Notes on Pollen Morphology of Trochodendron aralioides

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Sei-ichiro TSUJI* and Mariko MATSUSHITA** : Notes on Pollen Morphology of *Trochodendron aralioides*

辻 誠一郎*・松下まり子**：ヤマグルマの花粉形態について

Abstract

We observed pollen grains of *Trochodendron aralioides* mounted in glycerol-jelly and silicone oil under the light microscope, and described the pollen morphology including minute sculpturing and structure after swelling in glycerol-jelly. Pollen grains are tricolpate with semitectate exines and reticulate sculpturing which changes into discontinuous or granular sculpturing and forms the margo in the furrow marginal area. The ektexinous granules of various sizes and shapes sparsely cover the ektexinous furrow membrane, and resemble columellae in its arrangement and form. The distinct symplicolmellae exist only under the muri. Grain size and P/E ratio increase after swelling in glycerol-jelly is similar to those of other colpate or colporate pollen grains.

Key Words: LO-pattern—Pollen morphology—Size modification—*Trochodendron aralioides*

Trochodendron, a monotypic genera including *T. aralioides* SIEB. et ZUCC., is mainly distributed in the warm-temperate area of the Japanese Archipelago south from Yamagata Prefecture, Korea, and Taiwan. There are several studies on pollen morphology of this species (NAST and BAILEY, 1945; PRAGLOWSKI, 1975 etc.), because of taxonomical interest as one of the primitive vesselless angiosperms. However, there is no study on fossil pollen morphology or floral history by pollen analysis except for the only one report on the Holocene vegetation history in Yakushima Island by TAKEOKA and TORII (1982). Such neglect is due to the smaller pollen grains and their fine sculpturing and structure.

TSUJI (1986) suggested that swelling such materials is an effective method of observation. In this paper, the sculpturing and structure observation under light microscopy and the size modification of modern pollen grains after swelling in glycerol-jelly are described.

Materials and methods

Voucher specimens for the pollen samples are as follows: Mt.Eboshi, Wakayama Pref.; Shuichi NOSHIRO; June 2, 1981; TOFO (NOSHIRO no.38). Tashiro, Shigaraki, Shiga Pref.; S. TSUJI; June 12, 1986; OSCU (TSUJI no.936). Botanical Garden of the Osaka City Univ., Kisaichi, Osaka (cultivated); S. TSUJI; May 7, 1988; OSCU (TSUJI no. 1030). Shimogamo, Sakyo-ku, Kyoto (cultivated); S. TSUJI; April 16, 1989; OSCU (TSUJI no.1170). TOFO: The Univ. Museum, the Univ. of Tokyo. OSCU: Faculty of Science, Osaka City Univ.

Pollen used for light microscopy was prepared by standard acetolysis method and was mounted in glycerol-jelly and silicone oil. After swelling the acetolysed materials of NOSHIRO no.38 in glycerol-jelly for one year, the size modification and the detail sculpturing and structure were observed. Pollen samples have been deposited at the Faculty of Science, Osaka City University.

Results

Pollen class and outlines (Fig.1): The pollen grains are tricolpate (tri-zonocolpate), rarely syncolpate with two furrows combined into one continuous rings surrounding the whole grains, open circular in polar view, and suboblate to subprolate (rarely prolate) circular in equatorial view. Shape of syncolpate grains are oblate-spherical to prolate-spherical circular in

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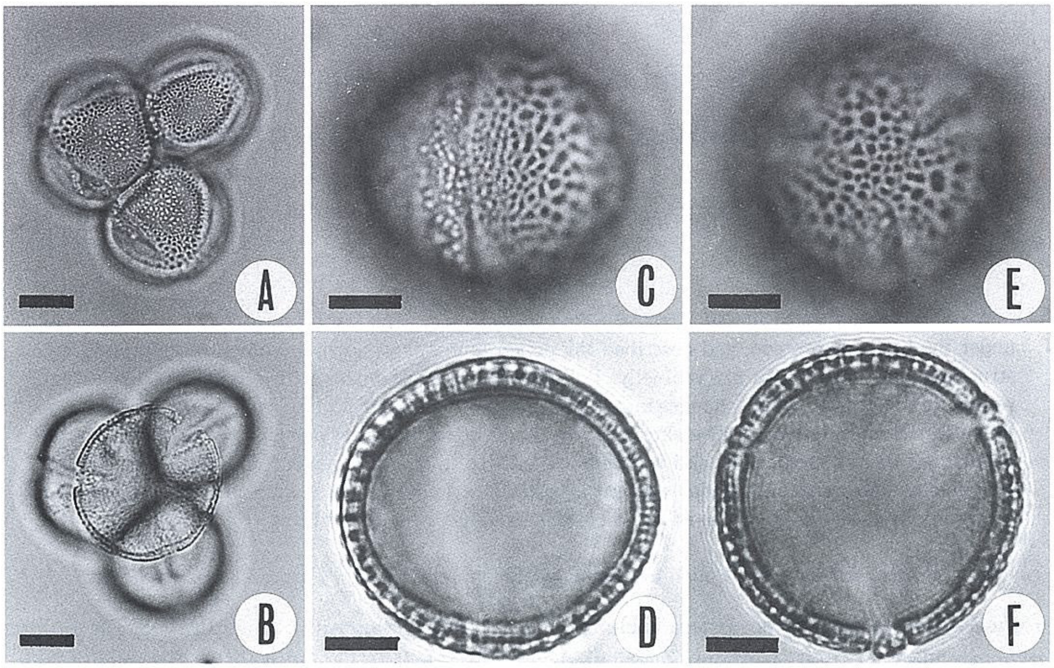

Fig. 1. Pollen grains of *Trochodendron aralioides* from specimens of NOSHIRO no.38, immediately after mounting in glycerol-jelly, under the light microscope. A,B: Tetrad. C,D: Pollen grains in equatorial position. E,F: Pollen grains in polar position. Scale bars show 10 μm for A and B, and 5 μm for C-F.

equatorial view.

Grain size and P/E ratio (Fig.2): Glycerol-jelly—P 18.0-(23.1)-25.5 × E 20.0-(24.3)-27.5 μm and P/E ratio 0.85-(0.95)-1.11, syncolpate grain P 17.5 × E 16.3 μm and P/E ratio 0.99, for NOSHIRO no.38; P 27.5-(34.7)-42.5 × E 25.0-(32.3)-37.8 μm and P/E ratio 0.89-(1.09)-1.39 for NOSHIRO no.38, measured one year after mounting; P 20.0-(21.2)-22.5 × E 22.5-(24.2)-27.5 μm and P/E ratio 0.80-(0.88)-1.00, syncolpate grain P 17.5 × E 19.3 μm and P/E ratio 0.91, for TSUJI no.936; P 23.8-(26.0)-28.0 × E 23.8-(26.1)-28.0 μm and P/E ratio 0.91-(0.99)-1.08 for TSUJI no.1030; P 20.0-(23.0)-25.3 × E 18.8-(24.1)-29.5 μm and P/E ratio 0.90-(0.95)-1.10 for TSUJI no.1170. Silicone oil—P 16.5-(18.5)-20.5 × E 15.3-(18.7)-21.3 μm and P/E ratio 0.86-(0.99)-1.23 for NOSHIRO no.38.

Apertures: Ectoaperture is meridional furrow with ektexinous furrow membrane, without equatorial constriction, 3.3-4.7 μm in width in equatorial area. Endoaperture is meridional furrow with marked resemblance to ectoaperture, without marginal costae. Polar area indices are 0.30-0.33.

Sculpturing and structure (Fig.3): The exine is semitectate with a reticulate pattern, 2-4 μm in thickness. The lumina is smaller towards the furrows and larger in the center of apocolpium and mesocolpium, 2-3 μm in breadth. The apocolpium includes 15-25 lumina. Near the furrows the diameter of lumina is equal to the breadth of muri, sometimes the reticulate pattern changes into discontinuous or granular pattern, and ektexine gradually thins, chiefly at the margo. The reticulum sometimes extends in poleward directions independently of grain size and P/E ratio. The surface of the furrow is sparsely covered with ektexinous granules of various sizes and shapes. The columellae also has variable size and shape, 0.2-0.5 μm in diameter or a maximum 1.3 μm in breadth. There are lines in a distinct symplicolumellate pattern only under the muri. No free columallae are in lumina. The ektexine is thicker than the endexine. The ektexinous furrow membrane is very thin, 0.2-0.5 μm in thickness.

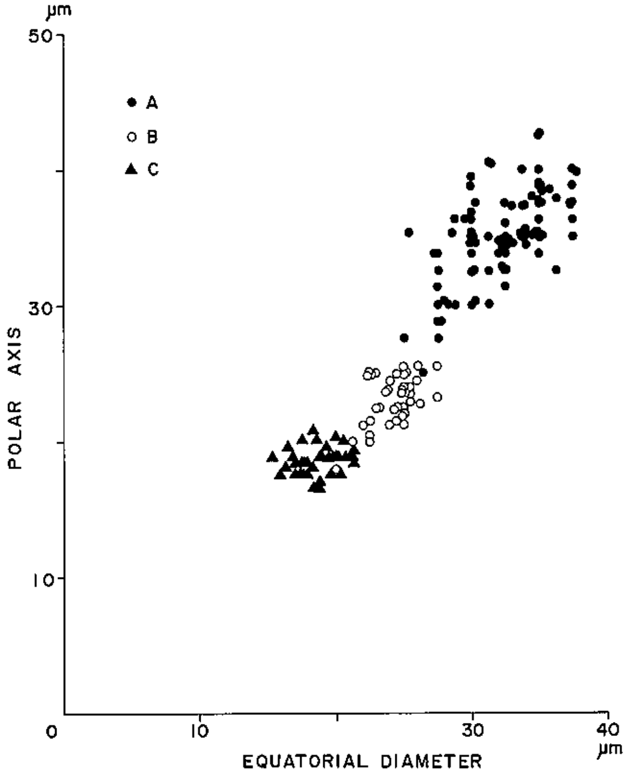

Fig. 2. Size distribution of the pollen grains of *Trochodendron aralioides* from specimens of NOSHIRO no.38. A: Grain size measured after swelling in glycerol-jelly for one year. B: Grain size measured immediately after mounting in glycerol-jelly. C: Grain size in silicon oil.

membrane is very thin, 0.2-0.5 μm in thickness.

Comments

Pollen grains of *Trochodendron* mounted in glycerol-jelly are larger than those in silicone oil, and after swelling an year their P/E ratio and the variation range of size became larger. Pollen swelling via the glycerol-jelly method has been reported in many modern taxa (CHRISTENSEN, 1954; ANDERSEN, 1960; TSUJI, 1982, 1986). A P/E ratio increases following the glycerol-jelly method is also reported in pollen grains with several meridional furrows, such as *Platycodon* and *Melia* (TSUJI, 1982, 1986). Though the increase in the variation range is the first report in this paper, it may be inferred that the modification of pollen size and shape in glycerol-jelly would be similar in colpate or colporate pollen grains.

The present observations show that LO-analysis after swelling smaller materials is an effective method for studing minute sculpturing and structure, with special reference to the columellae arrangement and ektexine stratification. Because fossil pollen grains have traditionally been mounted in glycerol-jelly, as single-grain preparations, this method would be most helpful in the identification of fossil pollen grains.

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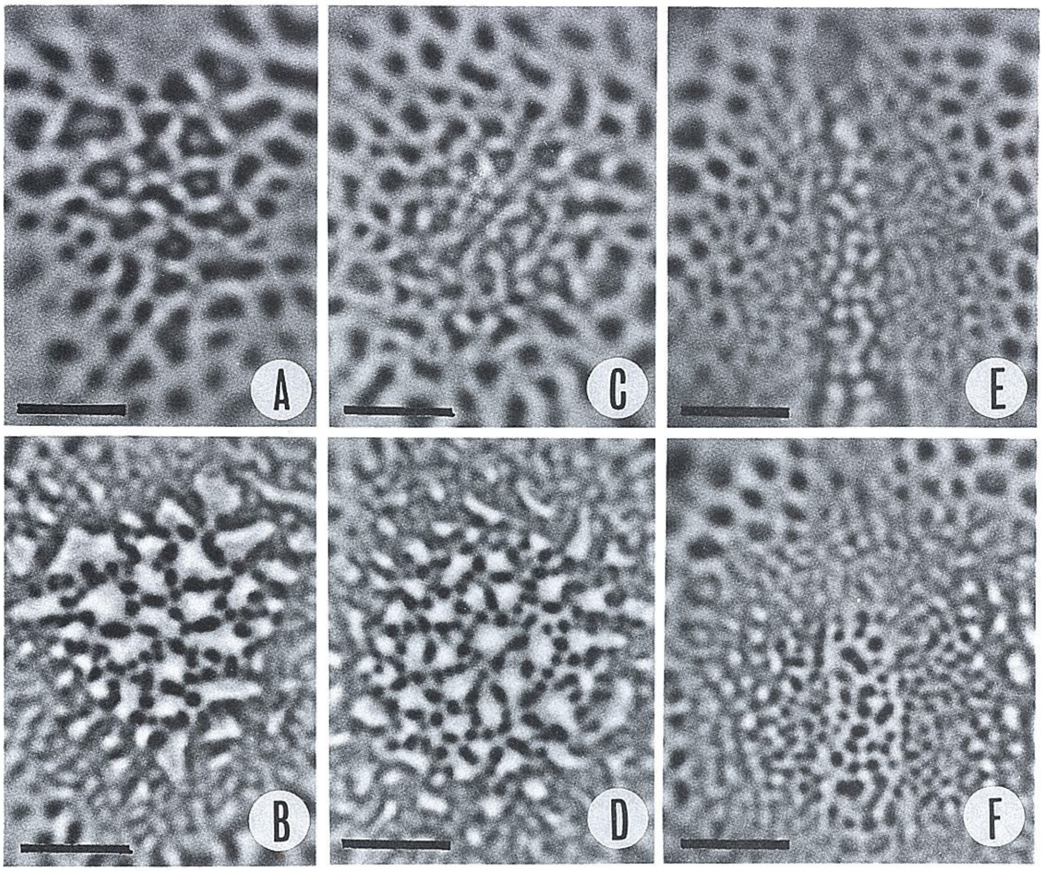

Fig. 3.　Pollen grains of *Trochodendron aralioides* from specimens of NOSHIRO no.38 after swelling in glycerol-jelly for one year, under the light microscope. A,B : LO-pattern of the exine in the apocolpium. C,D : LO-pattern of the exine in the mesocolpium. E,F : LO-pattern of the exine around the furrow. Scale bars represent 5 μm.

摘　要

グリセロール・ゼリーとシリコン・オイルに封入したヤマグルマの花粉を光学顕微鏡下で観察し，グリセロール・ゼリー中で膨張後の花粉彫紋・構造を含む花粉形態を記載した。花粉粒は半複構造の外膜と，溝周辺部で不連続あるいは顆粒状紋に変化しマーゴをつくる網状紋をもつ3溝型である。形・大きさともに変化に富む外層要素の顆粒が外層要素の溝薄膜をまばらに覆う。この顆粒は柱状体の配列・形に酷似する。網状紋の畝の下のみに明瞭な一条の柱状体が配列する。グリセロール・ゼリー中で膨張後に花粉の粒径とP／E比が大きくなるのは，他の溝型や溝孔型花粉粒と同様の傾向である。

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○　池上義信（監修）・石沢　進（編集）**新潟県分布図集　第11集**　植物同好じねんじょ会　（新潟県小千谷市山寺　関省吾方），1990年12月25日発行。A 4 判 96 頁。限定 300 部，頒価（〒別）3,000 円。

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