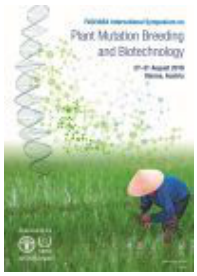

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IMPACT OF CROSS-BREEDING ON THE METABOLITE SIGNATURE RESULTING FROM THE osSULTR3;3 MUTATION IN LOW PHYTIC ACID RICE SEEDS

Phytic acid (myo-inositol 1,2,3,4,5,6-hexakisphosphate), the major storage form of phosphorus in cereals, is considered as an anti-nutrient in food and feed. During the past years, various cereals have been subjected to mutation breeding for generating low phytic acid (lpa) crops. Recently, it was demonstrated that reduction of phytic acid in the rice mutant MH86-lpa obtained by γ-irradiation was due to a disruption of OsSULTR3;3, an ortholog of the sulfate transporter family group 3 genes. The application of a GC/MS-based metabolite profiling approach revealed that the reduction of phytic acid was accompanied by changes in concentrations of metabolites from different classes in the MH86-lpa mutant.

Lpa mutant lines often exhibit lower grain yield and seed viability compared with the wild-type parents. To improve the agronomic performance of the MH86-lpa mutant, cross-breeding with two commercial cultivars was performed. The resulting progenies were genotyped using molecular markers to identify homozygous wild-type and lpa mutants from generations F3 to F8. The objectives of this study were (i) to investigate the impact of cross-breeding on the metabolic phenotype of the homozygous lpa mutant, and (ii) to assess the stability of the mutation-specific metabolite signature in the lpa progenies over several generations and in different field trials.

Statistical assessment of the data via multivariate and univariate approaches demonstrated that metabolite profiles of homozygous lpa mutant progenies were dependent on the mutation, the environmental conditions and the phenotypic traits of the commercial crossing partners. However, type and extent of the mutation-specific metabolite signature in the lpa progenies were comparable to the progenitor MH86-lpa mutant and consistent over generations.

These findings provide a basis for implementing mutation breeding in the generation of elite lpa cultivars.

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