

MICROMORPHOLOGICAL ASPECTS REGARDING THE LEAVES ON SOME ROSES WITH EMPHASIS ON SECRETORY GLANDS

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Abstracts: The multicellular glands, the epicuticular wax and the tector hairs observed on the leaves are influenced usually by genetic constitution.

The paper investigating 8 genetically related varieties: 'Foc de Tabără', 'Luchian' 'Paprika', 'Coup De Foudre', 'Independence', 'M-me A. Meilland', 'Cocktail', 'Laminuette'.

The micromorphological studies evidencing some characters with a certain value for diagnosis. These may be used in investigation concerning to the identification when the flower is absent.

Our study underlines micromorphology aspects of glands, epicuticular wax and tector hairs. All of them were been examining through scanning electron microscopy method.

Key words: rose varieties, secretory glands, epicuticular wax, leaves micromorphology

Introduction

Micromorphological aspects on the vegetative shoots of *Rosa* genus have been investigated in the last years preponderant to the botanic species and less to the culture varieties of these species [Adumitresei & al., 2009; Caissard et al., 2006; Hashidoko, 2001; Ritz & Wissemann, 2003; Werlemark et al., 1999; Wissemann, 2000]. Investigations refer especially to the species used in the perfumes industry (*R. damascena*, *R. moschata*, *R. gallica*, *R. rugosa*), and to the species from *Caninae* sub-section that have a special type of meiosis (named equilibrated heterogamy). These species belong to a polyploid series ($2n = 28, 35, 42$) and have a preponderant maternal heredity [Tackholm, 1920, 1922; Blackburn & Harrisson, 1921 din Krüssmann, 1986]. These facts determined Wissemann to conclude that the epicuticular wax is transmitted by maternal line [Werlemark et al., 1999; Wissemann, 2000].

The studied varieties from our country are in fact introgressive hybrids presenting polyphyletic and heterogeneous origins, characterized by $2n = 28$ ($x = 7$), typical meiosis and characters that are mendelian transmitted [Adumitresei et al., 2009; Cairns et al., 2000; Wagner, 2002; Krüssmann, 1986].

Material and methods

We investigated two romanian types with same genealogy – 'Foc de tabără' and 'Luchian', direct genitors of them ('Paprika' and 'Coup de Foudre'), two representative of their ascending-line up to the fourth generation ('Independence' and 'M-me A. Meilland') and two other types which have common ancestors with these ('Cocktail' and 'Laminuette').

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In fact, all types are introgressive hybrids (fertile hybrids from F1 are crossing for many times either with one of those parents or even with both parents with the view to fix of some characteristics):

- 'Foc de Tabără' (F, ST. Wagner, 1970): Paprika x Coup de Foudre;
- 'Luchian' (F, St. Wagner, R Paloxay, 1972): Paprika x Coup de Foudre;
- 'Paprika' (F, Meilland, 1956): Markenland x Red Favorite;
- 'Coup De Foudre' (F, Hemeray- Aubert, 1956): [(M-me A. Meilland x Independence)] x Oiseau de Feu;
- 'Independence' (F, Kordes, 1951): F2 seedling (Baby Chateau x Crimson Glory);
- 'M-me A. Meilland' (Th, Meilland 1945): (George Dikson x Souv. de Claudius Pernet) x Margaret Mc Gredy;
- 'Cocktail' (Po, Meilland, 1961): [(Independence x Orange Triumph) x Phillis Bide];
- 'Laminuette' (F, Lammerts, 1969): M-Me Meilland x Rumba [4, 14].

The plant material was collected "Anastase Fătu" Botanical Garden Iasi in June 2009.

Scanning electron microscopy (SEM) investigations – Portions of leaves, rachis and stipules were fixed in FEA in ethanol 50% for 48 hours, stored in 70% ethanol [Johansen, 1940]. After dehydration in a graded ethanol series, the material was critical point dried with CO₂, sputter-coated with a thin layer of gold (30 nm) and, finally, examined in a scanning electron microscopy (Tescan Vega II SBH) at an acceleration voltage of 27.88 kV.

Results and discussions

Leaves are odd-pinnate with 5-7 firm leaflets, with individual leaflets broadly elliptic. Leaf edges are serrated, usually with gland-tipped teeth.

'Foc de tabără' and 'Luchian' shows numerous similarities from micromorphological point of view (Fig 1). The epicuticular wax of the lower epidermis consists in membranous platlets [Barthlott et al, 1998] or triangular rodlets [Wissemann, 2000] (Fig 1 A, D). Stalked glands occur along the margin of the leaflets and on their mid ribs, on the rachis and at on the stipules margins. The glands have two types of secretory heads – subglobulose and pyriform elongated (Fig. 1 B, C, E). All the glands begin secretion when the leaf is still very young, and secretion continues during leaf expansion (mature gland are observed even on young leaves parts). These glands produce a sticky epicuticular secretion on the leaf surface. In the same time, scattered tector hairs, longs, flexuous, unicellular, could be observed (Fig. 1 B, C, E).

The cuticle which cover the lower epidermis of Paprika leaflets is quite smooth, without specific epicuticular wax (Fig 2A). The glands are of two types: some one long, pyriform elongate shaped secretory part and some one short, with the secretory subglobulose; the last ones appears as basal ramifications of the longest ones (Fig. 2B). The central part of the subglobulose secretory gland is visible prominent (Fig. 2 C).

The 'Coup de Foudre' cuticle (from the lower leaflet epidermis) show specific epicuticular wax (Fig. 2 D). The glands are short, with globular secretory part (Fig 2 E) or longer, with elongated secretory part (Fig. 2 F). The phenomenon of branching of the gland is still visible, but lower than in 'Paprika'.

The 'Independence's' leaflet shows very rough epicuticular wax on lower epidermis (Fig. 3, A). The same types of glands as in previous cases could be observed (Fig. 3 B).

On the contrary, 'Coktail' leaflets have more smooth epicuticular wax (Fig. 3 C). The all present glands are short, un-branched (Fig. 3 D, F). On the central part of the globular glands visible pores (probably implicated in the release of the secreted products) could be observed (Fig. 3 E).

'Mme Meilland' leaflets show a visible triangular rodlets (Fig. 4 A). The glands have long or short stalk, but only globular secretory parts (Fig. 4 B, C). 'Laminuette' leaflet presents epicuticular waxes to be characterised by a granule wax type (Fig. 4 D). The gland types are very similar with the ones of 'Mme Meilland' (Fig. 4 E, F).

The gland types are usually two: short, with subgobular – globular or pyriform secretory part in 'Foc de tabără', 'Luchian', 'Independence' and 'Coup de foudre'; long, branched with the same two kinds of secretory parts in 'Independence' and 'Coktail'. In 'Mme Meilland' and 'Laminuette' only glands with globular secretory part could be observed.

The majority of the investigated varieties show rough epicuticular was, with triangular rodlets more or less accentuated. 'Paprika' show smooth epicuticular surface and 'Laminuette' presents granule wax type. In *Rosa* genus – sect. *Caninae* the taxons develop the maternal type of wax structure due to the matroclinal inheritance [Werlemark et al., 1999], excepting 'Laminuette' variety [Ritz & Wissemann, 2003]. The wax type of the roses is influenced usually by the genetic constitution and not by environmental influences [Wissemann, 2000].

Thus, both types 'Foc de tabără' and 'Luchian' have two times the 'M-me A. Meilland' type in their "short genealogy" both for paternal line and maternal line, and just one time 'Paprika', 'Independence' and 'Coup de Foudre' types.

The glands, present all around the border, are there "by inheritance" from ancestral species and they are more frequent at types which have their genealogy either on *R. foetida* ('M-me A. Meilland', 'Paprika', 'Laminuette', 'Coup de Foudre', 'Luchian', 'Foc de Tabără' and 'Independence'), or *R. moschata* ('Cocktail', 'Coup de Foudre', 'Independence', 'Laminuette', 'Paprika', 'Luchian' and 'Foc de Tabără').

The glands could have a different morphology because, besides common ancestors which were been already mentioned or not (*R. chinensis*, *R. damascena*, *R. gallica*, *R. multiflora*), some of these types have either *R. roxburgii* ('Laminuette', 'Paprika', 'Foc de Tabără' and 'Luchian') or *R. setigera* ('Laminuette') inside of the ascending line.

Conclusions

'Foc de tabără' and 'Luchian' have many similarities from micromorphological point of view:

- 1) the epicuticular wax of the lower epidermis consists in membraneous platlets or triangular rodlets;
- 2) stalked glands occur along the margin of the leaflets and on their mid ribs, on the rachis and at on the stipules margins. The glands have two types of secretory heads – subglobulose and pyriform elongated.
- 3) All the glands begin secretion when the leaf is still very young, and secretion continues during leaf expansion (mature gland are observed even on young leaves parts).
- 4) These glands producing a sticky epicuticular secretion on the leaf surface.
- 5) Scattered tector hairs, longs, flexuous, unicellular, could be observed.

The gland types are usually two: short, with subgobular – globular or pyriform secretory part in ‘Foc de tabără’, ‘Luchian’, ‘Independence’ and ‘Coup de foudre’; long, branched with the same two kinds of secretory parts in ‘Independence’ and ‘Coktail’. In ‘Mme Meilland’ and ‘Laminuette’ only glands with globular secretory part could be observed.

The majority of the investigated varieties show rough epicuticular wax, with triangular rodlets more or less accentuated. ‘Paprika’ shows smooth epicuticular surface and ‘Laminuette’ presents granule wax type.

‘Laminuette’ variety develop epicuticular due only through parthenal line.

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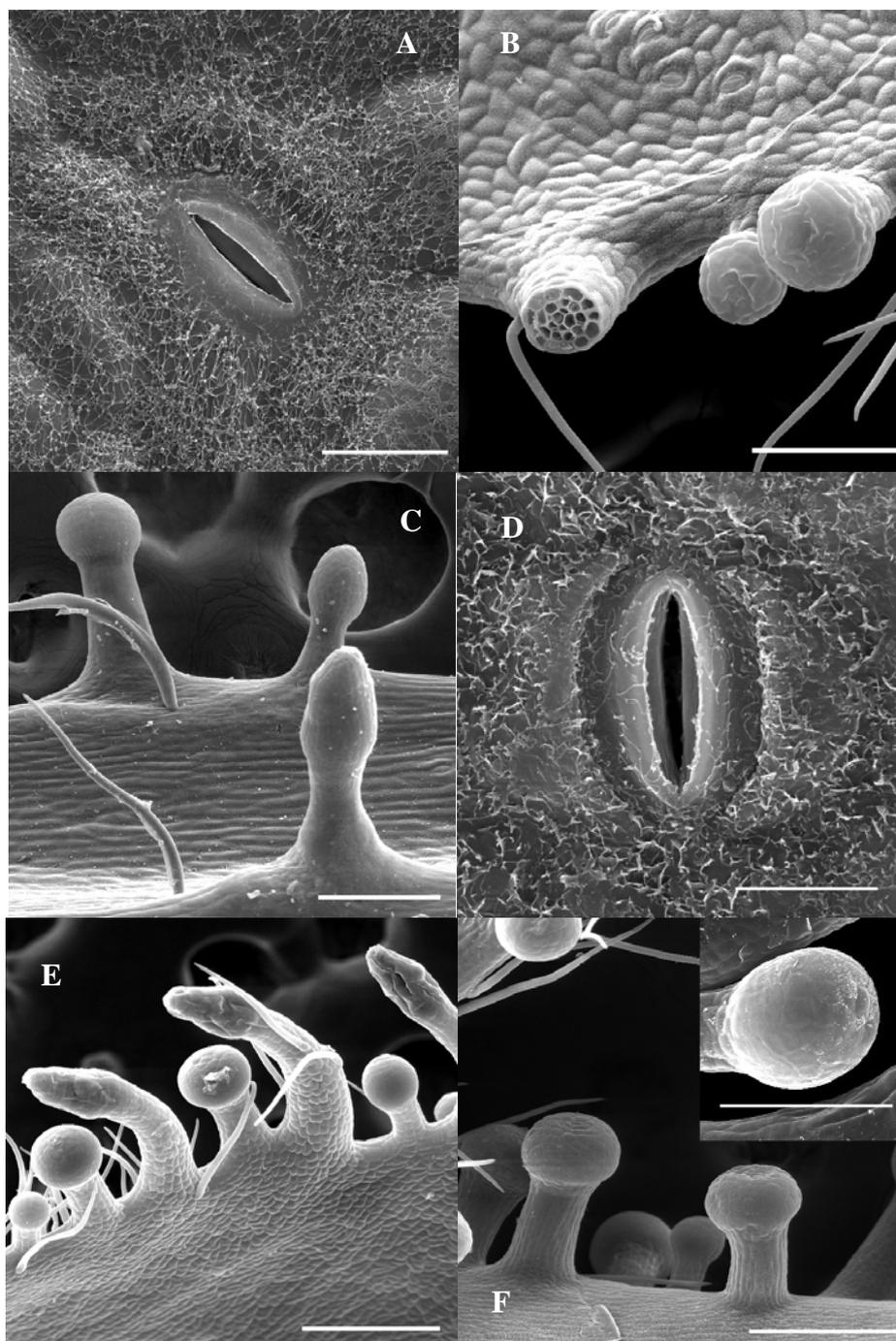


Fig. 1. *Foc de tabara*: A – young leaflet, lower epidermis, scale bar - 20 μm , B – young stipule – 100 μm , C – rachis - 200 μm , *Luchian*: D – young leaflet, lower epidermis, scale bar - 20 μm , E – young stipule - 200 μm , F – rachis – scale bar - 200 μm (down) - 100 μm (up)

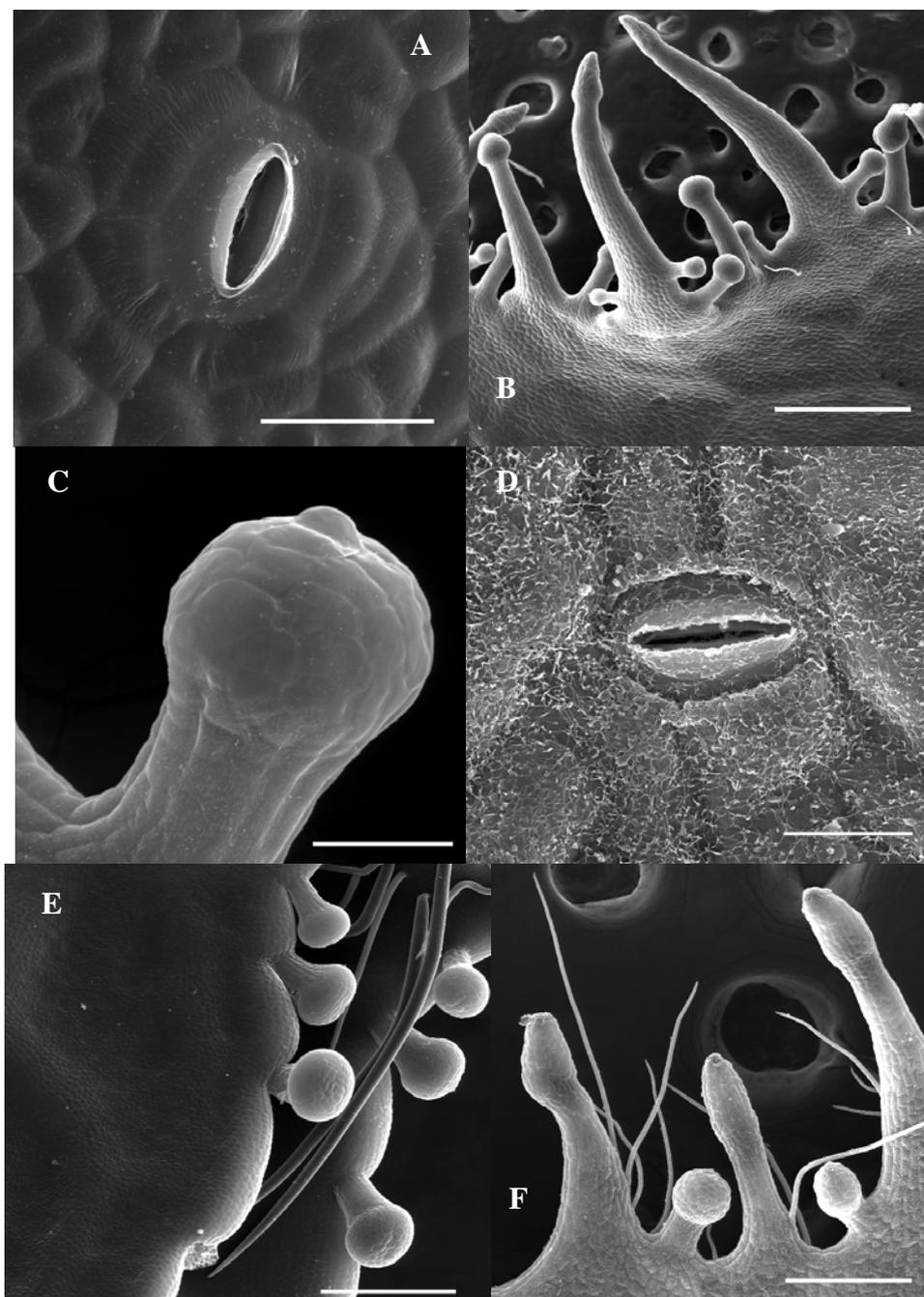


Fig 2. *Paprika*: A – young leaflet, lower epidermis, scale bar - 20 μm , B – young stipule - 500 μm , C – young stipule - 50 μm , *Coup de Foudre*: D – young leaflet, lower epidermis, scale bar – 20 μm , E – margin of the young leaflet, scale bar - 200 μm , F – young stipule - 200 μm

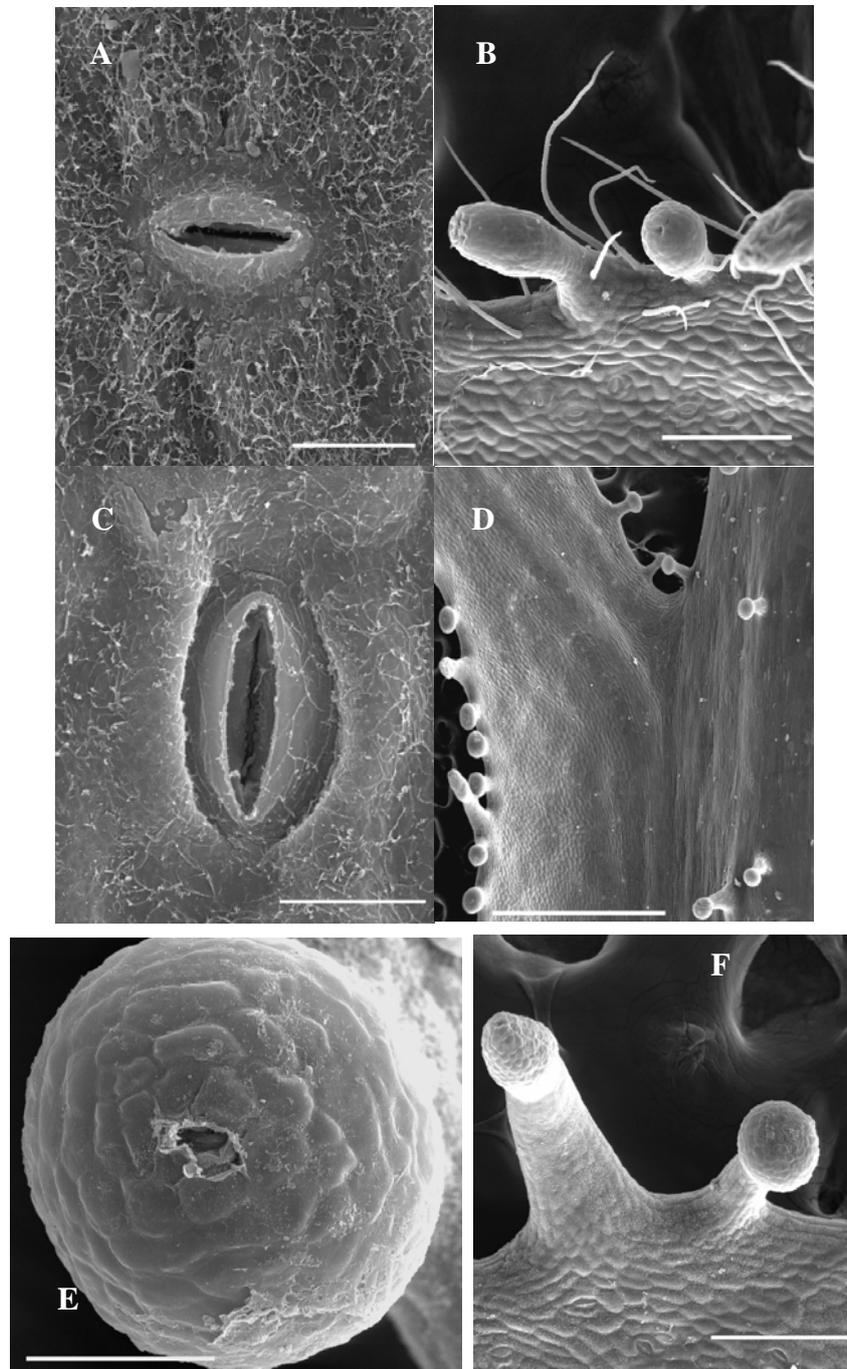


Fig. 3. Independence: A – leaflet, lower epidermis, scale bar - 20 μm , B – stipule - 200 μm , *Coktail:* C – leaflet lower epidermis, scale bar - 20 μm , D – mature stipule – 1 mm, E – gland from mature stipule - scale bar - 50 μm , F – two gland types from young stipule - scale bar - 200 μm

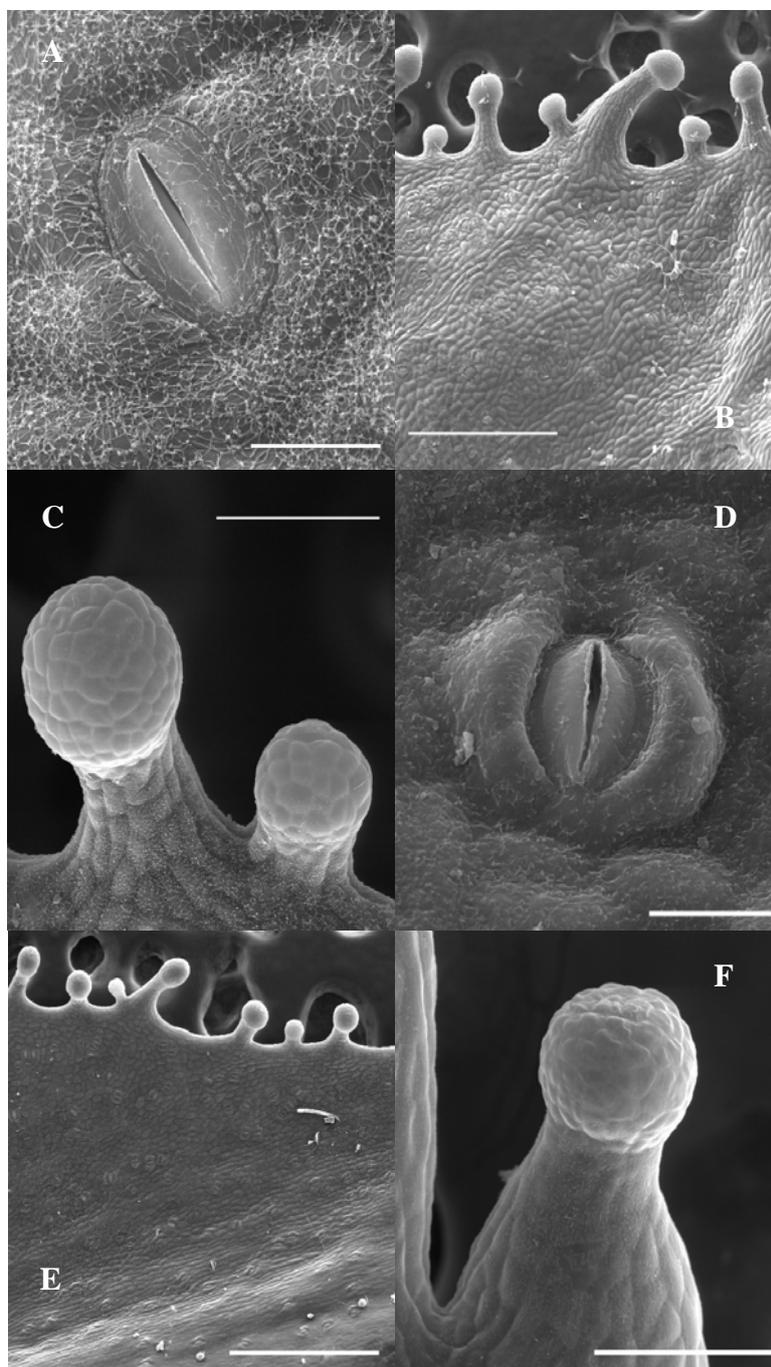


Fig. 4. *M-me Meillant*: A – leaflet, lower epidermis, scale bar - 20 μm, B – stipule - 400 μm, C - glands from young stipule - scale bar - 200 μm, *Laminuette*: D – leaflet, lower epidermis, scale bar - 20 μm, E - glands from young stipule - scale bar - 200 μm, F – gland from the margin of the leaflet, scale bar - 50 μm