

29 May 2024

Undergraduate Paper Award Committee

Canadian Council of University Biology Chairs
C/O Rofail Conference and Management Services
17 Dossetter Way, Ottawa, ON K1G 4S3

RE: THESIS SUPERVISOR'S SUPPORT LETTER FOR VANESSA SHIVNAUTH

Dear CCUBC Undergraduate Paper Award Committee,

It is my great pleasure to write this statement of strong support for **Vanessa Shivnauth's** nomination for the **CCUBC Undergraduate Paper Award**. Vanessa completed their B.Sc. (Honours) program in August 2021 at Wilfrid Laurier University, with a major in *Biology (Concentration in Cell and Molecular Biology and Genetics)* and a minor in *Chemistry*. I have known Vanessa since September 2019 when they first joined my laboratory as a research volunteer student. From 2019-2021, Vanessa served various undergraduate research roles in my laboratory as a *Directed Studies student, Honours Thesis student, Mitacs summer student* and *Summer Research Assistant*. Based on my interactions with the Nominee, I can confirm that they are a hard-working student and productive scientist. **Based on the Nominee's excellent research productivity during their undergraduate program at Laurier, Vanessa would be well-deserving of this prestigious recognition.**

Vanessa's primary achievement was the publication of their BSc research on the centrally important *CBP60* gene and protein family in tomato plants. This article "**Structural diversity and stress regulation of the plant immunity-associated CALMODULIN-BINDING PROTEIN 60 (CBP60) family of transcription factors in *Solanum lycopersicum* (tomato)**" was initially preprinted in *bioRxiv* in 2022 and then published in July 2023 in the peer-reviewed journal *Functional and Integrative Genomics* (5-year impact factor = 3.3). As previously reported in our earlier study using the model plant species *Arabidopsis thaliana* (Kim, Castroverde et al., 2022 *Nature*), CBP60 family proteins (e.g. CBP60g and SARD1) govern the resilience of the plant immune system to a warming climate. Specifically, CBP60g and SARD1 are paralogous CBP60 transcription factors in *Arabidopsis* that regulate numerous drivers of plant disease resistance under changing temperature conditions. However, CBP60 function, regulation and diversification in most plant species had remained unclear, and also whether temperature-sensitive immunity observed in *Arabidopsis* occurs in other plant taxa had remained underexplored.

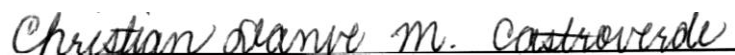
Vanessa helped to fill these critical knowledge gaps in the literature by investigating the CBP60 gene/protein family in tomato, one of Canada's (and Ontario's) major vegetable crops. Vanessa first compiled *CBP60* genomic, cDNA and protein sequences during the pandemic summer of

2020. Based on the thousands of *CBP60* homologs in diverse plant genomes, the Nominee then focused on genetic and functional studies of the 11 members of the tomato *CBP60* family. Based on Vanessa's research, phylogenetic analyses revealed that three homologs have the closest amino acid identity to *Arabidopsis* CBP60g and SARD1. Strikingly, these three tomato *CBP60* homologs also exhibited similar pathogen-induced and temperature-regulated gene expression profiles as their *Arabidopsis* counterparts. Vanessa's conserved domain analyses revealed that tomato CBP60 proteins possess calmodulin-binding domains, reflecting the potential involvement of these proteins in calcium signaling, which is a ubiquitous cellular pathway in eukaryotes. For this work, Vanessa gained experience in various laboratory techniques, including proper plant growth/care, preparation of bacterial pathogen cultures, tomato inoculation, plant disease assays, RNA extraction, cDNA synthesis, quantitative PCR and bioinformatics analyses. Demonstrating its impact and influence, Vanessa's publication has already received **4 citations to date (with 841 accesses)** and ranks **10th out of 50 similarly aged outputs** from this journal (based on Altmetric statistics). To my knowledge, Vanessa's work represents the first time that this important gene/protein family has been characterized in tomato plants, which could be harnessed in disease resistance and climate resilience engineering programs for this agriculturally important crop plant.

Apart from the nominated paper in *Functional and Integrative Genomics*, **Vanessa's contributions in my laboratory also resulted in several other publications**, including as a co-first author in *Frontiers in Plant Science*, 2nd author in *Plant Direct* and co-author of a manuscript under revision in the *Journal of Integrative Plant Biology*. The Nominee's research also contributed to data presented at various conferences (e.g. *International Society of Molecular Plant-Microbe Interactions Congress 2023*, *ASPB Plant Biology Meeting 2022* and *CSPB National Meeting 2020*). **Vanessa has received various awards and recognitions**, further exemplifying their notable research record at Laurier. In 2020, Vanessa received a very competitive **Mitacs Research Training Award** (one of only 15 Laurier undergraduate or graduate students to receive this prestigious award) and was featured in the university's *Spotlight* article on "Future Ready Researchers." In 2021, Vanessa was also awarded one of only 7 **Hypatia Awards** (for both undergraduate and graduate students) by the *Laurier Centre for Women in Science*.

I am confident that Vanessa's academic contributions and research excellence as a BSc student at Laurier make them a strong candidate for *CCUBC Undergraduate Paper Award*. Collectively, the evidence mentioned in this letter constitute **why I strongly support Vanessa's award nomination**.

Sincerely yours,



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