

Grain Quality of NtPT1-Transgenic Rice

Chonbuk National University : Myoung Ryoul Park, Song Joong Yun*
National Honam Agricultural Research Institute : Key-Young Kim

Objective

Transgenic rice overexpressing a tobacco high-affinity phosphate transporter (*NtPT1*) demonstrated improved phosphate use efficiency in a field trial. This study was conducted to investigate grain quality of transgenic rice overexpressing the *NtPT1* gene.

Materials and Methods

- Plant materials
 - Two 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 the standard procedure.
 - Assay of mineral contents: Dry seeds and flag leaves samples were wet-digested in a mixture of H₂SO₄ and H₂O₂, and the diluted digests were used for mineral elements assay using Sequential Plasma Spectrometer (ICPS-7500, Shimadzu Corporation, Japan).
 - Measurements of grain quality: Factors affecting appearance, chemical and physicochemical qualities of grains were measured using the standard methods.

Results and Discussion

Seed P contents of the transgenic lines 1-7-8 and 122-14-5 were higher by 6% and 20% respectively, than that of the non-transgenic line in the field trial. Contents of all mineral elements except N showed line-specific variations in the transgenic lines compared to those of the control line. The pigmentation values were similar or decreased in the transgenic lines. Protein, amylose, and fatty acid contents were significantly lower in the transgenic lines than in the control line. Significant negative correlations were indicated between the seed P contents and protein, amylose, and fatty acid contents. These results indicate that transgenic lines with increased seed P contents could have similar or significantly improved grain quality compared to the control line.

Corresponding author : S. J. Yun E-mail : sjyun@chonbuk.ac.kr Tel : 063-270-2508

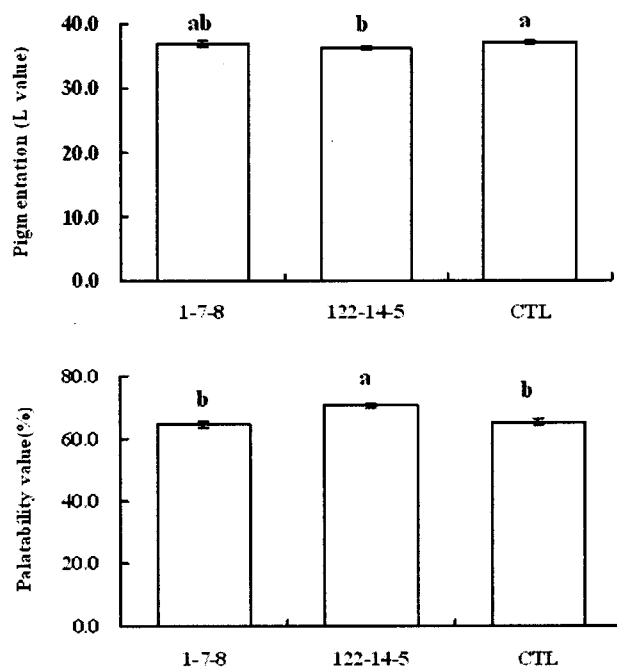


Fig. 1. Pigmentation and palatability value of grains in the transgenic (1-7-8 and 122-14-5) and non-transgenic (CTL) plants grown in paddy field containing 140 mg Pi/Kg. The columns indicated by the same letter are not significantly different at $p < 0.05$.

Table 1. Quality evaluation values and chemical compositions of brown rice grains of transgenic and control plants. Correlations between each trait and grain P contents are presented.

Varieties/lines	Quality evaluation value	Protein (%)	Amylose (%)	Fatty acids (%)	Moisture (%)
1-7-8	71.0	7.1	18.8	16.1	11.4
122-14-5	71.0	7.1	18.7	15.6	11.1
CTL	66.7	7.8	18.8	16.4	11.3
LSD	2.9	0.6	NS	0.6	0.2
Correlation	r value	-0.671	-0.714	-0.773	-0.625
	P value	0.040	0.031	0.015	NS

NS, Non-significant.