Genetic effect on carbon isotope composition of a C_3-plant

H. W. YEH[1], C. M. YANG[2] AND F. W. C[1]

[1]Institute of Earth Sciences, Academia Sinica, Taipei 115, Taiwan (hwyeh@earth.sinica.edu.tw)
[2]Institute of Botany, Academia Sinica, Taipei 115, Taiwan ib308@ccvax.sinica.edu.tw

Instruction

Carbon isotope composition of lacustrine organic sediments contains records of climatic history of the provenance and has great potential in deciphering late Pleistocene rapid climatic changes. In fact, this isotopic method is probably the only viable choice for investigating decadal to sub-decadal climate changes in low latitude, low altitude terrestrial environments. Success of this approach depends on our understanding the factors affecting the isotopic composition of terrestrial plants. Here we report preliminary results of our investigating into genetic effects.

Results & Discussions

Carbon isotope composition of *Ficus microcarpa L. f.* and *Ipomoea batatas(L.)Lam.* as well as their respective mutants were obtained in this study. The isotopic results are given in Table1. Analytical reproducibility is better than 0.1‰ in $\delta^{13}C_{PDB}$ values at 95% confidence level.

$\delta^{13}C_{PDB}$ values of the plants, ranging from -27.8 to -31.6 ‰, are consistent with the fact that they are C_3-plants. $\delta^{13}C_{PDB}$ values of the mutants are either similar to or about 2 ‰ less negative than the original var. The plants and their respective mutants were planted side by side. Hence the environmental conditions and the concentrations and $\delta^{13}C_{PDB}$ values of the CO_2 are the same and cannot be responsible for the differences.

Table 1. The Isotopic Results

Sample ID	$\delta^{13}C_{PDB}$ (‰)
Ipomoea batatas (L.) Lam. Green*	-27.8
Ipomoea batatas (L.) Lam. Purple**	-28.0
Ipomoea batatas (L.) Lam. Yellow***	-30.4
Ficus microcarpa L. f. *	-28.9
Ficus microcarpa cv. "Milky Stripe" **	-30.0
Ficus microcarpa cv."Goldon Leaves"***	-31.6

*Original Variety; **Mutant 1; ***Mutant 2.

Conclusion

We conclude that slight differences in genome between the plants are the most likely cause of the isotopic variations.

References

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Aromatic triterpenoids as angiosperm biomarkers in Cretaseous to Tertiary sediments

SVETLANA YESSALINE, NORIYUKI SUZUKI[1] AND TAKUYA YOSHIDA

Division of Earth and Planetary Sciences, Graduate School of Science, Hokkaido University
([1]suzu@ep.sci.hokudai.ac.jp)

Introduction

We have detected series of triterpenoid-related compounds, which have been proposed as biomarkers of angiosperm origin (Stout 1992 with references therein), in core samples of Cretaceous to Tertiary age from MITI Sanriku-oki borehole, offshore North East Japan. The main objective of the study is to test validity of the use of these compounds as indicators of the input of angiosperm-derived organic matter.

Results and Discussion

Sediment samples of Paleocene and Eocene age were determined to contain significant amount of terrigenous organic matter, as was ascertained from the dominance of numerous biomarkers of higher plant origin. Although all the samples showed very low oleanane/hopane ratio, high abundance of aromatic angiosperm biomarkers was observed in post-Cretaceous sediments (Paleocene to early Middle Miocene age). All these biomarkers disappear above the depth 1800 m, which marks the change of the depositional environment from fluvial-deltaic to marine (JNOC, 1998). In the depth interval from early Late Paleocene to early Middle Eocene, aromatic triterpenoids of possible angiosperm origin are the most prominent aromatic compounds. According to the palynological analysis by JNOC (1998), exactly the same stratigraphic interval is characterized by predominance of pollen from angiosperm. Although the identifications of these triterpenoid-related compounds remain tentative, our data are consistent well with the idea that aromatic triterpenoids in the present study are of angiosperm origin.

Conclusion

Our results suggest that triterpenoid-related compounds investigated in the present study are unique biomarkers of angiosperm in post-Cretaceous age and can be applied to more accurate assessment of the input of angiosperm-derived organic matter and their evolution in the geologic time.

References

Stout S. A. (1992) *Org.Geochem*. **18**, 51-66.

JNOC (Japan National Oil Corporation) (1998) *Report on the MITI Sanriku-oki drilling (in Japanese)*, p.48.

Appendix

Aromatic triterpenoids discussed in the present paper.