

空间搭载诱导水稻种子突变的分子标记多态性分析

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以卫星空间搭载广东水稻品种特籼占13干种子, 返地种植后经5代选择、培育, 获得一批形态及育性变异的突变体及品系(种), 如株高变矮, 稻穗变大, 雄性不育等。为了探索空间诱变的本质, 对选出的6个突变体及2个优良品系, 选用了130个10-mer随机扩增多态性DNA(RAPD)引物和17对扩增片段长度多态性(AFLP)引物组合, 分别对其基因组DNA进行多态性位点扫描分析, 两种方法的结果均显示: 不同的突变体与原种DNA之间存在不同程度的多态性差异, 且由两法得到的结果较接近, 为6%-12%。此结果从分子水平上进一步证明了空间环境确实对植物种子存在诱变作用。

DNA POLYMORPHIC ANALYSIS OF RICE MUTATION INDUCED BY SPACE FLIGHT WITH MOLECULAR MARKERS

Dry seeds of Texianzhan 13, an indica rice variety, had been on board the Chinese satellite at an orbit of 178-320 km for 15 days. Mutations in morphological characters on plants developed from the recovered seeds, as well as their selected progenies, were investigated. Several types of stable mutants in morphological and fertility characters, such as male sterility, dwarf, shorten grain, larger spikelet etc. were obtained after selected and then inbred for 4 generations. For exploring the genetic basis of mutation induced by space flight, RAPD and AFLP, two kinds of molecular marker analysis were conducted to find the differences in genomes among 8 stable mutation lines, including two high-performing lines used in rice production in Guangdong Province, and the original variety. 130 random primers and 17 primer combinations were screened in RAPD and AFLP analysis respectively, and around 1 000 loci were totally investigated. The results indicated that the variation rates of genomic DNA between each mutant and Texianzhan 13 could reach the level as high as 6%-12%, which is only equal to 10%-25% of the polymorphism between two indica rice varieties in general. The various polymorphic rates were observed in different mutants. The results from this study demonstrated that space flight could induce mutation on rice seeds and the changes of genetic material in mutants were verified. The importance of space radiation, especially high LET particles in mutation induction is discussed. Further study in the detection of space particles hitting seeds, as well as the analysis of the mutagenic effects is being performed to understand the mechanism of space induced mutation.

关键词

空间搭载(Space flight); 水稻突变体(Rice mutants); 分子标记分析(Molecular marker analysis)