The interplay between bZIP9 and G-Protein in ABA response in Arabidopsis: What I Plan to do During my Short Visit at UNC

One of the most important signaling cascade in plants is played by the Heterotrimeric G complex. This complex act as signal transducer and mediates intracellular responses through some atypical mechanisms to control growth, development, hormonal, and stresses responses. Among the hormone signaling modulated by G-protein, abscisic acid (ABA) plays an important role in stress adaptation, and it is essential to numerous biological processes, such as bud dormancy and seed germination. It was shown that AGB1 can physically interact with the mitogen-activated kinase (MAPK) AtMPK6, a member of several MAPK cascades with numerous roles in plant physiological processes (Xu *et al*., 2015), including regulation of ABA stomatal responses (Li *et al*., 2017). The expression of four ABA-responsive genes (AtMPK6, AtVIP1, AtMYB44, and RD29A) were significantly increased in *agb1* mutants compared to WT plants. Despite its involvement in several G-protein mediated signaling pathways, ABA signaling in plants is a complex response that lacks more elucidation at molecular level and the specific function of the G subunits in this signaling.

As essential components of signaling pathways, transcription factors are the effectors of the physiological response. Among the various transcription factors present in Arabidopsis, our focus is the bZIP-like transcription factor bZIP9. A recent study reported that bZIP9 is involved in responses to abiotic stress such as water, salt and hypoxia, development, and response to hormones, especially ABA signaling. It was observed a strong binding signal at the promoters of RD29A and RD29B (two well-known markers of ABA response (Msanne *et al*., 2011)). Furthermore, the expression of these two markers was significantly reduced in *bzip9* mutant compared to wild type following ABA treatment (Li *et al*., 2022). Thus, the hypothesis is that RGS1/AGB1 modulation relies on the bZIP9 transcription factor and its bZIP partners in response to the ABA stimulus.

Xu, D. B., Chen, M., Ma, Y. N., Xu, Z. S., Li, L. C., Chen, Y. F., & Ma, Y. Z. (2015). A Gprotein β subunit, AGB1, negatively regulates the ABA response and drought tolerance by down-regulating AtMPK6-related pathway in Arabidopsis. PloS one, 10(1), e0116385. https://doi.org/10.1371/journal.pone.0116385

Li, K., Yang, F., Zhang, G., Song, S., Li, Y., Ren, D., Miao, Y., & Song, C. P. (2017). AIK1, A Mitogen-Activated Protein Kinase, Modulates Abscisic Acid Responses through the MKK5-MPK6 Kinase Cascade. Plant physiology, 173(2), 1391–1408. https://doi.org/10.1104/pp.16.01386

Li, M., Lin, W., Hinckley, W., Yao, T., Muchero, W., Chen, J., Huang, S. C. (2022). Uncovering the "ZIP code" for bZIP dimers reveals novel motifs, regulatory rules and one billion years of cis-element evolution. bioRxiv. https://doi.org/10.1101/2022.04.17.488518

Msanne, J., Lin, J., Stone, J. M., & Awada, T. (2011). Characterization of abiotic stressresponsive Arabidopsis thaliana RD29A and RD29B genes and evaluation of transgenes. Planta, 234(1), 97–107. https://doi.org/10.1007/s00425-011-1387-y