Early–middle Albian angiosperms from the Kolyma river basin, Northeastern Russia

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In Northeastern Russia angiosperms firstly appeared in the early–middle Albian, preserved in deposits of the Buorkemuss Formation of the Kolyma river basin. The Buorkemuss flora is characterized by high taxonomic diversity. It includes about 80 species and consists of ferns, cycadophytes, czekanowskialeans, conifers and angiosperms. Ferns predominate. Diversity is rather high, comprising about 20 species. The early spreading of angiosperms was not accompanied by reduction of the older Mesozoic groups that had also experienced a progressive phase in their evolution at that time. The dominant plant communities in the early-middle Albian are reconstructed as closed deciduous forests consisted of conifers, ginkgophytes and czekanowskialeans. Another widespread vegetational type was represented by open herbaceous to shrubby communities consisted of ferns and cycadophytes. The fern diversity during the Early Cretaceous was negatively correlated with the diversity of ginkgophytes, czekanowskiales and conifers. Such relationships can be evidence that the majority of ferns formed separate communities rather than were incorporated as undergrowth in the ginkgo-conifer forests. These open fern communities developed mostly on periodically flooded areas of river valleys.

The angiosperm remains occur rare and irregular. Most part of species is represented by single or by several specimens. All angiosperm leaves of the Buorkemuss flora are characterized by small sizes, up to 1–4 cm. This suggests predominance of herbaceous and shrubby life forms. Angiosperm remains were found mostly in association with ferns. Other fossils occur very rare in angiosperm sites as allochtonous admixture. It is likely, that angiosperms inhabited periodically flooded open herbaceous fern communities as a minor component.

The process of replacement of the older Mesozoic elements began in the late Albian and Cenomanian. In this time the conifers *Parataxodium, Araucarites, Sequoia* and *Elatocladus* became dominant. The late Albian and Cenomanian angiosperms represent an entirely new stage of evolution in this group. The small-leaved shrubby forms, members of the Mesozoic-type communities, were replaced by broad-leaved arboreal plants that could probably form predominantly angiosperm communities. Diverse platanoids and representatives of genus *Trochodendroides* first appeared. Later these taxa formed a core of the Late Cretaceous floras in Siberia. Angiosperm radiation was correlated with extinction or considerable reduction of different Mesozoic groups. Among them ferns underwent the strongest reduction.