Upper Cretaceous staminate heads with pollen grains

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ABSTRACT. Tricolpopollianthus burejensis gen. et sp. nov., the staminate heads with tricolpate grains in situ, are described from the Upper Cretaceous of the Amur Basin, Far East of the U.S.S.R.

Different types of angiosperm pollen grains of obscure affinities have been described from Upper Cretaceous and Palaeogene deposits. The discovery of pollen grains within the pollen-bearing structures is of interest in linking the angiosperm mega- and microfossils. Unfortunately, angiosperm fossil flowers are extremely rare. Few fossil flowers with pollen grains have been reported from the Tertiary of Europe and the staminate heads described in this paper are the only ones known so far from the Cretaceous. They have been collected (Krassilov 1971) from the Tsagajan Formation near the mouth of the Bureja River, a tributary of the Amur. The Tsagajan Formation is composed of conglomerates, gravels, and sands containing fossiliferous clay and siltstone lenses. These rocks are of alluvial origin. Dinosaur remains have been collected from the beds somewhat older than the plant-bearing strata. Plant megafossils from Tsagajan Beds have been described by Heer, Kryshtofovich, Baikovskaya, and others. Kryshtofovich (in Kryshtofovich and Baikovskaya 1966) assigned the Tsagajan fossil flora to the Danian stage whereas Bratzeva (1969) advocated a Maastrichtian age on the plant microfossil evidence. The Tsagajan flora comprised about 60 species of conifers and angiosperms. This fossil assemblage was dominated by Sequoia and Trochodendroides and represented a lowland-valley forest of temperate aspect.

Methods. Balsam transfer preparations of heads have been prepared and the stamen fragments have been macerated with HNO₃ and KOH.

SYSTEMATIC DESCRIPTION
Genus TRICOLPOPOLLIANTHUS gen. nov.

Diagnosis. As for species diagnosis below.

Tricolpopollianthus burejensis sp. nov.

Plate 3, figs. 1-13

Diagnosis. Staminate heads, globular, 7-8 mm in diameter borne singly or in spikes. Stamens with inconspicuous filaments and long anthers. Connective distally expanded. Pollen small, tricolpate.

Holotype. Specimen 571-331 and slide 571-331a, Far East Geological Institute Collections; Pl. 3, figs. 4, 7.

Occurrence. Right bank of the Bureja River near the bottom of Belaja Mountain, Tsagajan Formation.

Age. Maastrichtian-Danian.

Description. There are five heads of uniform size (7-8 mm in diameter). Only short pieces of peduncle (or spike axis) preserved. Peduncle about 1 mm thick. Receptacle relatively massive. Individual flowers not distinguishable. Stamens in surface view are seen in split heads (Pl. 3, figs. 2–3). They are about 3 mm long, 0-8 mm wide, distally expanded in a shield with leaf-like process. The latter triangular, often curved or reflexed. Two ridges below the distal expansion of connective represent pollen sacs. On imprints of head surface, distal expansions of stamens are seen as polygonal shields 1 mm wide (Pl. 3, figs. 1, 4-6). Cuticle of connective delicate. Cells elongated, with straight walls. Stomata were not observed.

Masses of pollen grains adhere to stamen and connective cuticles. It was difficult to separate the individual pollen grains and they have been photographed lying on the cuticle. Pollen tricolpate, spherical, trilobate in polar view, elliptical in equatorial view. Diameter 18 /m, equals the polar axis. Exine c. 1 /m thick, ektexine clavate-microreticulate. Colpi long, almost reaching the poles.

Remarks. Tricolpopollianthus stamens may be compared with those of Nymphaea, some members of the Magnoliaceae, and to some extent, with Platanus and Nelumbo, which have distally expanded connectives. However, if this interpretation of Tricolpopollianthus morphology is correct, it differs from the staminate structures of these modern genera.

Pollen grains resemble Tricolpopollenites micromunus Groot et Penny which have been reported from several Upper Cretaceous and Lower Tertiary localities in Asia and North America (see Drugg 1967). Brenner (1963, p. 93) compared T. micromunus with pollen grains of living Trochodendron. Similar pollen grains were obtained from the staminate heads assigned to the Tertiary Platanus neptuni; Bužek et al. (1967) compared these pollen grains with Tricolpopollenites microhenrici.

According to Chang (1964) the pollen grains of Platanus are tricolpate, spherical, 18-5-22-5 /m in diameter, with ektexine microreticulate. However, they differ from the pollen grains of Tricolpopollianthus burejensis in comparatively short and broad colpi. The pollen grains of Trochodendron aralioides Sieb. et Zucc. differ from those of the present species in more elongate form (polar axis up to 26 /m, diameter 20 /m) and in having larger meshes of the exine reticulum. Corylopsis pauciflora Sieb. et Zucc. has comparable but somewhat larger pollen grains.

Tricolpopollianthus supplements the record of Cretaceous angiosperm reproductive structures which are mostly unisexual, devoid of conspicuous perianth, and clustered in spikes, racemes, or heads. It illustrates the primitive type of stamen retained with some modifications in several living genera.
KRASSILOV, Cretaceous flower with pollen
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