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研究论文

CO_2浓度倍增对城市银杏（*Ginkgo biloba*）叶片膜脂过氧化与抗氧化酶活性的影响

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摘要 以生长在沈阳市区内的银杏为试材，使用开顶箱模拟法对倍增CO_2浓度（700μmolmol^{-1}）和正常空气CO_2浓度(≈350μmolmol^{-1}）条件下银杏生长参数，超氧阴离子自由基（$O_2^{-\bullet}$）产生速率，丙二醛（MDA）含量，抗坏血酸（ASA）含量，超氧化物歧化酶（SOD）、抗坏血酸过氧化物酶（APX）及谷胱甘肽还原酶（GR）活性动态变化进行分析，探讨高浓度CO_2对银杏膜脂过氧化与抗氧化酶活性的影响。结果表明，在短期(60d)内CO_2浓度倍增使银杏细胞内$O_2^{-\bullet}$产生速率与H_2O_2含量减少，而ASA含量与SOD、APX、GR活性升高。与对照相比，大多数测定显示出显著差别。但较长期（70d以上）CO_2浓度倍增处理则使试验结果发生逆转，活性氧$O_2^{-\bullet}$产生速率略有升高，SOD、APX、GR活性略有下降，ASA含量仍略高于对照（但与对照相比差异并不显著），长期CO_2浓度倍增处理可能使试验结果发生逆转。

关键词 CO_2倍增；银杏；膜脂过氧化；抗氧化酶活性；活性氧水平

分类号 Q945,Q948

Effects of elevated CO_2 on lipid peroxidation and activities of antioxidant enzymes in *Ginkgo biloba*

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Abstract To study the impact of elevated atmospheric CO_2 concentrations on activities of antioxidative enzymes and lipid peroxidation of trees, the superoxide anion ($O2^{-\bullet}$) generating rate, malondialdehyde (MDA) content, activities of superoxide dismutase (SOD), ascorbate peroxidase (APX) and glutathione reductase (GR), and ascorbic acid (ASA) content were periodically analyzed in leaves of Ginkgo biloba exposed in open-top chambers to either ambient (≈350μmol mol^{-1}) or elevated (700μmol mol^{-1}) CO_2 concentrations in urban area for a growing season. The results show that elevated CO_2 exposure in the short-term reduced generating rate of superoxide anion radical and content of hydrogen peroxide. Malondialdehyde (MDA) content as an index of lipid peroxidation was also decreased. The activities of SOD, APX and GR, and ascorbate content were increased by high CO_2 exposure. However the results were reversed by the long-term elevated CO_2 exposure. Generating rate of superoxide anion radical and content of hydrogen peroxide slight increased, the activities of SOD, APX and GR tiny declined and ASA content increased. These results were not significant difference compared to control. It is concluded that the activities of antioxidant system in Ginkgo biloba increased and the ability of scavenging reactive oxygen enhanced. However, the antioxidant ability might be declined by the long-term high CO_2 exposure.

Key words Ginkgo biloba _ elevated CO_2 concentration _ anti-oxidantive enzymes _ level of reactive oxygen

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