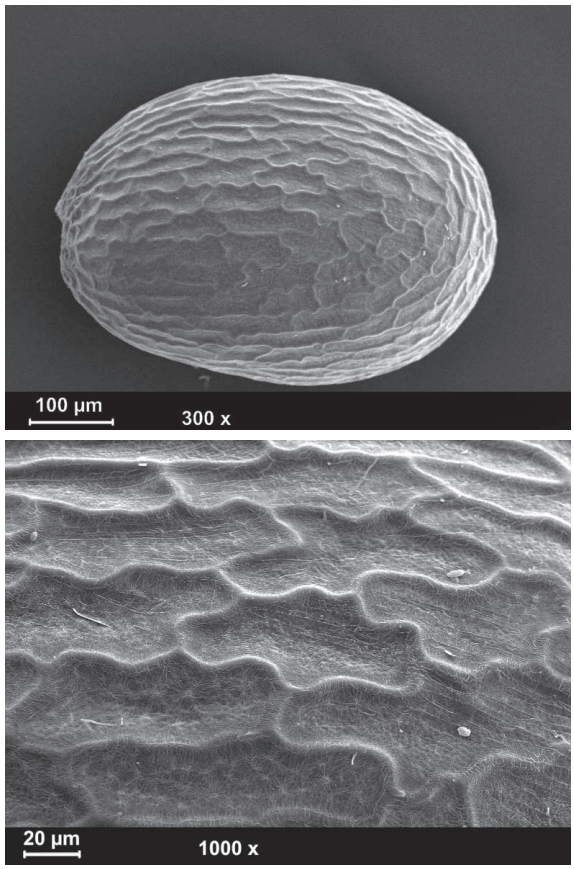


Fig. 116. *Erica peltata* Andrews (SEM), seed (a) and surface of seed coat (b)

110. *Erica argentea* Klotzsch ex Benth., DC. Prodr. 7: 686 (1839)

Sect. 38 *Eurystoma*

Erect shrubs, with twisted twigs, reaching 30-35 cm in height. Leaves appressed to twigs. Flowers pink, pendent, in small groups at shoot apices. Corolla conical, 2-4 mm long, stamens hidden, anthers with short appendages. Corolla, to half its length, covered with smooth and shiny sepals. Flowering: Sep-Oct, at higher altitudes Nov-Jan.

Found in Koue Bokkeveld and in mountains around Clanwilliam, Ceres and Piketberg.

Seed shape variable, elliptic in outline, nearly round in cross-section, but slightly flattened ventrally. Hilum apical. Seed 0.52-0.71 mm long, 0.24-0.32 mm wide. Seed surface delicately reticulate (Fig. 117a). Outer periclinal cell walls of the seed coat delicately but deeply concave. Seed coat cells elongate, 2-5 times longer than wide; ca. 13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls markedly undulate. Secondary sculpture partly regularly striate (Fig. 117b). Under a light microscope delicately reticulate, dull.

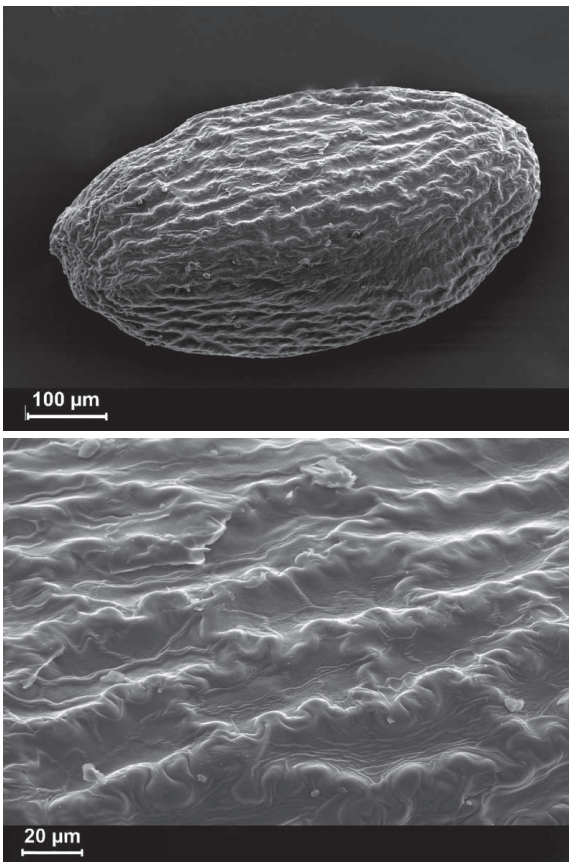


Fig. 117. *Erica argentea* Klotzsch ex Benth. (SEM), seed (a) and surface of seed coat (b)

111. *Erica calycina* L., Sp. Pl. ed. 2: 507 (1762)

Sect. 38 *Eurystoma*

Erect shrub, with spreading branches, up to 60 cm high. Flowers usually white, on shoot apices. Corolla bell-shaped, ca. 4 mm long, with recurved lobes. Stamens within corolla, although visible, anthers black, with appendages. Flowering: Aug-Mar.

Widespread, distributed from Clanwilliam to Grahamstown.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.41-0.50 mm long, 0.27-0.33 mm wide. Seed surface smooth, very delicately reticulate (Fig. 118a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 3-6 times longer than wide, ca. 10-12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth, sometimes with delicate, crowded pits (surface foveate) on the thin outer wall adhering to it which are impressions of pits in the inner periclinal wall, (Fig. 118b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

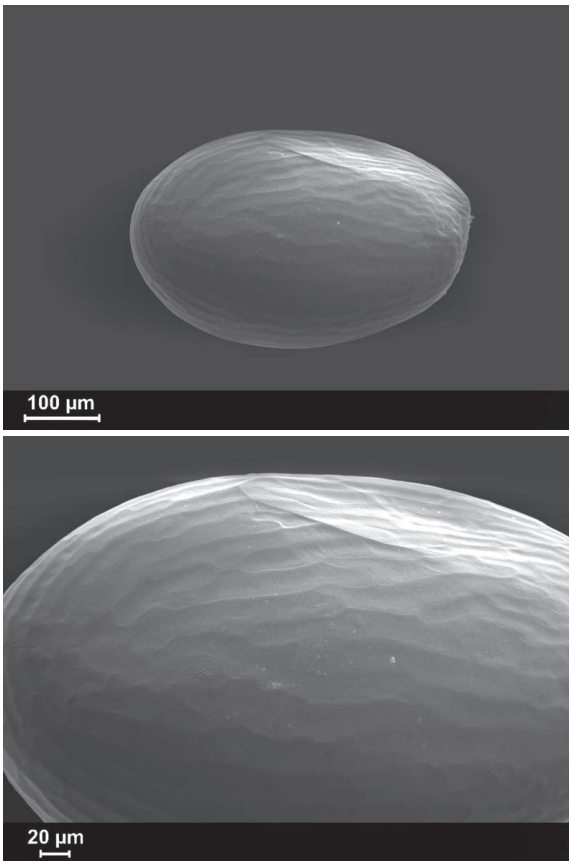


Fig. 118. *Erica calycina* L. (SEM), seed (a) and surface of seed coat (b)

112. *Erica pseudocalycina* Compton, Journ. S. Afr. Bot. 9: 132 (1943)

Sect. 38 *Eurystoma*

Perennial dwarf shrub up to 0.5 m height. Corolla white, urn-shaped, anthers with appendages.

Found in the north west Cape Prowince and in the Karoo Mtn.

Seeds elliptic to ovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical or subapical. Seed 0.60-0.68 mm long, 0.29-0.39 mm wide. Seed surface smooth, very delicately reticulate (Fig. 119a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 3-6 times longer than wide; ca. 10-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 119b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

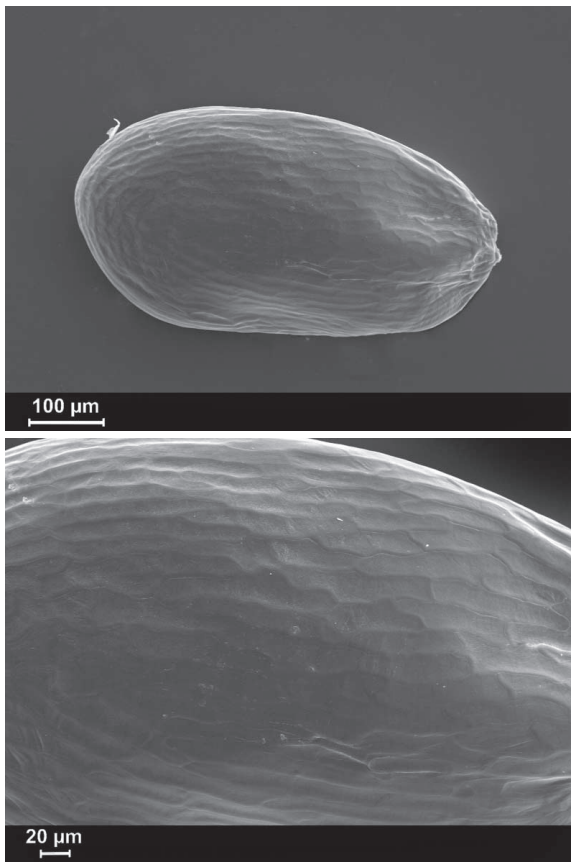


Fig. 119. *Erica pseudocalycina* Compton (SEM), seed (a) and surface of seed coat (b)

113. *Erica floccifera* Zahlbr., Ann. Nat. Hist. Hofmus Wien 20: 41 (1905)

Sect. 38 *Eurystoma*

Erect shrubs, up to 35 cm high, covered with abundant, white flowers. Corolla ca. 4 mm long, bell-shaped, with spreading lobes. Stamens hidden, anthers with appendages. Flowering: Aug-Oct.

Found in mountains near Montagu and Robertson, in the Swartberg Mts above Celadon, and on Eseljagsberg near Boontjieskraal.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.53-0.65 mm long, 0.38-0.48 mm wide. Seed surface smooth, very delicately reticulate (Fig. 120a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, 3-6 times longer than wide; ca. 10-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 120b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

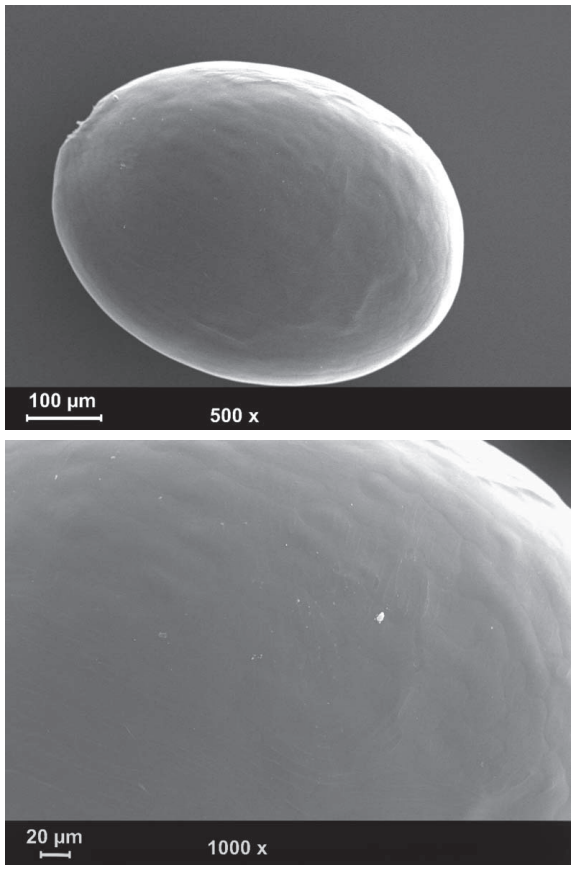


Fig. 120. *Erica floccifera* Zahlbr. (SEM), seed (a) and surface of seed coat (b)

114. *Erica jacksoniana* H.A.Baker, Journ. S. Afr. Bot. 35: 28 (1969)

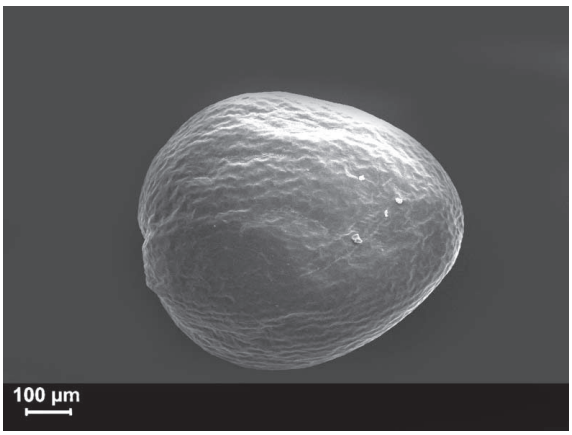
Sect. 38 *Eurystoma*

Erect, large shrubs, up to 1.5 m high, with sparse shoots but numerous short lateral branches, which are densely covered with pink flowers. Corolla 3 mm long, cup-shaped, stamens hidden, anthers without appendages. Flowering: Mar-May.

Found on wetlands and humid slopes, at altitudes of 1000-1200 m, in the Hottentots-Holland Mts, between Landdroskop and Moordenaarskop.

Seeds obovate in outline, round in cross-section. Hilum on a somewhat wider end. Seed 0.78-0.83 mm long, 0.60-0.62 mm wide. Seed surface smooth, very delicately reticulate (Fig. 121a). Outer periclinal cell walls of the seed coat nearly flat. Seed coat cells elongate, 2-4 times longer than wide; ca. 15-18 cells along the long axis of the seed (in the chalazal part of the seed, cells small, perpendicular to the long axis). Cell boundaries raised, anticlinal walls markedly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 121b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells; the whole seed coat very delicate.

a



b

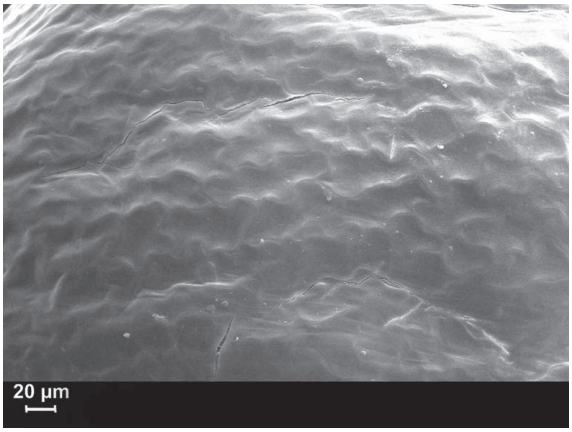


Fig. 121. *Erica jacksoniana* H.A.Baker (SEM), seed (a) and surface of seed coat (b)

115. *Erica uysii* H.A.Baker, (1973)

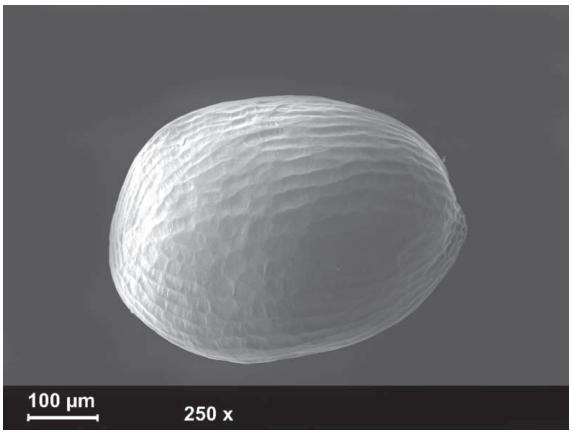
Sect. 38 *Eurystoma*

Robust, erect shrubs, up to 2 m high. Flowers abundant, on lateral branches, pink. Corolla ca. 4 mm long, roundish to urn-shaped, with a slightly constricted throat. Stamens dark, somewhat protruding, anthers with appendages. Flowering: Sep-Oct.

Found near Bredasdorp, in De Hope Nature Reserve, on limestone formations.

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.42-0.52 mm long, 0.28-0.40 mm wide. Seed surface smooth, very delicately reticulate (Fig. 122a). Outer periclinal cell walls of the seed coat flat. Seed coat cells elongate, up to 5 times longer than wide, ca. 10-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, anticlinal walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 122b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

a



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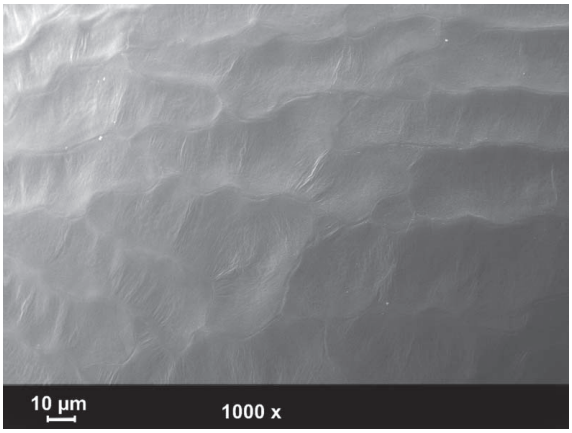


Fig. 122. *Erica uysii* H.A.Baker (SEM), seed (a) and surface of seed coat (b)

116. *Erica oakesiorum* E.G.H.Oliv., Yb. Heather Soc. 1997: 18 (1997)

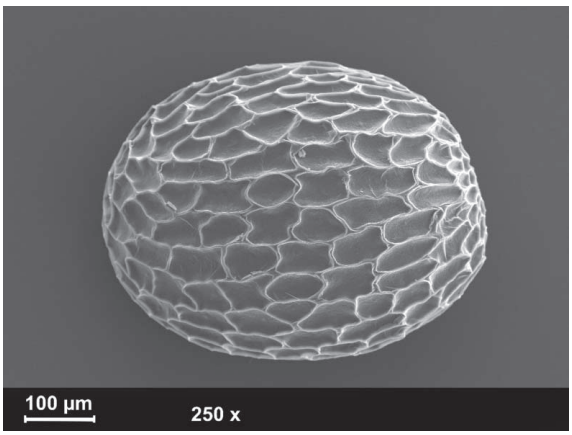
Sect. 38 *Eurystoma*

Large, erect shrubs, reaching 2-4 m in height. Each produces a single stem, up to 6 cm across, and numerous erect branches, bearing secondary laterals, up to 5 cm long, and tertiary laterals up to 1 cm long, ending with apical flowers. Whole branches resemble long, dense inflorescences. Corolla 4-lobed, 2.3 mm long, cup-shaped, white. Stamens visible, but not protruding, anthers with appendages. Flowering in September.

Found near Greyton and in the Riviersonderend Mts (Pilaarkop).

Seeds broadly elliptic in outline, round in cross-section. Hilum apical. Seed 0.47-0.55 mm long, 0.35-0.41 mm wide. Seed surface reticulate (Fig. 123a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells isodiametric or somewhat elongate, up to 3 times longer than wide, ca. 10-13 cells along the long axis of the seed (in the micropylar part, around the hilum, seed coat cells smaller). Cell boundaries channelled, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth, some cells with delicate, crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 123b). Slightly shiny under a light microscope.

a



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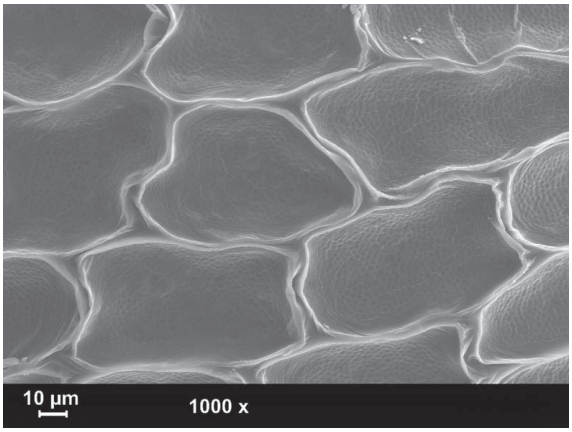


Fig. 123. *Erica oakesiorum* E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

117. *Erica seriphiifolia* Salisb., Prodr. 297 (1796)

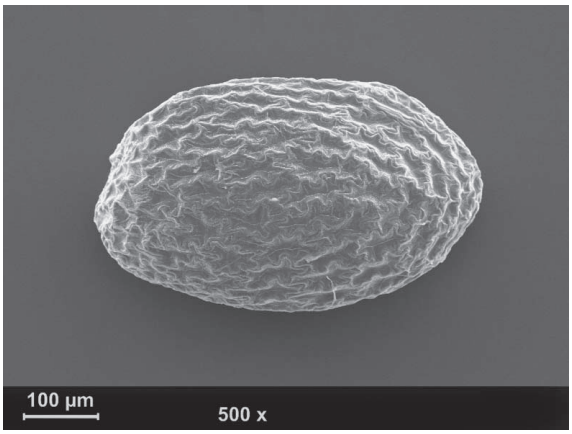
Sect. 39 *Melastoma*

Erect, profusely branched shrubs, reaching 30-40 cm in height, twigs covered with appressed, slightly hooked leaves. Flowers dark pink, on quite long stalks, forming small flower heads at shoot apices. Corolla 3-4 mm long, wide open, so stamens are visible. Anthers without appendages. Flowering: Dec-Feb.

Distributed in the regions Mossel Bay, George and Knysna, and further east to Uitenhage and the Van Stadens Mts.

Seed shape variable, broadly elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical, sometimes subapical, on the ventral side. Seed 0.49-0.59 mm long, 0.28-0.35 mm wide. Seed surface reticulate (Fig. 124a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells slightly elongate, up to 3 times longer than wide, ca. 12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries channelled, anticlinal walls markedly undulate. Secondary sculpture striate, some striae parallel (Fig. 124b). Shiny under a light microscope.

a



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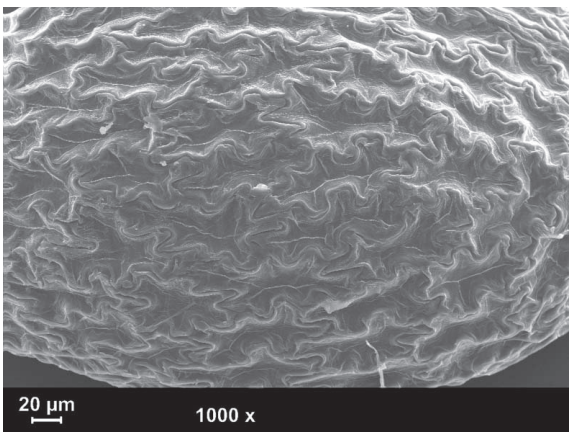


Fig. 124. *Erica seriphiifolia* Salisb. (SEM), seed (a) and surface of seed coat (b)

118. *Erica cristiflora* Salisb., Trans. Linn. Soc. 6: 332 (1802)

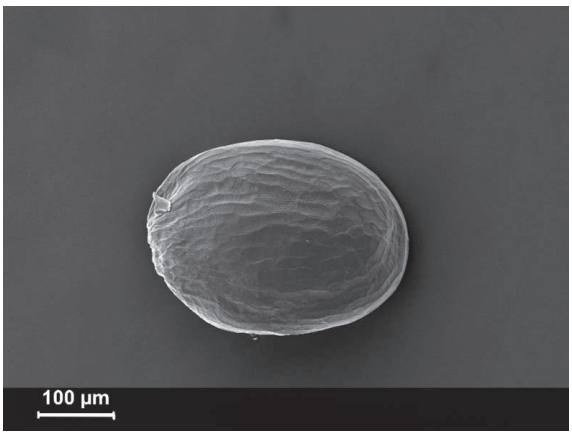
Sect. 39 *Melastoma*

Usually erect shrubs, with spreading or vertical branches, with lateral twigs that are densely covered with pink flowers. Corolla 2-4 mm long, cup-shaped, stamens hidden, anthers without appendages. Flowering: Sep-Oct.

Found in mountains in Namaqualand, and near Clanwilliam, Tulbagh, Ceres, Paarl, Franschhoek, and on the Cape Peninsula.

Seeds elliptic in outline, flattened dorsoventrally. Hilum apical. Seed 0.32-0.37 mm long, 0.22-0.28 mm wide. Seed surface smooth, very delicately reticulate (Fig. 125a). Outer periclinal cell walls of the seed coat nearly flat. Seed coat cells very elongate, 5-10 times longer than wide; ca. 10-13 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 125b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

a



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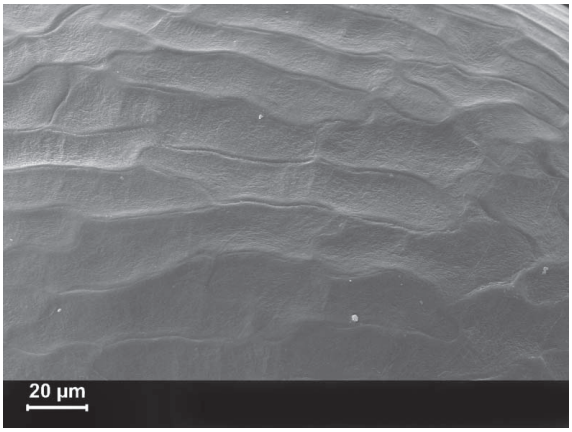


Fig. 125. *Erica cristiflora* Salisb. (SEM), seed (a) and surface of seed coat (b)

119. *Erica gillii* Benth., DC. Prodr. 7: 684 (1839)

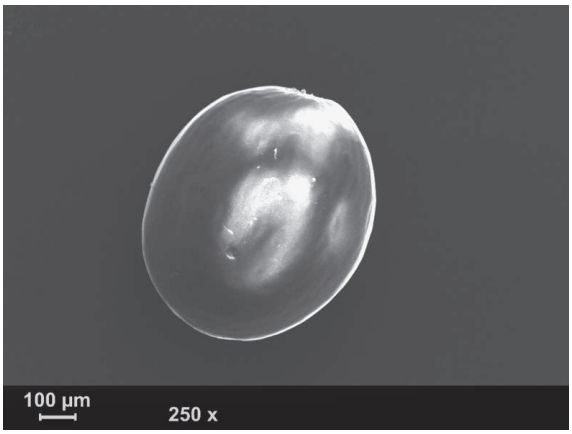
Sect. 39 *Melastoma*

Shoots erect or spreading, up to 1.2 m high. Flowers pale or dark pink, densely covering twigs. Corolla ca. 4 mm long, cup-shaped, wide open, stamens dark, without appendages. Flowering: Aug-Oct.

Very rare, found near Attaquaskloof, between Mossel Bay and Oudtshoorn.

Seeds broadly elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally. Hilum apical. Seed 0.49-0.58 mm long, 0.37-0.45 mm wide. Seed surface smooth, very delicately reticulate (Fig. 126a). Outer periclinal cell walls of the seed coat flat. Seed coat cells poorly visible, elongate, ca. 5 times longer than wide; ca. 10-12 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 126b). Under a light microscope, the seeds smooth and shiny, with a visible very delicate network of cells.

a



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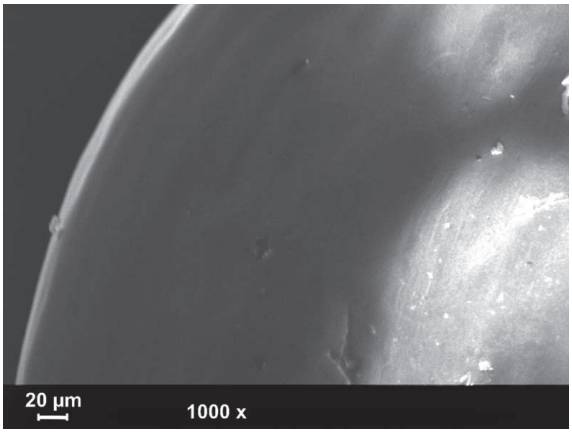


Fig. 126. *Erica gillii* Benth. (SEM), seed (a) and surface of seed coat (b)

120. *Erica melanthera* L., Diss. Erica nr. 37 (1770)

Sect. 40 *Gamochlamys*

Medium-sized shrubs, with erect or spreading branches, reaching 40-70 cm in height. Flowers abundant pale to dark pink. Corolla 3-5 mm long, wide open. Anthers black, without appendages, partly protruding. Flowering: Jun-Oct.

Found on dry and warm sites, in mountains: Langeberg, Outeniqua, Swartberg, and Little Karoo.

Seeds obovate in outline, nearly round in cross-section, slightly flattened ventrally. Hilum on a broader end. Seed 0.35-0.41 mm long, 0.22-0.28 mm wide. Seed surface reticulate (Fig. 127a). Outer periclinal cell walls of the seed coat rather gently and slightly sunken. Seed coat cells elongate, ca. 3 times longer than wide; ca. 8 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, striae at least partly oriented (Fig. 127b). Semi-dull under a light microscope.

a

b

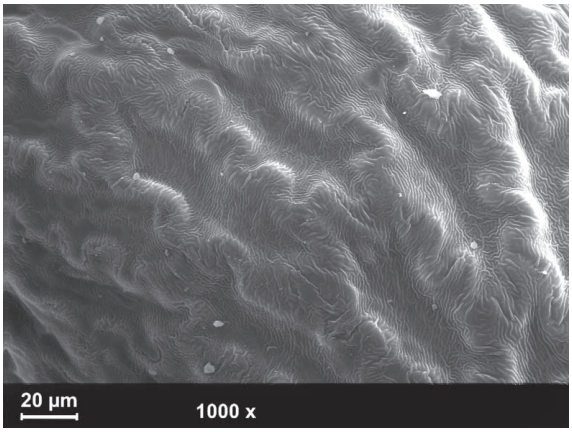


Fig. 127. *Erica melanthera* L. (SEM), seed (a) and surface of seed coat (b)

121. *Erica newdigatea* Dulfer, Ann. Naturhist. Mus. Wien 67: 85 (1964)

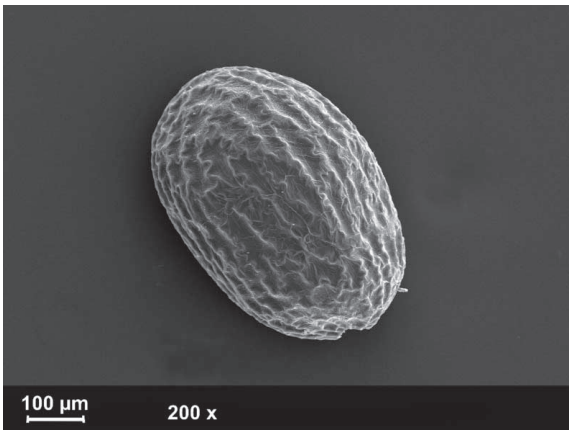
Sect. 40 *Gamochlamys*

Erect shrubs, up to 1 m high. Flowers abundant, pink. Corolla ca. 4 mm long, wide open. Stamens dark, without appendages, visible but not protruding. Flowering: Aug-Oct.

Distributed in the regions Knysna, and eastwards to Grahamstown.

Seed shape variable, elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.35-0.43 mm long, 0.24-0.30 mm wide. Seed surface reticulate (Fig. 128a). Outer periclinal cell walls of the seed coat rather gently and slightly sunken. The cells elongate, up to 5 times longer than wide, ca. 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, anastomosing (Fig. 128b). Semi-dull under a light microscope.

a



b

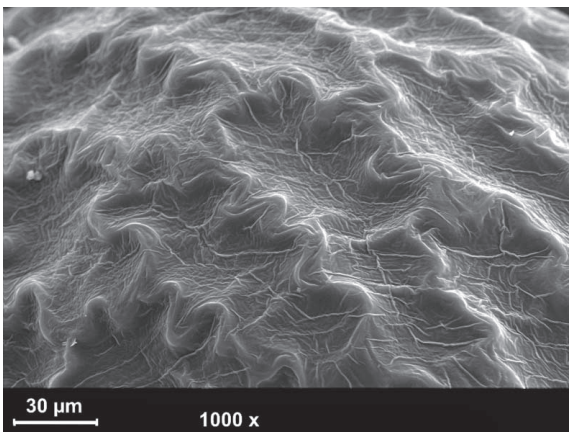


Fig. 128. *Erica newdigatea* Dulfer (SEM), seed (a) and surface of seed coat (b)

122. *Erica canaliculata* Andrews, Heathery t. 156 (1806)

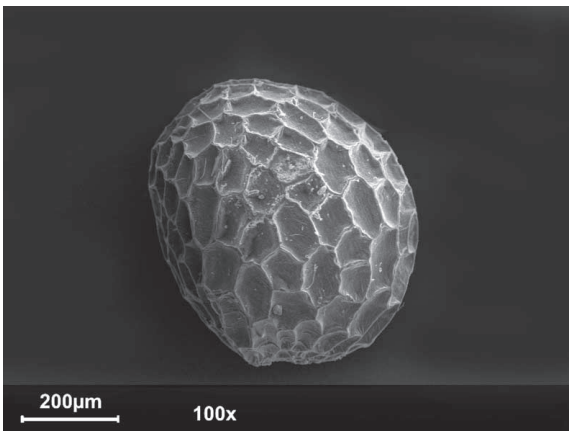
Sect. 40 *Gamochlamys*

Large shrubs, reaching 2-5 m in height, sometimes small trees. Flowers abundant, purple-pink, sometimes white, at apices of small twigs. Corolla 3-5 mm long, wide open. Stamens somewhat protruding, anthers without appendages. Flowering: Nov-Feb.

Found between George and Port Elizabeth.

Seed shape variable, broadly elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed 0.51-0.61 mm long, 0.40-0.49 mm wide. Seed surface reticulate (Fig. 129a). Outer periclinal cell walls of the seed coat steeply concave. Seed coat cells isodiametric or somewhat elongate, up to 2 times longer than wide, ca. 8-9 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. Secondary sculpture striate, anastomosing; in some parts the striae parallel (Fig. 129b). Semi-dull under a light microscope.

a



b

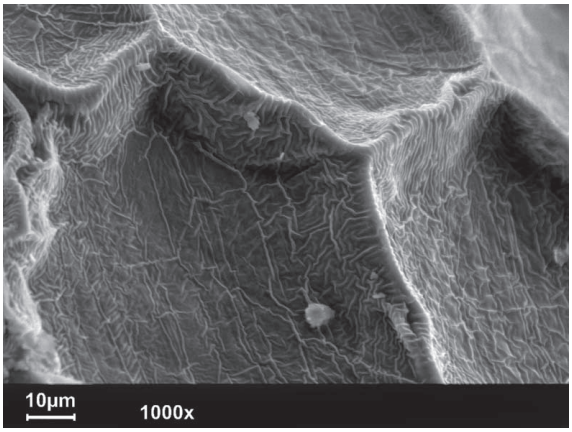


Fig. 129. *Erica canaliculata* Andrews (SEM), seed (a) and surface of seed coat (b)

123. *Erica thunbergii* Montin, Act. Nov. Upsala 2: 292, t. 9, fig. 2 (1775)

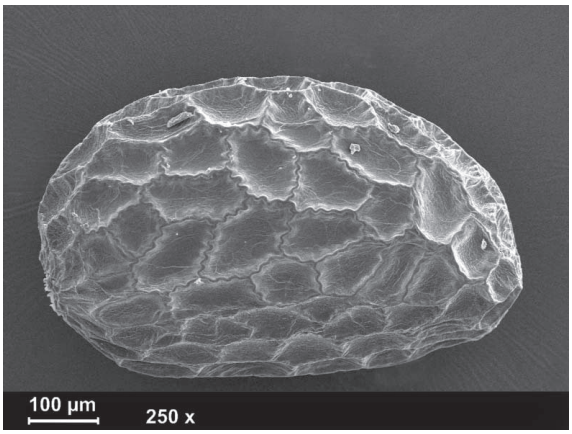
Sect. 41 *Cyatholoma*

Very delicate plants, with flexible, but erect twigs, up to 60 cm high. Flowers up to 10 mm long, bicoloured, bracts and sepals pale yellow, corolla whitish at base, while apical part orange-red. Corolla funnel-shaped at base (white), widely cup-shaped at apex (red). Stamens hidden, anthers without appendages. Flowering: Sep-Nov.

Found at altitudes of 1000-1200 m, in the Cederberg Mts and near Ceres.

Seeds obovate in outline, rarely elliptic, slightly flattened bilaterally, triangular-ovate in cross-section. Seed 0.60-0.64 mm long, 0.38-0.43 mm wide. Hilum near a broader end. Seed surface reticulate (Fig. 130a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric, or somewhat elongate, up to 2 times longer than wide, ca. 9-10 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, regularly or partly irregularly (Fig. 130b). Semi-dull under a light microscope.

a



b

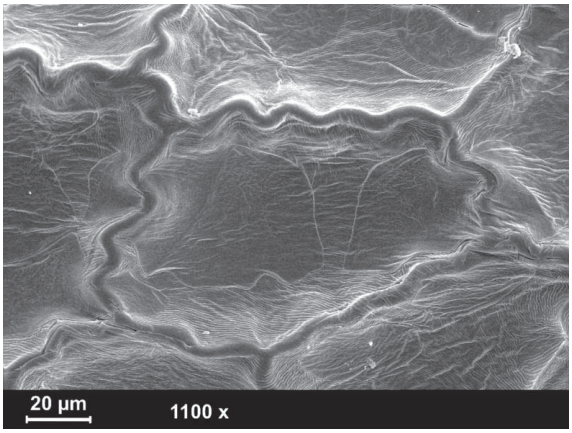


Fig. 130. *Erica thunbergii* Montin (SEM), seed (a) and surface of seed coat (b)

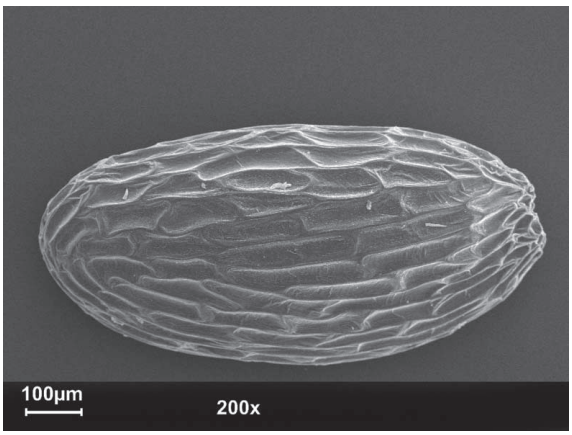
124. *Erica benguelensis* (Welw. ex Engl.) E.G.H.Oliv., Kew Bulletin 47, 4: 666 (1992) (*Philippia benguelensis*)

Flowers small, nearly spherical, ca. 1 mm across, forming small apical umbels or flower heads.

Distributed in tropical Africa, from Angola to Zimbabwe.

Seeds narrowly elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Seed 0.72-0.89 mm long, 0.37-0.45 mm wide. Hilum apical. Seed surface reticulate (Fig. 131a). Outer periclinal cell walls of the seed coat gently and shallowly sunken. Seed coat cells elongate, up to 3 times longer than wide, ca. 8-9 cells along the long axis of the seed. Cell boundaries raised, radial walls somewhat curved. Secondary sculpture striate, partly regularly, partly irregularly (anastomosing) (Fig. 131b). Semi-dull under a light microscope.

a



b

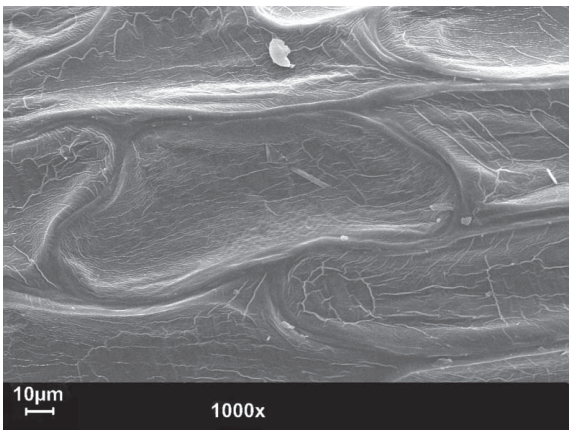


Fig. 131. *Erica benguelensis* (Welw. Ex Engl.) E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

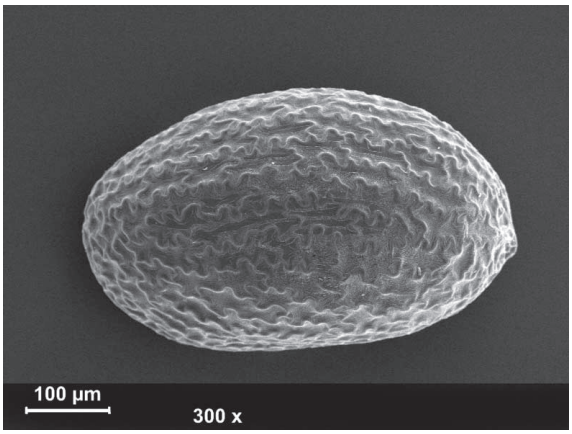
125. *Erica microdonta* (C.H.Wright) E.G.H.Oliv., Bothalia 24, 2: 124 (1994) (*Ericinella microdonta*)

Tall shrubs, up to 3 m high, or rarely up to 4 m.

Distributed in tropical Africa, in SW Tanzania, at higher altitudes in Malawi.

Seed shape variable, elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum apical. Seed (0.41) 0.45-0.52 (0.56) mm long, 0.26-0.32 mm wide. Seed surface reticulate (Fig. 132a). Outer periclinal cell walls of the seed coat gently and very shallowly sunken. Seed coat cells elongate, up to 3 times longer than wide, ca. 8-10 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, partly regularly (Fig. 132b). Semi-dull under a light microscope.

a



b

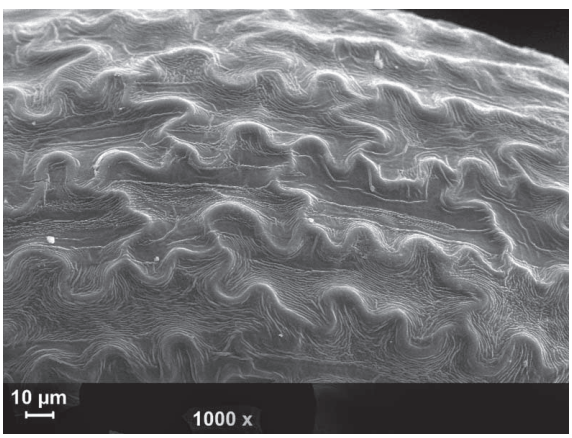


Fig. 132. *Erica microdonta* (C.H.Wright) E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

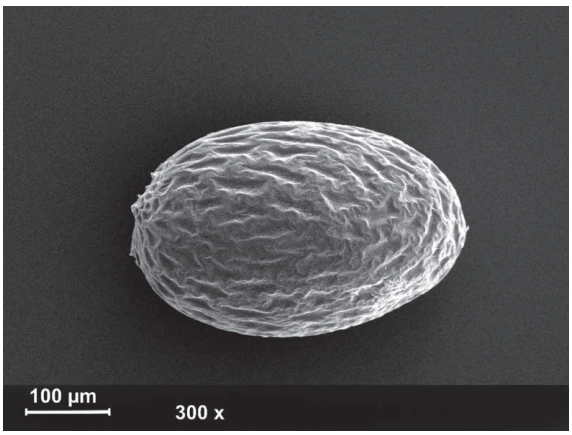
126. *Erica nyassana* (Alm & Fries) E.G.H.Oliv., Kew Bulletin 47, 4: 667 (1992) (*Philippia nyassana*)

Leaves small, 1-1.5 mm long, Flowers small, nearly spherical, ca. 1 mm across, stamens 4.

Central Africa.

Seed shape variable, elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Hilum subapical. Seed 0.36-0.43 mm long, 0.26-0.30 mm wide. Seed surface reticulate (Fig. 133a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells elongate, up to 5 times longer than wide; ca. 7-8 cells along the long axis of the seed. Cell boundaries raised, radial walls markedly undulate. Secondary sculpture striate, anastomosing (Fig. 133b). Semi-dull under a light microscope.

a



b

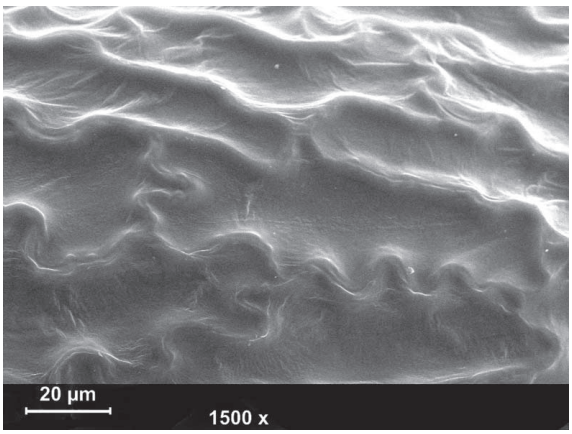


Fig. 133. *Erica nyassana* (Alm & Fries) E.G.H.Oliv. (SEM), seed (a) and surface of seed coat (b)

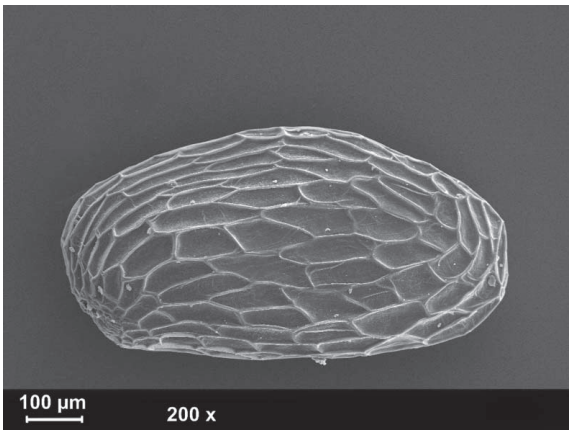
127. *Erica trimera* (Engl.) Beentje, Utafiti 3, 1: 13 (1990) (*Philippia trimera* Engl., *Philippia neohumbertii* Staner, *Philippia longifolia* Engl., *Philippia humbertii* Staner, *Philippia lebrunii* Staner)

Shrub or tree 0.4-12 m high, branched, the branches erect, leaves 5-6.5 mm long, flowers in small apical umbels of 4-12 at branch ends, corolla pink, red or white, shortly campanulate with 4 lobes, ca. 3 mm across, stamens 8.

Found in Central Africa, Kenya, in the alpine zone.

Seeds ovate-elliptic in outline, nearly round in cross-section, slightly flattened ventrally. Seed (0.61) 0.65-0.77 (0.80) mm long, 0.33-0.41 (0.45) mm wide. Hilum subapical, on the ventral side. Seed surface reticulate (Fig. 134a). Outer periclinal cell walls of the seed coat quite steeply but shallowly concave. Seed coat cells slightly elongate, up to 3 times longer than wide, ca. 10 cells along the long axis of the seed. Cell boundaries raised, radial walls straight. Secondary sculpture striate, anastomosing, sometimes with delicate, crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall, (Fig. 134b). Semi-dull under a light microscope.

a



b

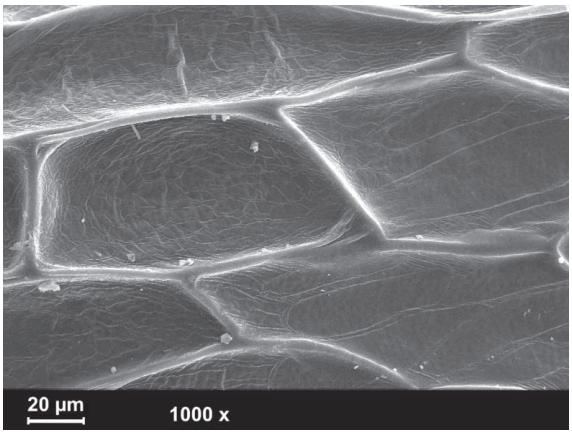


Fig. 134. *Erica trimera* (Engl.) Beentje (SEM), seed (a) and surface of seed coat (b)

128. *Erica whyteana* Britten, Trans. Linn. Soc. Bot. 4: 24 (1894) (*E. princeana* Engl., *E. swynnertonii* S. Moore)

Shrubs up to 2 m high, branches densely pubescent, grey. Leaves light green, up to 6 mm long. Flowers small, calyx composed of 3 sepals, with a bract adhering to it; corolla white or reddish, ca. 2.5 mm long, anthers with appendages.

Found on Mt Kenya, Tanzania (Iringa and Njombe Districts), Zimbabwe

Seeds elliptic in outline, nearly round in cross-section, slightly flattened ventrally, sometimes also laterally. Seed 0.50-0.58 mm long, 0.29-0.42 mm wide. Hilum subapical. Seed surface reticulate (Fig. 135a). Outer periclinal cell walls of the seed coat rather gently and slightly sunken. Seed coat cells slightly elongate, up to 3 times longer than wide, ca. 10 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 135b). Semi-dull under a light microscope.

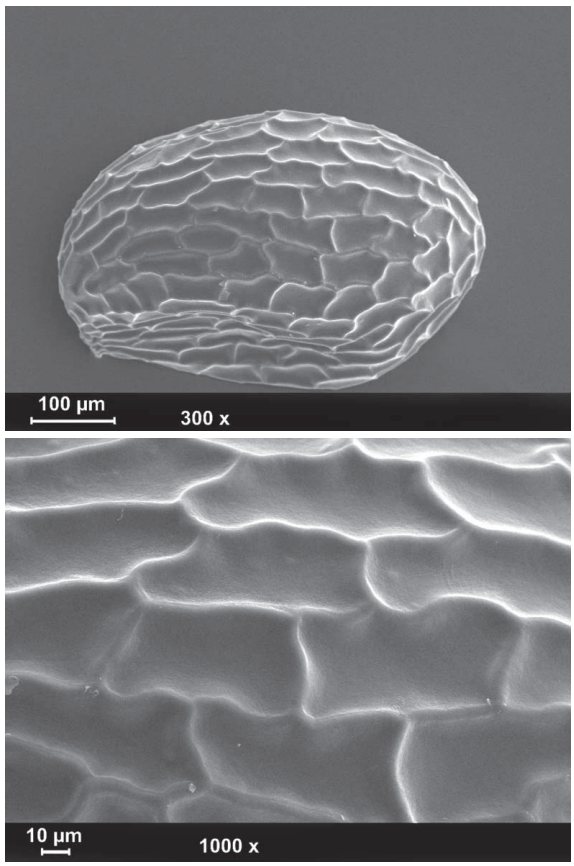


Fig. 135. *Erica whyteana* Britten (SEM), seed (a) and surface of seed coat (b)

129. *Erica arborea* L., Sp. Pl. ed. 1: 353 (1753)

Sect. *Arsace*

Large shrubs or small trees, up to 4 m high, or rarely 7 m. Young twigs densely covered with small, straight, and larger branched trichomes. Flowers small, in lateral racemes. Corolla 2.5-4 mm long, white, widely bell-shaped. Stamens hidden, anthers with appendages. Flowering: Feb-Jul.

Found in the Mediterranean region: South Europe, North Africa, East Africa, and in SW part of the Arabian Peninsula.

Seeds broadly elliptic in outline, nearly round in cross-section, slightly flattened dorsoventrally, so that they are ovate or elliptic in cross-section. Hilum apical. Seed 0.44-0.53 mm long, 0.25-0.34 mm wide. Under a scanning electron microscope (SEM), seed surface delicately reticulate (Fig. 136a). Outer periclinal cell walls of the seed coat nearly flat. Seed coat cells elongate, 4-8 times longer than wide; 9-11 cells along the long axis of the seed. Cell boundaries raised, radial walls slightly undulate. Secondary sculpture minutely striate (Fig. 136b). Under a light microscope, the seeds smooth and shiny.

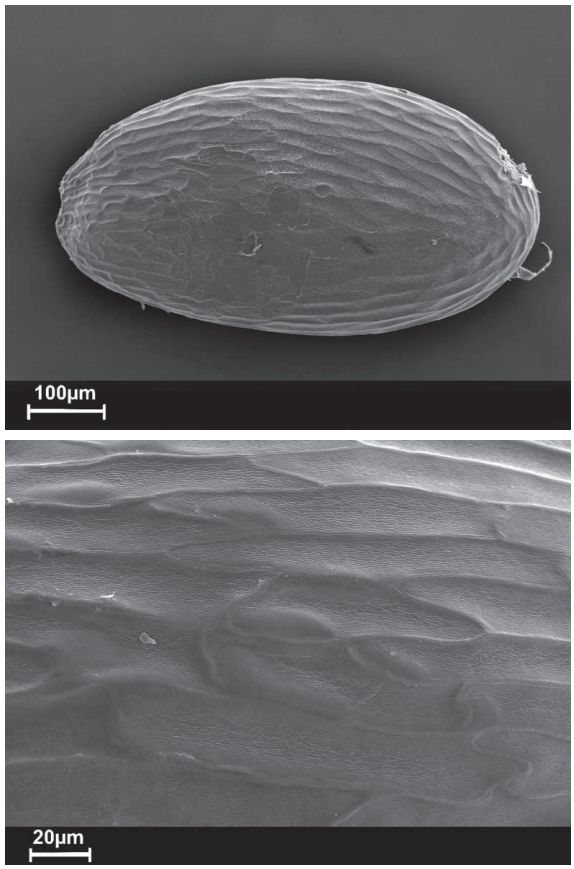


Fig. 136. *Erica arborea* L. (SEM), seed (a) and surface of seed coat (b)

130. *Erica carnea* L., Sp. Pl. ed.1: 353 (1753), (*E. herbacea* L.)

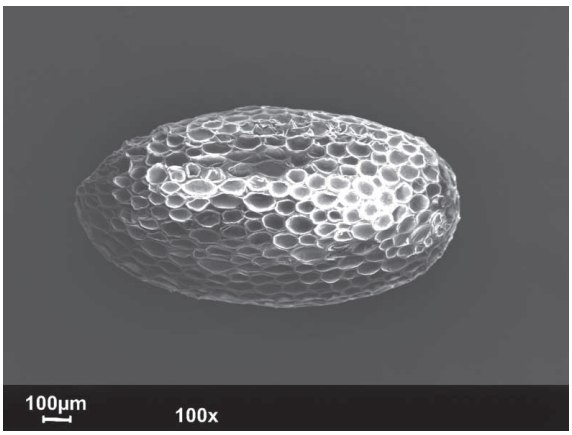
Sect. *Callicodon*

Dwarf shrubs, with flexible, ascending shoots. Flower-bearing twigs erect, up to 25 cm high. Flowers in short apical umbels. Corolla 5-6 mm long, tubular, ending with straight lobes, stamens protruding, anthers without appendages. Flowering in winter or early spring.

Distributed in mountains of Central and South Europe. In vertical distribution, it reaches the alpine zone, up to 2600-2650 m in altitude. Associated mostly with calcareous sites.

Seeds elliptic to ovate in outline, round in cross-section. Hilum apical. Seed 1.00-1.30 mm long, 0.55-0.67 mm wide. Seed surface reticulate (Fig. 137a). Seed coat cells, 5-7- gonal, although because of curvature of outer periclinal walls, the cells oval, isodiametric, or somewhat elongate (up to 2 times longer than wide), only along the funiculus more elongated; ca. 18 cells along the long axis of the seed. Anticlinal walls straight. Cell boundaries channelled. Periclinal walls elevated at the junctions with anticlinal walls, with a sunken central part. No secondary sculpture, the surface of outer periclinal walls smooth (Fig. 137b).

a



b

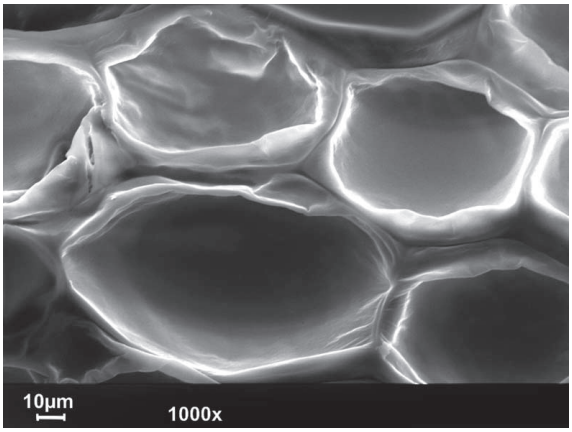


Fig. 137. *Erica carnea* L. (SEM), seed (a) and surface of seed coat (b)

131. *Erica cinerea* L., Sp. Pl. ed. 1: 352 (1753)

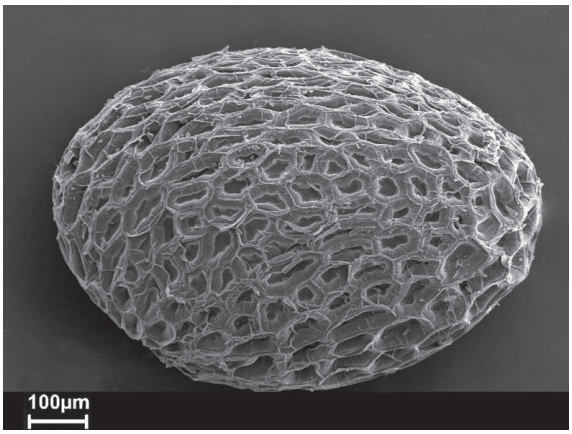
Sect. *Brachycallis*

Small shrubs, up to 75 cm high, with sparse, erect twigs. Young shoots pubescent. Flowers in small apical umbels or racemes. Corolla 4-7 mm long, pale pink to purple, cup-shaped, stamens hidden, anthers with appendages. Flowering: Jun-Sep.

Found in western Europe, in the north to Norway, and in the east to northern Italy. Associated with acidic soils, moors, dry peatlands, woodlands, and rocky areas.

Seeds obovate in outline, nearly round in cross-section, slightly flattened ventrally, and bilaterally, so that they are ovate in cross-section. Hilum on a broader end, subapical. Seed 0.76-0.90 mm long, 0.53-0.63 mm wide. Seed surface reticulate-foveate (Fig. 138a). Outer periclinal cell walls of the seed coat are quite steeply and deeply concave. Seed coat cells polygonal, isodiametric; ca. 15 cells along the long axis of the seed. Cell boundaries raised, although outer periclinal walls form small folds, reaching cell edges, which seem to be channelled; radial walls straight. Secondary sculpture regularly striate (Fig. 138b). Semi-dull under a light microscope.

a



b

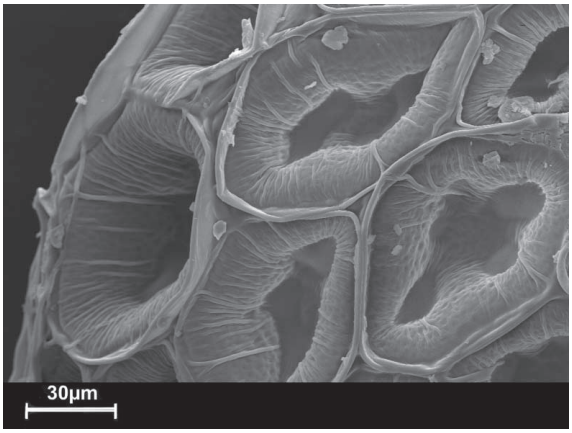


Fig. 138. *Erica cinerea* L. (SEM), seed (a) and surface of seed coat (b)

132. *Erica erigena* R.Ross, Watsonia 7: 164 (1969), (*E. mediterranea* L.)

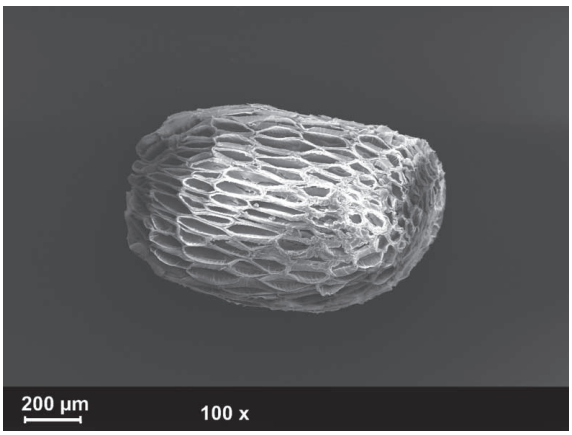
Sect. *Callicodon*

Small shrubs, with erect shoots, reaching 60-120 (200) cm in height. Otherwise similar to *E. carnea*. Flowers often forming panicles. Anthers without appendages.

Found in the western part of Europe. Associated with humid sites. Flowering: Jan-Apr.

Seeds elliptic in outline, round in cross-section, with blunt ends. Seed 0.82-1.02 mm long, 0.48-0.62 mm wide. Hilum apical. Seed surface reticulate (Fig. 139a). Seed coat cells polygonal (5-7-sided), elongate (1.5 up to 3 times longer than wide), isodiametric only at the chalazal end; ca. 10 cells along the long axis of the seed. Anticlinal walls straight. Cell boundaries channelled. Periclinal walls elevated at junctions with anticlinal walls, with a sunken central part. No secondary sculpture, the surface of outer periclinal walls smooth, with single, irregularly distributed folds. They are visible on the sunken periclinal walls, running from the upper cell edge downwards (Fig. 139b). These folds are ridge-like thickenings of epidermal cell walls. They are clearly visible under a light microscope.

a



b

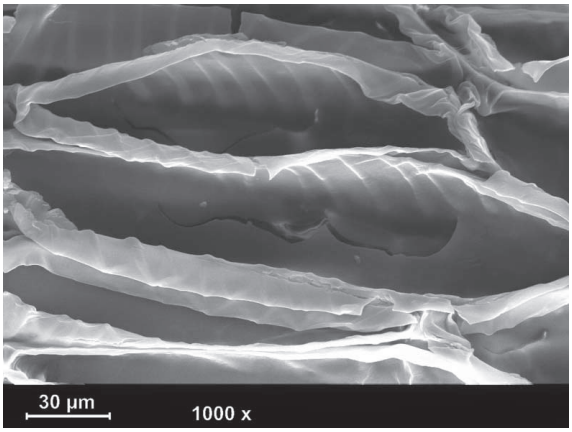


Fig. 139. *Erica erigena* R.Ross (SEM), seed (a) and surface of seed coat (b)

133. *Erica multiflora* L., Sp. Pl. ed. 1: 355 (1753)

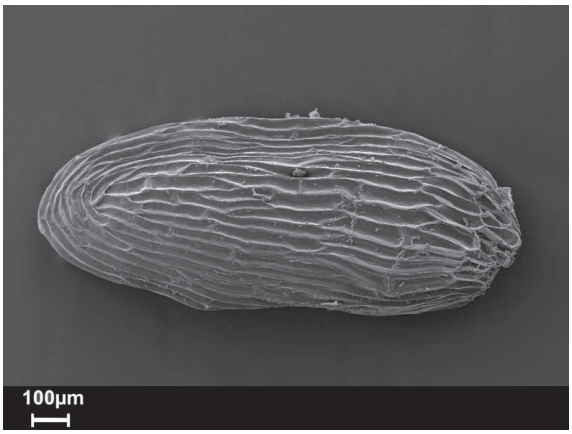
Sect. *Gypsocallis*

Robust, erect shrubs, up to 80 (250) cm high. Inflorescences dense, apical or subapical, up to 5 cm long. Corolla 4-5 (7) mm long, pink, tubular or bell-shaped. Anthers without appendages. Flowering: Aug-Jan.

Found in the western Mediterranean region, on rocky hills, in dry forests, and thickets.

Seeds narrowly elliptic in outline, flattened dorsoventrally. Hilum apical. Seed (0.83) 0.96-1.20 (1.28) mm long, 0.40-0.51 (0.56) mm wide. Seed surface delicately reticulate (Fig. 140a). Outer periclinal cell walls of the seed coat rather gently and shallowly sunken. Seed coat cells very elongate, 5-10 times longer than wide; 12-14 cells along the long axis of the seed (in the chalazal part of the seed, cells perpendicular to the long axis). Cell boundaries raised, radial walls slightly undulate or somewhat curved. No secondary sculpture, the surface of outer periclinal walls smooth, shiny under a light microscope (Fig. 140b).

a



b

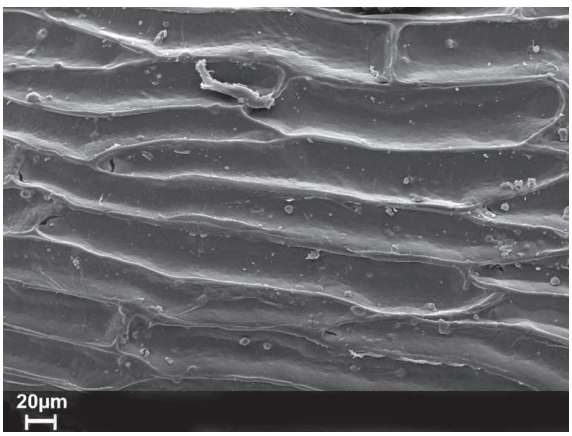


Fig. 140. *Erica multiflora* L. (SEM), seed (a) and surface of seed coat (b)

134. *Erica scoparia* L., Sp. Pl. ed. 1: 353 (1753)

Sect. *Chlorocodon*

Slender, erect shrubs, reaching 1-6 m in height. Flowers in narrow, apical racemes. Corolla 1.5-3 mm long, green with reddish tint, widely bell-shaped. Stamens hidden, anthers without appendages. Flowering: May-Jul.

Found in SW Europe, in forests and moors.

Seeds elongate, narrowly elliptic in outline, nearly round in cross-section, slightly flattened ventrally, and bilaterally, so that they are ovate in cross-section. Hilum on a broader end, subapical. Seed 0.46-0.57 (0.61) mm long, 0.28-0.38 mm wide. Seed surface delicately reticulate (Fig. 141a). Outer periclinal cell walls of the seed coat slightly sunken. Seed coat cells isodiametric or somewhat elongate, up to 3 times longer than wide, 8-9 cells along the long axis of the seed. Cell boundaries raised, anticlinal walls markedly undulate in some parts. Secondary sculpture striate (Fig. 141b). Semi-dull under a light microscope.

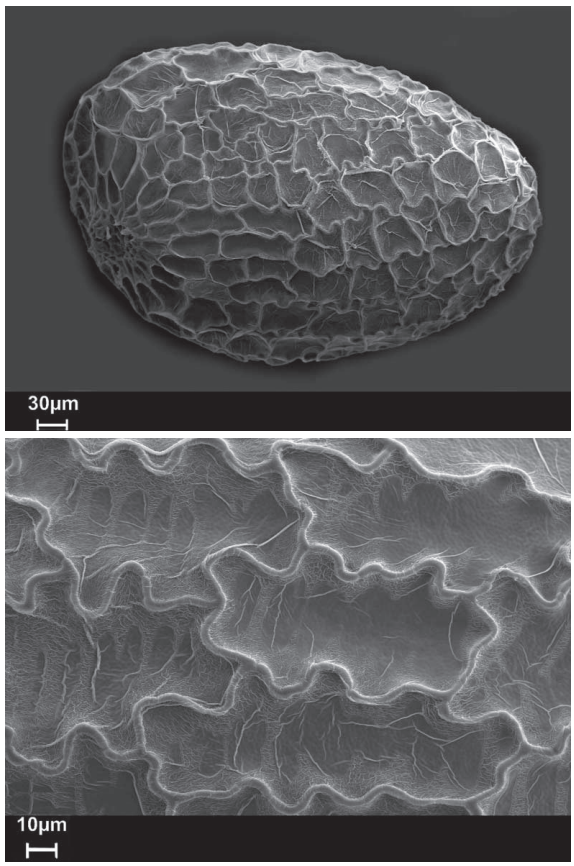


Fig. 141. *Erica scoparia* L. (SEM), seed (a) and surface of seed coat (b)

135. *Erica tetralix* L., Sp. Pl. ed. 1: 353 (1753)

Sect. *Eremocallis*

Straggly dwarf shrubs, with delicate, erect shoots, and a relatively small number of ascending branches. Flowers in apical umbels, corollas 5-9 mm long, pale pink, vase-shaped. Stamens hidden, anthers with appendages. Flowering: Mai-Sep.

Found in northern and western Europe, on acidic sites: bogs, moors, coastal coniferous forests.

Seeds elliptic in outline, round in cross-section. Hilum on a somewhat blunt end. Seed 0.31-0.39 mm long, 0.21-0.27 mm wide. Seed surface reticulate (Fig. 142a). Outer periclinal cell walls of the seed coat quite steeply, but shallowly concave. Seed coat cells are isodiametric or somewhat elongate, up to 2 times (rarely 3 times) longer than wide; ca. 12-13 cells along the long axis of the seed. Cell boundaries channelled, radial walls undulate. Secondary sculpture striate, with delicate, crowded pits (surface foveate) on the thin sunken outer wall which are impressions of pits in the inner periclinal wall (Fig. 142b). Dull under a light microscope.

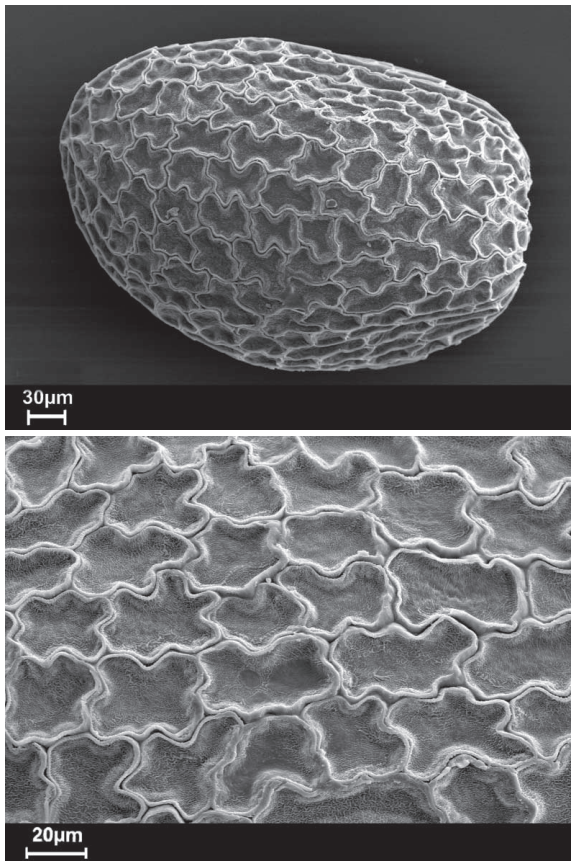


Fig. 142. *Erica tetralix* L. (SEM), seed (a) and surface of seed coat (b)

136. *Erica vagans* L., Mant. Alt. 230 (1771)

Sect. *Gypsocallis*

Procumbent or decumbent shrubs, up to 60-80 cm high. Inflorescences compact, apical or subapical, up to 10 cm long. Corolla 2.5-3.5 mm long, pink or white, widely bell-shaped. Anthers without appendages. Flowering: Jul-Sep.

Distributed in western Europe, from Spain to SW England. Found in moors and forests on acid soils.

Seeds broadly elliptic in outline, nearly spherical. Hilum on an inconspicuous apex. Seed 0.47-0.53 (0.56) mm long, 0.40-0.48 mm wide. Seed surface reticulate (Fig. 143a). Outer periclinal cell walls of the seed coat quite steeply concave. Seed coat cells polygonal, isodiametric; ca. 15 cells along the long axis of the seed. Cell boundaries raised, although outer periclinal walls form small folds, overlapping cell edges, which seem to be channelled; radial walls slightly undulate. Secondary sculpture striate (Fig. 143b). Dull under a light microscope.

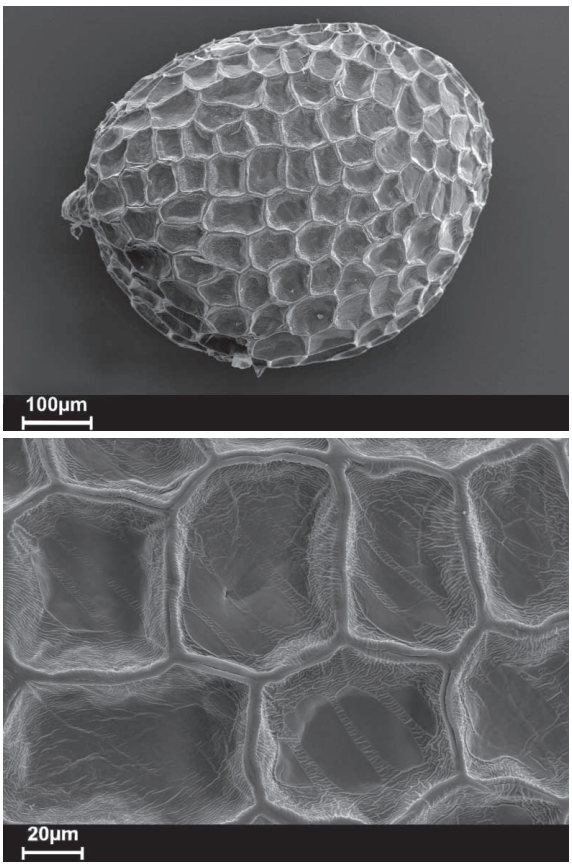


Fig. 143. *Erica vagans* L. (SEM), seed (a) and surface of seed coat (b)

4.3. Key to identification of *Erica* seeds

The key is based on selected diagnostic features visible under SEM (fine relief observed at 1000× magnification)

1 Seed covered in papillae **2**
1* Seed smooth or reticulate **7**
2 Papillae fragile, completely wrinkled and sunken **3**
2* Papillae stiff, robust, preserving their shape **4**
3 Seed narrowly elliptic, elongate in outline ... ***E. cristata***
3* Seed nearly spherical (group of species with very similar seeds): ..... ***E. jasminiflora***, ***E. shannonii***, ***E. retorta*** (in *E. retorta*, sunken papillae are rounded at base)
4 Seed nearly spherical, papillae cone-shaped ... ***E. odorata***
4* Seed somewhat elongate, elliptic or ovate in outline **5**
5 Papillae cone-shaped ..... ***E. fascicularis***
5* Papillae shaped differently **6**
6 Papillae dome-shaped, covered with micropapillae ..... ***E. juniperina***
6* Papillae finger-shaped, sometimes with a sunken side, produced by only some epidermal cells; cells are elongate ..... ***E. stylaris***
7 Seed smooth or very delicately reticulate **8**
7* Seed reticulate **19**
8 Seed flat, winged **9**
8* Seed not winged **11**
9 Seed nearly rounded in outline ..... ***E. nabea***
9* Seed ovate in outline **10**
10 Seed broadly ovate in outline, surrounded by an evenly broad wing ..... ***E. albens***
10* Seed narrowly ovate to narrowly elliptic in outline, narrowly winged (wing widest at halazal end) ..... ***E. tetragona***
11 Seed smooth with caruncle **12**
11* Seed smooth without caruncle **13**
12 Seed elliptic to ovate in outline, caruncle in the form of elongated cells, decurrent on the seed ..... ***E. palliiflora***
12* Seed narrowly elliptic, caruncle conical on a blunt end, made of compact mass of minute, light cells ..... ***E. karooica***
13 Seed broadly elliptic or broadly ovate in outline ...**14**
13* Seed narrowly ovate or narrowly elliptic in outline **17**
14 Seed broadly ovate in outline, with anticlinal walls strongly undulated ..... ***E. jacksoniana***
14* Seed elliptic in outline with anticlinal walls slightly undulated or straight or nearly invisible **15**

15 Seed smooth with distinct secondary sculpture striation ..... ***E. accomodata***
15* Seed smooth without secondary sculpture **16**
16 Seed smooth, antyclinal wall nearly invisible (a group of very similar species): .... ***E. coccinea***, ***E. intermedia***, ***E. floccifera***, ***E. monsoniana***, ***E. gillii***, ***E. tegulifolia***, ***E. uysii***, ***E. cumuliflora***
16* Seed smooth, antyclinal wall delicately visible (a group of very similar species): .... ***E. calycina***, ***E. cristiflora***, ***E. pseudocalycina***, ***E. desmantha***, ***E. lasciva***, ***E. bruniades***, ***E. rhodantha***
17 Seed smooth, narrowly elliptic with antyclinal wall invisible ..... ***E. oreophila***
17* Seed smooth, narrowly ovate or narrowly elliptic with antyclinal wall delicately visible **18**
18 Seed smooth, narrowly elliptic ..... ***E. paniculata***
18* Seed smooth, narrowly ovate ..... ***E. selaginifolia***
19 Seed reticulate with channelled cell boundaries ... **20**
19* Seed reticulate with raised cell boundaries **56**
20 Seed reticulate with channelled cell boundaries, seed coat cells isodiametric **21**
20* Seed reticulate with channelled cell boundaries, seed coat cells elongate **41**
21 Seed coat cells isodiametric, anticlinal walls straight **22**
21* Seed coat cells isodiametric, anticlinal walls undulated **30**
22 Seed coat cells large **23**
22* Seed coat cells small **25**
23 Seed coat cell edges irregular ..... ***E. alfredii***
23* Seed coat cell edges straight, regular **24**
24 Secondary sculpture tubercles minute, regular, seed length 0.85-1.0 mm ..... ***E. taxifolia***
24* Secondary sculpture tubercles minute, irregular, partly connected, seed length 0.65-0.85mm .... ***E. borboniifolia***
25 Seed coat cells without secondary sculpture **26**
25* Seed coat cells covered by striate **27**
26 Seed coat cells oval in outline ..... ***E. carnea***
26* Seed coat cells polygonal:
(1) ***E. pageana*** (the surface of outer periclinal walls generally smooth)
(2) ***E. kogelbergensis*** (outer periclinal walls generally smooth, very thin, apparently vermiculate sometimes)
27 Seed coat cell edges narrow, outer periclinal walls are steeply and deeply concave, striae of secondary sculpture very delicate **28**
27* Seed coat cell edges broad, soft, outer periclinal walls are slightly sunken, striae of secondary sculpture big **29**
28 Seed coat cells regular, polygonal ..... ***E. abietina***
28* Seed coat cells irregular, oval in outline..... ..... ***E. insignis***
29 Seed narrowly elliptic in outline, with rounded ends ..... ***E. lanuginosa***
29* Seed elliptic in outline, one end blunt .... ***E. sessiliflora***
30 Seed coat cells without secondary sculpture **31**
30* Seed coat cells with striations secondary sculpture **34**
31 Seed without secondary sculpture, anticlinal walls strongly undulated **32**
31* Seed without secondary sculpture, anticlinal walls slightly undulated **33**
32 Seeds broadly elliptic in outline, seed coat cells are regular, polygonal, isodiametric ..... ***E. vestita***
32* Seeds irregular, rectangular to ovate in outline, seed coat cells are irregular, polygonal ..... ***E. cruenta***
33 Seeds spherical, on the surface of outer periclinal walls are visible impressions of pits in the inner periclinal wall ..... ***E. amicorum***
33* Seed coat cells irregular, rectangular in outline, anticlinal walls slightly undulated:
(1) ***E. oakesiorum***
(2) ***E. schlechteri*** (seeds irregular, ovate in outline, slightly flattened laterally and ventrally)
34 Seed with secondary sculpture, anticlinal walls strongly undulated **35**
34* Seed with secondary sculpture, anticlinal walls slightly undulated **39**
35 Seed elliptic, minute (0.3-0.4 mm long) ... ***E. tetralix***
35* Seed ovate, often irregular, more than 0.5 mm long **36**
36 Seed coat cells are roundish, outer periclinal cell walls are convex, in the centre slightly concave .... ***E. mammosa***
36* Seed coat cells irregular, polygonal, isodiametric or some elongate **37**
37 Seeds ovate in outline, regular, hilum on a broader end, seed coat cell edge wide, convex ... ***E. rhodopsis***
37* Seeds irregular, ovate in outline, some flattened bilaterally, hilum on a broader end **38**
38 Hilum on a broader end, the surface of outer periclinal walls complete covered by striate ..... ***E. praecox***
38* Hilum near a broader end, striae of secondary sculpture near the edge cells ..... ***E. filialis***
39 Seeds ovate in outline ..... ***E. phillipsii***
39* Seeds elliptic in outline **40**
40 Seeds 0.5-0.6 mm long, about 10 cells along the long axis of the seed, striae secondary sculpture covered whole surface of outer periclinal walls ... ***E. scytophylla***
40* Seeds 0.6-0.8 mm long, more than 12 cells along the long axis of the seed, striae of secondary sculpture near the edge cells ..... ***E. physodes***
41 Seed coat cell edges slightly convex, cells oval in outline **42**
41* Seed coat cells elongated, polygonal or irregular **45**
42 Seed coat cells without secondary sculpture **43**
42* Secondary sculpture striate **44**

43 Seed narrowly elliptic in outline, with rounded ends ..... ***E. fastigiata***
43* Seed elliptic in outline, with blunt ends ... ***E. erigena***
44 Seeds broad elliptic in outline, seed coat cells minute, about 12 cells along the long axis of the seed .... ***E. maximilianii***
44* Seeds ovate, somewhat bigger
(1) ***E. umbrosa*** (6-7 cells along the long axis of the seed),
(2) ***E. atrovinosa*** (9-10 cells along the long axis of the seed)
45 Seed coat cells without secondary sculpture .... ***E. glutinosa***
45*Seed coat cells with secondary sculpture **46**
46 Secondary sculpture verrucate **47**
46* Secondary sculpture striate **48**
47 Seed coat cells irregular, secondary sculpture very delicate, granulate ..... ***E. petrophila***
47* Seed coat cells are large, polygonal, elongate, tubercle of secondary sculpture irregular ..... ***E. lutea***
48 Seed delicately reticulate, near smooth **49**
48* Seed reticulate **50**
49 Seed delicately reticulate, cell boundaries channelled, indistinct ..... ***E. hispidula***
49* Cell boundaries channelled, indistinct. Secondary sculpture rugulose, anastomosing, but additionally outer periclinal wall forming stellate, or peripheral patterns, arranged around the cell ..... ***E. grata***
50 Seeds ovate in outline **51**
50* Seed elliptic in outline **52**
51 Seeds ovate in outline, broader end obliquely truncate, striae secondary sculpture covered whole surface of outer periclinal walls ..... ***E. transparens***
51* Seeds ovate or irregular in outline, seed coat cells partly oval in outline, striae of secondary sculpture near the edge cells ..... ***E. sicifolia***
52 Seeds minute, less than 0.5 mm length **53**
52* Seeds 0.5 mm length or more **54**
53 Seed coat cells narrow and very long .... ***E. genistifolia***
53* Seed coat cells up to 3 times longer than wide (a group of very similar species)
(1) ***E. setosa*** (cells rectangular in outline, ca. 7-8 cells along the long axis of the seed),
(2) ***E. scabriuscula*** (cells elongate, irregular in shape, ca. 5-6 cells along the long axis of the seed),
(3) ***E. strigosa*** (6-7 cells along the long axis of the seed, radial walls strongly undulated, jigsawed)
54 Radial walls softly undulated **55**
54* Radial walls strongly, deeply undulated, wave partly triangular ..... ***E. seriphiifolia***
55 Seed coat cells polygonal, up to 3 times longer than wide; ca. 9-10 cells along the long axis of the seed, secondary sculpture e striate, partly regular .... ***E. nudiflora***
55* Seed coat cells are elongate, 3-5 times longer than wide, ca. 7-8 cells along the long axis of the seed, secondary sculpture irregularly rugose .... ***E. sphaerocephala***
56 Seed reticulate with raised cell boundaries, seed coat cells isodiametric **57**
56* Seed reticulate with raised cell boundaries, seed coat cells elongate **79**
57 Seed coat cells isodiametric, anticlinal walls straight **58**
57* Seed coat cells isodiametric, anticlinal walls wave **70**
58 Secondary sculpture absence **59**
58* Secondary sculpture tuberculate **60**
58** Secondary sculpture striate **63**
59 Seed coat cells polygonal, isodiametric, 10-11 cells along the long axis of the seed ..... ***E. sparrmanii***
59* Seed coat cells polygonal, somewhat elongate, 12-15 cells along the long axis of the seed ... ***E. oresigena***
60 Seed somewhat elongate, elliptic or ovate in outline **61**
60* Seed nearly rounded in outline **62**
61 Seeds ovate in outline, sometimes one end slightly elongate, narrowed with a hilum, secondary sculpture tubercles regular, round ..... ***E. versicolor***
61* Seed shape variable, elliptic to ovate in outline, secondary sculpture tubercles irregular, partly connected ..... ***E. plukenetii***
62 Seed flattened dorsoventrally, somewhat curved, hilum at a end, seed length 0.75-0.86 mm, secondary sculpture tubercles regular, round ..... ***E. unicolor***
62* Seeds flattened bilaterally, hilum on a flat side, seed length 1.00-1.20 mm, secondary sculpture tubercles irregular, partly connected ..... ***E. umbelliflora***
63 Seed coat cell anticlinal walls broad, convex, outer periclinal walls steeply and deeply concave **64**
63* Seed coat cell outer periclinal walls slightly sunken **67**
64 Seed nearly rounded in outline **65**
64*Seed ovate in outline **66**
65 Hilum apical, flat, 8-9 cells along the long axis of the seed ..... ***E. vallis-gratiae***
65* Hilum apical, somewhat protruding, ca. 13 cells along the long axis of the seed ..... ***E. senilis***
66 Seeds irregular, cuneate-ovate in outline, length (0.48) 0.50-0.54 mm, ca. 8-10 cells along the long axis of the seed ..... ***E. carduifolia***
66* Seeds ovate in outline, nearly round in cross-section, length 0.76-0.90 mm, ca. 15 cells along the long axis of the seed ..... ***E. cinerea***
67 Seeds broadly ovate, nearly rounded in outline, length 0.55-0.70 mm **68**
67*Seed somewhat elongate, length 0,70-0,83 mm ... **69**
68 Secondary sculpture striate, 7-8 cells along the long axis of the seed ..... ***E. cerinthoides***

68* Secondary sculpture irregularly undulated, 10-12 cells along the long axis of the seed ..... ***E. oatesii***
69 Seed elliptic in outline, secondary sculpture striate, striae partly oriented (near cell edges), partly stellate, 9-10 cells along the long axis of the seed ..... ***E. patersonii***
69* Seeds broadly ovate, hilum somewhat laterally, secondary sculpture striate, oriented at edges, anastomosing at centre, 10-12 cells along the long axis of the seed ..... ***E. strigilifolia***
70 Secondary sculpture absence **71**
70* Secondary sculpture tuberculate ... ***E. brachycentra***
70** Secondary sculpture stricte **73**
71 Seed coat cell anticlinal walls broad with protruding edges ..... ***E. tenella***
71* Seed coat cell anticlinal walls thin **72**
72 Seed broadly ovate in outline, hilum on a broader end, somewhat protruding, 8-9 cells along the long axis of the seed, 6-7 cells across ..... ***E. axilliflora***
72* Seeds broadly elliptic in outline, nearly spherical, ca. 9-10 cells along the long axis of the seed, 9-10 cells across ..... ***E. columnaris***
73 Seed coat cell anticlinal walls strongly undulated **74**
73* Seed coat cell anticlinal walls slightly undulated **75**
74 Seed length 0.50-0.60 mm, hilum near a broader end, slightly lateral, secondary sculpture very delicately striate ..... ***E. tomentosa***
74* Seed length 0.30-0.42 mm, ca. 8-9 cells along the long axis of the seed, cell boundaries partly seemingly channelled ..... ***E. woodii***
75 Seeds nearly rounded in outline **76**
75* Seed elongate, elliptic or ovate in outline **77**
76 Hilum somewhat protruding, seed coat cells polygonal, isodiametric, ca. 15 cells along the long axis of the seed, secondary sculpture striate, striae parallel .... ***E. vagans***
76* Hilum apical, flat, seed coat cells somewhat elongate, up to 2 times longer than wide, ca. 8-9 cells along the long axis of the seed, secondary sculpture striate, anastomosing ..... ***E. canaliculata***
77 Seed length 0.60-0.75 mm, secondary sculpture striate, partly regular, additionally some thicker, anastomosing folds **78**
77* Seed length 0.83-0.95 mm, secondary sculpture striate, striae partly oriented (near cell edges), partly stellate ..... ***E. sacciflora***
78 Seeds nearly round in cross-section, hilum near somewhat wider end, seed coat cells polygonal, isodiametric ..... ***E. parilis***
78* Seeds slightly flattened bilaterally, triangular-ovate in cross-section, hilum on a broader end, seed coat cells somewhat elongate, up to 2 times longer than wide ..... ***E. thunbergii***
79 Seed coat cells elongate, anticlinal walls straight or nearly straight **80**
79* Seed coat cells elongate, anticlinal walls undulated **90**
80 Secondary sculpture absent or seemingly foveate (pitted) **81**
80* Secondary sculpture tuberculate **84**
80** Secondary sculpture striate (delicately striate) **86**
81 Seeds narrowly elliptic in outline, flattened dorsoventrally, length 0.90-1.20 mm ..... ***E. multiflora***
81* Seeds nearly round in cross-section, length 0.48-0.72 mm **82**
82 Seed coat cells very large, isodiametric or somewhat elongate, up to 2 times longer than wide .. ***E. conferta***
82* Seed coat cells narrow and very long **83**
83 Seeds ovate-elliptic in outline, seed coat cell anticlinal walls thick ..... ***E. obtusata***
83* Seeds ovate in outline, seed coat cell anticlinal walls thin ..... ***E. banksii***
84 Seed length more than 1.0 mm with head-like caruncle on end ..... ***E. viridiflora***
84* Seed length less than 1.0 mm, ovate in outline ... **85**
85 Seed nearly circular in cross-section, length 0.55-0.65 mm ..... ***E. coarctata***
85* Seed ovate in outline, slightly flattened dorsiventrally, length 0.80-0.93 mm ..... ***E. physantha***
86 Seed with a head-like caruncle ..... ***E. tenuis***
86* Seed without caruncle **87**
87 Seed slightly reticulate, seed coat cells narrow, markedly elongate ..... ***E. arborea***
87* Seed distinctly reticulate **88**
88 Seed coat cells polygonal, somewhat elongate, up to 3 times longer than wide; anticlinal walls thick, secondary sculpture striate, distinct ..... ***E. baccans***
88* Seed coat cells up to 5 times longer than wide, often rectangular in outline, anticlinal walls thin, secondary sculpture slightly striate **89**
89 Seed narrowly elliptic in outline, hilum apical..... ..... ***E. benguelensis***
89* Seed ovate-elliptic in outline, hilum subapical (on the ventral side) ..... ***E. trimera***
90 Seed coat cells elongate, anticlinal walls undulate, secondary sculpture absence **91**
90* Seed coat cells elongate, anticlinal walls undulate, secondary sculpture tuberculate ..... ***E. rubiginosa***
90** Seed coat cells elongate, anticlinal walls undulate, secondary sculpture striate **94**
91 Anticlinal walls markedly undulate (a group of very similar species):
(1) ***E. ovina*** (seed coat cells up to 5 times longer than wide)
(2) ***E. peziza*** (seed coat cells 3-4 times longer than wide)
(3) ***E. rubens*** (seed coat cells up to 3 times longer than wide)

91* Anticlinal walls slightly undulate **92**
92 Outer periclinal cell walls slightly sunken, anticlinal walls slightly undulated, sometimes indistinct .... ***E. kirstenii***
92* Anticlinal walls distinct **93**
93 Outer periclinal cell walls of the seed coat steeply and deeply concave ..... ***E. rehmii***
93* Outer periclinal cell walls of the seed coat rather gently and slightly sunken ..... ***E. whyteana***
94 Seed coat cells elongate, secondary sculpture striate, anticlinal walls slightly undulate **95**
94* Seed coat cells elongate, secondary sculpture striate, anticlinal walls markedly undulate **99**
95 Seeds elliptic to ovate in outline, hilum on a broader, obliquely truncate end, somewhat laterally, seed coat cells polygonal or somewhat elongate (up to 2.5 times longer than wide) ..... ***E. cooperi***
95* Seeds elliptic or ovate in outline, hilum apical, seed coat cells elongate **96**
96 The long anticlinal walls of the seed coat cell straight, secondary sculpture striae delicate, loose, partly anastomosing ..... ***E. pyxidiflora***
96* All anticlinal walls of the seed coat cell undulated, secondary sculpture striae delicate, dense **97**
97 Seed ovate in outline, hilum on a broader end, ca. 8-10 cells along the long axis of the seed ..... ***E. algida***
97* Seed elliptic in outline, 10-13 cells along the long axis of the seed **98**
98 Secondary sculpture striae delicate, dense (anastomosing) ..... ***E. sparsa***
98* Secondary sculpture densely, delicately striate, some striae parallel, some stellate ..... ***E. peltata***
99 Hilum subapical **100**
99* Hilum apical **101**
100 Seed length 0.36-0.43 mm, cell boundaries broad, partly indistinct ..... ***E. nyassana***
100* Seed length 0.46-0.60 mm, cell boundaries distinct ..... ***E. scoparia***
101 Seed ovate in outline, hilum on a broader end .... ***E. melanthera***
101* Seed elliptic in outline (a group of very similar species):
(1) ***E. argentea*** (Seed length 0.52-0.71 mm, seed coat cells 2-5 times longer than wide; ca. 13 cells along the long axis of the seed)
(2) ***E. newdigatea*** (Seed length 0.35-0.43 mm, seed coat cells up to 5 times longer than wide, ca. 7-8 cells along the long axis of the seed)
(3) ***E. microdonta*** (Seed length 0.45-0.52 mm, seed coat cells up to 3 times longer than wide, ca. 8-10 cells along the long axis of the seed)
(4) ***E. nubigena*** (Seed length 0.46-0.55 mm, seed coat cells 2-3 times longer than wide, ca. 8-10 cells along the long axis of the seed)

4.4. Morphological seed variation in the genus *Erica*

On analysing seed structure in the studied taxa, three major morphological groups can be clearly distinguished: smooth, reticulate, and papillate. However, there are many intermediate forms between these groups. That is why the studied seeds were classified first of all depending on the relief of cell boundaries. Next, within these sets of species, several subsets were distinguished on the basis of anticlinal walls: with markedly undulate walls, with slightly or irregularly

Table 3. Listing of the groups and subgroups which were distinguished by clustering I (see Fig. 144)

Group – description		Subgroup – description		Species
I	Cell boundaries channelled, anticlinal walls strongly undulated, cells up to twice as long as wide	a	seed conspicuously reticulate	***E. vestita***, *E. cruenta, E. tetralix*
		b	seed delicately reticulate, only slightly sunken	***E. rodopis***, *E. praecox, E. filialis*
		c	seed covered with stiff papillae	*E. mammosa, E. fascicularis,* ***E. odorata***, *E. juniperina*
		d	seed covered with fragile papillae	***E. retorta***, *E. jasminiflora, E. shannonii, E. cristata*
II	Cell boundaries channelled, anticlinal walls strongly undulated, cells 2-5 times as long as wide	a	cells rectangular in outline, their walls markedly undulated	***E. transparens***, *E. setosa, E. scabriuscula, E. genistifolia, E. seriphiifolia*
		b	cells with wedge-shaped ends	*E. atrovinosa,* ***E. umbrosa***, *E. sicifolia, E. strigosa, E. sphaerocephala, E. nudiflora*
		c	seed nearly smooth	*E. grata,* ***E. hispidula***
III	Cell boundaries channelled, anticlinal walls slightly undulated, cells up to twice as long as wide	a	cells with striate relief	*E. phillipsii, E. scytophylla,* ***E. physodes***
		b	cells with no fine relief	***E. amicorum***, *E. schlechteri, E. oakesiorum*
		c	cells with micropapillate relief	***E. alfredii***

IV	Cell boundaries channelled, anticlinal walls slightly undulated, cells 2-5 times as long as wide	a	seed smooth	***E. setacea,*** *E. bruniades, E. desmantha*
		b	seed reticulate	*E. fastigiata,* ***E. lutea***
		c	seed with papillae	***E. stylaris***
V	Cell boundaries channelled, anticlinal walls straight, cells up to twice as long as wide	a	cells only slightly sunken, with striate relief	***E. sessiliflora****, E. lanuginosa*
		b	seed reticulate (cells cup-like)	***E. abietina,*** *E. kogelbergensis, E. doliiformis, E. sitiens, E. pageana, E. insignis, E. carnea*
		c	cells large, with micropapillate relief	***E. borboniifolia****, E. taxifolia*
VI	Cell boundaries channelled, anticlinal walls straight, cells 2-5 times as long as wide	a	cells reticulate (cup-like)	*E. maximilianii,* ***E. erigena***
		b	cells vesicle-like, their central part sunken	***E. petrophila***
VII	Cell boundaries channelled, anticlinal walls straight, cells more than 5 times as long as wide	a		***E. brevifolia***
VIII	Cell boundaries convex, anticlinal walls markedly undulated, cells up to twice as long as wide	a	walls markedly but minutely undulated	***E. tomentosa****, E. parilis, E. thunbergii*
		b	walls strongly undulated, puzzle-like	***E. woodii***
IX	Cell boundaries convex, anticlinal walls markedly undulated, cells 2-5 times as long as wide	a	cells with no fine relief, prominent edges of cell boundaries	***E. peziza****, E. ovina, E. rubens, E. jacksoniana, E. nubigena*
		b	cells with striate relief	*E. algida, E. melanthera,* ***E. newdigatea****, E. microdonta, E. nyassana, E. argentea , E. scoparia*
		c	seed markedly flattened, with delicate striate relief	***E. nabea***
X	Cell boundaries convex, anticlinal walls slightly undulated, cells up to twice as long as wide	a	seed nearly round in outline, cells as wide as long	***E. tenella****, E. columnaris, E. canaliculata, E. vagans*
		b	seed ovate (elliptic) in outline, cells clearly longer than wide	***E. sacciflora****, E. axilliflora, E. cooperi*
XI	Cell boundaries convex, anticlinal walls slightly undulated, cells 2-5 times as long as wide	a	seed smooth	***E. coccinea****, E. intermedia, E. bicolor, E. cumuliflora, E. lasciva, E. uysii, E. accommodate, E. monsoniana, E. tegulifolia, E. selaginifolia, E. gillii, E. rhodanta, E. calycina, E. floccifera E. pseudocalycina*
		b	seed reticulate	*E. rubiginosa,* ***E. rehmii****, E. kirstenii*
		c	seed delicately reticulate	*E. pyxidiflora, E. tenuis,* ***E. sparsa****, E. peltata, E. benguelensis, E. whyteana*
XII	Cell boundaries convex, anticlinal walls slightly undulated, cells more than 5 times as long as wide	a	seed reticulate	*E. banksii, E. obtusata,* ***E. arborea****, E. multiflora*
		b	seed smooth, round in cross-section	***E. oreophila****, E. paniculata, E. karooica, E. cristiflora*
		c	seed nearly smooth (very delicately reticulate), flattened	***E. albens****, E. tetragona*
XIII	Cell boundaries convex, anticlinal walls straight, cells up to twice as long as wide	a	cells with micropapillate relief	***E. plukenetii****, E. viridiflora, E. unicolor, E. versicolor, E. brachycentra, E. umbelliflora*
		b	cells with striate relief	***E. patersonii****, E. strigilifolia, E. oatesii, E. cerinthoides, E. vallis-gratiae, E. carduifolia, senilis, E. cinerea*
		c	cells with no fine relief	*E. sparrmanii,* ***E. oresigena***
XIV	Cell boundaries convex, anticlinal walls straight, cells 2-5 times as long as wide	a	cells with micropapillate relief	*E. coarctata,* ***E. physantha***
		b	cells with striate relief	*E. palliiflora,* ***E. baccans****, E. trimera*
		c	cells with no fine relief, large,	***E. conferta***

Explanations: bold names denote the species that can be considered as typical for seed morphology in the given subgroup

undulate walls, and with straight walls. At the next level, the classification was based on cell shape: isodiametric (up to twice as long as wide), elongate (2-5 times as long as wide), and strongly elongate (more than 5 times as long as wide) (clustering I). As a result, 14 well-defined groups of taxa were distinguished (Table 3, Fig. 144). Within each of them, using other characters, several morphologically homogeneous subgroups can be distinguished (Table 3). In such order, seeds were presented in Appendix.

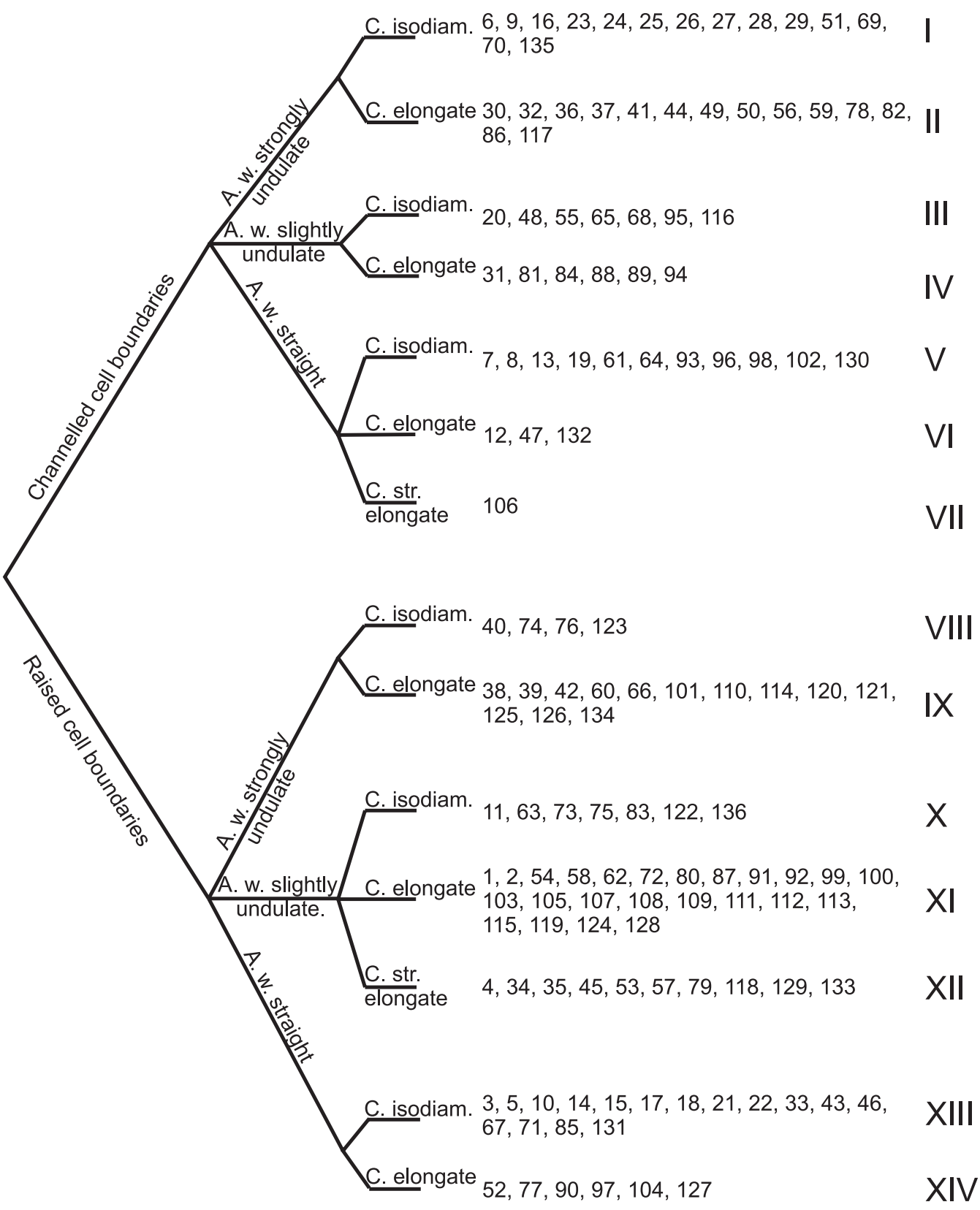


Fig. 144. Grouping based on most important characters, chosen *a priori* (clustering I)
Explanations: A.w. – anticlinal walls, C. – cells, 1-136 – number of species as in Table 1, I-XIV – group numbers

4.5. Phenetic analysis based on seed morphology in *Erica*

To verify the grouping of the clustering I (Fig. 144) a phenetic analysis was performed (clustering II). It was based on the same 10 selected characters (Table 2), assuming that all of them are equally important (Table 4).

Agglomerative clustering based on the selected morphological seed characters divides the taxa into a number of clusters. The resultant dendrogram (Fig. 145) shows the cut-off point, which determines the smallest, clearly distinct clusters. In this way, 13 clusters were distinguished (Table 5).

Table 4. Database used for Ward's agglomerative clustering

No.	Name of species	Features									
		1	2	3	4	5	6	7	8	9	10
1	*E. coccinea*	7	11	2	1	1	2	1	2	2	1
2	*E. intermedia*	5	12	2	1	1	2	1	2	2	1
3	*E. plukenetii*	9	12	2	1	1	1	3	2	1	2
4	*E. banksii*	6	11	2	1	1	3	1	2	1	1
5	*E. viridiflora*	12	14	2	2	1	1	3	2	1	2
6	*E. mammosa*	10	17	2	1	1	1	2	1	1	3
7	*E. sessiliflora*	10	14	2	1	1	1	3	1	1	3
8	*E. abietina*	7	12	2	1	1	1	3	1	1	3
9	*E. vestita*	6	10	2	1	1	1	2	1	1	1
10	*E. patersonii*	8	10	2	1	1	1	3	2	1	3
11	*E. sacciflora*	9	10	2	1	1	1	1	2	1	3
12	*E. maximilianii*	8	12	2	1	1	2	3	1	1	3
13	*E. kogelbergensis*	7	9	1	1	1	1	3	1	1	1
14	*E. unicolor*	8	10	1	2	1	1	3	2	1	2
15	*E. versicolor*	9	11	2	2	1	1	3	2	1	2
16	*E. cruenta*	5	10	2	1	1	1	2	1	1	1
17	*E. strigilifolia*	8	12	2	1	2	1	3	2	1	3
18	*E. sparrmanii*	6	11	2	1	1	1	3	2	1	1
19	*E. doliiformis*	8	15	2	1	2	1	3	1	1	1
20	*E. phillipsii*	6	12	2	1	2	1	1	1	1	3
21	*E. oatesii*	6	12	1	1	1	1	3	2	1	3
22	*E. cerinthoides*	6	8	2	1	1	1	3	2	1	3
23	*E. fascicularis*	9	12	2	1	1	1	2	1	3	3
24	*E. retorta*	7	17	1	1	1	1	2	1	3	3
25	*E. jasminiflora*	8	15	1	1	1	1	2	1	3	3
26	*E. shannonii*	7	17	1	1	1	1	2	1	3	2
27	*E. cristata*	8	17	2	1	1	1	2	1	3	1
28	*E. rhodopis*	7	12	2	1	1	1	1	1	1	3
29	*E. praecox*	8	10	2	1	1	1	2	1	1	3
30	*E. atrovinosa*	8	10	2	1	1	2	2	1	1	3
31	*E. fastigiata*	7	11	2	1	1	2	1	1	1	1
32	*E. transparens*	5	8	2	1	1	2	2	1	1	3
33	*E. vallis-gratiae*	8	9	1	1	1	1	3	2	1	3
34	*E. albens*	15	20	2	2	1	3	1	2	2	3
35	*E. tetragona*	15	20	2	2	1	3	1	2	2	1
36	*E. glutinosa*	5	7	2	1	1	2	2	1	1	1
37	*E. umbrosa*	7	7	2	1	1	2	2	1	1	3
38	*E. peziza*	5	8	2	1	1	2	1	2	1	3
39	*E. ovina*	4	7	2	1	1	2	1	2	1	1
40	*E. tomentosa*	6	10	2	1	2	1	2	2	1	3
41	*E. sicifolia*	5	6	2	1	1	2	1	1	1	3
42	*E. algida*	5	9	2	1	1	2	2	2	1	3
43	*E. oresigena*	7	12	2	1	1	1	3	2	1	1
44	*E. setosa*	3	8	2	1	1	2	1	1	1	3
45	*E. oreophila*	4	8	2	2	1	3	3	2	2	1
46	*E. brachycentra*	6	7	1	1	1	1	3	2	1	2
47	*E. petrophila*	6	10	2	1	1	2	3	1	1	2
48	*E. amicorum*	5	9	1	1	1	1	1	1	1	1
49	*E. strigosa*	4	7	2	1	1	2	2	1	1	3
50	*E. grata*	4	7	2	1	1	2	2	1	2	3

51	*E. filialis*	7	9	2	1	2	1	2	1	1	3
52	*E. conferta*	6	5	2	1	1	2	3	2	1	3
53	*E. obtusata*	5	6	2	1	1	3	1	2	1	1
54	*E. rubiginosa*	5	8	2	1	1	2	1	2	1	2
55	*E. scytophylla*	5	10	2	1	1	1	1	1	1	3
56	*E. nudiflora*	6	10	2	1	1	2	1	1	1	3
57	*E. paniculata*	6	11	2	1	1	3	1	2	2	1
58	*E. bicolor*	4	12	2	1	1	2	1	2	2	1
59	*E. scabriuscula*	4	6	2	1	1	2	1	1	1	3
60	*E. rubens*	5	8	2	1	1	2	2	2	1	1
61	*E. sitiens*	6	9	1	1	1	1	3	1	1	3
62	*E. rehmii*	6	8	2	1	1	2	1	2	1	1
63	*E. tenella*	6	11	1	1	1	1	1	2	1	1
64	*E. pageana*	6	10	1	1	1	1	3	1	1	1
65	*E. schlechteri*	5	10	2	1	1	1	1	1	1	3
66	*E. nubigena*	5	9	2	1	1	2	2	2	1	3
67	*E. umbelliflora*	11	15	1	2	2	1	3	2	1	2
68	*E. physodes*	7	12	2	1	1	1	1	1	1	3
69	*E. odorata*	6	9	1	1	1	1	2	1	3	3
70	*E. juniperina*	8	12	2	1	1	1	2	1	3	2
71	*E. carduifolia*	5	10	2	1	1	1	3	2	1	3
72	*E. pyxidiflora*	4	9	2	1	1	2	1	2	1	3
73	*E. columnaris*	6	10	1	1	1	1	1	2	1	1
74	*E. parilis*	7	10	2	1	2	1	1	2	1	3
75	*E. axilliflora*	5	9	2	1	1	1	1	2	1	1
76	*E. woodii*	4	9	2	1	1	1	2	2	1	3
77	*E. coarctata*	6	8	2	1	1	2	3	2	1	2
78	*E. hispidula*	4	5	2	1	1	2	2	1	1	3
79	*E. karooica*	5	8	2	1	1	3	1	2	2	1
80	*E. tenuis*	6	13	2	1	1	2	1	2	1	3
81	*E. setacea*	5	10	2	1	1	2	1	1	2	3
82	*E. sphaerocephala*	5	8	2	1	1	2	2	1	1	3
83	*E. cooperi*	7	8	2	1	2	2	1	2	1	3
84	*E. stylaris*	10	15	2	1	1	2	1	1	3	3
85	*E. senilis*	7	13	1	1	1	1	3	2	1	3
86	*E. genistifolia*	3	7	2	1	1	2	2	1	1	3
87	*E. cumuliflora*	5	10	2	1	1	2	1	2	2	1
88	*E. bruniades*	5	10	2	1	1	2	1	1	2	1
89	*E. desmantha*	4	7	1	1	1	2	1	1	2	1
90	*E. physantha*	9	8	2	2	1	2	3	2	1	2
91	*E. lasciva*	4	9	2	1	1	2	1	2	2	1
92	*E. accommodata*	3	9	2	1	1	2	1	2	2	3
93	*E. borboniifolia*	7	5	2	1	2	1	3	1	1	2
94	*E. lutea*	6	5	2	1	2	2	1	1	1	2
95	*E. alfredii*	8	6	2	1	1	1	3	1	1	2
96	*E. taxifolia*	9	7	2	1	1	1	3	1	1	2
97	*E. palliiflora*	4	9	2	1	1	2	3	2	2	3
98	*E. lanuginosa*	10	15	2	1	1	1	3	1	1	3
99	*E. monsoniana*	9	12	2	1	1	2	1	2	2	1
100	*E. kirstenii*	8	10	2	1	1	2	1	2	1	1
101	*E. nabea*	17	20	1	2	1	2	2	2	2	3
102	*E. insignis*	12	14	2	1	1	1	3	1	1	3
103	*E. tegulifolia*	6	10	2	1	1	2	1	2	2	1
104	*E. baccans*	7	15	2	1	1	2	3	2	1	3
105	*E. selaginifolia*	5	15	2	1	1	2	1	2	2	1
106	*E. brevifolia*	7	10	2	2	1	3	3	1	1	1
107	*E. sparsa*	5	13	2	1	1	2	1	2	1	3
108	*E. rhodantha*	5	12	2	1	1	2	1	2	2	1
109	*E. peltata*	5	12	2	1	1	2	1	2	1	3
110	*E. argentea*	6	13	2	1	1	2	2	2	1	3
111	*E. calycina*	5	11	2	1	1	2	1	2	2	1
112	*E. pseudocalycina*	6	12	2	1	1	2	1	2	2	1
113	*E. floccifera*	6	13	2	1	1	2	1	2	2	1

114	*E. jacksoniana*	8	17	2	1	1	2	2	2	2	1
115	*E. uysii*	5	12	2	1	1	2	1	2	2	1
116	*E. oakesiorum*	5	12	2	1	1	1	1	1	1	1
117	*E. seriphiifolia*	5	12	2	1	1	2	2	1	1	3
118	*E. cristiflora*	4	12	2	1	1	3	1	2	2	1
119	*E. gillii*	5	11	1,5	1	1	2	1	2	2	1
120	*E. melanthera*	4	8	2	1	1	2	2	2	1	3
121	*E. newdigatea*	4	8	2	1	1	2	2	2	1	3
122	*E. canaliculata*	5	8	1	1	1	1	1	2	1	3
123	*E. thunbergii*	6	9	2	1	1	1	2	2	1	3
124	*E. benguelensis*	8	8	2	1	1	2	1	2	1	3
125	*E. microdonta*	5	10	2	1	1	2	2	2	1	3
126	*E. nyassana*	4	8	2	1	1	2	2	2	1	3
127	*E. trimera*	7	10	2	1	2	2	3	2	1	3
128	*E. whyteana*	5	10	2	1	1	2	1	2	1	1
129	*E. arborea*	5	10	2	1	1	3	1	2	1	3
130	*E. carnea*	6	18	2	1	1	1	3	1	1	1
131	*E. cinerea*	8	15	2	1	1	1	3	2	1	3
132	*E. erigena*	9	10	2	1	1	2	3	1	1	1
133	*E. multiflora*	10	13	2	2	1	3	3	2	1	1
134	*E. scoparia*	5	9	2	1	2	2	2	2	1	3
135	*E. tetralix*	4	12	2	1	1	1	2	1	1	3
136	*E. vagans*	5	15	1	1	1	1	1	2	1	3

Explanations: features 1-10 as in the Table 2

Similarly as in the grouping based on the selected characters of higher rank (clustering I), it can be noticed that the distinguished clusters include species from various sections or even various subgenera. Moreover, species from Europe and tropical Africa are also scattered in various clusters, among taxa from South Africa. However, the clusters distinguished here are not well-defined, so it is impossible to create a key to distinguish between them.

Table 5. Listing of the groups which were distinguished by clustering II (see Fig. 145)

	Group – description	Species
I	Seed smooth, cells 2-5 times as long as wide, radial walls slightly undulated, rarely markedly undulated, cell boundaries convex	*E. bicolor, E. calycina, E. coccinea, E. cumuliflora, E. floccifera, E. gillii, E. intermedia, E. jacksoniana, E. lasciva, E. monsoniana, E. pseudocalycina, E. rhodantha, E. selaginifolia, E. tegulifolia, E. uysii*
II	Seed delicately reticulate or smooth, cells 2-5 times as long as wide, radial walls slightly undulated, rarely markedly undulated, cell boundaries convex	*E. arborea, E. axilliflora, E. banksii, E. cristiflora, E. glutinosa, E. karooica, E. kirstenii, E. obtusata, E. ovina, E. paniculata, E. peziza, E. rehmii, E. rubens, E. whyteana*
III	Seed reticulate or smooth, cells up to twice as long as wide, with undulated radial walls, cell boundaries channelled	*E. bruniades, E. cruenta, E. desmantha, E. fastigiata, E. oakesiorum, E. schlechteri, E. setacea, E. vestita*
IV	Seed reticulate, flattened, cells up to twice as long as wide, radial walls straight, cell boundaries convex.	*E. physantha, E. umbelliflora, E unicolor, E. versicolor, E. viridiflora*
V	Seed reticulate or smooth, narrowly elliptic, flattened, cells 2-5 times as long as wide, cell boundaries convex or channelled	*E. brevifolia, E. multiflora, E. oreophila*
VI	Seed reticulate, flattened, winged, cells 2-5 times as long as wide, radial walls undulated, cell boundaries convex	*E. albens, E. nabea, E. tetragona*

VII	Seed reticulate, cells up to twice as long as wide, with straight, rarely undulated radial walls, cell boundaries convex	*E. baccans, E. carduifolia, E. cerinthoides, E. cinerea, E. oresigena, E. patersonii, E. plukenetii, E. sacciflora, E. sparrmanii, E. thunbergii, E. woodii*
VIII	Seed reticulate, cells up to 5 times as long as wide, with straight or undulated radial walls, cell boundaries channelled	*E. abietina, E. alfredii, E. carnea, E. doliiformis, E. erigena, E. insignis, E. lanuginosa, E. maximilianii, E. petrophila, E. physodes, E. praecox, E. scytophylla, E. sessiliflora, E. rhodopis, E. taxifolia, E. tetralix*
IX	Seed reticulate, nearly spherical, cells up to twice as long as wide, with straight or slightly undulated radial walls, cell boundaries channelled or convex	*E. amicorum, E. brachycentra, E. canaliculata, E. columnaris, E. kogelbergensis, E. pageana, E. oatesii, E. senilis, E. sitiens, E. tenella, E. vagans, E. vallis-gratiae*
X	Seed with papillae, cells mostly up to twice as long as wide, with markedly undulated radial walls, cell boundaries channelled	*E. cristata, E. fascicularis, E. jasminiflora, E. juniperina, E. mammosa, E. odorata, E. retorta, E. shannonii, E. stylaris*
XI	Seed reticulate, cells up to 5 times as long as wide, radial walls straight or undulated, cell boundaries channelled or convex	*E. borboniifolia, E. cooperi, E. filialis, E. lutea, E. nyassana, E. parilis, E. phillipsii, E. scoparia, E. strigilifolia, E. tomentosa, E. trimera*
XII	Seed reticulate, cells 2-5 times as long as wide, with markedly undulated radial walls, cell boundaries channelled	*E. atrovinosa, E. genistifolia, E. grata, E. hispidula, E. nudiflora, E. scabriuscula, E. seriphiifolia, E. setosa, E. sicifolia, E. sphaerocephala, E. strigosa, E. transparens, E. umbrosa*
XIII	Seed reticulate, cells 2-5 times as long as wide, with slightly or markedly undulated radial walls, cell boundaries convex	*E. accommodata, E. algida, E. argentea, E. benguelensis, E. coarctata, E. conferta, E. melanthera, E. microdonta, E. newdigatea, E. nubigena, E. palliiflora, E. peltata, E. pyxidiflora, E. rubiginosa, E. sparsa, E. tenuis*

5. Discussion

Results of this study confirm that reticulate seeds are most common in the genus *Erica* (Netolitzky 1926; Bertsch 1941; Oliver 1991; Szkudlarz 2006). However, many species have smooth seeds, and this applies to more taxa than those listed by Oliver (1991, 2000). However, these species do not form homogenous taxonomic unit but belong to various sections and subgenera. As mentioned by Oliver (1991, 2000), seeds of some species are papillate. Seeds of this type are extremely rare in the family Ericaceae, reported earlier only in the genus *Daboecia* (Peltrisot 1904; Stevens 1971; Oliver 2000; Fagúndez & Izco 2004c). This study showed that this seed type is found in at least 10 species of *Erica*, which belong to various sections. My results indicate that these seeds are not morphologically uniform, but clearly differ with respect to papilla structure. Seed surface in some of them – *E. retorta*, *E. jasminiflora*, *E. shannonii*, and *E. cristata* – is covered with fragile papillae with sunken walls. Similar seeds are also observed in *E. curvifolia* (Oliver 1991). All the species belong to the section *Euryloma*. They look very similar to seeds of the genus *Daboecia*. In contrast, seeds of *E. odorata*, *E. juniperina*, *E. fascicularis*, and *E. stylaris*, are covered with robust, stiff papillae; only in *E. mammosa* are the papillae partly sunken at the apex.

However, considering the results of Barthlott (1981), the direct division of the genus *Erica* into the groups of species based on reticulate, smooth and papillate seeds seems not to be appropriate because the curvature of outer periclinal walls is of minor taxonomic value.

Research on a large, varied group of taxa shows that, in terms of taxonomy, the most valuable character of the seed epidermis is the relief of cell boundaries, but also the curvature of anticlinal walls (Barthlott & Ehler 1977; Barthlott & Voit 1979; Barthlott & Ziegler 1981; Barthlott 1981). These features are of great taxonomic value for distinguishing between genera, or even subfamilies. Similar conclusions were drawn by Huckerby *et al*. (1972). Another trait of large taxonomic value, indicated by these authors, is the shape of a seed coat cell. On the basis of these characters grouping of species was performed. The species whose seed morphology was analysed in this study, represent all subgenera and nearly all sections distinguished within the genus *Erica* for southern Africa (Guthrie & Bolus 1905). Additionally, selected species from tropical Africa and Europe were included in the analysis.

Traditional grouping based on characters considered *a priori* as most important in taxonomy by Barthlott (1981) and Huckerby *et al*. (1972) (clustering I), allowed to distinguish well-defined groups, which can be subdivided into morphologically homogeneous subgroups.

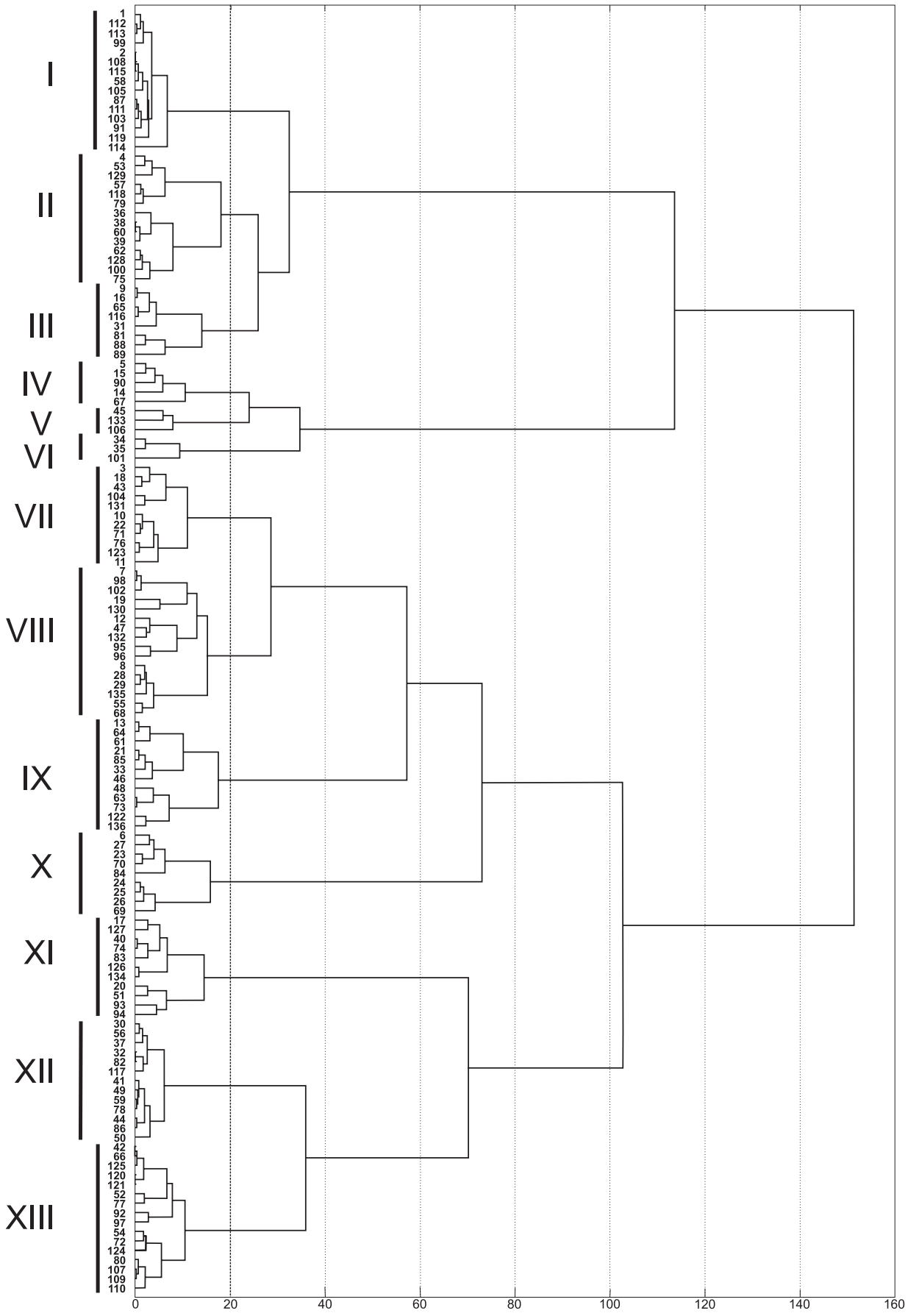


Fig. 145. Clustering dendrogram based on Ward's (1963) method
Explanations: 1-136 – number of species as in Table 1, I-XIII – group numbers

Both the groups and subgroups are composed of members of various, often distantly related sections. Comparison of the composition of those groups with taxonomic classification of the species (Guthrie & Bolus 1905; Hansen 1950) indicates that the grouping is mostly incompatible with the classification. Species from each section are usually scattered in various morphological groups, because as a rule seed variation is high even within sections. This is most conspicuous in large sections, which are richly represented in this study. Nevertheless, in some sections (e.g. sections *Evanthe*, *Dasyanthes*, *Euryloma*, *Lamprotis* or *Eurystoma*), seeds of some species form morphologically uniform complexes (species *E. patersonii, E. unicolor, E. versicolor*; or *E. strigilifolia, E. sparrmanii, E. oatesii, E. cerinthoides*; or *E. retorta, E. jasminiflora, E. shannonii, E. cristata, E. rodopis* or *E. borboniifolia, E. taxifolia*; or *E. calycina, E. pseudocalycina, E. floccifera, E. uysii*) (Fig.144). Within the distinguished subgroups, the clustering of some geographically distant species is particularly interesting. Such clusters link South African with tropical African species, or European with South African ones, or species from all the three regions, e.g. (**Ia**) *E. tetralix*, *E. vestita*, *E. cruenta*; (**Vb**) *E. carnea*, *E. insignis*, *E. pageana*, *E. sitiens*, *E. doliiformis*, *E. kogelbergensis*, and *E. abietina*; (**VIa**) *E. erigena* and *E. maximilianii*; (**IXb**) *E. scoparia*, *E. nyassana*, *E. microdonta*, *E. newdigateae*, *E. melanthera*, *E. argentea*, and *E. algida*; (**Xa**) *E. vagans*, *E. columnaris*, *E. canaliculata* and *E. tenella*; (**XIc**) *E. whyteana*, *E. benguelensis*, *E. peltata*, *E. sparsa*, *E. tenuis*, and *E. pyxidiflora*; (**XIIa**) *E. arborea*, *E. multiflora*, *E. obtusata* and *E. banksii*; (**XIIIb**) *E. cinerea*, *E. cerinthoides*, *E. strigilifolia*, *E. oatesii, E. carduifolia, E. vallis-gratiae*, and *E. patersonii* (Table 3). Yet another pair of taxa, *E. karooica* and *E. australis* (cf. Fagúndez & Izco 2004 b), linking the Cape Floristic Region and Europe, have very characteristic seeds: smooth, shiny, with a caruncle.

In this study, it is noteworthy that *E. carnea* and *E. erigena* are in two different groups. So far, these two European taxa have been regarded as very closely related (Bentham 1839; Hansen 1950; Szkudlarz 2008), but – at the same time – clearly isolated taxonomically from other species, both from Cape Region and from Europe (Bentham 1839; Hansen 1950). Results of this study show differences between those species, but do not confirm the hypothesis about their isolated taxonomic position. In this aspect, my results are consistent with the findings of McGuire & Kron (2005). Similarly, *E. multiflora*, *E. vagans*, and *E. cinerea* from the section *Gypsocallis* (Hansen 1950), are also in separate subgroups.

As a result of agglomerative clustering, treating all characters as equal, 13 clusters of taxa were distinguished (clustering II). The clusters are also incompatible with the current classification of the genus. Moreover, agglomerative clustering distinguished mostly heterogeneous clusters, with mixed characters, repeated in various clusters. However, in the groups of clustering II the whole sequences of species from the groups of clustering I and even some groups with almost the same set of species appear. Generally, groups of clustering II contain the species with completely different features, so these groups are heterogeneous.

Thus agglomerative clustering in this case does not seem to be a reliable method for classification of species. This does not disqualify the method completely, as in this study of seed morphology only 10 characters were taken into account, and this number is too low for proper taxometric analysis. It should be emphasized, however, that like in the previous grouping, subclusters can be distinguished within the clusters. Composition of these subclusters, to a large extent, corresponds with subgroups from the previous grouping method. This suggests that the division into subgroups is quite accurate.

Subgenera distinguished by Guthrie and Bolus (1905) for a long time have been considered as natural groups of species (Hansen 1950). However, later revisions of the genus (Dulfer 1965; Oliver & Oliver 2002) have not confirmed this opinion. Nevertheless, no alternative classification of *Erica* has been proposed because available data on its morphology did not allow those authors to put forward the new division of this genus into sections.

Results of this study confirm that the division of *Erica* into subgenera and sections used so far does not reflect its natural classification. Not only the sections but also subgenera distinguished by Guthrie and Bolus (1905) are not reflected in seed morphology. Moreover, there is no clear boundary between subgenera typical for Cape Province and the subgenus *Euerica*, with a broader range. It must be emphasized that the present study on seed morphology provides many new characters that have not been considered earlier. They throw new light on the systematics of *Erica*. Apart from the new approach to the division of this genus, they provide important information that species from tropical Africa (Table 1, no. 124-128) and from Europe (Table 1, no. 129-136) do not form well-defined, isolated groups, but show many similarities to seeds of various groups from Cape Province.

In the present study, the first method of grouping allowed to distinguish well-defined groups (Table 3). They could form the basis for distinguishing the sections in a new subdivision of the genus *Erica*. Within them, morphologically homogeneous subgroups can be distinguished However, to diagnose individual subgeneric taxa, it is necessary to continue detailed research on seed morphology in this genus. At the present

stage of research, on the basis of the most important characters of seed morphology (Barthlott 1981; Huckerby *et al*. 1972; Fraga 1984), 14 such groups were distinguished and, within them, 40 subgroups.

The numerous similarities of seeds from various parts of the geographic range of *Erica* confirm hypotheses about strong relationships between individual parts of the range. Results of the current study do not provide direct explanation about the place of origin and directions of dispersal of *Erica* spp., but they allow to draw some indirect conclusions. Taxa from Cape Floristic Region are much more diverse in terms of seed morphology than taxa from other parts of the range, and only some of the distinguished morphological forms are represented in tropical Africa or Europe. Thus it can be assumed that the genus originates from South Africa and, in favourable conditions, some forms have spread northwards, reaching as far as Europe. It seems unlikely that all forms found in Europe have migrated to Cape Region and further developed there. Moreover, it would be difficult to explain why taxa with a great potential for dispersal (southward migration across the whole African continent) have lost this potential, as most of South African species are very limited in distribution.

Anatomical examination of selected taxa confirm that the seed coat in the genus *Erica* is composed of only a single layer of cells (Netolitzky 1926; Takhtajan 1992). Still exceptional in respect of this feature is *E. tetralix*, whose seed coat includes also a subepidermal layer with characteristic striation (Szkudlarz 2001). Another example of exceptional features is *E. juniperina*, which in this study proved to have strongly thickened outer periclinal walls. By contrast, in all other species studied so far, these walls are thin and may even form papillae (Peltrisot 1904; Netolitzky 1926; Stevens *et al*. 2004). The observed features seem to be taxonomically valuable, but to use them for diagnostic purposes it is necessary to collect more detailed data on this genus.

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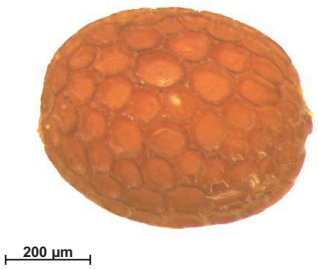
Appendix. Seeds of *Erica* photographed in the light microscope

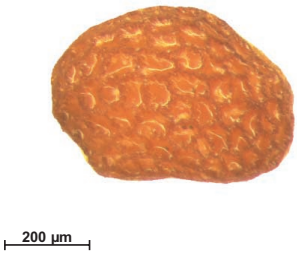
Seeds presented in the groups according to clustering I (Table 3). The number in the brackets which follows the species name denotes its consecutive number from the Table 1

Group I

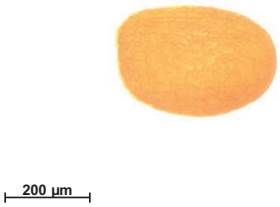
Subgroup a



Erica vestita (9)



Erica cruenta (16)



Erica tetralix (135)

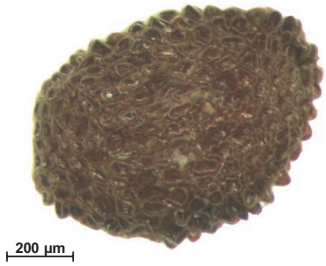
Subgroup b

Erica rodopis (28)

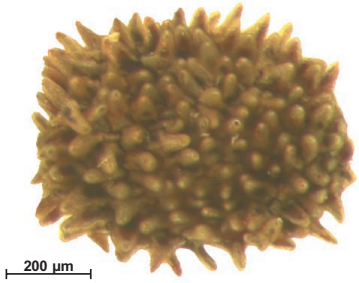
Erica praecox (29)

Erica filialis (51)

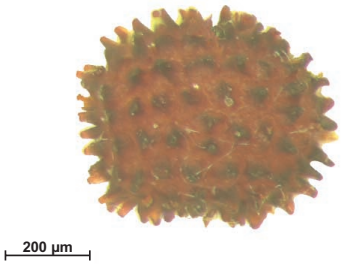
Subgroup c



Erica mammosa (6)



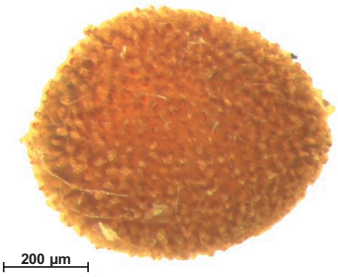
Erica fascicularis (23)



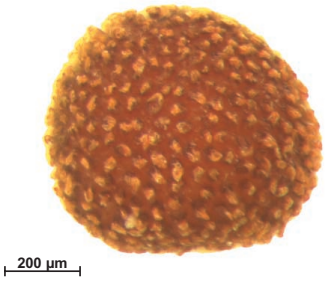
Erica odorata (69)

Erica juniperina (70)

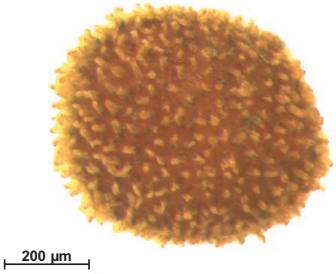
Subgroup d



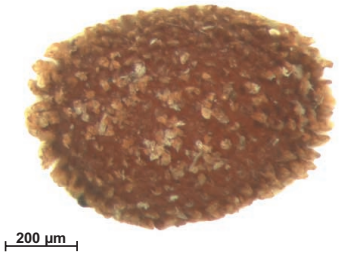
Erica retorta (24)



Erica jasminiflora (25)



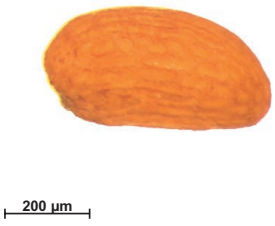
Erica shannonii (26)



Erica cristata (27)

Group II

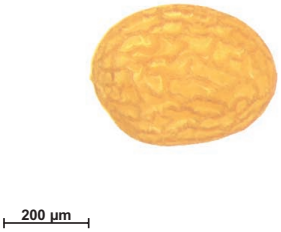
Subgroup a



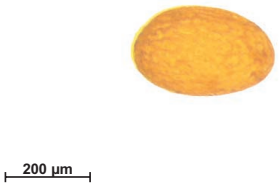
Erica transparens (32)

Erica glutinosa (36)

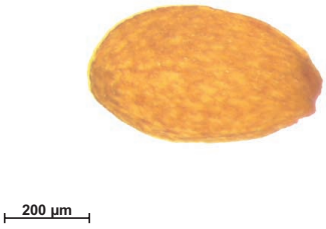
Erica setosa (44)



Erica scabriuscula (59)



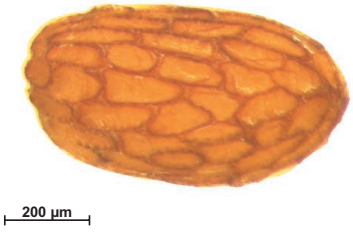
Erica genistifolia (86)



Erica seriphiifolia (117)

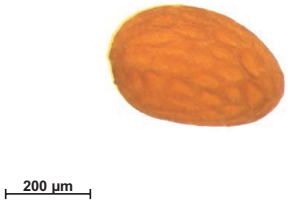
Subgroup b

Erica atrovinosa (30)

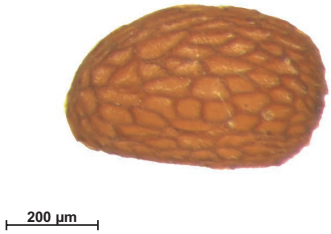


Erica armata (37)

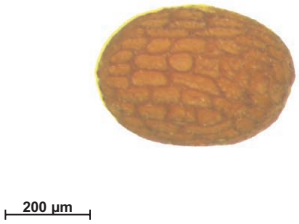
Erica sicifolia (41)



Erica strigosa (49)

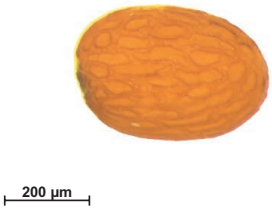


Erica nudiflora (56)

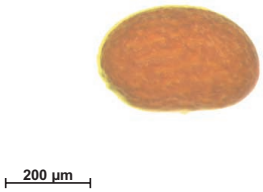


Erica sphaerocephala (82)

Subgroup c



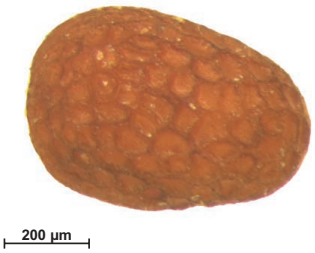
Erica grata (50)



Erica hispidula (78)

Group III

Subgroup a

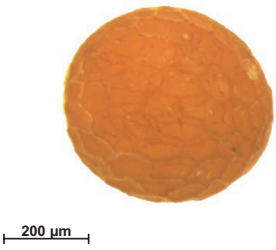


Erica phillipsii (20)

Erica scytophylla (55)

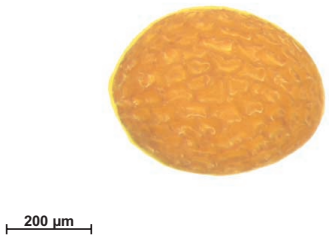
Erica physodes (68)

Subgroup b



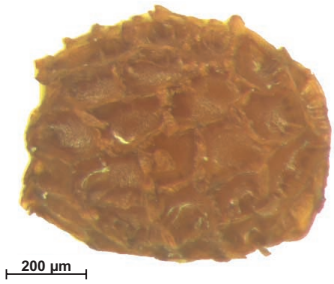
Erica amicorum (48)

Erica schlechteri (65)



Erica oakesiorum (116)

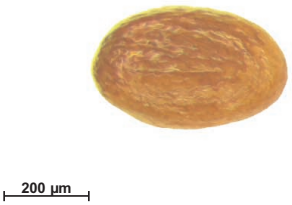
Subgroup c



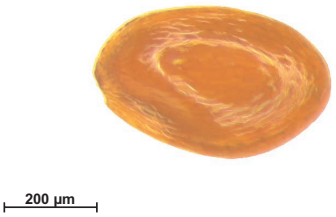
Erica alfredii (95)

Group IV

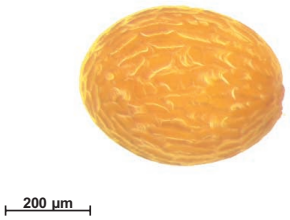
Subgroup a



Erica setacea (81)



Erica bruniades (88)



Erica desmantha (89)

Subgroup b

Erica fastigiata (31)

Erica lutea (94)

Subgroup c

Erica stylaris (84)

Group V

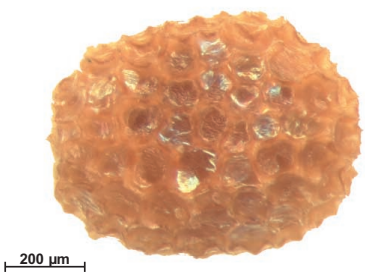
Subgroup a

Erica sessiliflora (7)

Erica lanuginosa (98)

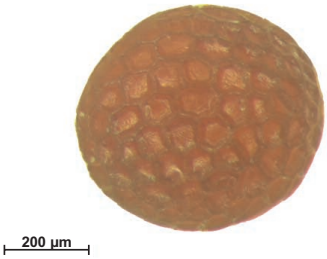
Subgroup b

Erica abietina (8)

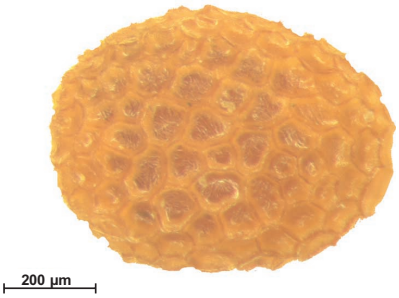


Erica kogelbergensis (13)

Erica doliiformis (19)



Erica sitiens (61)



Erica pageana (64)

Erica insignis (102)

Erica carnea (130)

Subgroup c

Erica borboniifolia (93)

Erica taxifolia (96)

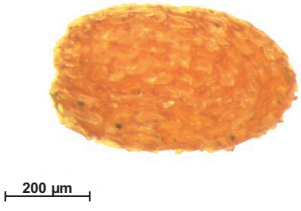
Group VI

Subgroup a

Erica maximilianii (12)

Erica erigena (132)

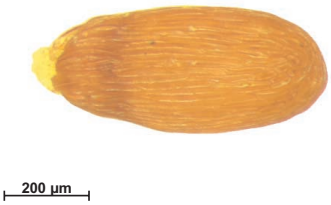
Subgroup b



Erica petrophila (47)

Group VII

Subgroup a

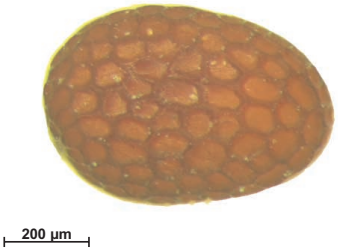


Erica brevifolia (106)

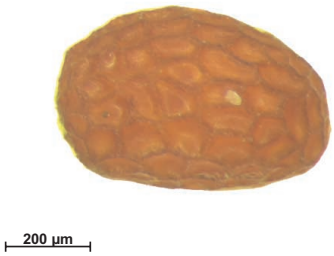
Group VIII

Subgroup a

Erica tomentosa (40)

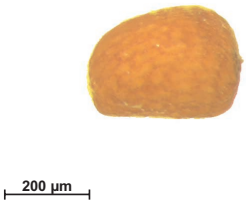


Erica parilis (74)



Erica thunbergii (123)

Subgroup b

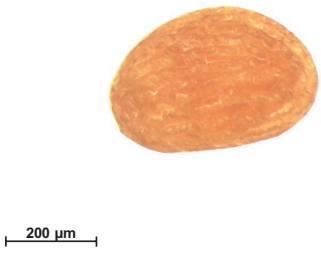


Erica woodii (76)

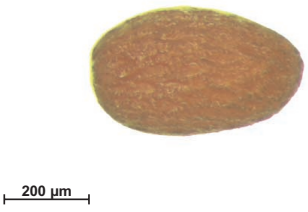
Group IX

Subgroup a

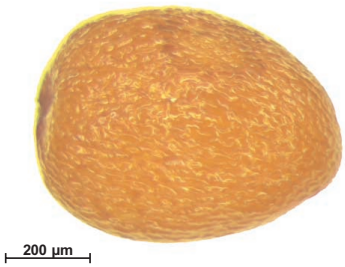
Erica peziza (38)



Erica ovina (39)

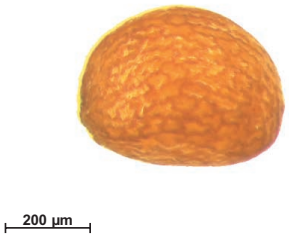


Erica rubens (60)

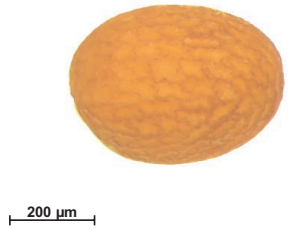


Erica jacksoniana (114)

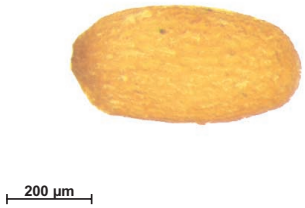
Subgroup b



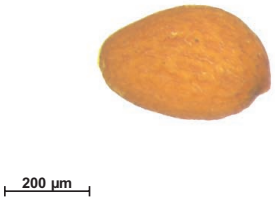
Erica algida (42)



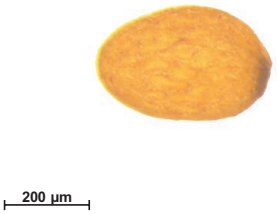
Erica nubigena (66)



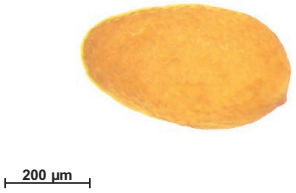
Erica argentea (110)



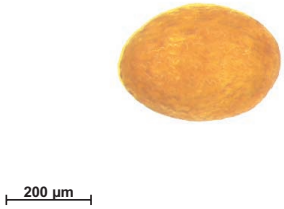
Erica melanthera (120)



Erica newdigatea (121)



Erica microdonta (125)



Erica nyassana (126)

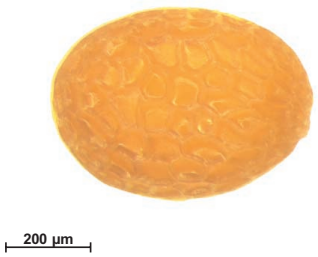
Erica scoparia (134)

Subgroup c

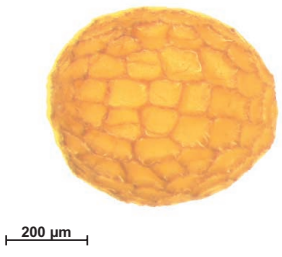
Erica nabea (101)

Group X

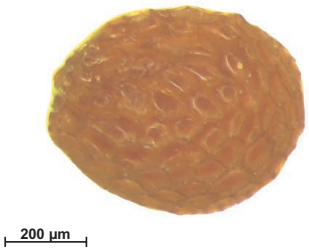
Subgroup a



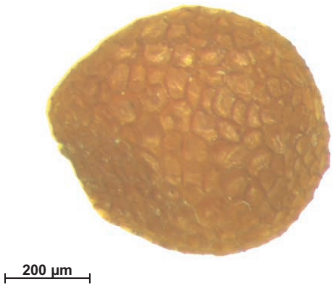
Erica tenella (63)



Erica columnaris (73)

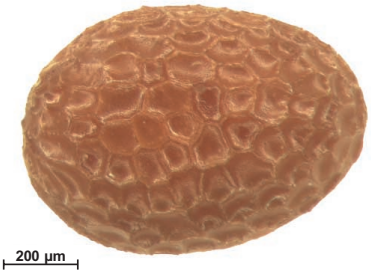


Erica canaliculata (122)

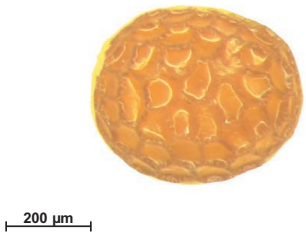


Erica vagans (136)

Subgroup b



Erica sacciflora (11)

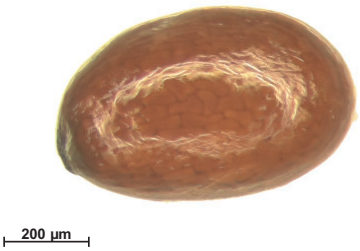


Erica axilliflora (75)

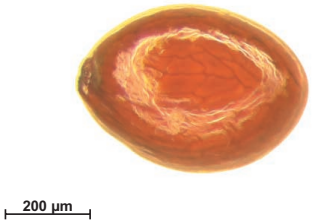
Erica cooperii (83)

Group XI

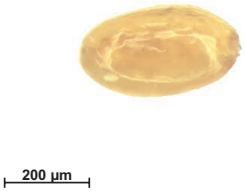
Subgroup a



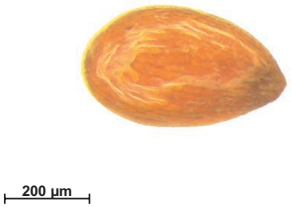
Erica coccinea (1)



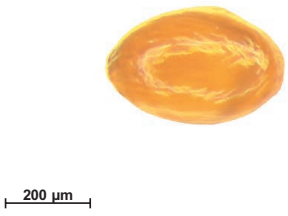
Erica intermedia (2)



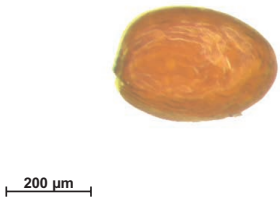
Erica bicolor (58)



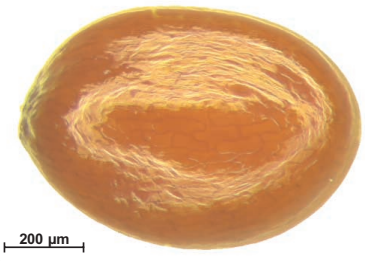
Erica cumuliflora (87)



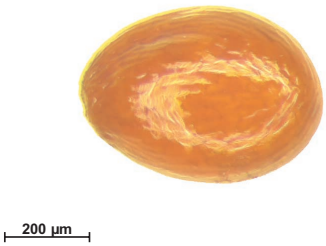
Erica lasciva (91)



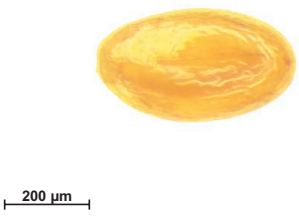
Erica accommodate (92)



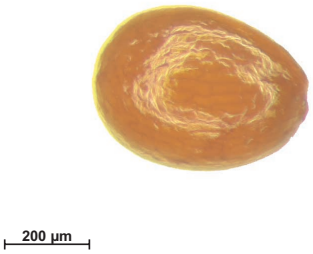
Erica monsoniana (99)



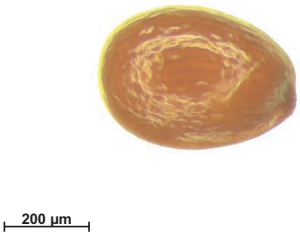
Erica tegulifolia (103)



Erica selaginifolia (105)

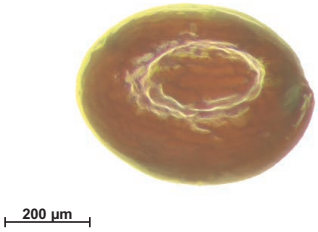


Erica rhodanta (108)

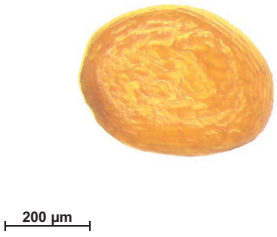


Erica calycina (111)

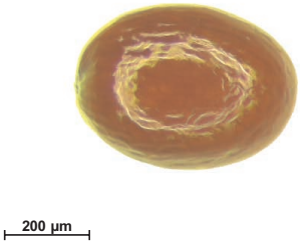
Erica pseudocalycina (112)



Erica floccifera (113)

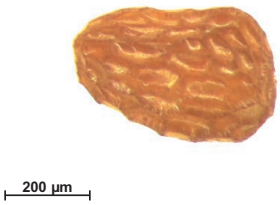


Erica uysii (115)

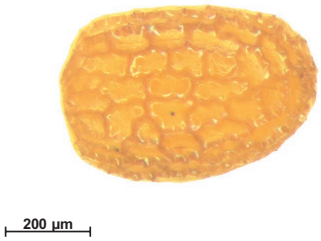


Erica gillii (119)

Subgroup b



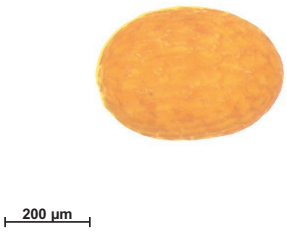
Erica rubiginosa (54)



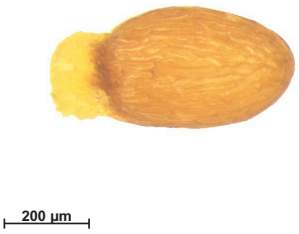
Erica rehmii (62)

Erica kirstenii (100)

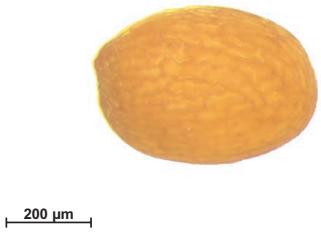
Subgroup c



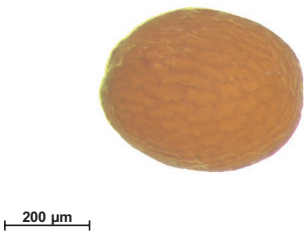
Erica pyxidiflora (72)



Erica tenuis (80)

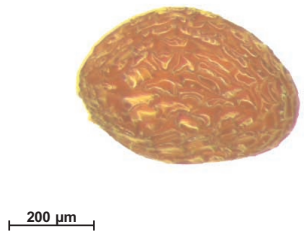


Erica sparsa (107)



Erica peltata (109)

Erica benguelensis (124)



Erica whyteana (128)

Group XII

Subgroup a

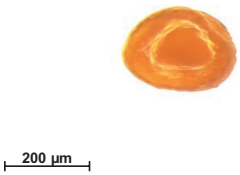
Erica banksii (4)

Erica obtusata (53)

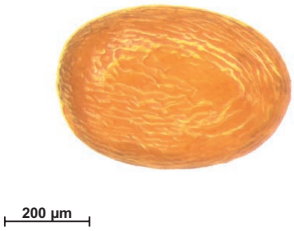
Erica arborea (129)

Erica multiflora (133)

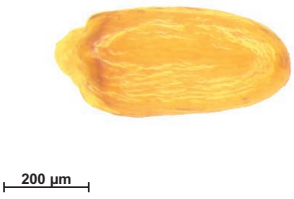
Subgroup b



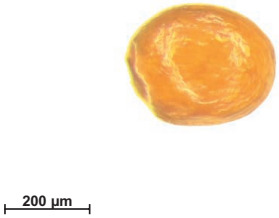
Erica oreophila (45)



Erica paniculata (57)



Erica karooica (79)



Erica cristiflora (118)

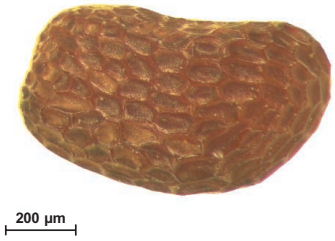
Subgroup c

Erica albens (34)

Erica tetragona (35)

Group XIII

Subgroup a

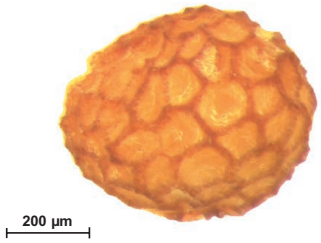


Erica plukenetii (3)

Erica viridiflora (5)

Erica unicolor (14)

Erica versicolor (15)

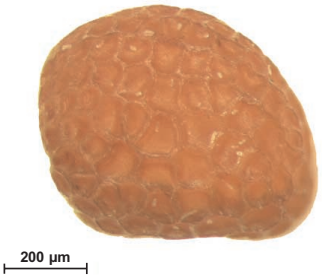


Erica brachycentra (46)

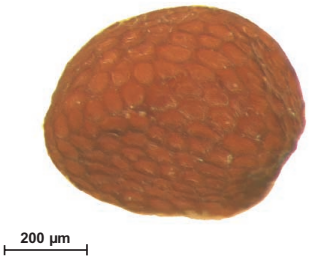
Erica umbelliflora (67)

Subgroup b

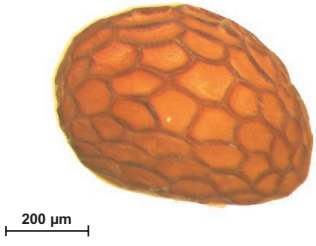
Erica patersonii (10)



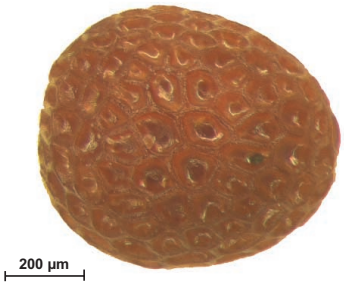
Erica strigilifolia (17)



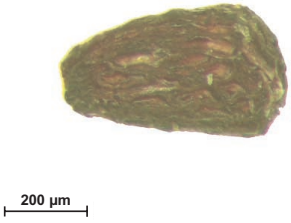
Erica oatesii (21)



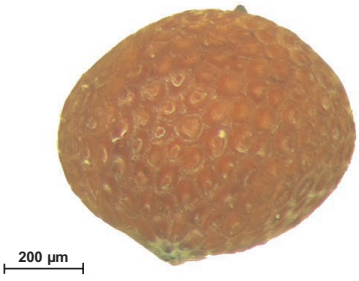
Erica cerinthoides (22)



Erica vallis-gratiae (33)



Erica carduifolia (71)

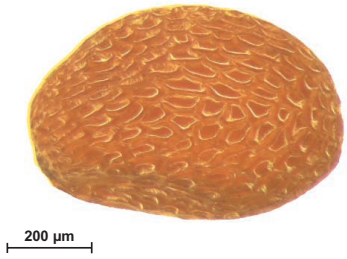


Erica senilis (85)

Erica cinerea (131)

Subgroup c

Erica sparrmanii (18)



Erica oresigena (43)

Group XIV

Subgroup a

Erica coarctata (77)

Erica physantha (90)

Subgroup b

Erica palliiflora (97)

Erica baccans (104)

Erica trimera (127)

Subgroup c

Erica conferta (52)