

Plant Genomics

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Molecular and cytological studies on pollen development in autotetraploid rice

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Autotetraploid rice has a great genetic potential to increase the rice production but lower pollen fertility is a major barrier in its utilization. Intersubspecific autotetraploid rice hybrids showed greater genetic variation compared to their diploid counterparts. Here, we observed the pollen development and its relation with seed set in autotetraploid rice. Microgametogenesis in autotetraploid rice was similar to diploid rice but different kinds of abnormalities, including microspores degeneration, cytoplasm shrinkage and abnormal cell walls were found in autotetraploid rice. Many different kinds of chromosomal abnormalities were found during various development stages of pollen mother cell meiosis such as chromosome lagging, chromosome straggling, pre-separation of two chromosome set, randomly arranged chromosome on the equator, abnormal spindle and incomplete/no separation of cytokinesis. We identified 55 meiosis related or meiosis stage specific genes and 7 genes related with photosynthesis system I that were down-regulated in autotetraploid rice. Gene ontology analysis on the targets of up-regulated DEM showed that they were enriched in transport and membrane in pre-meiotic interphase, reproduction in meiosis and nucleotide binding in single microspore stage. Quantitative RT-PCR was used to validate differentially expressed genes and microRNAs selected from functional categories based on the gene ontology analysis. The results showed that their expression patterns were consistent with the microarray data and high-throughput sequencing, respectively. These stably expressed genes not only related to the pollen development genes but also involved in cell metabolism, cell physiology, binding, catalytic activity, molecular transducer activity and transcription regulator activity. These findings provide a foundation for understanding the effect of polyploidy on meiosis related genes and miRNAs expression patterns during pollen development that lead to low pollen fertility in autotetraploid rice.

Biography

Muhammad Qasim Shahid has completed his PhD from South China Agricultural University and Postdoctoral studies from South China Agricultural University and Istanbul University. He is working as an Associate Professor in South China Agricultural University. He has published more than 25 papers in reputed journals such as *Plant Physiology*, *Journal of Experimental Botany*, *PLOS ONE* and *Crop Science*.

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