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TEMASEK LIFESCIENCES LABORATORY

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The Auditorium (Level 1)

Hosted by: Dr Yin Zhongchao & Dr Toshiro Ito

Molecular mechanism for flower and branch formation in Arabidopsis

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Nobutoshi Yamaguchi, PhD, is an assistant professor of the Graduate School of Biological Sciences at Nara Institute of Science and Technology (NAIST) in Japan. His research focus is on molecular mechanism of flower development. Prior to NAIST, Dr. Yamaguchi was a postdoctoral fellow of the Dr. Doris Wagner's laboratory at the University of Pennsylvania in the USA.

Today we face two major challenges: drastic climate change and exponential growth of human population. Conditions for crop growth and harvest can become worsen while consumption of food will increase. One possible solution for the issues is to produce plants that creates sustainable amount of crop yield. Our laboratory team is investigating mechanisms of flower and branch formation. We have found that two key parameters would influence seed set and, ultimately, plant yield. Plant hormones take part in determining these numbers in Arabidopsis.

The hormone auxin plays a role in initiating flower primordia and determines their position on the plant and their number. Upon auxin sensing, the auxin-dependent transcription factor called MONOPTEROS (MP) recruits SWI/SNF chromatin remodeling ATPases to increase accessibility of the DNA for induction of key regulators of flower primordium initiation. In the absence of the hormonal cue, auxin sensitive Aux/IAA proteins bound to MP block recruitment of the SWI/SNF chromatin remodeling ATPases in addition to recruiting a co-repressor/histone deacetylase complex.

The transcription factor LEAFY (LFY) regulates the number of branches plants produce. LFY induces expression of a gibberellin catabolism gene; consequently, increased LFY activity causes reduced gibberellin levels. This allows accumulation of gibberellin-sensitive DELLA proteins. The DELLA proteins are recruited by SQUAMOSA PROMOTER BINDING PROTEIN–LIKE transcription factors to regulatory regions of the floral commitment gene APETALA1 and promote APETALA1 up-regulation and floral fate synergistically with LFY.

Recent Publications:

1. Auxin-regulated chromatin state switch directs organogenesis in Arabidopsis. Wu, M-F*., **Yamaguchi, N***, Xiao, J*., Bargmann, B., Estelle, M., Sang, Y., and Wagner, D. e-Life (2015) 4, e09269
2. Gibberellin acts positively then negatively to control onset of flower formation in Arabidopsis. **Yamaguchi, N**, Winter, C., Wu, M-F., Kanno, Y., Yamaguchi, A., Seo, M., Wagner, D. Science 2014, 344, 638-64.
3. A molecular framework for auxin-mediated initiation of floral promordia. **Yamaguchi, N**, Wu, M-F., Winter, C., Berns, M., Nole-Wilson, S., Yamaguchi, A., Coupland, G., Krizek, B., Wagner, D. Developmental Cell 2013, 24, 271-282.