

Evaluation of genetic diversity of Asian wheat landrace germplasm based on HMW glutenin subunit

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[Introduction]

Quality improvement of wheat is mainly focused on the qualitative characteristics of gluten, the key factor for food processing, which decides viscoelasticity of storage protein. High molecular weight glutenin subunit (HMW-GS) related to Glu-1 loci has especially a strong correlation with bread-making quality because it decides the elasticity of wheat flour. This study aims to clarify the genetic variation of bread HMW-GS subunit characteristics of Asian wheat collection maintained in National Agrobiodiversity Center (NAC), Rural Development Administration(RDA), Rep. of Korea.

[Materials and Methods]

In this study, the allelic composition of HMW-glutenin subunit of 1,068 wheat accessions originated from Korea, China, Japan, Afghanistan, Iran, Pakistan, Middle East Asia and Caucasus were investigated. The collections were maintained in National Agrobiodiversity Center, National Institute of Agricultural Sciences, Rural Development Administration. HMW-GS patterns were evaluated by allele-specific DNA markers and SDS-PAGE. And Genetic diversity based on geographical groups was analyzed.

[Results and Discussions]

the number of accessions having reported HMW-GS pattern in previous studies was 855(80.1%). However, the number of accessions having newly detected HMW-GS pattern was 114(10.7%), These new HMW-GS patterns were categorized in 4 types based on their similarity. Eight Korean accessions having these four specific types were found. One of the types of the accessions from Korea was also found in 47 accessions from Afghanistan regardless of geographical distance. On the nature of landrace germplasm, 99 accessions (9.3%) showed heterogeneous patterns caused by seed mixture. As the result of the analysis of allelic variation of Glu-1 loci, the percentage of Glu-A1c(73.6%), Glu-B1b(60.2%) and Glu-D1a(68.5%) were most frequent in Glu-A1, Glu-B1 and Glu-D1 loci, respectively. Chinese germplasm had distinct characteristics. The rate of preferable alleles for bread baking, Glu-A1a and Glu-D1d allele in Chinese accessions were especially high. Thus, in the evaluation of bread baking quality by Glu-1 scoring system, 24 accessions were from China among 35 accessions which got full mark, 10, despite of relatively small sample size. The result of polymorphic information content index (PIC) of each origin based on the combination of HMW glutenin subunits showed that West Asian and neighboring regions wheats except Afghanistan ones were more diverse than East Asian wheats except Chinese ones. Polymorphic analysis by Unweighted neighbor joining method based on the combination of Glu-1 allele showed that most accessions from Korea, Japan and Afghanistan which have low PIC were in the same group. However, many accessions from China and other West Asian countries having high PIC in the other side regardless of geographical distance.

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