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PALYNOLOGY AND THE STABLE CARBON AND NITROGEN ISOTOPIC COMPOSITION OF TERTIARY BROWN COALS IN HUNGARY

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The palynolgical and the elemental composition of coals may reflect both differences in plant assemblages and depositional environment at the time of peat accumulation (Sajgó and Brukner-Wein, 2003). In this study we integrate the carbon and nitrogen isotopic biogeochemistry of Tertiary Pannonian coals with palynology to elucidate the role of different factors in coalification e.g. specified floral contributions (individual plant families), microbial activity (bacterial decay, fungal degradation) and type of mire.

Bulk coal parameters, palynological characteristics and stable isotope ratios of organic C and N were measured in a survey of 45 low-rank coals (lignites and brown coals) from two different areas (samples were deposited in the Transdanubian Mid-Mountains during the Middle Eocene: 9 coal fields, mostly in paralic environment, under subtropical climate and in North Mid-Mountains during Middle Miocene: 5 coal fields in particularly paralic environment with narrow seaways and their heteropic sedimentary facies at the margin of the Pannonian Basin under warm temperate climate, probably mesophytic forest frost-free winters).

On the basis of palynology, we differentiated paleobotanical assemblages (ferns: Schizaeaceae and Polypodiaceae, Taxodiaceae-Cupressaceae, Palmae, Cupuliferae, Myricaceae, Ericaceae and mixed types including Junglandaceae, Betulaceae), mire zones (open marsh, swamp forest, semiterrestic forest, shrub fen, eutrophic forest and fern shrub), preservation of microfossil structures (good, medium, weak, bad and very bad) and microbial (fungal and bacterial) activity (weak, medium and strong).

Some geochemical mean data for paleobotanical assemblages are given in the next Table.

Dominant floral family	TOC[%]*	H/C_{at}	N/C_{at}	S_{org}/C_{at}	Fe_{pyr}[%]	$\delta^{13}C$[‰]	$\delta^{15}N$[‰]
Schizaeaceae, Polypodiaceae (ferns)	55.67	0.79	0.022	0.026	0.98	-25.91	2.8
Taxodiaceae-Cupressaceae	36.97	0.82	0.019	0.024	0.64	-24.96	4.7
Ericaceae	57.15	0.81	0.014	0.030	0.11	-25.73	3.2
Myricaceae	56.81	0.82	0.015	0.030	0.24	-25.54	-0.8
Cupuliferae	56.36	0.84	0.015	0.040	0.49	-24.95	2.6
Palmae	46.81	0.84	0.017	0.028	1.07	-25.79	2.8

*data of whole sample; all other data for isolated kerogens; $_{at}$: atomic ratio; Fe_{pyr}: pyritic iron

Besides the phytogenic input the depositional and diagenetic impact on composition coals can be determinative, consequently for grouping it is important to trace their palaeo-environmental signature. The samples of Cupuliferae and Palmae progenitors are the most hydrogen rich and the fern families originated coals are poorest, meanwhile phytogenic precursors affected by accumulating in different mire conditions.

The variation of $\delta^{13}C$ and $\delta^{15}N$ values as function of maturation and maceral composition was studied in coals (Whiticar, 1996 and Rimmer et al., 2006). The enriched $\delta^{15}N$ values in vitrinites were suggested to reflect microbial effect during coalification process resulted in preferential removal of ^{14}N. We found that the N/C_{at} and $\delta^{15}N$ values are higher with increasing microbial activity. The Fig. 1 demonstrates the environmental marker potential for N/C_{at} and $\delta^{15}N$ values, which are useful as correlation tools.

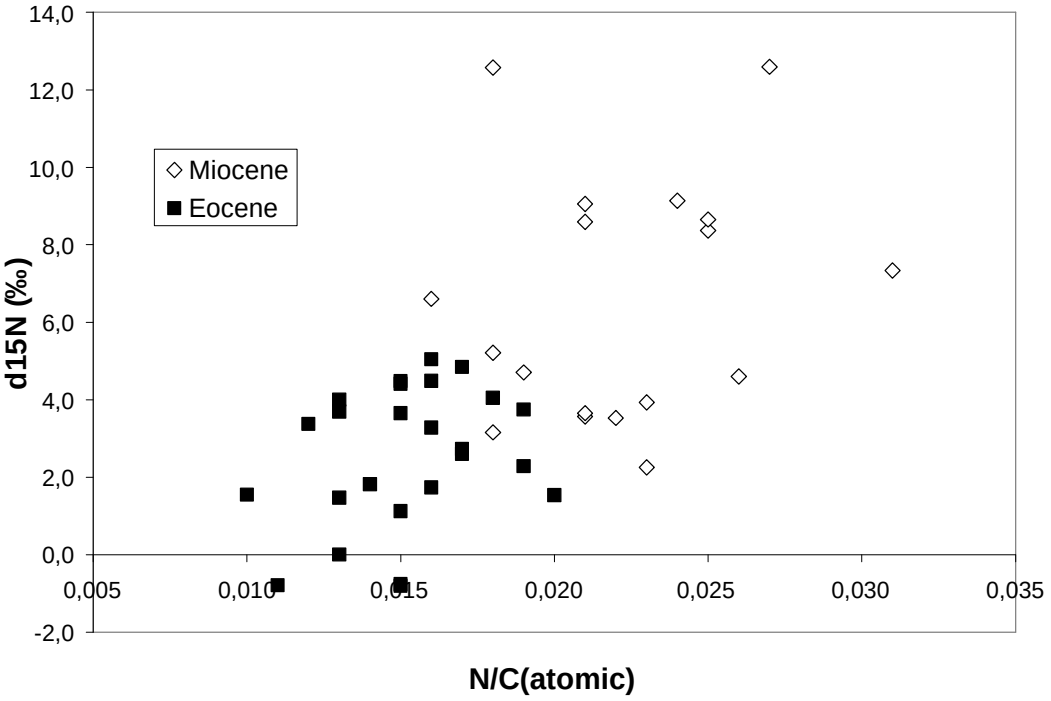

Figure 1. Relationship between atomic $\delta^{15}N$ values and N/C atomic ratios in kerogens of Tertiary coal from Hungary.

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