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Agronomic Characteristics of NtPT1-Transgenic Rice Lines

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Objective

Phosphorus (P) is one of the macronutrients required for plant growth and development. It plays important roles as a control element in the processes of energy transfer, signal transduction, photosynthesis and respiration. Transgenic rice overexpressing a tobacco high-affinity phosphate transporter (*NtPT1*) was developed to improve phosphate use efficiency of rice. This study was conducted to investigate agronomic characteristics of transgenic rice overexpressing the *NtPT1* gene.

Materials and Methods

○ Plant materials

- Seventeen transgenic T3 lines and a non-transgenic control variety (Dongjin-byeo).

○ Experimental methods

- Rice cultivation: Seedlings were established in glasshouse, transplanted to an experimental paddy field and cultivated according to a standard procedure.
- Assay of mineral contents: Dry seeds and flag leaves samples were wet-digested in a mixture of H_2SO_4 and H_2O_2, and the diluted digests were used for mineral elements assay using a Sequential Plasma Spectrometer (ICPS-7500, Shimadzu Corporation, Japan).
- Measurements of chlorophyll contents and CO_2 assimilation: Chlorophyll contents were measured with a SPAD meter and CO_2 assimilation with a Infra-red gas analyzer (LCA-4, ADC Ltd., UK) for the fully expanded flag leaves.

Results

Seed P contents of the transgenic lines were increased by 16-25% over the non-transgenic rice variety Donjinbyeo in the field trial. Most of the transgenic lines had similar agronomic traits and showed similar levels of performance as those of control plants except several transgenic lines showing inferior agronomic traits such as panicle length, culm length, and 1,000 grains weight compared to non-transgenic control plants. These results demonstrate that overexpression of a high affinity transporter enhances phosphate uptake by roots and accumulation in rice plant tissues including seeds.

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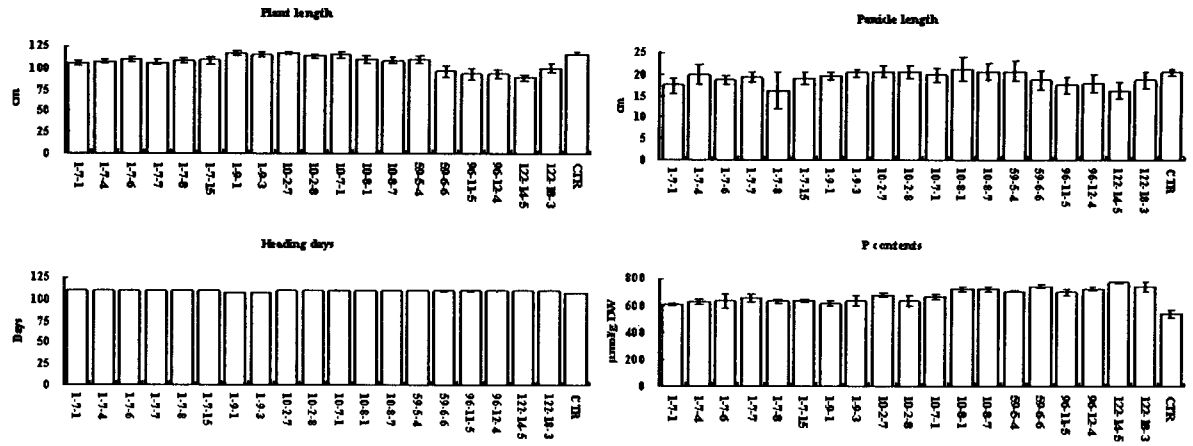

Fig. 1. Plant length, panicle length, heading days, and seed P contents of the seventeen transgenic and non-transgenic (CTR) plants grown in paddy field containing Pi at 140 mg Pi/Kg.

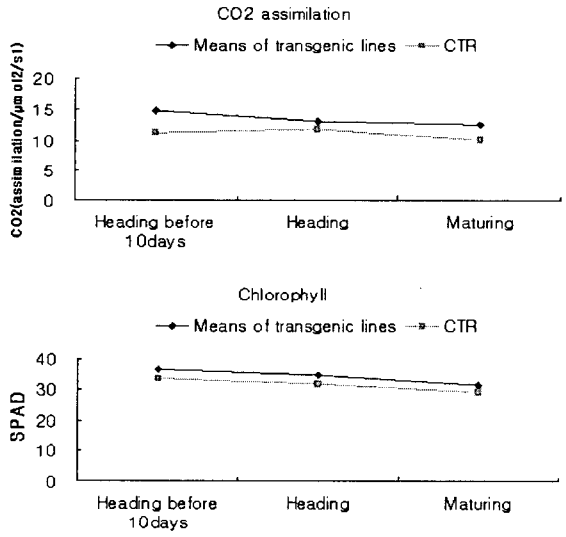

Fig. 2. Mean CO_2 assimilation and chlorophyll contents of the seventeen transgenic and non-transgenic (CTR) plants grown in paddy field containing Pi at 140 mg Pi/Kg.