UNIVERSITY of GUELPH

COLLEGE of BIOLOGICAL SCIENCE

DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY

Announcement:

All interested members of the university community are invited to attend the Final Oral Examination for the degree of ***Master of Science*** *of*

CAROLINE TYRAWA

On Tuesday, December 4, 2018 at 1 p.m. in SSC 2315

Thesis Title: **Demystifying *Brettanomyces bruxellensis*: Fermentation kinetics, flavour compound production, and nutrient requirements during wort fermentation**

Examination Committee:

Dr. J. Yankulov, Dept. of Molecular and Cellular Biology (Exam Chair)
Dr. G. van der Merwe, Dept. of Molecular and Cellular Biology
Dr. E. Allen-Vercoe, Dept. of Molecular and Cellular Biology
Dr. R. Shapiro, Dept. of Molecular and Cellular Biology

Advisory Committee:

Dr. G. van der Merwe (Adv)
Dr. E. Allen-Vercoe

Abstract: *Brettanomyces bruxellensis* is beginning to gain popularity in the craft brewing industry as an alternative to *Saccharomyces cerevisiae*. *Brettanomyces* produces unique ester and phenolic compounds that allow for the development of a greater diversity of beer products, providing breweries with a competitive edge in this quickly expanding market. In recent decades it has been mostly regarded as a wine spoilage organism, resulting in the majority of research being directed towards its control and removal in a wine fermentation setting. This has greatly hindered research into its biology and fermentation capabilities. As a result, brewers utilizing *Brettanomyces* are currently facing lengthy and unpredictable fermentations, stemming from a lack of understanding of how this yeast functions and what nutrients it requires to perform optimally. Here eight novel *Brettanomyces* strains were characterized and two were chosen for secondary and co-pitch fermentations, along with an industry standard, BSI Drei. The ester and phenol content of these beers was slightly lower than that found in primary *Brettanomyces* fermentations. Regardless, mixed fermentations proved to be a viable approach to developing beers with "*Brett* character" in a shortened timeframe. It was also observed that ester and phenol synthesis peaked around day 14 and near the end of the fermentation, respectively. Furthermore, supplementation of thiamine or various amino acids to the pre-growth or fermentation appeared to have a positive effect on fermentation rate in a strain-dependent manner. Overall, these findings will allow brewers to be better informed when developing products using *Brettanomyces*.

Curriculum Vitae: Caroline obtained her Bachelor of Science (Hons.) at the University of Guelph in 2016. She then began her M.Sc. in the lab of Dr. George van der Merwe in the fall of the same year.

Publications: Preiss, R., Tyrawa, C., Krogerus, K., Garshol, L. M., & van der Merwe, G. (2018). Traditional Norwegian Kveik are a genetically distinct group of domesticated *Saccharomyces cerevisiae* brewing yeasts. Front Microbiol, 9. doi:10.3389/fmicb.2018.02137.

Preiss, R., Tyrawa, C., & van der Merwe, G. (2018). Autophagy gene overexpression in Saccharomyces cerevisiae perturbs subcellular organellar function and accumulates ROS to accelerate cell death with relevance to sparkling wine production. Appl Microbiol Biotechnol, 102: 8447-8464. Doi:10.1007/s00253-018-9304-y.