Capacity of Enzymes of the Euphorbiacea *Aleurites montana* Involved in CO_2-Fixation, Compared to Plants Having C_3-, C_4- and *Crassulacean* Acid Metabolism

Norbert Grotjohann[a], Ping He[b] and Georg H. Schmid[a,*]

[a] Lehrstuhl für Zellphysiologie, Fakultät für Biologie, Universität Bielefeld, Postfach 10 01 31, 33501 Bielefeld, Bundesrepublik Deutschland.
Fax: +49 (521) 1066410. E-mail: G.Schmid@Biologie.Uni-Bielefeld.de

[b] Central South Forestry University, Zhuzhou/Hunan 41206, People's Republic of China

* Author for correspondence and reprint requests

Z. Naturforrsch. **55 c**, 383–391 (2000); received March 2/April 7, 2000

Dedicated to Professor Wilhelm Menke on the occasion of his 90th birthday

Aleurites montana, Phosphoenolpyruvate Carboxylase, Malic Enzyme, Malate Dehydrogenase, Ribulose Bisphosphate Carboxylase

Capacities of phosphoenolpyruvate carboxylase (PEP-Co), ribulose bisphosphate carboxylase (Rubisco), $NADP^+$ malic enzyme (ME) and of malate dehydrogenase (MDH) were measured in the Euphorbiacea *Aleurites montana,* grown under 700 ppm CO_2 for four weeks prior to enzyme extraction. For comparison *Bryophyllum daigremontiana* (CAM), *Saccharum officinarum* (C_4) and *Capsicum frutescens* (C_3) were treated in the same way. PEP-Co capacity of *Aleurites* was in the range of 12-, that of *Capsicum* approx. 26 nmol × min^{-1} × mg $protein^{-1}$, without significant influence of the light period or CO_2-treatment. In contrast, the activity of the enzyme from *Saccharum* was, depending on the duration of light, 160- respectively 96 times higher than that of the tung-oil tree. In *Bryophyllum* a rather low activity in the morning was increased during the day to approx. 230 nmol × min^{-1} × mg $protein^{-1}$ in plants grown in the greenhouse and to approx. 115 nmol × min^{-1} × mg $protein^{-1}$ in those from the growth chamber. Malate was hardly detectable in extracts of *Aleurites*, whereas it was high in *Bryophyllum*, depending on the light period. The ratio of average PEP-Co to Rub-Co capacity was high for the CAM-plant (20:1), somewhat lower for sugar cane (10:1), but almost at equality for *Aleurites* (0.9:1) and chilli (0.8:1). For the $NADP^+$ malic enzyme, low capacity (20 to 28 nmol × min^{-1} × mg $protein^{-1}$) was found for *Aleurites* and for *Capsicum*, whereas it was 10 to 17 times higher in *Saccharum*. In *Bryophyllum,* the activity was up to 80 nmol × min^{-1} × mg $protein^{-1}$, dependent on light period. MDH capacity was extremely high in all plants investigated. Highest rates (10–20 μmol × min^{-1} × mg $protein^{-1}$), were obtained for *Bryophyllum*, followed by sugar cane and *Capsicum* with 5–8 μmol × min^{-1} × mg $protein^{-1}$. Again, the lowest capacity was found in extracts of *Aleurites* with approx. 1.3 to 1.6 μmol × min^{-1} × m $protein^{-1}$. Thus, in *Aleurites montana* no indication for C_4- or *Crassulacean* acid metabolism was obtained. Therefore, the earlier observed very efficient uptake of CO_2 cannot be explained by a high expression of the PEP-Co protein, known to occur in CAM- and C_4-plants.