SEMINAR

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TEMASEK LIFESCIENCES LABORATORY

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The Auditorium (Level 1)
Hosted by: Dr Yin Zhongchao

Molecular genetic mechanisms of hybrid male sterility in rice

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Yao-Guang Liu, PhD of Kyoto University, Professor of South China Agricultural University. Professor Liu's research fields include molecular genetics and plant genetic engineering. He have studied the genetic systems controlling fertility traits used in hybrid rice, including cytoplasmic male sterility (CMS) and restoration, hybrid sterility, and temperature sensitive genic male sterility. A recent representative achievement is the isolation of the CMS and restorer genes for the Wild-Abortive CMS system, revealing the molecular mechanisms of the CMS-induction, fertility restoration, and origination of the CMS genes. Professor Liu also has developed a number of biotechnologies, such as the thermal asymmetric interlaced PCR (TAIL-PCR), transformation-competent artificial chromosome (TAC) binary vector system, multi-gene stacking vector system, and plant CRISPR/Cas9 multiplex genome editing system. He published more than 100 papers, which reached over 5500 citations.

Hybrid sterility occurs commonly in hybrids among divergent populations, and represents a major postzygotic reproductive isolation mechanism for speciation. The *japonica* and *indica* subspecies of Asian cultivated rice (*Oryza sativa L.*) were domesticated from the wild species *Oryza rufipogon*, and hybrid sterility is extensive in *japonica-indica* hybrids. So far, six hybrid sterility loci (or locus pairs) have been cloned in rice, showing distinct molecular genetic mechanisms for hybrid sterility. In this seminar, I introduce the isolation and characterization of the gene at the locus *Sc* conferring hybrid male sterility in *japonica-indica* hybrids. We demonstrate that the genomic structure variations can mediate allelic suppression as a novel mechanism of hybrid incompatibility, and provide a potential approach via genome editing to overcome hybrid sterility in hybrid breeding.

Recent Publications:

1. Luo D , Xu H, Liu Z , Guo J, Li H, Chen L, Fang C, Zhang Q, Bai M, Yao N, Wu H, Ji C, Zheng H, Chen Y, Ye S, Li X, Zhao X, Li R, **Liu Y-G***. 2013 A detrimental mitochondrial-nuclear interaction causes cytoplasmic male sterility in rice. Nature Genetics 45 573-577.
2. Chen L and **Liu Y-G***. 2014. Male Sterility and Fertility Restoration in Crops. Annual Review of Plant Biology 65:579-606.
3. Tang H., Zheng X., Li C, Xie X, Chen Y., Chen L., Zhao X., Zheng H., Zhou J., Ye S., Guo J., **Liu Y.-G***. 2016. Multi-step formation, evolution, and functionalization of new cytoplasmic male sterility genes in the plant mitochondrial genomes. Cell Res. doi:10.1038/cr.2016.115