

FAO/IAEA International Symposium on Plant Mutation Breeding and Biotechnology



Contribution ID: 271

Type: Oral

CHARACTERIZATION OF SILICON AND ARSENIC UPTAKE AND ACCUMULATION IN RICE TILLING MUTANTS

Arsenic (As), a known carcinogen that predominantly exists as arsenite in irrigated rice fields, has similar chemical properties to silicic acid (Si). The *Lsi1* (*Low silicon 1*) and *Lsi2* genes are involved in As and Si uptake by rice plants and *OsABCC1* (*O. sativa C-type ATP-binding cassette transporter family 1*) affects accumulation of As in grains. The objective of this research is to develop rice germplasm with reduced As but sufficient Si to support normal grain yield and stress tolerance. To achieve this objective, Targeting of Induced Local Lesions in Genomes (TILLING) was used to screen a mutant population derived by chemical mutagenesis of Nipponbare for mutations in *Lsi1*, *Lsi2* and *OsABCC1*. A total of 27 mutations were identified. Mutants homozygous for 16 of these mutations were phenotyped for response to germanium (Ge), a toxic chemical analog of Si, and field grown plants were assessed for total As and Si in rice straw. Three mutants clearly differed from the wild type in their Ge response. NM-E1746 (*lsi1*) was extremely tolerant, NM-3403 (*lsi1*) exhibited three day-delayed response, and NM-3036 (*lsi2*) showed more sensitivity to Ge than wild type. In the *lsi1* mutants, NM-E1746 and NM-3403, total As was significantly increased while Si was decreased compared to wild type. In the *lsi2* mutant NM-3036, Si was significantly higher than wild type but total As content was essentially the same. Elemental analysis revealed that NM-4903 (*osabcc1*) had the lowest total As and highest Si of all the mutants. Most of mutations identified are unique based on the natural variation present in the 3,000 *O. sativa* genomes project. Analysis of rice grains is underway and As speciation will be conducted. These mutations will be valuable resources for breeding and for studying gene function.

Country or International Organization

USA

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Track Classification: New challenges and technologies in plant genomics and breeding