

The Northwest European Pollen Flora, 42

VERBENACEAE

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Literature

El-Gazzar and Watson (1970), Erdtman (1952), Erdtman et al. (1963), Faegri and Iversen (1975), Gibon (1950), Heusser (1971), Markgraf and D'Antoni (1978), Moore and Webb (1978), Nair and Rehman (1962), Raj (1983), Serbanescu-Jitariu and Mitroiu (1973).

Introduction

The Verbenaceae is a large family with up to 98 genera and about 2600 species. These are distributed worldwide, but with a concentration in tropical and subtropical regions. Only one genus occurs in Western Europe, *Verbena officinalis*.

One term, already used in previous parts of the NEPF is of special interest here. Its definition is as follows:

H-endoaperture: A composite endoaperture, consisting of a central part which connects two lateral, longitudinally elongated extensions (arms), thus forming an H (Punt and Nienhuis, 1976).

The equatorial diameter (E) of the pollen is measured without the fastigium. The fastigium in *Verbena* is protruding to a considerable, but variable, extent and this could mean, that measurements of E would also vary considerably. Consequently, to avoid inconsistency, and to ensure comparable measurements of the E, parameters of the fastigium have been excluded.

Specimens examined

All specimens listed here are housed in the herbarium of Utrecht (U).

Verbena officinalis L. — England: Sloet 18; France: Exc. Biol. Stud. Utrecht 1961–1703; Germany: Behrendsen s.n.; The Netherlands: Colaris s.n., Fresh Material, Punt, Anno 1957.

Description of the pollen type

***Verbena officinalis* type**

Pollen class: 3-Zonocolporate

P/E ratio: Usually slightly subtransverse, sometimes slightly semitransverse, adequate or slightly suberect.

Apertures: Ectoaperture — colpus; very narrow, of medium length, sunken; margins irregular; ends acute, often very irregular (e.g. forked); colpus membrane not visible; costae colpi absent; fastigium distinct, high but narrow. Endoaperture — a complex H-like thinning consisting of a lalongate, colpus-like central part, two narrow, lateral thinnings (arms) which run longitudinally and which are about as long as the colpus or join above the colpus.

Exine: Thick. Sexine usually thinner than nexine; nexine is very thick at mesocolpium and under the colpus, only slightly thinner at poles. Sexine 1 is a narrow layer without distinct columellae; sexine 2 a distinct tectum.

Ornamentation: Tectum is smooth except in the mesocolpium. In the middle of the mesocolpium usually an irregular ornamentation of narrow depressions and small raisings are visible, thus forming a rugulate pattern of irregular shape. This ornamentation is hardly visible with LM.

Outlines: Equatorial view — elliptic or sometimes circular. Polar view — angular with flat or intruding colpi. Sides usually concave, or

when the mesocolpial elements are small, convex; angles obtuse or slightly flattened.

Measurements: Glycerine jelly — P 24.0–(26.0)–29 µm, E 25.0–(27.5)–30.0 µm, P/E ratio 0.84–(0.95)–1.07; exine 1.5–3.5 µm; apocolpium index 0.30–(0.45)–0.50. Silicone oil — P 19.0–(22.0)–26.0 µm, E 20.0–(24.5)–28.0 µm, P/E ratio 0.79–(0.80)–1.03.

Species: Verbena officinalis

Comments

Literature concerning pollen of Verbenaceae is infrequent, that of *Verbena officinalis* even scarce and those available give rather bad information. It is surprising that the H-endoaperture in *Verbena* has not previously been properly described. Nair and Rehman (1962) described the arms of the H in *Verbena officinalis* as "a small width marking a pseudocolpus round the colpus"; Markgraf and D'Antoni (1978) in *Verbena junipera* as "margo, frequently joined across the poles", however, their photographs of that margo look very much like the H in *Verbena officinalis*.

The H-endoaperture is not only found in Verbenaceae, but also in Cornaceae (Ferguson, 1978), Gentianaceae (Punt and Nienhuis, 1976) and in a few families not yet described (Vochysiaceae, Garryaceae). Ferguson gives a detailed description of the H-endoaperture in the Cornaceae (the genera *Cornus*, *Curtisia* and *Mastixia*) where the arms of the H are not formed by the complete absence of the nexine, as in *Verbena* but by the reduction of the nexine.

Some authors apparently did not recognize the complexity of the apertures. Erdtman (1952) described colpoid meridional streaks near colpi margins, whereas Gibon (1955), describing *Verbena officinalis* in only a few lines, states, that its pollen has "three pores, projecting".

Faegri and Iversen (1975) and Moore and Webb (1978) called pollen of *Verbena* heterocolpate, which in our opinion is not correct and, moreover, they described the aperture-complex wrongly. Faegri and Iversen recognized "9 meridional fissure like furrows in three groups, the central furrow of each group

crossed by a transverse furrow; the lateral furrows within each group may fuse at the ends", Moore and Webb "three porate colpi and six nonporate colpi, the nonporate colpi situated on either side of a porate colpus". Also Nair and Rehman (1962), in a small drawing, situated a pseudocolpium in the area around the colpus between the places where the arms of the H lay under the sexine. In our opinion, *Verbena officinalis* pollen is 3-zonocolporate with complex endoapertures (H-endoapertures) rather than heterocolpate. This opinion is in agreement with that of Raj (1983) who described a *Verbena* type, but as the description is mainly based on SEM-micrographs, features of the endoaperture are hardly mentioned. Probably his description of "transparent colpoid streaks in the mesocolpium" represents the arms of the endoaperture.

Little has been published concerning the ornamentation in the mesocolpium. Raj (1983) gives a description of the mesocolpium being an "oval-shaped depression". His pictures, on the other hand, distinctly show some kind of irregular ornamentation. These sexine-elements in the middle of the slightly sunken area may belong to the harmomegathical system.

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Plate descriptions (all figures × 2000)

PLATE 1 (p.78)

Verbena officinalis L. (figs.1,3, 5–6, Behrendsen s.n.; figs.2,4, Sloet 18)

1. SEM micrograph; polar view.
2. SEM micrograph; oblique view, ornamentation mesocolpium.
3. SEM micrograph; equatorial view, ornamentation mesocolpium
4. Polar view, lateral thinnings of H-endoaperture join at colpus ends.
5. Polar view, cross-section, irregular ornamentation in mesocolpium present.
6. Equatorial view, distinct fastigium visible.

PLATE 2 (p.79)

Verbena officinalis L. (figs.1–5, Behrendsen s.n.; fig.6, Sloet 18)

1. Distinct fastigium at high focus.
2. Fastigium at slightly lower position with an indistinct colpus.
3. Colpus in the middle of the central part of the H-endoaperture.
4. Central part of the H-endoaperture at lower focus.
5. Mesocolpium with irregular ornamentation.
6. Distinct lateral thinnings of the H-endoaperture about as long as the less distinct colpus.

PLATE 1 (*Verbena officinalis* type: *V. officinalis*)

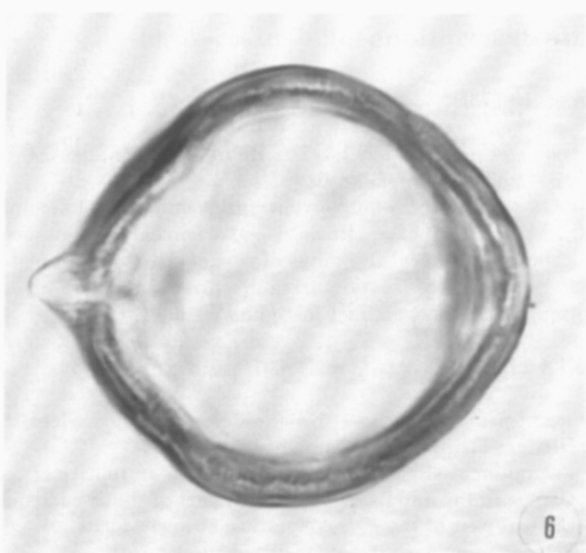
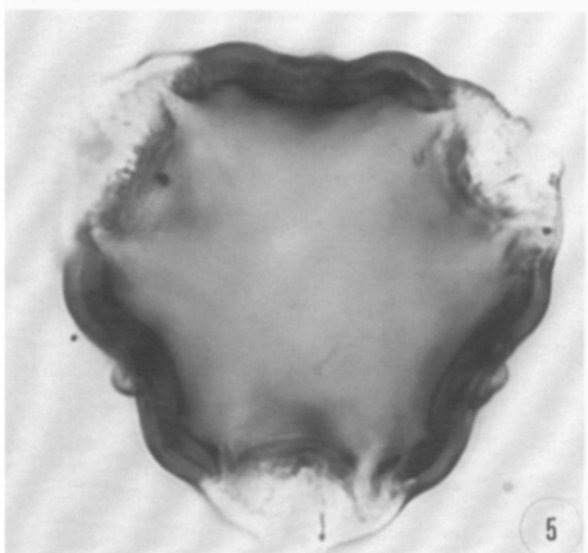
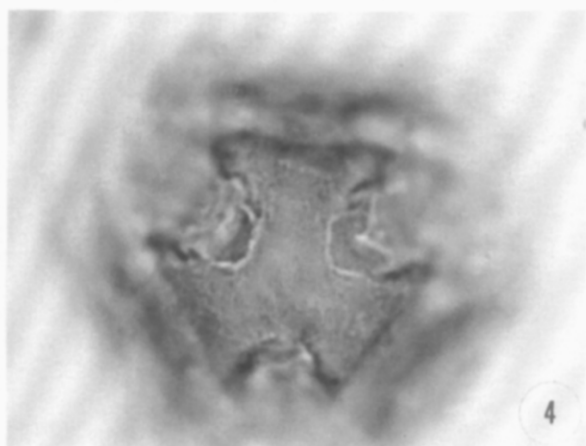
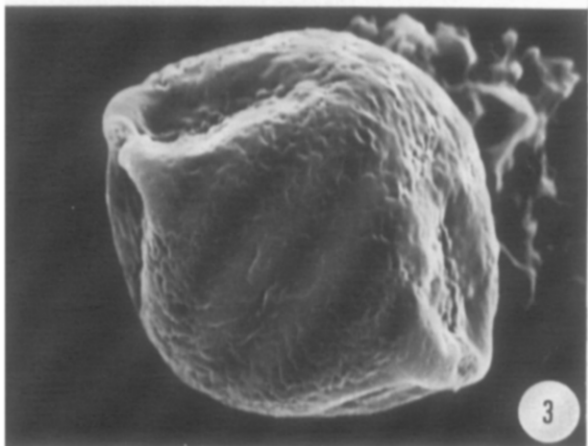
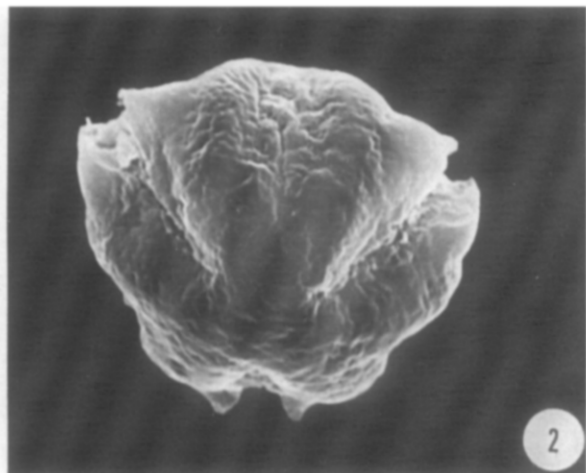
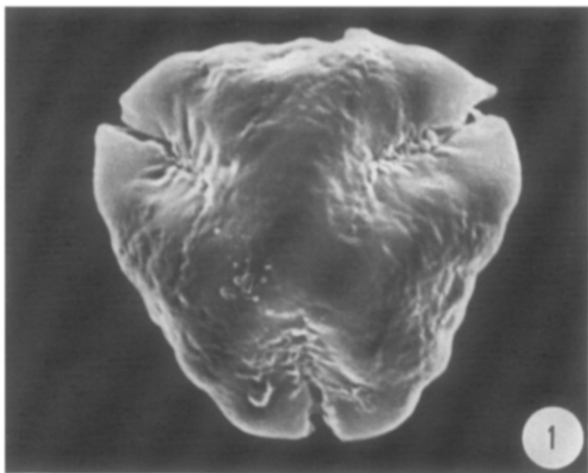


PLATE 2 (*Verbena officinalis* type: *V. officinalis*)