

8. LITERATURVERZEICHNIS

- Acosta, H., Dubourdie, M., Quinones, W., Caceres, A., Bringaud, F. and Concepcion, J. L.** 2004. Pyruvate phosphate dikinase and pyrophosphate metabolism in the glycosome of *Trypanosoma cruzi* epimastigotes. *Comp. Biochem. Physiol. B. Biochem. Mol. Biol.* **138**(4): 347-356.
- Ahn, S. J., Sivaguru, M., Osawa, H., Chung, G. C. and Matsumoto, H.** 2001. Aluminum inhibits the H⁺-ATPase activity by permanently altering the plasma membrane surface potentials in squash roots. *Plant Physiol.* **126**: 1381-1390.
- Andreo C. S., González, D. H., Iglesias, A. A.** 1987. Higher plant phosphoenolpyruvate carboxylase. Structure and function. *FEBS Lett.* **213**: 1-7.
- Aniol, A. M.** 1995. Physiological aspects of aluminium tolerance associated with the long arm of chromosome 2D of the wheat (*Triticum aestivum* L.) genome. *Theor. Appl. Genet.* **91**: 510-516.
- Aoyagi, K. and Bassham, J. A.** 1984 Pyruvate orthophosphate dikinase of C₃ seeds and leaves as compared to the enzyme from maize. *Plant Physiol.* **75**: 387-392.
- Aoyagi, K., Bassham, J. A. and Greene, F. C.** 1984. Pyruvate Orthophosphate Dikinase Gene Expression in Developing Wheat Seeds. *Plant Physiol.* **75**: 393-396.
- Aoyagi, K. and Chua, N.-H.** 1988. Cell-specific expression of pyruvate, Pi dikinase: *in situ* mRNA hybridization and immunolocalization labeling of protein in wheat seed. *Plant Physiol.* **86**: 364-368.
- Balachandran, S., Hull, R., Martins, R. A., Vaadia, Y. and Lucas, W. J.** 1997. Influence of environmental stress on biomass partition in transgenic tobacco plants expressing the movement protein of tobacco mosaic virus. *Plant Physiol.* **114**: 475-481.
- Basu, U., Godbold, D. and Taylor G. J.** 1994. Aluminum resistance in *Triticum aestivum* associated with enhanced exudation of malate. *Plant Physiol.* **144**: 747-753.
- Benfey, P. N. and Chua, N. H.** 1990 The cauliflower mosaic virus 35S promoter: combinatorial regulation of transcription in plants. *Science* **250**: 959-966.
- Bennett, W. F. (ed.)** 1993. Nutrient deficiencies and toxicities in crop plants. APS Press. 202 p. St. Paul, Minnesota, U. S. A.
- Bevan, M.** 1984. Binary *Agrobacterium* vectors for plant transformation. *Nucl. Acids. Res.* **12**: 8711-8721.
- Black, B. L., Fuchigami, L. H. and Coleman, G. D.** 2002. Partitioning of nitrate assimilation among leaves, stems and roots of poplar. *Tree Physiol.* **22**: 717-724.
- Blanke, M. M., Bacher, W., Pring, R. J. and Baker, E. A.** 1996. Ammonium nutrition enhances chlorophyll and Glaucousness in Kohlrabi. *Ann. Bot.* **78**: 599-604.
- Borland, A. M. and Taybi, T.** 2004. Synchronization of metabolic processes in plants with Crassulacean acid metabolism. *J. Exp. Bot.* **55**(400): 1255-1265.
- Breuer, H.** 1996. Reaktionsmechanismus der Ninhydrinprobe, Praxis der Naturwissenschaften.
- Bringaud, F., Baltz, D. and Baltz, T.** 1998. Functional and molecular characterization of a glycosomal Ppi-dependent enzyme in trypanosomatids: Pyruvate, phosphate dikinase. *Proc. Natl. Acad. Sci. U. S. A.* **95**: 7963-7968.
- Brix, H., Dyhr-Jensen, K. and Lorenzen, B.** 2002. Root-zone acidity and nitrogen source affects *Typha latifolia* L. growth and uptake kinetics of ammonium and nitrate. *J. Exp. Bot.* **53**(379): 2441-2450.
- Buchanan, B. B.** 1974. Orthophosphate requirement for the formation of phosphoenolpyruvate from pyruvate by enzyme preparations from photosynthetic bacteria. *J. Bacteriol.* **119**: 1066-1068.
- Buchanan, B. B., Grussem, W. and Jones, R. L.** 2000. Biochemistry & Molecular Biology of plants. American Society of Plant Physiologists, Rockville, Maryland, 625 p.
- Bullock, W. O.; Fernández, J. M. and Short, J. M.** 1987. X11-blue: A high efficiency plasmid transforming recA *Escherichia coli* strain with β-galactosidase selection. *BioTech.* **5**: 376-379.

- Burcham, T.** 1989. Scan Analysis. The densitometer for the Macintosh Manual. Biosoft. U.K.
- Burnell, J. N. and Hatch, M. D.** 1985. Light-dark modulation of leaf pyruvate, Pi dikinase. Trends Biochem. Sci. **10**: 288–91.
- Carroll, L. J., Mehl, A. F. and Dunaway-Mariano, D.** 1989. The Mode of Triple Phosphoryl Group Transfer in Pyruvate Phosphate Dikinase Catalysis. Demonstration of the Intermediacy of Pyrophosphorylated and Phosphorylated Enzyme Species. J. Am. Chem. Soc. **111**: 5965–5967.
- Chastain, C. J., Fries, J. P., Vogel, J. A., Randklev, C. L., Vossen, A. P., Dittmer, S. K., Watkins, E. E., Fiedler, L. J., Wacker, S. A., Meinhover, K. C., Sarath, G. and Chollet, R.** 2002. Pyruvate, Orthophosphate Dikinase in Leaves and Chloroplasts of C₃ Plants Undergoes Light-/Dark-Induced Reversible Phosphorylation. Plant Physiol. **128**: 1368–1378.
- Chen, C. C. S. and Plant, A. L.** 1999. Salt-induced protein synthesis in tomato roots: the role of ABA. J. Exp. Bot. **50**(334): 667–687.
- Chen, R. D. and Tabaeizadeh, Z.** 1991. Alteration of gene expression in tomato plants (*Lycopersicon esculentum*) by drought and salt stress. Genome **35**: 385–391.
- Chinthapalli, B., Raghavendra, A. S., Rischi, A. S. and Goyal, A.** 2002. Phosphoenolpyruvate Carboxylase from C₄ Plants: Properties and Regulation. In: Reviews in Plant Biochemistry and Biotechnology. Goyal, A., Mehta, S. L. and Lodha, M. L. (eds.) Vol I. pp. 143–159.
- Chomczynski, P. and Sacchi, N.** 1987. Single step method of RNA isolation by acidic guanidium thiocyanate-phenol-chloroform extraction. Anal. Biochem. **162**: 156–159.
- Coustou, V., Besteiro, S., Biran, M., Diolez, P., Bouchaud, V., Voisin, P., Michels, P. A. M., Canioni, P., Baltz, T. and Bringaud, F.** 2003. ATP generation in the *Trypanosoma brucei* procyclic form: cytosolic substrate level phosphorylation is essential, but not oxidative phosphorylation. J. Biol. Chem. **278**(49): 49625–49635.
- Cushman, J. C. and Bohnert, H. J.** 1999. Crassulacean acid metabolism: Molecular genetics. Annu. Rev. Plant Physiol. Plant Mol. Biol. **50**: 305–332.
- Deblaere, R., Bytenier, B., DeGreve, H., Schell, J., Van Montagou, M. and Leemans, J.** 1985. Efficient octopine Ti plasmid-derived vectors for *Agrobacterium*-mediated gene transfer to plants. Nucl. Acids Res. **13**: 4777–4788.
- De la Fuente, J. M., Ramirez-Rodriguez, V., Cabrera-Ponce, J. L. and Herrera-Estrella, L.** 1997. Aluminum tolerance in transgenic plants by alteration of citrate synthase. Science **276**: 1566–1568.
- Delhaize, E., Hebb, D. M. and Ryan, P. R.** 2001. Expression of a *Pseudomonas aeruginosa* citrate synthase gene in tobacco is not associated with either enhanced citrate accumulation or efflux. Plant Physiol. **125**: 2059–2067.
- Delhaize, E., Ryan P. R. and Randall P. J.** 1993. Aluminum tolerance in wheat (*Triticum aestivum* L.): II. Aluminum-stimulated excretion of malic acid from root apices. Plant Physiol. **103**: 695–702.
- Delrot, S., Rochat, C., Tageder, M. and Frommer, W.** 2001. Amino Acid Transport. In: Plant Nitrogen. Lea, P. J. and Morot-Gaudry, J.-F. (eds.). pp. 213–235.
- Devi, S. R., Yamamoto, Y. and Matsumoto, H.** 2001. Isolation of aluminum-tolerant cell lines of tobacco in a simple calcium medium and their responses to aluminum. Physiol. Plant. **112**: 397–402.
- Duff, S. M. G. and Chollet, R.** 1995. *In vivo* regulation of wheat-leaf phosphoenolpyruvate carboxylase by reversible phosphorylation. Plant Physiol. **107**: 775–782.
- Edwards, G. E., Franceschi, V. R. and Voznesenskaya, E. V.** 2004. Single-cell C₄ photosynthesis versus the dual-cell (Kranz) paradigm. Annu. Rev. Plant. Biol. **55**: 1773–196.
- Edwards, G. E., Nakamoto, H., Burnell, J. N. and Hatch, M. D.** 1985. Pyruvate, Pi dikinase and NADP-malate dehydrogenase in C₄ photosynthesis: properties and mechanism of light/dark regulation. Annu. Rev. Plant Physiol. **36**: 255–286.
- Errebhi, M. and Wilcox, C. A.** 1990. Plant species response to ammonium-nitrate concentration ratios. J. Plant Nutr. **13**(8): 1017–1029.
- Fang, R. X., Nagy, F., Sivasubramaniam, S. and Chua, N. H.** 1989. Multiple cis regulatory elements for maximal expression of cauliflower mosaic virus 35S promoter in transgenic plants. Plant Cell **1**: 141–150.

- Faure, J. D., Meyer, C. and Caboche, M.** 2001. Nitrate assimilation: nitrate and nitrite reductases. In: Nitrogen assimilation by plants. Morot-Gaudry, J. F. (ed.) Enfield: Science Publisches Inc., pp. 33-52.
- Fichtner, K., Quick, W. P., Schulze, E.-D., Mooney, H. A., Rodermel, S. R., Bogorad, L. and Stitt, M.** 1993. Decreased ribulose-1,5-bisphosphate carboxylase-oxygenase in transgenic tobacco transformed with 'antisense' rbcS. *Planta* **190**: 1-9.
- Fißlthaler, B.** 1993. Die Pyruvat, Phosphat Dikinase aus der fakultativen Crassulaceen-Säurestoffwechsel-Pflanze *Mesembryanthemum crystallinum*: Sequenzierung und Charakterisierung des Gens. Dissertation. Frei Universität Berlin. Deutschland. 113 S.
- Fißlthaler, B., Meyer, G., Bohnert, H. J. and Schmitt, J. M.** 1995. Age-dependent induction of pyruvate, orthophosphate dikinase in *Mesembryanthemum crystallinum* L. *Planta* **196**: 492-500.
- Foy, C. D.** 1992. Soil chemical factors limiting plant root growth. *Adv. Soil Sci.* **19**: 97-149.
- Fukayama, H., Tsuchida, H., Agarie, S., Nomura, M., Onodera, H., Ono, K., Lee, B.-H., Hirose, S., Toki, S., Ku, M. S. B., Makino, A., Matsuoka, M. and Miyao, M.** 2001. Significant Accumulation of C₄-Specific Pyruvate, Orthophosphate Dikinase in a C₃ Plant, Rice. *Plant Physiol.* **127**: 1136-1146.
- Geiger M., Walch-Liu, P., Engels, C., Harnecker, J., Schulze, E.-D., Ludewig, F., Sonnewald, U., Scheible, W.-R. and Stitt, M.** 1998. Enhanced carbon dioxide leads to a modified diurnal rhythm of nitrate reductase activity and higher levels of amino acids in young tobacco plants. *Plant Cell Environ.* **21**: 253-268.
- Gerendas, J., Zhu, Z., Bendixen, R., Ratcliffe, R. G. and Sattelmacher, B.** 1997. Physiological and biochemical processes related to ammonium toxicity in higher plants. *Zeit. Pflanzenernähr. Bodenk.* **160**: 239-251
- Ghannoum, O., von Caemmerer, S., Ziska, L. H. and Conroy, J. P.** 2000. The growth response of C₄ plants to rising atmospheric CO₂ partial pressure: a reassessment. *Plant Cell Environ.* **23**: 931-942.
- Giglioli-Guivarc'h, N., Pierre, J.-N., Brown, S., Chollet, R., Vidal, J. and Gadal P.** 1996. The light-dependent transduction pathway controlling the regulatory phosphorylation of C₄ phosphoenolpyruvate carboxylase in protoplasts from *Digitaria sanguinalis*. *Plant Cell* **8**: 573-586.
- Givan, C. V.** 1979. Metabolic detoxification of ammonia in tissues of higher plants. *Phytochem.* **18**: 375-382.
- Glass, A. D. M., Britto, D. V., Kaiser, B. N., Kinghorn, J. R., Kronzucker, H. J., Kumar, A., Okamoto, M., Rawat, S., Siddiqi, M. Y., Unkles, S. E. and Vidmar, J. J.** 2002. The regulation of nitrate and ammonium transport systems in plants. *J. Exp. Bot.* **53**(370): 855-864.
- González, M.-C., Sánchez, R. and Cejudo, F. J.** 2003. Abiotic stresses affecting water balance induce phosphoenolpyruvate carboxilase expression in roots of wheat seedlings. *Planta* **216**: 985-992.
- Gulick, P. J. and Dvorak, J.** 1987. Gene induction and repression by salt treatment in roots of the salinity sensitive Chinese Spring wheat and the salinity-tolerant Chinese Spring x *Elytrigia elongata* amphiploid. *Proc. Natl. Acad. Sci. U. S. A.* **84**: 99-103.
- Hanahan, D.** 1983. Studies on transformation of *Escherichia coli* with plasmids. *J. Mol. Biol.* **166**: 557-580.
- Hanahan, D.** 1985. Techniques for transformation of *Escherichia coli*. In: DNA Cloning, Volume I, a practical approach. Glover, D. M. (ed.). Oxford. pp. 109-135.
- Hannaert, V., Bringaud, F., Opperdoes, F. R. and Michels P. A. M.** 2003. Evolution of energy metabolism and its compartmentation in Kinetoplastida. *Bio. Med. Central. Kinetoplastid Biol. Dis.* **2**(1):11.
- Hatch, M. D.** 1979. Regulation of C₄ photosynthesis: factors affecting cold-mediated inactivation and reactivation of pyruvate, Pi-dikinase. *Aust. J. Plant Physiol.* **6**: 607-619.
- Hatch, M. D. an Slack, C. R.** 1969. Studies on the Mechanism of Activation and Inactivation of Pyruvate, Phosphate Dikinase. *Biochem. J.* **112**: 549-558.
- Häusler, R. E., Hirsch, H.-J., Kreuzaler, F. and Peterhänsel, C.** 2002. Overexpression of C₄-cycle enzymes in transgenic C₃ plants: a biotechnological approach to improve C₃-photosynthesis. *J. Exp. Bot.* **53**(369): 591-607.

- Hayashi, H. and Chino, M.** 1990. Chemical composition of phloem sap from the upper most internode of the rice plant. *Plant Cell Physiol.* **31**: 247–251.
- Hayes, J. E. and Ma, J. F.** 2003. Al-induced efflux of organic acid anions is poorly associated with internal organic acid metabolism in triticale roots. *J. Exp. Bot.* **54**(388): 1753-1759.
- He, Z., von Caemmerer, S., Hudson, G. S., Price, G. D., Badger, M. R. and Andrews, T. J.** 1997. Ribulose-1,5-Biphosphate Carboxylase/Oxygenase Activse Deficiency Delays Senescence of Ribulose-1,5-Biphosphate Carboxylase/Oxygenase but Progressively Impairs Its Catalysis during Tobacco Leaf Development. *Plant Physiol.* **115**: 1569-1580.
- Heldt, H. W.** 1999. Pflanzenbiochemie. 2. Auflage. Spektrum Akademischer Verlag GmbH. Heidelberg; Berlin. 597 S.
- Herzberg, O., Chen, C. C., Kapadia, G., McGuire, M., Carroll, L. J., Noh, S. J. and Dunaway-Mariano, D.** 1996. Swiveling-domain mechanism for enzymatic phosphotransfer between remote reaction sites. *Proc. Natl. Acad. Sci. U. S. A.* **93**: 2652-2657.
- Hewitt, E. J.** 1966. Sand and water culture methods used in the study of plant nutrition. 2nd. Edition. Commonwealth Bureau of Horticulture and Plantation Crops, East Malling. Tech. Communication. Number 22. UK.
- Hikosaka, K. and Hirose, T.** 2000. Photosynthetic nitrogen-use efficiency in evergreen broad-leaved woody species coexisting in a warm-temperate forest. *Tree Physiol.* **20**: 1249-1254.
- Höfner, R., Vázquez-Moreno, L., Winter, K., Bohnert, H. J., and Schmitt, J. M.** 1987. Induction of Crassulacean acid metabolism in *Mesembryanthemum crystallinum* by high salinity: mass increase and de novo synthesis of PEP-carboxylase. *Plant Physiol.* **83**: 915-919.
- Höfner, R., Vázquez-Moreno L., Abou-Mandour A. A., Bohnert, H. J. and Schmitt, J. M.** 1989. Two isoforms of phspoenolpyruvate carboxylase in the facultative CAM plant *Mesembryanthemum crystallinum*. *Plant Physiol. Biochem.* **27**: 803-810.
- Hurkman, W. J., Tanaka, C. K. and Fornari C. S.** 1989. A comparison of the effects of salt on polypeptides and translatable mRNAs in the roots of a salt-tolerant and a salt-sensitive cultivar of barley. *Plant Physiol.* **90**: 1444-1456.
- Ishimaru, K., Ichikawa, H., Matsuoka, M. and Ohsugi, R.** 1997. Analysis of a C₄ maize pyruvate, orthophosphate dikinase expressed in C₃ transgenic *Arabidopsis* plants. *Plant Sci.* **129**: 57-64.
- Ishimaru, K., Ohkawa, Y., Ishige, T., Tobias, D. J. and Ohsugi, R.** 1998. Elevated pyruvate, orthophosphate dikinase (PPDK) activity alters carbon metabolism in C₃ transgenic potatoes with a C₄ maize PPDK gene. *Physiol. Plant.* **103**: 340-346.
- Imaiizumi, N., Samejima, M. and Ishihara, K.** 1997. Characteristics of photosynthetic carbon metabolism of spikelets in rice. *Photosynt. Res.* **52**(2): 75-82.
- Inui, M., Nakata, K., Hyeob, J., Zahn, K. and Yukawa, H.** 1999. Molecular and Functional Characterization of the *Rhodopseudomonas palustris* No. 7 Phosphoenolpyruvate Carboxykinase Gene. *J. Bacteriol.* **181**(9): 2689-2696.
- Jeanneau, M., Vidal, J., Gousse-Dupont, A., Lebouteiller, B., Hodges, M., Gerentes, D. and Pérez, P.** 2002. Manipulating of PEPC levels in plants. *J. Exp. Bot.* **53**(376): 1837-1845.
- Jensen, P. E., Gilpin, M., Knoetzel, J. and Scheller, H. V.** 2000. The PSI-K subunit of photosystem I is involved in the interaction between light-harvesting complex I and the photosystem I reaction center core. *J. Biol. Chem.* **275**: 24701-24708.
- Jeong, B. and Lee, Ch. W.** 1992. Ammonium and nitrate nutrition of 11 bedding plant species. *Acta Hort.* **319**: 505-510.
- Jones, D. L.** 1998. Organic acids in the rhizosphere: a critical review. *Plant Soil* **205**: 25-44.
- Jones, D. L., Gilroy, S., Larsen, P. B., Howell, S. H. and Kochian, L. V.** 1998. Effect of aluminum on cytoplasmic Ca²⁺ homeostasis in root hairs of *Arabidopsis thaliana* (L.). *Planta* **206**: 378-387.
- Kaufman, P. B., Carlson, T. F., Dayanandan, P., Evans, M. L., Fisher, J. B., Parks, C. and Wells, J. R.** 1989. Plants: their biology and importance. Harper & Row, Publishes. New York, U. S. A. 715 p.
- Keeley, J. E.** 1999. Photosynthetic pathway diversity in a seasonal pool community. *Funct. Ecol.* **13**: 106-118.
- Kinraide, T. and Parker, D.** 1990. Apparent phytotoxicity of mononuclear hydroxyaluminium complexes. *Physiol. Plant.* **79**: 283-288.
- Kluge, M.** 1999. Ökologische Anpassungen: Crassulaceen-Säurestoffwechsel und C₄-Photosynthese. In: *Photosynthese*. Häder, D-P (ed.). Stuttgart, New York: Thieme. pp. 194-215.

- Knop, C.** 1998. Untersuchungen zum Zucker und Aminosäuretransport bei der symplastischen Pfloembeladung. Diplomarbeit. Math. Nat. Fakultät. Universität Göttingen.
- Kochian, L. V.** 1995. Cellular mechanisms of aluminum toxicity and resistance in plants. Annu. Rev. Plant Physiol. Plant Mol. Biol. **46**: 237-260.
- Kochian, L. V., Hoekenga, O. A. and Piñeros, M. A.** 2004. How do crop plants tolerate acid soils? Mechanisms of aluminium tolerance and phosphorous efficiency. Annu. Rev. Plant Physiol. Plant Mol. Biol. **55**: 459-493.
- Kondo A., Nose, A., and Ueno, O.** 1998. Leaf inner structure and immunogold localization of some key enzymes involved in carbon metabolism in CAM plants. J. Exp. Bot. **49**: 1953-1961.
- Kondo, A., Nose, A., Yuasa, H. and Ueno, O.** 2000. Species variation in the intracellular localization of pyruvate, Pi dikinase in leaves of crassulacean-acid-metabolism plants: an immunogold electron-microscope study. Planta **210**: 611-621.
- Kondo, A., Nose, A. and Ueno, O.** 2001. Coordinated accumulation of the chloroplastic and cytosolic pyruvate, Pi dikinases with enhanced expression of CAM in *Kalanchoë blossfeldiana*. Physiol. Plant. **111**: 116-122.
- Ku, M. S. B., Kano-Murakami, Y. and Matsuoka, M.** 1996. Evolution and Expression of C₄ photosynthesis Genes. Plant Physiol. **111**: 949-957.
- Laemmli, U. K.** 1970. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature **227**: 680-685.
- Lam, E.** 1994. Analysis of tissue-specific elements in the CaMV 35S promoter. In: Plant promoters and transcription factors. Nover, L. (ed.). Springer Verlag, Germany, pp. 181-196.
- Lam, H.-M., Coschigano, K. T.; Oliveira, I. C., Melo-Oliveira, R. and Coruzzi, G. M.** 1996. The molecular-genetics of nitrogen assimilation into amino acids in higher plants. Annu. Rev. Plant Physiol. Plant Mol. Biol. **47**: 569-593.
- Latzko, E. and Kelly, G.** 1983. The many-faceted function of phosphoenolpyruvate carboxylase in C₃ plants. Physiol Vég. **21**(5): 805-815.
- Lawlor, D. W.** 2002. Carbon and nitrogen assimilation in relation to yield: mechanisms are the key to understanding production systems. J. Bot. Exp. **53**(370): 773-787.
- Lawlor, D. W., Lemaire, G. and Gastal, F.** 2001. Nitrogen, plant growth and crop yield. In: Plant Nitrogen. Lea, P. J. and Morot-Gaudry, J.-F. (eds.) pp. 343-367.
- Leegood, R. C.** 2002. C₄ photosynthesis: principles of CO₂ concentration and prospects for its introduction into C₃ plants. J. Exp. Bot. **53**(369): 581-590.
- Li, B., Zhang, X.Q. and Chollet, R.** 1996. Phosphoenolpyruvate carboxylase kinase in tobacco leaves is activated by light in a similar but not identical way as in maize. Plant Physiol. **111**: 497-505.
- Lin, J.-F. and Wu S.-H.** 2004. Molecular events in senescing *Arabidopsis* leaves. Plant J. **39**: 612-628.
- Liu, X.-Y., Rocha-Sosa, M., Hummel, S., Willmitzer, L. and Frommer, W. B.** 1991. A detailed study of the regulation and evolution of the two classes of patatin genes in *Solanum tuberosum* L. Plant Mol Biol **17**: 1139-1154.
- Ma, J. F., Hiradate, S. and Matsumoto, H.** 1998. High Aluminum Resistance in Buckwheat. II. Oxalic Acid Detoxifies Aluminum Internally. Plant Physiol. **117**: 753-759.
- Ma, J. F.** 2000. Role of Organic Acids in Detoxification of Aluminum in Higher Plants. Plant Cell Physiol. **41**(4): 383-390.
- Ma, J. F., Rengel, Z. and Kuo, J.** 2002. Aluminium toxicity in rye (*Secale cereale*): Root growth and dynamics of cytoplasmic Ca²⁺ in intact root tips. Ann. Bot. **89**: 241-244.
- Mackown, C. T. and Sutton, T. G.** 1998. Using early-season leaf traits to predict nitrogen sufficiency of burley tobacco. Agron. J. **90**: 21-27.
- Maldonado, R. A. and Fairlamb, A. H.** 2001. Cloning of a pyruvate phosphate dikinase from *Trypanosoma cruzi*. Mol. Biochem. Parasitol. **112**(2): 183-191.
- Marschner, H.** 2002. Mineral nutrition of higher plants. Second Edition. Academic Press. London, UK. 889 p.
- Masclaux, C., Valadier, M.-H., Brugière, N., Morot-Gaudry, J.-F. and Hirel, B.** 2000. Characterization of the sink/source transition in tobacco (*Nicotiana tabacum* L.) shoots in relation to nitrogen management and leaf senescence. Planta **211**: 510-518.
- Matsuoka, M., Furbank, R. T., Fukayama, H. and Miyao, M.** 2001. Molecular Engineering of C₄ Photosynthesis. Annu. Rev. Plant Physiol. Plant Mol. Biol. **52**: 297-314.

- Matsuoka, M., Nomura, M., Agarie, S., Miyao-Tokutomi, M. and Ku, M. S. B.** 1998. Evolution of C₄ photosynthetic genes and overexpression of maize C₄ genes in rice. *J. Plant Res.* **111**: 333-337.
- Matsuoka, M., Tada, Y., Fujimura, T. and Kano-Murakami, Y.** 1993. Tissue-Specific Light-Regulated Expression Directed by the Promoter of a C₄ Gene, Maize Pyruvate, Orthophosphate Dikinase, in a C₃ Plant, Rice. *Proc. Natl. Acad. Sci. U. S. A.* **90**(20): 9586-9590.
- Matt, P., Geiger, M., Walch-Chiu, P., Engels, C., Krapp, A. and Stitt, M.** 2001. Elevated carbon dioxide increases nitrate uptake and nitrate reductase activity when tobacco is growing on ammonium nitrate. *Plant Cell Environ.* **24**: 1119-1137.
- Matt, P., Krapp, A., Haake, V., Mock, H.-P. and Stitt, M.** 2002. Decreased Rubisco activity leads to dramatic changes of nitrate metabolism, amino acid metabolism and the levels of phenylpropanoids and nicotine in tobacco antisense RBCS transformants. *Plant J.* **30**(6): 663-677.
- Mayne, M. B., Subramanian, M., Blake, T. J., Coleman, J. R. and Blumwald, E.** 1994. Changes in protein synthesis during drought conditioning in roots of jack pine seedlings (*Pinus banksiana* Lamb.). *Tree Physiol.* **14**: 509-519.
- McCullough, D. E., Girardin, Ph., Mihajlovic, M., Aguilera, A. and Tollenaar, M.** 1994. Influence of N supply on development and dry matter accumulation of an old and new maize hybrid. *Can. J. Plant Sci.* **74**: 471-477.
- McGuire, M., Huang, K., Kapadia, G., Herzberg, O. and Dunaway-Mariano, D.** 1998. Location of the phosphate binding site within *Clostridium symbiosum* pyruvate phosphate dikinase. *Biochem.* **33**: 1134-1142.
- Mehl, A., Xu, Y. and Dunaway-Mariano, D.** 1994. Energetics of pyruvate phosphate dikinase catalysis. *Biochem.* **33**(5): 1093-1102.
- Mengel, K.** 1991. Ernährung und Stoffwechsel der Pflanze. Gustav Fischer Verlag Jena. 7., überarb. Aufl. Germany. 466 S.
- Migge, A., Carayol, E., Hirel, B. and Becker, T. W.** 2000. Leaf-specific overexpression of plastidic glutamine synthetase stimulates growth of transgenic tobacco seedlings. *Planta* **210**: 252-260.
- Miyao, M.** 2003. Molecular evolution and genetic engineering of C₄ photosynthetic enzymes. *J. Exp. Bot.* **54**(381): 179-189.
- Miyao, M., Fukayama, H., Tamai, T. and Matsuoka, M.** 2001. High level expression of C₄ photosynthesis enzymes in transgenic rice. In: Proceedings of 12th International Congress on Photosynthesis, Canberra, Australia: CSIRO Publishing, S39-001.
- Miyasaka, S. C., Buta J. G., Howell R. K. and Foy C. D.** 1991. Mechanism of aluminum tolerance in snapbeans: root exudation of citric acid. *Plant Physiol.* **96**: 737-743.
- Mohr, H. und Schopfer, S.** 1992. Pflanzenphysiologie. Verlag, 4. Berlin, Heidelberg, Springer. Germany.
- Moons, A., Valcke, R. and Van Montagu, M.** 1998. Low-oxygen stress and water deficit induce cytosolic pyruvate orthophosphate dikinase (PPDK) expression in roots of rice, a C₃ plant. *Plant J.* **15**(1): 89-98.
- Moore, S. and Stein, W. H.** 1948. Photometric ninhydrin method for use in chromatography of amino acids. *J. Biol. Chem.* **176**: 367-388.
- Moore, S. and Stein, W. H.** 1954. A modified ninhydrin reagent for the photometric determination of amino acids and related compounds. *J. Biol. Chem.* **211**: 907-913.
- Mott, K. A.** 1998. Ribulose 1,5-biphosphate carboxylase/oxygenase In: Plant metabolism. Dennis, D. T., Turpin, D. H., Lefebvre, D. D. and Layzell, D. B. (eds.). Longman. Singapore. pp. 286-298.
- Murashige T. and Skoog F.** 1962. A revised medium for rapid growth and bioassays with tobacco tissue culture. *Physiol. Plant.* **15**: 473-497.
- Naidu, S. L., Moose, S. P., Al-Shoabi, A. K., Raines, C. A. and Long, S. P.** 2003. Cold Tolerance of C₄ photosynthesis in *Miscanthus x giganteus*: Adaptation in Amounts and Sequence of C₄ Photosynthetic Enzymes. *Plant Physiol.* **132**: 1-10.

- Nomura, M., Sentoku, N., Nishimura, A., Lin, J.-H., Honda, C., Taniguchi, M., Ishida, Y., Ohta, S., Komari, T., Miyao-Tokutomi, M., Kano-Murakami, Y., Tajima, S., Ku, M. S. B. and Matsuoka, M.** 2000. The evolution of C₄ plants: acquisition of cis-regulatory sequences in the promoter of C₄-type pyruvate, orthophosphate dikinase gene. *Plant J.* **22**(3): 211-221.
- Oberhuber, M., Berghold, J., Breuker, K., Hörtensteiner, S. and Kräutler, B.** 2003. Breakdown of chlorophyll: A nonenzymatic reaction accounts for the formation of the colorless „nonfluorescent“ chlorophyll catabolites. *Proc. Natl. Acad. Sci. U. S. A.* **100**(12): 6910-6915.
- Odell, J. T., Nagy, F. and Chua, N.-H.** 1985. Identification of DNA sequences required for activity of the cauliflower mosaic virus 35S promoter. *Nature* **313**: 810-812.
- Ohta, S., Usami, S., Ueki, J., Kumashiro, T., Komari, T. and Burnell, J. N.** 1997. Identification of the amino acid residues responsible for cold tolerance in *Flaveri brownii* pyruvate, orthophosphate dikinase. *FEBS Lett.* **403**: 5-9.
- Osawa, H. und Matsumoto, H.** 2001. Possible Involvement of Protein Phosphorylation in Aluminum-Responsive Malat Efflux from Wheat Root Apex. *Plant Physiol.* **126**: 411-420.
- Osmond, C. B. and Holtum, J. A. M.** 1981. Crassulacean acid metabolism. In: The biochemistry of plants. Hatch M. D. and Boardman, N. K. (eds.) Vol 8, Photosynthesis. Academic Press, New York, pp. 283-326.
- Osteras, M., Driscoll, B. T. and Finan, T. M.** 1997. Increase pyruvate orthophosphate dikinase activity results in an alternative gluconeogenic pathway in *Rhizobium (Sinorhizobium) meliloti*. *Microbiol.* **143**: 1639-1648.
- Orry, A., Macduff, J. H., Volenec, J. J. and Gaudillere, J. P.** 2001. Nitrogen traffic during plant growth and development. In: Plant Nitrogen. Lea, P. J. and Morot-Gaudry, J. F. (eds.) pp. 255-274.
- Ow D. W., Jacobs J. D. and Howell S. H.** 1987. Functional regions of the Cauliflower mosaic virus 35S RNA promoter determined by use of the firefly luciferase gene as a reporter of promoter activity. *Proc. Natl. Acad. Sci. U. S. A.* **84**: 4870-4874.
- Pellet, D. M., Grunes, D. L. and Kochian, L. V.** 1995. Organic acid exudation as an aluminum-tolerance mechanism in maize (*Zea mays* L.). *Planta* **196**: 788-795.
- Piñeros, M. A. and Kochian L. V.** 2001. A Patch-Clamp Study on the Physiology of Aluminum Toxicity and Aluminum Tolerance in Maize. Identification and Charachterization of Al³⁺-Induced Anion Channels. *Plant Physiol.* **125**: 292-305.
- Plaxton, W. C.** 1996. The organization and regulation of plant glycolysis. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* **47**: 185-214.
- Plaxton, W. C.** 2002. Metabolic Flexibility Helps Plants to Survive Stress. In: Plant Physiology Online. Sinauer Associates. Sunderland, MA. U. S. A.
- Quick W. P., Schurr U., Fichtner K., Schulze E-D., Romeder S. R., Bogorad L. and Stitt M.** 1991. The impact of decreased Rubisco on photosynthesis, growth, allocation and storage in tobacco plants which have been transformed with antisense rbcS. *Plant J.* **1**: 51-58.
- Raab, T. K. and Terry, N.** 1994. Nitrogen source regulation of growth and photosynthesis in *Beta vulgaris* L. *Plant Physiol.* **105**: 1159-1166.
- Rademacher, T., Häusler, R. E., Hirsch, H.-J., Zhang, L., Lipka, V., Weier, D., Kreuzaler, F. and Peterhänsel, C.** 2002. An engineered phosphoenolpyruvate carboxilase redirects carbon and nitrogen flow in transgenic potato plants. *Plant J.* **32**: 25-39.
- Ramage, C. M. and Williams, R. R.** 2002. Inorganic nitrogen requirements during shoot organogenesis in tobacco leaf discs. *J. Exp. Bot.* **53**(373): 1437-1443.
- Ranjith, S. A., Meinzer, F. C., Perry, M. H. and Thorn, M.** 1995. Partitioning of carboxilase activity in nitrogen-stressed sugarcane and its relation to bundle sheath leakiness to CO₂, photosynthesis and carbon isotope discrimination. *Aust. J. Plant Physiol.* **22**: 903-911.
- Rocha-Sosa M., Sonnewald U., Frommer W., Stratmann M., Schell J. and Willmitzer, L.** 1989. Both developmental and metabolic signals activate the promoter of a class I patatin gene. *EMBO J.* **8**: 23-29.
- Ronimus, R. S. and Morgan, H. W.** 2003. Distribution and phylogenies of enzymes of the Embden-Meyerhof-Parnas pathway from archaea and hyperthermophilic bacteria support a gluconeogenic origin of metabolism. *Archaea* **1**: 199-221.
- Rosendahl, I., Vance, C. P. and Pedersen, W. B.** 1990. Products of dark CO₂ fixation in pea root nodules support bacteriod metabolism. *Plant Physiol.* **93**: 12-19.

- Ryan, P. R., Delhaize E. and Randall, P. J.** 1995. Malate efflux from root apices and tolerance to aluminum are highly correlated in wheat. *Aust. J. Plant Physiol.* **22**: 531-536.
- Sachs, L.** 1999. *Angewandte Statistik. Anwendung statistischer Methoden.* 9. Auflage. Springer-Verlag Berlin Heidelberg. Germany.
- Salahas, G., Cormans, E. and Zervoudakis, G.** 2002. Cold Inactivation of Phosphoenolpyruvate Carboxylase and Pyruvate Orthophosphate Dikinase from the C4 Perennial Plant *Atriplex halimus*. *Russian J. Plant Physiol.* **49**(2): 211-215.
- Saliendra, N. Z., Meinzer, F. C., Perry, M. and Thorn, M.** 1996. Associations between partitioning of carboxilase activity and bundle sheath leakiness to CO₂, carbon isotope discrimination, photosynthesis, and growth in sugarcane. *J. Exp. Bot.* **47**: 907-914.
- Salinovitch, O. and Montelaro, R. C.** 1986. Reversible staining and peptide mapping of proteins transferred to nitrocellulose after separation by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. *Anal. Biochem.* **156**: 341-347.
- Sambrook J. and D. W. Russell.** 2001. Molecular cloning. A laboratory manual. Third edition .Volume 3 Cold. Spring Harbor Laboratory Press. New York, U. S. A.
- Schmitt, J. M., Höfner, R., Abou-Mandour, A. A., Vázquez-Moreno, L. and Bohnert, H. J.** 1989. CAM induction in *Mesembryanthemum crystallinum*: protein expression. *In: Photosynthesis – Molecular Biology and Bioenergetics.* Singhal, G. S. (ed.) Springer, Berlin. pp. 259-268.
- Schnabl, H.** 1981. The compartmentation of carboxylating and decarboxylating enzymes in guard cell protoplasts. *Planta* **152**: 307-313.
- Sheen, J.** 1999. C₄ Gene Expression. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* **50**: 187-217.
- Sheriff, A.** 1994. Untersuchung der Ubiquitinierung der Phosphoenolpyruvat Carboxylase aus *Mesembryanthemum crystallinum* und von Tabak, der die Pyruvat Phosphat Dikinase aus *M. crystallinum* exprimiert. Inaugural-Dissertation. Fachbereich Chemie der FU-Berlin. Berlin, Deutschland. 103 S.
- Sheriff, A., Meyer, H., Riedel, E., Schmitt, J. M., and Lapke, C.** 1998 The influence of plant pyruvate, orthophosphate dikinase on a C₃ plant with respect to the intracellular location of the enzyme. *Plant Sci.* **136**: 43-57.
- Sims, D. A., Seemann, J. R. and Luo, Y.** 1998. Elevated CO₂ concentration has independent effects on expansion rates and thickness of soybean leaves across light and nitrogen gradients. *J. Bot. Exp.* **49**(320):583-591.
- Sivaguru, M. and Horst, W. J.** 1998. The distal part of the transition zone is the most aluminum-sensitive apical root zone of maize. *Plant Physiol.* **116**: 155–163.
- Slaski, J. J.** 1995. Differences in the metabolic responses of root tips of wheat and rye to aluminum stress. *In: Structure and Function of Roots.* F. Baluska (ed.) Kluwer Academic Publishers, Dordrecht. pp. 327-333.
- Sood, C. R., Chanda, S. V. and dev Singh, Y.** 2002. Effect of different nitrogen sources and plant growth regulators on glutamine synthetase and glutamate synthase activities of radish cotyledons. *Bulg. J. Plant Physiol.* **28**(3-4): 46-56.
- Spreitzer, R. J. and Salvucci, M. E.** 2002. RUBISCO: Structure, regulatory interactions, and possibilities for a better enzyme. *Annu. Rev. Plant Biol.* **53**: 449-475.
- Steiner, A. A. and van Winden, H.** 1970. Recipe for ferric salts of ethylenediaminetetraacetic acid. *Plant Physiol.* **46**: 862-863.
- Stenzel, R.** 1997. Die Expression der Pyruvat, Phosphat Dikinase in transgenen Pflanzen. Diplomarbeit. Universität des Saarlandes. Deutschland. 92 S.
- Stitt, M.** 1998. Pyrophosphate as an energy donor in the cytosol of plant cells: an enigmatic alternative to ATP. *Bot. Acta.* **111**: 167–175.
- Stitt, M., Müller, C., Matt, P., Gibon, Y., Carillo, P., Morcuende, R., Scheible, W.-R. and Krapp, A.** 2002. Steps towards an integrated view of nitrogen metabolism. *J. Exp. Bot.* **370**(53): 959-970.
- Terashima, I. and Hikosaka, K.** 1995. Comparative ecophysiology of leaf and canopy photosynthesis. *Plant Cell Environ.* **18**: 1111-1128.
- Tillard, P., Passama, L. and Gojon, A.** 1998. Are phloem amino acids involved in the shoot to root control of NO₃⁻ uptake in *Ricinus communis* plants? *J. Exp. Bot.* **325**(49): 1371-1379.
- Tobin, A. K. and Yamaya, T.** 2001. Cellular compartmentation of ammonium assimilation in rice and barley. *J. Exp. Bot.* **52**(356): 591-604.

- Tolbert, N. E.** 1997. The CO₂ oxidative photosynthetic carbon cycle. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* **48**: 1-25.
- Towbin, H.; Staehlin, T. and Gordon, J.** 1979. Electrophoretic transfer of protein from polyacrylamide gels to nitrocellulose sheets: Procedure and some applications, *Proc. Natl. Acad. Sci.* **76**: 4350-4354.
- Turpin, D. H. and Weger, H. G.** 1990. Interaction between photosynthesis, respiration and nitrogen assimilation. In: *Plant Physiology, Biochemistry and Molecular Biology*. Dennis D. T. and Turpin, D. H. (eds.) Longman Scientific, Singapore, 422 pp.
- Van der Eerden, L. J. M.** 1982. Toxicity of ammonia to plants. *Agric. Environ.* **7**: 223-236.
- Vidal, J. and Chollet, R.** 1997. Regulatory phosphorylation of C₄ PEP carboxylase. *Trends Plant Sci.* **2**: 230-237.
- Voll, L., Häusler, R. E., Hecker, R., Weber, A., Weissenböck, G., Fiene, G., Waffenschmidt, S. and Flügge, U.-I.** 2003. The phenotype of the *Arabidopsis* cue1 mutant is not simply caused by a general restriction of the shikimate pathway. *Plant J.* **36**: 301-317.
- von Wirén, N., Gojon, A., Chaillou, S. and Raper, D.** 2001. Mechanisms and regulation of ammonium uptake in higher plants. In: *Plant Nitrogen*. Lea, P. J. and Morot-Gaudry, J.-F. (eds.). pp. 61-77.
- Walch-Liu, P.; Neumann, G.; Bangerth, F. und Engels C.** 2000. Rapid effects of nitrogen form on leaf morphogenesis in tobacco. *J. Exp. Bot.* **51**(343): 227-237.
- Weber, A. P. M., Schneidereit, J. and Voll, L. M.** 2004. Using mutants to probe the in vivo function of plastid envelope membrane metabolite transporters. *J. Exp. Bot.* **55**(400): 1231-1244.
- Weiner, H., Stitt, M. and Held, H. W.** 1987. Subcellular compartmentation of pyrophosphate and alkaline pyrophosphatase in leaves. *Biochim. Biophys. Acta* **893**: 13-21.
- Winter, K., Foster, J. G., Edwards, G. E. and Holtum, J. A. M.** 1982. Intracellular localization of enzymes of carbon metabolism in *Mesembryanthemum crystallinum* exhibiting C₃ photosynthetic characteristics of performing Crassulacean Acid Metabolism. *Plant Physiol.* **69**: 300-307.
- Winter, K., Luttge, U., Winter, E. and Troughton, J.H.** 1978. Seasonal shift from C₃ photosynthesis to Crassulacean acid metabolism in *Mesembryanthemum crystallinum* growing in its natural environment. *Oecologia* **34**: 225-237.
- Wood H. G.** 1985. Inorganic pyrophosphate and polyphosphates as sources of energy. *Curr. Top. Cell. Regul.* **26**: 355-369.
- Wood, H. G., O'Brien, W. E. and Michaelis, G.** 1977. Properties of carboxy-transphosphorylase; pyruvate, phosphate dikinase; PPi-phospho-fructokinase and PPi-acetate kinase and their roles in the metabolism of inorganic pyrophosphate. *Adv. Enzymol.* **45**: 85-155.
- Yanagisawa, S., Akiyama, A., Kisaka, H., Uchimiya, H. and Miwa, T.** 2004. Metabolic engineering with Dof1 transcription factor in plants: Improved nitrogen assimilation and growth under low-nitrogen conditions. *Proc. Natl. Acad. Sci. U. S. A.* **101**(20): 7833-7838.
- Yankie, L., Xu, Y. and Dunaway-Mariano, D.** 1995. Location of the catalytic site for phosphoenolpyruvate formation within the primary structure of *Clostridium symbiosum* pyruvate phosphate dikinase. 2. Site-directed mutagenesis of an essential arginine contained within an apparent P-loop. *Biochem.* **34**: 2188-2194.
- Zlatanova, J.; Paneva, E. and Yaneva, J.** 1994. A spot test for protein detection and semiquantitative estimation in small samples. *Cytobios* **78**: 135-138.