PRESS RELEASE

Plant Biology Sheds Light on the Development of Important Plant Organs

8 July 2016, Singapore – Scientists at Temasek Life Sciences Laboratory (TLL) have successfully identified an important protein that plays a crucial role in controlling the development of the shoot apical meristem (SAM). SAM is a key part of a plant that contains stem cells which continuously differentiate and produce all the above-ground parts of the plant. This discovery may contribute to the design of new breeding approaches for increasing the yield of important plant organs, such as leaves and flowers.

The SAM is the source of all above-ground (aerial) organs of a plant and determines the lifespan of the plant by renewing itself and giving rise to new specialized aerial organs, such as leaves and flowers. The SAM contributes significantly to the needs of the community in terms of our diet as it impacts directly on the plant's ability to produce important plant products such as grains, leaf crops and fruits.

Using the Arabidopsis plant as a model, a team led by Professor Yu Hao, Temasek Senior Investigator and Executive Director at TLL, has discovered a specific regulatory protein (FIP37) that mediates RNA modification (m^6A) to control the stability of plant stem cells, which prevents the overproliferation of SAM and ensures proper growth of all aerial plant organs. These findings have been published as a research article in the prestigious international journal *Developmental Cell*.

FIP37 is a core component of the plant m^6A methyltransferase complex that modifies RNAs of key meristem regulators and eventually determines their stability in the SAM. As a result, the mutants that lack *FIP37* exhibit enlarged SAMs and will fail to generate all aerial tissues, thus considerably shorten the lifespan of the plants. These findings have revealed a new layer of gene regulation underlying the control of shoot stem cell fate in plants. The discovery may contribute to designing new approaches for plant breeding by balancing proliferation and differentiation of the SAM, thus allowing plants to keep the regenerative power while continuously producing useful aerial tissues, such as leaves and flowers.

According to Prof Yu Hao, this research has significant contributions to two areas. Firstly, the mechanism of RNA modification might be conserved across all the multicellular organisms such as plants, flies and mammals. Thus, the findings will shed light on the underlying mechanisms of controlling developmental traits in both plants and animals. Secondly, FIP37 and its interacting partners could be used as breeding targets for increasing the yields of economically important crops, such as vegetables and rice, in a sustainable manner.

Peter Chia, TLL Chief Operating Officer, says, “Impactful applications are often made on the foundation laid by basic sciences. Prof Yu Hao’s work in understanding how plants regulate the development of different important organs will help us select new crop varieties with important agronomic traits. I would like to congratulate Prof Yu and his team on the publication of this work and hope that they will be able to successfully translate this discovery into areas that will help address global food security concerns.”

Citation

Shen et al., N^6-Methyladenosine RNA Modification Regulates Shoot Stem Cell Fate in Arabidopsis, Developmental Cell (2016), http://dx.doi.org/10.1016/j.devcel.2016.06.008

About Temasek Life Sciences Laboratory (TLL)

TLL, established in 2002, is a beneficiary of the Temasek Trust and affiliated to the National University of Singapore and Nanyang Technological University. The research institute focuses primarily on understanding the cellular mechanisms that underlie the development and physiology of plants, fungi and animals. Such research provides new understanding of how organisms function, and also provides foundation for biotechnology innovation.

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