

Comparison of DNA-based and Pedigree-based Genetic Similarity among Korean Rice Cultivars

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Objectives

CP analysis and DNA fingerprinting are the most reliable methods used to investigate genetic variation of crop plants. The objectives of this study were to assess the level of genetic similarity among the Korean-bred rice cultivars and to investigate the correlation between two methods of measuring genetic similarity; the DNA-based genetic similarity (GS_{DNA}) and pedigree-based genetic similarity (GS_{ped}).

Materials and Methods

Plant materials: 287 rice cultivars used for Korean Rice breeding parents.

SSR primers used: A total of 15 SSR primers were used in this experiments

Estimation of Genetic similarity: Coefficient of parentage and DNA fingerprinting

Correlation coefficient: Pearson's coefficient (r).

Results and Discussion

○ The mean of the 5886 GS_{ped} pairwise comparisons was 0.13, with the range from 0.000 to 0.751, with higher distribution in the region of $GS_{ped} < 0.20$. In contrast, GS_{DNA} were normally distributed (mean = 0.79), suggesting that GS_{DNA} may have more utility than GS_{ped} for identifying parental combinations with maximum allelic variation.

○ In spite of substantially different means and distributions of the two diversity measures, a correlation ($r = 0.266$, $P < 0.05$) was detected between the two GS matrix, indicating the DNA data may help to more-accurately quantify the degree of relationship among rice cultivars. Clustering analysis based on pedigree and DNA-based GS detected a similar hierarchical pattern of genetic diversity among the 109 cultivars evaluated.

○ Although GS_{ped} was not well suited for identifying degree of relatedness among individuals, it may be adequate for assessing overall patterns of genetic variation among rice germplasm.

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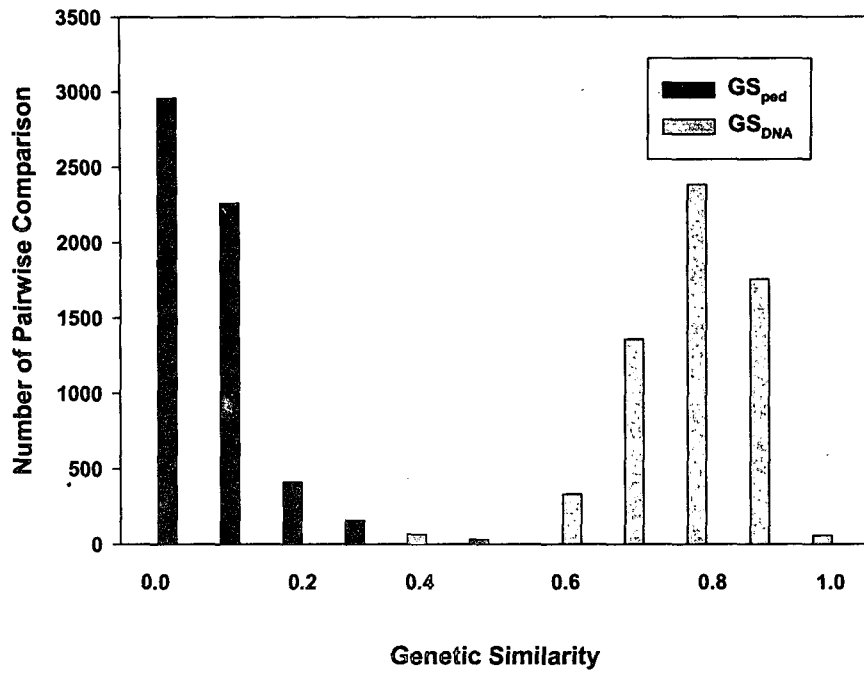


Fig. 1. Frequency distribution of genetic similarity based on DNA polymorphism (GSDNA) and pedigree analysis (GS_{ped}). GSDNA is based on Neis Similarity Coefficient whereas GS_{ped}, from Coefficient Parentage value (CP).

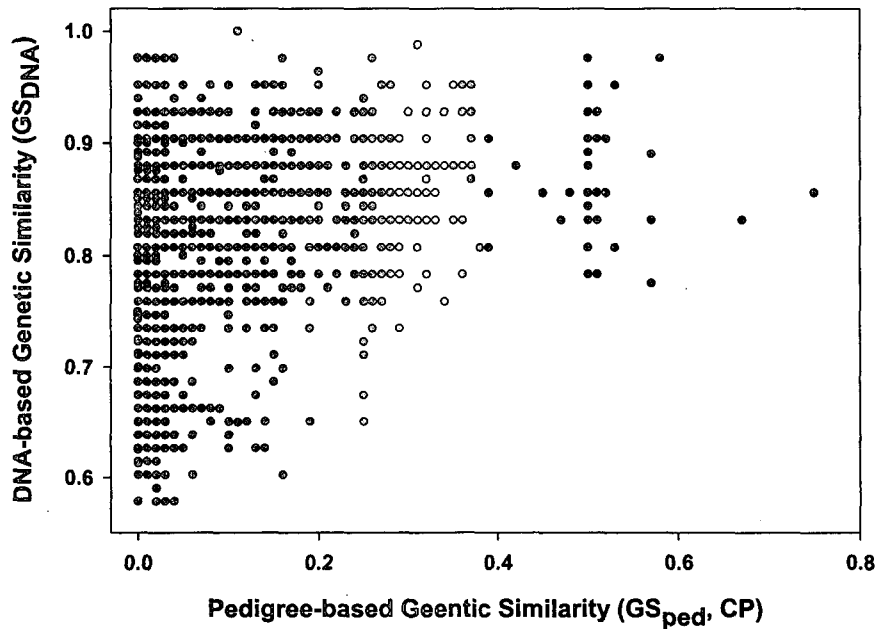


Fig. 2. Plot of DNA-based and pedigree-based genetic similarity of Korean-bred rice cultivars (Pearsons correlation $r=0.266^*$).