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DEVELOPMENT AND IMPROVEMENT OF LOW PHYTATE BASMATI RICE THROUGH INDUCED MUTAGENESIS AND BACK CROSS BREEDING

Breeding low phytate (Lpa) crops is the sustainable solution for complementing human mineral deficiencies in some important nutrients. Through induced mutation, three Lpa mutants, with up to 58% reduction in phytic acid but showing poor yield and low germination rate, were identified. Hybridization/backcrosses were performed and three generations (F2:3, F3:4 and BC1F2:3) were developed and screened for the improved mentioned traits. Within F2:3 homozygous (226), heterozygous (65) and wild type (46) Lpa recombinants were identified. Within homozygous category, four mutants were identified with up to 46% of improved germination and 5-10% and yield increase respectively. Within F3:4 homozygous generation, 86 Lpa recombinants were identified and among these, only six recombinants Lpa12-3 (18%), Lpa55-1(12%), Lpa56-2(13%), Lpa66-4 (12%), Lpa101-2 (17%) and Lpa174-4 (15%) produced higher yields as compared to parental mutants. The association analysis suggested that selection for panicle primary branches and length, and productive tillers might improve the yield. Within BC1F2:3 generations, two Lpa recombinants Lpa141 and Lpa205 were selected. Interestingly, these Lpa derived mutants are the first reported in Basmati rice with low phytate. For Lpa trait, recently reported SSR markers (Lpa1-CAPS and Lpa1-InDel) and functional molecular markers were applied. For InDel marker, homozygous wild type (WT) allele of 98bp was detected in both parental types indicating the absence of Z9B-Lpa allele in tested mutants. For XS-Lpa in the OsMRP5 gene, using CAPS marker, a fragment of 1,166 bp was amplified for both the WT and XS-Lpa allele. After digestion with HaeIII, two fragments (721bp and 445bp) were detected, showing the homozygous WT allele in mutant and WT parents. Therefore, results indicated the absence of XS-Lpa mutation in OsMRP5 gene and strong possibility of novel Lpa mutations.

Country or International Organization

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