

## PEPC过表达可以减轻干旱胁迫对水稻光合的抑制作用

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## Alleviation of Drought Stress Inhibition on Photosynthesis by Over Expression of PEPC Gene in Rice

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摘要

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**摘要** 为了明确磷酸烯醇式丙酮羧化酶(PEPC)过量表达能否提高水稻的光合速率, 测定了42个表达不同PEPC水平的转玉米PEPC基因水稻株系及对照(受体亲本中花8号)开花期和灌浆期的光合速率。结果表明, 在水田条件下, 转基因株系光合速率与未转基因对照相比没有明显差异; 而在旱地条件下, 转基因水稻的光合速率显著高于对照(27%和24%)。随机选取2个PEPC相对活性分别为10倍和25倍的转基因株系进行网室精确控水盆栽实验得到相似的结果。说明单纯导入PEPC并不能提高水稻的光合速率, 而干旱胁迫下转基因水稻的光合优势可能是由于PEPC参与水稻的抗旱反应而减轻了干旱胁迫对光合作用的抑制作用。

**关键词:** 干旱 转基因水稻 磷酸烯醇式丙酮羧化酶(PEPC) 光合速率

**Abstract:** Introducing enzymes involved in photosynthesis of  $C_4$  plants into rice is supposed to enhance the photosynthesis and crop productivity. However, only a few researches showed that the photosynthesis and crop productivity has been improved by introducing phosphoenolpyruvate carboxylase (PEPC) gene into rice. In the present research, the photosynthesis in 42 lines of PEPC gene overexpressed rice was investigated. The average photosynthetic rate ( $P_n$ ) of transgenic rice lines was almost the same as that of the wild type (control) in paddy field, while much higher in upland field. Only a few transgenic lines showed higher  $P_n$  in paddy field and most of them showed higher  $P_n$  in upland field. Similar results were found in the water controlled experiment. Two transgenic rice lines with different relative activities of PEPC (10 and 25 fold) were selected to study their photosynthesis under different water potentials (0, -20, and -40 kPa). In both lines,  $P_n$  was similar with that in the wild type under normal condition (0 kPa) and much higher under drought conditions (-20 and -40 kPa). In both experiments, the transgenic lines had higher  $P_n$  under drought conditions, with a much slower decreasing rate than the wild type. Therefore, the present results suggested that the overexpressed PEPC could not improve the photosynthetic rate of transgenic rice plants. But the photosynthetic rate of transgenic rices declined slowly under drought condition. So it is supposed that PEPC might be involved in drought resistance to decrease the inhibition of drought stress on photosynthesis in rice.

**Keywords:** Drought Transgenic rice Phosphoenolpyruvate carboxylase (PEPC) Photosynthetic rate

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