Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

BPT024-11 Room:201B Time:May 22 17:00-17:15

Molecular paleontological characteristics of plant fossils from plant fragment-condensed bed in Cretaceous Futaba Group

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Lipids such as hydrocarbons and isoprenoids and resistant macromolecules as cutin and suberin constituting living plants are stable and have resistance to microbial degradation and diagenesis. And they are considered the main parts of plant fossils and plant-origin sedimentary organic matters (SOM). But it is unknown that what factor affects the preservation of composition of molecular unit. In this study, we analyzed resistant macromolecule of a wide variety of plant fossils collected from the same Cretaceous coal layer and investigated variability of composition of their molecular units.

We analyzed mesofossils of angiosperms and gymnosperms collected from Ashizawa Formation, Futaba Group, Kamikitaba, northeastern Japan. For example, fruit fossils of *Hironoia fusiformis* and *Archaefagacea futabensis*, flower fossils of *Esgueiria futabensis*, leaf fossils of *Juniperus*, a stem fossil of *Epfedra* and some fossils of fruits, seeds and woods which are uncertain about taxonomy. Powder somples of above fossils were solvent-extracted normally and under high temperature to be removed free compounds completely. The residues were operated saponification by KOH/methanol to be extracted ester-bond compounds. For classification and determination of compounds, GC-MS are used.

First, as a result of analyses of free compounds in living-like plant fossils obtained from the Cretaceous rock in the same way of above fossils to investigate the maturity, beta-sitosterol and *n*-alkanes with high-CPI were detected. They are indicators of living higher terrestrial plants. It indicates the existence of fossils that have not been affected diagenesis, even in Cretaceous fossils. Secondly, as a result of investigation of ester-bond molecular units of resistant macromolecules, fatty acids (C_{10}-C_{28}) and *n*-alkanols (C_{10}-C_{28}) were detected in all samples. Distributions of carbon number of fatty acids were clearly different according to a part of samples. In organs have cuticles (e. g. flowers, fruits and leaves), C_{14} /C_{16} ratios of fatty acids are high and C_{18} /C_{16} ratios are low. In other hands, in woods, C_{14} /C_{16} ratios are low and C_{18} /C_{16} ratios are high. Possibly, it indicates the characteristic composition of cutin and suberin respectively. From scatter diagram used these ratios as independent variables, a linear function which distinguish flower, fruit and leaf fossils from wood fossils was obtained. In the future, this function will be useful to determine the parts of broken fossils. And from scatter diagram used C_{20} /C_{18} ratios and C_{20} /C_{16} ratios of *n*-alkanols as independent variables, wood fossils are separated from flower, fruit and leaf fossils roughly. The high ratio of C_{20}*n*-alkanol may indicate the composition of suberin.

Keywords: Cretaceous flower fossil, evolution of angiosperm, resistant macromolecule, suberin, cutin, chemotaxonomy