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Condensation of STM empowers meristem activity and enhances salt tolerance

Cao X.[1]*, Wang Y.[2], Jiao Y.[1, 2, 3]

[1] *Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing, China*

[2] *College of Life Sciences, University of Chinese Academy of Sciences, Beijing, China*

[3] *School of Life Sciences, Peking University, Beijing, China*

* *caoxiuwei12@genetics.ac.cn*

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In plants, shoot meristem generates the entire shoot system, and is precisely maintained throughout the life cycle under various environmental challenges. Here, we identified a prion-like domain (PrD) in the key shoot meristem regulator SHOOT MERISTEMLESS (STM), that distinguish STM from other related KNOX1 proteins. We demonstrate that PrD promotes STM to form nuclear condensates, which is required for maintaining the shoot meristem. STM nuclear condensation formation is stabilized by selected PrD containing STM-interacting BELL proteins *in vivo* and *in vitro*. Moreover, condensation promotes interaction between STM and Mediator to enhance transcription. Thus, condensation formation emerges as a novel mechanism of regulating shoot meristem function. Furthermore, we find that the formation of STM condensates is enhanced upon salt stress, which allows enhanced salt tolerance and increased shoot branching. Our findings highlight the importance of partitioning of transcription factors in cell fate determination, and as a tunable environmental sensing mechanism.