Molecular mechanisms of neutron radiation dose effects on M 1 generation peas

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Abstract

Radiation mutation breeding is an important method for obtaining new crop varieties. In radiation mutation breeding research, the dose effect of radiation has long been a topic of concern. However, the molecular mechanism behind the dose effect is still unclear. Through analyzing the transcriptome and proteome of M 1 generation pea (Pisum sativum L.) leaves, three important rules of global gene expression were found in the studied dose range. First, neutron irradiation of pea seeds does not cause changes in the overall gene expression of M 1 generation peas at the transcriptional and translational levels. Second, the greater the difference in neutron absorbed dose between two radiation treatment groups, the greater the difference in differential expression between the two groups and the control group. Third, the distribution of differentially expressed genes in M 1 generation peas caused by neutron irradiation on pea seeds has a similar proportional relationship in each major functional classification. We also obtained important sensitive metabolic pathways of neutron radiation, as well as related key genes. Furthermore, the overall molecular regulation mechanism of dose effect was further revealed based on the main functional items obtained.

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