Improving Storage of Pollinators

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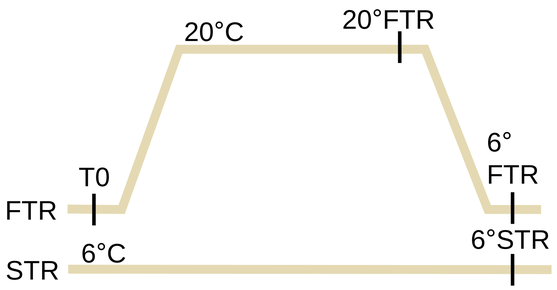
Introduction

- Fluctuating thermal regimes (FTR) effectively increase the shelf-life of *Megachile rotundata* compared to static thermal regimes (STR)[1]
- FTR can increase lifespan of *M. rotundata* as well as increase pollinator quality, but the exact mechanisms for this are not as well understood[2]
- **Hypothesis:** there is a significant difference in gene expression between the FTR and STR groups that can account for the differing phenotypes that are observed.

Methods



Organisms exposed to FTR and STR respectively

RNA samples were taken from the organisms as indicated

RNA was sequenced

Samples compared with one another using Linux command lines

Statistical tests and gene ontology analysis completed

Results

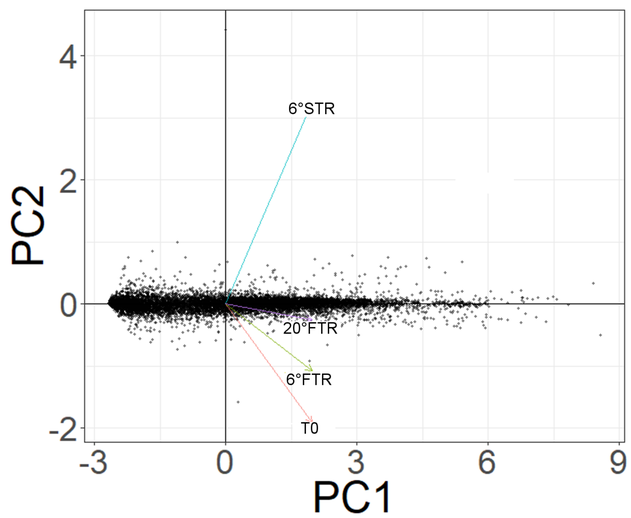


Figure 1. PCA plot of expression profiles of the genes in the various samples; lines from FTR samples are grouped together indicating similar expression

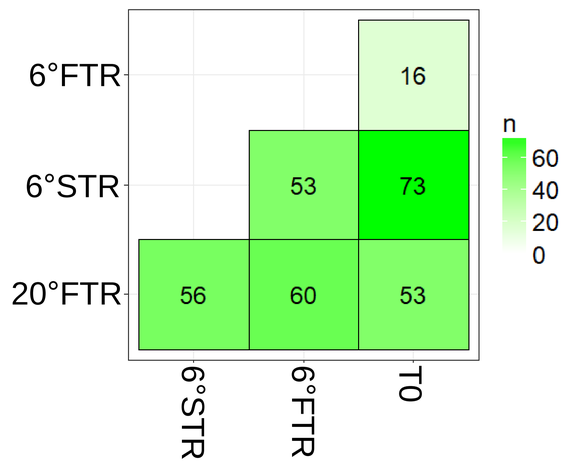


Figure 2. Comparison of number of genes being differentially expressed between each sample, significant genes at alpha 0.05

vs. 6°STR	Up-regulated	Down-regulated
T0	33	40
20°FTR	27	29
6°FTR	24	29

Table 1. Number of up and down-regulated genes for each sample compared to the 6°STR group

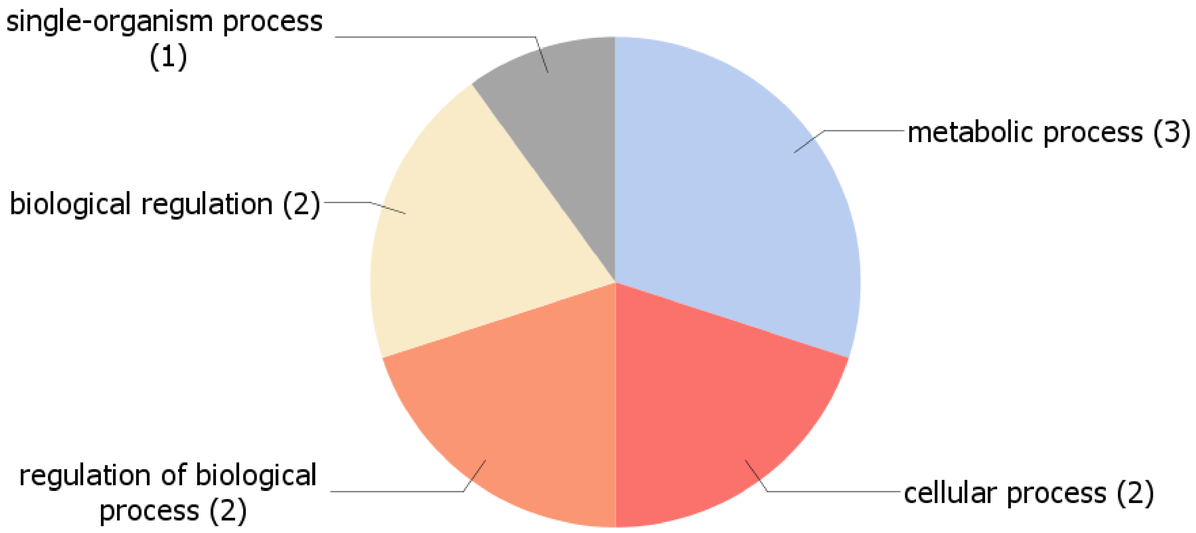


Figure 3. Biological processes associated with upregulated 20°FTR vs 6°STR transcripts

Conclusions

- Expression profiles of FTR samples are more similar to each other than the STR sample indicating FTR yields similar regulation patterns (Figure 1)
- Significant difference in gene expression between the FTR and STR groups indicates that there is support for the hypothesis (Figure 2 and Table 1)
- Ontological analysis of 20°FTR vs 6°STR upregulated genes revealed a proportion of transcripts involved in metabolic and other biological processes (Figure 3)
- Upregulation of genes associated with metabolic processes correlates to previous studies done on long-term regulatory effects of FTR and further confirms that they are likely important in dealing with chill injury[2]
- Future studies could determine whether or not these regulations act as reactionary or preventative measures

References

1. Rinehart, J., G. Yocum, M. West and W. Kemp. 2011. A Fluctuating Thermal Regime Improves Survival of Cold-Mediated Delayed Emergence in Developing *Megachile rotundata* (Hymenoptera: Megachilidae). Journal of Economic Entomology 104(4): 1162-1166.
2. Torson, A., G. Yocum, J. Rinehart, W. Kemp and J. Bowsher. 2015. Transcriptional responses to fluctuating thermal regimes underpinning differences in survival in the solitary bee *Megachile rotundata*. The Journal of Experimental Biology 218: 1060-1068.

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