Discriminative analysis of *Eucalyptus camaldulensis* grown from seeds of various origins based on lignin components measured by Py-GC

[Background] Lignin is a natural cross-linked polymer consisting of various phenyl propane units. The lignin in hardwoods such as *Eucalyptus* consists of syringyl propane units (S) and guaiacyl propane units (G). It is known that the lignin content and its composition, particularly S/G ratio, often vary depending on origins and growth conditions of the trees as well as genera and species. In this work the Py-GC method for lignin characterization previously developed was applied to the discriminative analysis of the origins of seeds for *Eucalyptus Camaldulensis* trees of varied origins grown at the same field, in which the principal component analysis (PCA) was used for data reduction.

[Experimental] Eleven wood samples taken from 2-year-old *Eucalyptus camaldulensis* trees grown under the same condition and grown from the seeds collected from four different habitats in Australia were cryo-milled into fine powders prior to Py-GC analysis. About 100 µg of the wood sample was pyrolyzed at 450 ºC under He carrier gas. A metal capillary column was used for GC separation. The distribution of lignin-derived pyrolyzates was processed using the PCA software.

[Results] Fig.1 shows a pyrogram of a *Eucalyptus* sample grown from the seed collected from Murchison River. Pyrolyzates derived from lignin were observed as peaks S-1 through S-13 and G-1 through G-13. Other samples yielded similar pyrograms and the distribution of the pyrolyzates for all samples showed a similar tendency. The discriminative analysis among the samples was first attempted on the basis of S/G ratio obtained from the relative molar yields between syringyl (S) and guaiacyl (G) related pyrolyzates. However, it was found it difficult to make unequivocal specification for the origin of the seeds by the observed S/G ratio alone. Therefore, the PCA method was applied in which information extracted from multivariate data was converted into individual variables, rather than reducing the whole data into a single value (S/G ratio). Fig.2 shows a score plot of the first and second principal components for the 11 *Eucalyptus* samples grown from the seeds obtained at the 4 different origins, showing rough grouping of the samples according to the origin of the seeds.

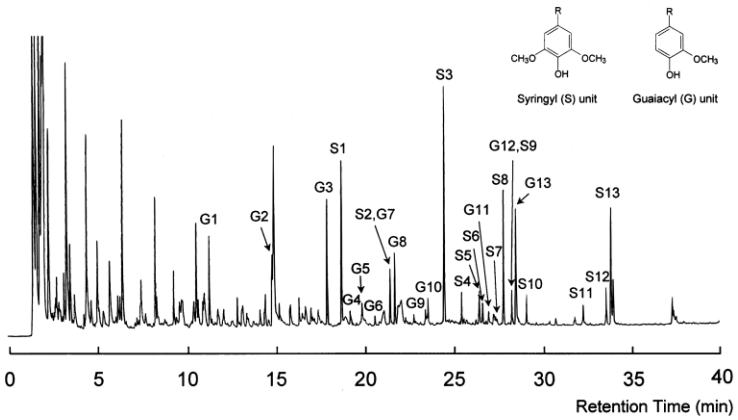

Fig. 1. Pyrogram of *Eucalyptus* (M-1) obtained at 450 ºC observed by FID.

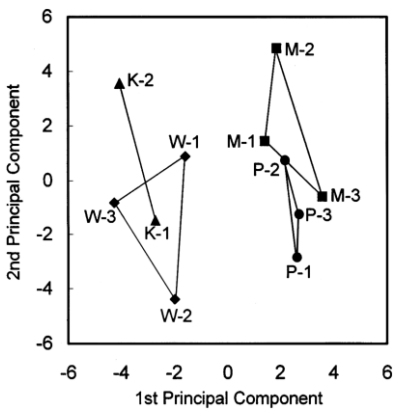

Fig. 2. Score plot of the first and second principal components for the trees. P, Petford; M,Murchison River; W, Wrotham Park; K,Katherine River

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Products used : Multi-functional pyrolyzer

Applications : General polymer analysis

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