Drugged plants talk: A chemical genetic dissection of defense hormone signaling in Arabidopsis thaliana

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Salicylic acid (SA) plays a major role in both local and systemic plant defense responses. Upon pathogen attack, SA levels increase and it binds to its receptors NPR3 and NPR4 (NPR1 paralogs), which mediate degradation of NPR1 and thereby lead to subsequent expression of defense-related genes such as PR1, PR2 and PR5. Investigation of SA signaling, however, suffers from poor knowledge about the intermediate signaling components. To answer this, we employed a forward chemical genetic approach, which can overcome the limitations of traditional forward genetics such as genetic redundancy, lethality and pleiotropy. By using a novel GUS quantification method in a 96-well format we screened various chemical libraries on transgenic *Arabidopsis thaliana* lines, harboring the SA responsive reporter PR1p::GUS. We identified a novel bioactive chemical from a rhizobacteria, acting as agonist of SA signaling by upregulating SA level. Mode-of-action was found to be dependent on SA-biosynthesis. More interestingly, the chemical can also inhibit JA signaling independent of SA and thus might be very useful to identify the cross talk components of SA-JA signaling which has eluded us for a long time. Being produced from rhizobacteria, the compound also showed a positive effect on lateral root growth at nanomolar concentrations. Most interestingly, its activity was dependent on a cell wall harboring enzyme called phospholipase D (PLD). Thus, it indicates a possible role of PLD in mediating SA and JA crosstalk. In a nutshell, the compound has dual role of potentiating plant defense responses as well as contributing towards plant growth. Currently, we are performing target identification to identify components targeted by the compound. This is the first time that such a compound has been identified and it will help us immensely to usher novel insight in SA signaling.