

研究论文

转基因棉花苗期光合特性的研究

孙彩霞¹，齐华²，孙加强¹，张丽莉³，缪璐¹

¹东北大学生物工程与技术研究所，辽宁沈阳110004 ²沈阳农业大学农学系，辽宁沈阳110161 ³中国科学院沈阳应用生态研究所，辽宁沈阳110016

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摘要 以3种不同转基因棉花及其亲本对照为材料，研究了盆栽条件下不同棉花品种苗期光合作用及有关生理特性。结果表明，与其非转基因对照相比，转基因棉花叶片的气孔导度、蒸腾速率和胞间CO₂浓度的变化不明显，且不同抗虫棉的变化趋势不同，其中仅有转Bt基因棉Z30与其对照Z16之间的净光合速率差异达显著水平；所有供试转基因棉花叶片中的RuBP羧化酶活性均显著下降而乙醇酸氧化酶的活性均显著上升，但叶绿素a、b和总含量以及叶绿素a/b无显著变化。推测转基因抗虫棉花叶片RuBP羧化酶和乙醇酸氧化酶参与调控的光合及呼吸代谢过程可能发生了改变。随着转入基因的多样化，其可能引发转基因作物产生的非预期效应更加不确定与复杂。

关键词 [棉花](#) [Bt](#) [CpTI](#) [光合特性](#)

分类号

Photosynthetic Characteristics of Bt or CpTI-Bt Transgenic Cotton at Seedling Stage

SUN Cai-Xia¹, QI Hua², SUN Jia-Qiang¹, ZHANG Li-Li³, MIAO Lu¹

¹ Institute of Biotechnology, Northeastern University, Shenyang 110004, Liaoning; ² Agronomy College, Agricultural University of Shenyang, Shenyang 110161, Liaoning; ³ Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, Liaoning, China

Abstract

Photosynthesis is an important physiological process related to yield production and biomass accumulation in plants. With the research, development and application of genetically modified (GM) crops in the world, their risk assessment has been paid an increasing attention. In order to find out effects of exogenous genes on photosynthesis in transgenic plants, photosynthetic characteristics of transgenic Bt (Z30) and CpTI-Bt (CCRI41 and SGK321) cotton at seedling stage were studied by pot experiment. The results showed that the changes of stomatal conductance, transpiration rate and intercellular CO₂ concentration in the leaves of Bt and CpTI-Bt transgenic cotton were not obvious in comparison with non-transgenic cotton (Z16, CCRI23 and SY321, respectively) and differed among different cotton cultivars. The difference of net photosynthetic rate between Bt transgenic cotton Z30 and non-Bt cotton Z16 was significant. The RuBPcase activity was decreased significantly and the GO activity increased significantly in the leaves of all tested transgenic cotton in comparison with non-transgenic cotton. But there were not significant differences in the content of Chlorophyll a, Chlorophyll b, Chlorophyll a/b, and the total Chlorophyll content between transgenic and non-transgenic cotton. The responses of photosynthetic rate to light in intensities in mature cotton leaves were also measured under different light intensity conditions (the light intensities were 0, 10, 20, 40, 60, 80, 100, 200, 400, 600, 800, 1 000, and 1 200 μmol m⁻² s⁻¹). The parameters of apparent quantum yield, maximum net photosynthetic rate, apparent dark respiration rate, light compensation point and light saturation point were calculated by model fitting. The possible changes of these parameters were observed at a certain extent. But the results still need to be validated through farther test. From these results, the processes of photosynthesis and respiration regulated by RuBPcase and GO are changed possibly. The analysis by combination of dry biomass and photosynthetic characteristics studied in this experiment indicated that the response of biomass accumulation to genetical modification by exogenous genes of Bt and CpTI in transgenic cotton was related to both photosynthesis and other processes which were not studied in this experiment. The unanticipated effects of transgenic crops would be more uncertain and complex along with diversification of transgenic genes.

Key words [Cotton](#) [Bt](#) [CpTI](#) [Photosynthetic characteristics](#)

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通讯作者 孙彩霞 scxdd@yahoo.com.cn