Exploring rRNA hidden breaks in plants

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Motivation

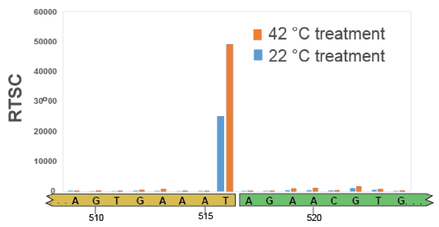
- Plants play a vital role in our ecosystem and diet,
- RNA structural features have significant impact on organisms' function,[1]
- Hidden breaks are a unique structural feature in RNA found in plants' chloroplasts (the light harvesting portion of the plant)
- Determining why this feature exists and if it is altered under various conditions could help assist plant growth and development

Project Description

- Eventually, my goal is to establish how hidden breaks correspond to plant survival under environmentally stressful conditions and to determine if there is a way to optimize these to allow for more robust plant growth.
- The goal of this seeding grant will be to develop an effective readout of these hidden breaks and compare the extent of hidden breaks in *coffee*, *rice*, and *spinach* leaves under *heat* and *cold* stress conditions.

Context

- Hidden breaks have not been well-studied to determine either their cause or overall significance. Hidden breaks have only been mentioned in passing.[2-5]
- My work prior to coming to Pitt-Johnstown demonstrates that there is a difference in hidden breaks upon a heat treatment in rice (below).[6]



- I will use standard biochemical techniques (reverse transcription and PCR) to further the understanding on these hidden breaks.

University of Pittsburgh

Analyzing **rRNA hidden breaks** in **plants** exposed to **temperature stress** to determine extent and significance

Project Deliverables

- Following the 1-year funding period, I will have data from analyzing the hidden breaks in coffee, spinach, and rice under heat and cold treatment.
- These data will provide results for a publication. Depending on the results, this publication could focus on comparing the plants and/or comparing the temperature regarding effects on the hidden breaks.

Potential Impact

- This will greatly help to expand the biochemical research opportunities at Pitt-Johnstown for our students.
- This will help to lay foundation to studying why RNA harbors these hidden breaks.
- Results could also help add to the growing amount of research attempting to understand how plants survive in extreme conditions, to eventually cultivate other plants to survive these conditions.
- Further work would also compare hidden breaks in plants to similar structure found in other organisms.

References and/or Acknowledgements

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2. Liu, J. *et al. Plant Physiol* doi:10.1104/pp.114.255000 (2015).
3.Nishimura, K., et al. *Plant J* doi:10.1111/j.1365-313X.2010.04276.x (2010).
4. Bieri, P., et al. *EMBO J* doi:10.15252/embj.201695959 (2017).
5. Leaver, C. J. *Biochem J* **135**, 237-240 (1973).
6. Ritchey, L. E. *et al. Nucleic Acids Res* doi:10.1093/nar/gkx533 (2017).

- Mentorship finding at Pitt-Johnstown has allowed for some preliminary analysis