DBT-RCB team studies adaptation of plants to developmental or physiological cues

New Delhi, Feb 25: Dr. Saikat Bhattacharjee of DBT Regional Centre for Biotechnology (DBT-RCB) has along with his group members and collaborators published a research article on 'Proteomic analysis of SUMO1-SUMOylome changes during defense elicitation in Arabidopsis (https://doi.org/10.1016/j.jprot.2020.104054).

Rapid adaptation of plants to developmental or physiological cues is facilitated by specific receptors that transduce the signals mostly via post-translational modification (PTM) cascades of downstream partners. Reversible covalent attachment of Small Ubiquitin-like Modifier (SUMO), a process termed as SUMOylation, influences growth, development and adaptation of plants to various stresses. Strong regulatory mechanisms maintain the steady-state SUMOylome and mutants with SUMOylation disturbances display mis-primed immunity often with growth consequences. Identity of the SUMO-substrates undergoing SUMOylation changes during defenses however remain largely unknown.

Here the authors have exploited either the auto-immune property of an Arabidopsis mutant or defense responses induced in wild-type plants against Pseudomonas syringae pv tomato (PstDC3000) to enrich and identify SUMO1-substrates. The results demonstrate massive enhancement of SUMO1-conjugates due to increased SUMOylation efficiencies during defense responses. Of the 261 proteins identified, 29 have been previously implicated in immune-associated processes. Role of others expands to diverse cellular roles indicating massive readjustments the SUMOylome alterations may cause during induction of immunity.

Overall, this study highlights the complexities of a plant immune network and identifies multiple SUMO-substrates that may orchestrate the signaling. Significance: In all eukaryotes, SUMOylation on target proteins affects their fate and function. Plants display reversible readjustments in the pool of SUMOylated proteins during biotic and abiotic stress responses. Here, a net increase in global SUMO1/2-SUMOylome of Arabidopsis thaliana at induction of

immunity was demonstrated. 261 SUMO1-substrates enhanced in defenses that categorize diverse cellular processes were enriched and identified and include novel candidates with uncharacterized immune-associated roles. Overall, the results of this study highlighted intricacies of SUMO1-orchestration in defense signaling networks.

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