INVESTIGATION OF THE TERRESTRIAL OCCURRENCE AND BIOLOGICAL SOURCE OF THE PETROLEUM GEOCHEMICAL BIOMARKER OLEANANE

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Oleanane is a triterpane that is commonly found in Late Cretaceous (Campanian) through Cenozoic marine and deltaic rocks and related oils. Based on its affinity to the ß-Amyrin group of natural products and its abundance in Tertiary deltaic sediments and oils, such as in the Niger Delta, oleanane is thought to be a geochemical fossil of terrestrial flowering plants. The ß-Amyrin group forms the basis of many angiosperm triterpenoids and triterpenoid saponins. These compounds appear in moderately advanced flowering plant lineages and are often used as a defense against herbivores. This group of compounds has not been reported from any other seed plant group, including conifers.

We examined a suite of middle to early Cretaceous terrestrial sediments and plant fossils for the presence of oleanane. The existence of oleanane was documented by Gas Chromatography - Mass Spectrometry (GC-MS) and confirmed with Metastable Reaction Monitoring (MRM) GC-MS.

Oleanane was identified from fossil bennettitaleans, an extinct group of seed plants. Cycadeoidea paynei and C. superba are permineralized fossil stems and are from the Early Cretaceous Inyan Kara Group of the Black Hills, SD. Oleanane was also found in carbonaceous compressed leaf fossils of Dioonites from the Barremian - early Aptian (Zone I) of the Potomac Group from Richmond, VA. This increases the number of seed plant groups known to have oleanane, and is of additional interest as the bennettitaleans are thought to be closely related to angiosperms.

Oleanane was not found in contemporaneous fossil conifers. Our sample consisted of fossil conifer wood collected from the Campanian Magothy Beds of Martha's Vineyard, MA; the Cenomanian Raritan Formation of Sayreville, NJ; and the Barremian - early Aptian Patuxent Formation of Greenbelt, MD.

Confirmed reports of oleanane have been from Late Cretaceous and younger marine sediments. We now report oleanane from Early Cretaceous terrestrial strata of the Inyan Kara Group. In addition we systematically sampled the sequence of Cretaceous terrestrial sediments of the coastal plain of the eastern U.S.A, and found oleanane in the Barremian - early Aptian (Zone I) Potomac Group. Preliminary data indicate variation in the occurrence of oleanane in contemporaneous Early Cretaceous sites from the Potomac Group. The localities accumulated in different depositional environments and the occurrence may be controlled by lithofacies.