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Apichart Vanavichit

Kasetsart University, Thailand

New insight into the induced mutation and the origin of genetic variation

When "Survival of the fittest" is well recognized as the key step of natural selection in evolution, the origin of genetic variation was not well understood. One of the most powerful generators of genetic variation is irradiation. Once the useful mutant is identified, new plant varieties can be readily developed via mutation breeding. New insight into induced mutation reveals patterns of natural genetic variation that were once lost. Understanding how irradiation copies natural genetic variation will pave ways to restore and broaden genetic variation.

Next-generation sequencing revealed irradiation affects genome stability and generates a high density of single nucleotide variation (SNV) of which over 80% was duplicated with spontaneous variation. By forward and reverse screening, valuable gain/lost-of-function mutants can be isolated, characterized and sequenced for functional analysis. Most of these selected mutants carried genomic changes and SNVs in duplication with those rare natural genetic variations. The hallmark is that, unlike non-functional mutations, all functional mutations are outcomes of unknown, non-random processes. It is possible that with intensive selection against instable genomic changes generated by irradiation rare genetic recombination may be fully enhanced by enabling "Survival of the fittest". Understanding how irradiation generation new genetic variation is the key to direct gene evolution towards more effective molecular breeding for cope with imminent climate changes.

Speaker Biography

Apichart Vanavichit has a M.Sc. in plant breeding and a Ph.D. in crop science. He was the lead Thai scientist in the team that sequenced the rice genome (IRGSP) with 9 other nations, and furthermore he established the Rice Gene Discovery and Rice Science Center to facilitate rice molecular breeding in Thailand. His centers have led in the discovery of genes for 2-acetyl-1-pyrroline (aromatic gene), Sub1C (flash flooding tolerance), Fe-toxic tolerance, waxy, and terpene synthase (brown planthopper resistance). Significant outcomes from his centers have established a high-through-put platform for breeding-by-pyramiding MAS to improve Thai Jasmine and low GI rice to withstand flash flooding, drought, heat, salinity, diseases and insects problems. He has pioneered a new research frontier in rice; by using fast neutron bombardment to understand how genetic variation can be induced leading to the discovery of undiscovered or novel gene functions. He is also a leader in the molecular breeding of environmentally friendly rice. His high nutrition rice which has enriched grain iron levels, a high level of antioxidants and a low glycemic index has become a new national product

e: vanavichit@gmail.com

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