**Sugar signaling acts as a proxy for cytokinin signaling for de novo meristem formation during nodule organogenesis.**

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Symbiosis between plants and diazotrophs require formation of a *de novo* meristem for endocytic accommodation of symbionts, a process that is tightly regulated by plant hormones cytokinin and auxin. Cytokinin signaling through CRE1 receptor causes auxin accumulation by regulating its transport or biosynthesis to initiate cell division for nodule organogenesis. Accordingly CRE1 mutant (*cre1*) is unable to undertake symbiosis and our objective was to strategize and restore functional symbiosis in *cre1* for understanding the downstream events. Our findings are :- (i) Sucrose signalling can restore functional symbiosis in *cre1*. (ii) Sucrose signalling upregulated an auxin conjugate hydrolase *MtIAR33* that converts IAA-asp to IAA*.* Overexpression of *MtIAR33* could also restore symbiosis in *cre1* indicating deconjugation of auxin conjugates to be a potential pathway of auxin accumulation during nodule organogenesis. (iii) Sugar signaling significantly upregulated an auxin responsive homeobox transcription factor WOX5 well known for its role in meristem maintenance. While *AhWOX5* from *Arachis* having determinate meristem could completely restore symbiosis in *cre1, MtWOX5* from *Medicago* having indeterminate nodule meristem failed to do so. We could show that *MtWOX5* function as a repressor whereas *AhWOX5* acts as an activator and swapping a single amino acid is sufficient to functionally convert *MtWOX5* to *AhWOX5* and vice versa. Based on these evidences, we propose a model where we show CRE1-independent deconjugation of auxin to be a potential contributor to auxin accumulation and activation of NIN-WOX5 axis, a step forward toward having an integrated view of how organogenesis starts during root nodule symbiosis.

***References:***

1. Molla, F., Kundu, A. and DasGupta, M., 2023. Sucrose-induced auxin conjugate hydrolase restores symbiosis in a Medicago cytokinin perception mutant. *Plant Physiology*, *191*(4), pp.2447-2460.
2. Kundu, A., Molla, F. and DasGupta, M., 2019. Turanose mediated WOX5 expression rescues symbiosis in cytokinin perception mutant cre1. *bioRxiv*, p.830661.