SUMMARY AND CONCLUSION

Plant employs layered defense mechanisms to fend off pathogen infection. Hormonal signaling plays a pivotal role in plant defense and development. SA considered being a most significant defense hormone of plant. Modulating SA signaling alters plant defense. Again SA acts in synergistic or antagonistic fashion with other plant hormones such as ET/JA, ABA, auxin and etc. The NPR1 gene of Arabidopsis which codes for a transactivator is a key positive regulator of SA-mediated plant defense. Here we have identified cdd1 mutant as a novel suppressor of npr1-5 mutant. The cdd1 mutant can express PRI constitutively and exhibit spontaneous resistance against bacterial and oomycete pathogens, both in NPR1-dependent and -independent mechanism. The enhanced PRI expression and defense response is depends on elevated SA accumulation; clearly suggesting cdd1 modulates SA mediated signaling and disease resistance. In agreement with this we have seen cdd1 induced the expression of SA biosynthetic gene ICS1. However, unlike other SA signal activating mutant cdd1 did not exhibit any growth and developmental defects as seen from plant phenotype and biomass yield at different time point of growth.

The cdd1 is a single locus recessive mutation. The identity of CDD1 is yet to be uncovered. The locus is mapped to lower arm of chromosome 5 between LFY and G2368 markers. The markers span almost 948 kbp of Arabidopsis genome and there are approximately 289 genes between these two markers as per Arabidopsis genome website (www.arabidopsis.org). However, interestingly among these 289 genes there is no reported suppressor of npr1 mutation in this part of genome, even though there are almost 8 different suppressor loci of npr1 are reported. More importantly unlike all the known mutants of Arabidopsis having hyper-activated defense there is no growth abnormalities in cdd1. Thus it appears to be a novel suppressor of npr1 and thus a novel regulator of SA signaling.

The basal ET/JA signaling in cdd1 appears to be normal like WT plant. The ET/JA markers like PDF1.2 and ORA59 expressed almost at per with uninfected WT plants. The single mutant cdd1 also behaves almost like WT plants in terms of these ET/JA marker genes expression upon infection with B. cinerea that is known to induce...
ET/JA signaling. As known previously for antagonistic role of SA signaling to JA response mediated by NPR1, the npr1-5 mutant plants showed hyper-activation of these ET/JA markers. In our studies with cddl npr1-5 double mutant after infecting with B. cinerea, we noticed that ET/JA signaling markers are expressed only at WT level, in other words the npr1-5 mediated enhanced expression of these markers are suppressed in double mutant. Thus, cddl mutant facilitates SA-mediated suppression of JA signaling independent of npr1-5.

The global gene expression profile supports the constitutive activation of plant defense as several defense related genes are up-regulated in cddl plants. Thorough gene expression profile analysis of cddl in compared to the WT plants coupled with studying the disease resistance profile in the knock-out mutant plants we have identified two novel genes At4g13040 and At2g19810 which code for AP2/EREBP and ZINC FINGER containing transcription factors respectively that are necessary to mount resistance in Arabidopsis. The expressions of these two genes are up-regulated in cddl mutant. The mutants of these two genes are less responsive in terms of PRI expression after pathogen infection. Thus, in addition to being a novel regulator of SA signaling, the cddl mutant background also offers an useful genetic tool to dissect plant innate immunity pathways. The successful implementation of this scientific knowledge can eventually lead to generation of transgenic crop plants that are resistant to diseases without compromising the growth and yield potentialites.