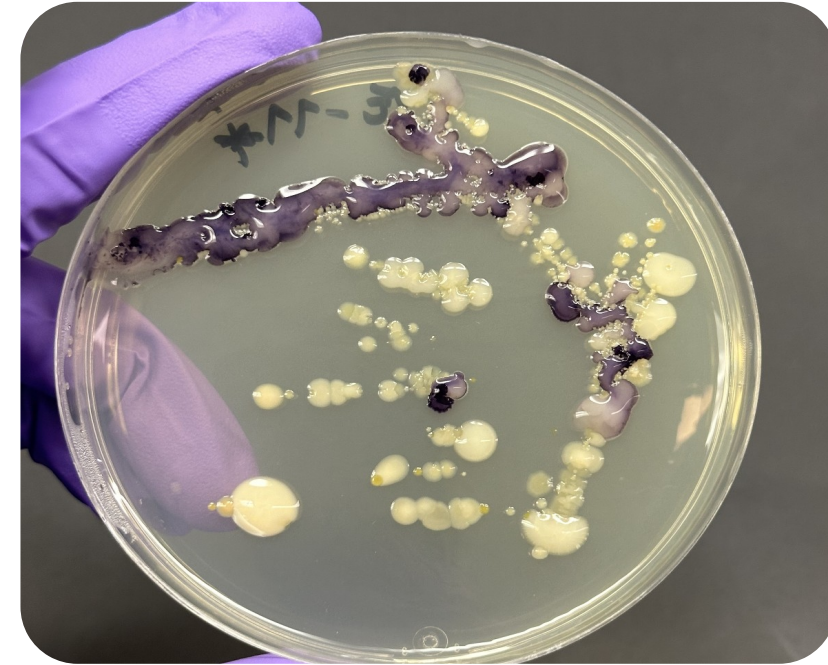


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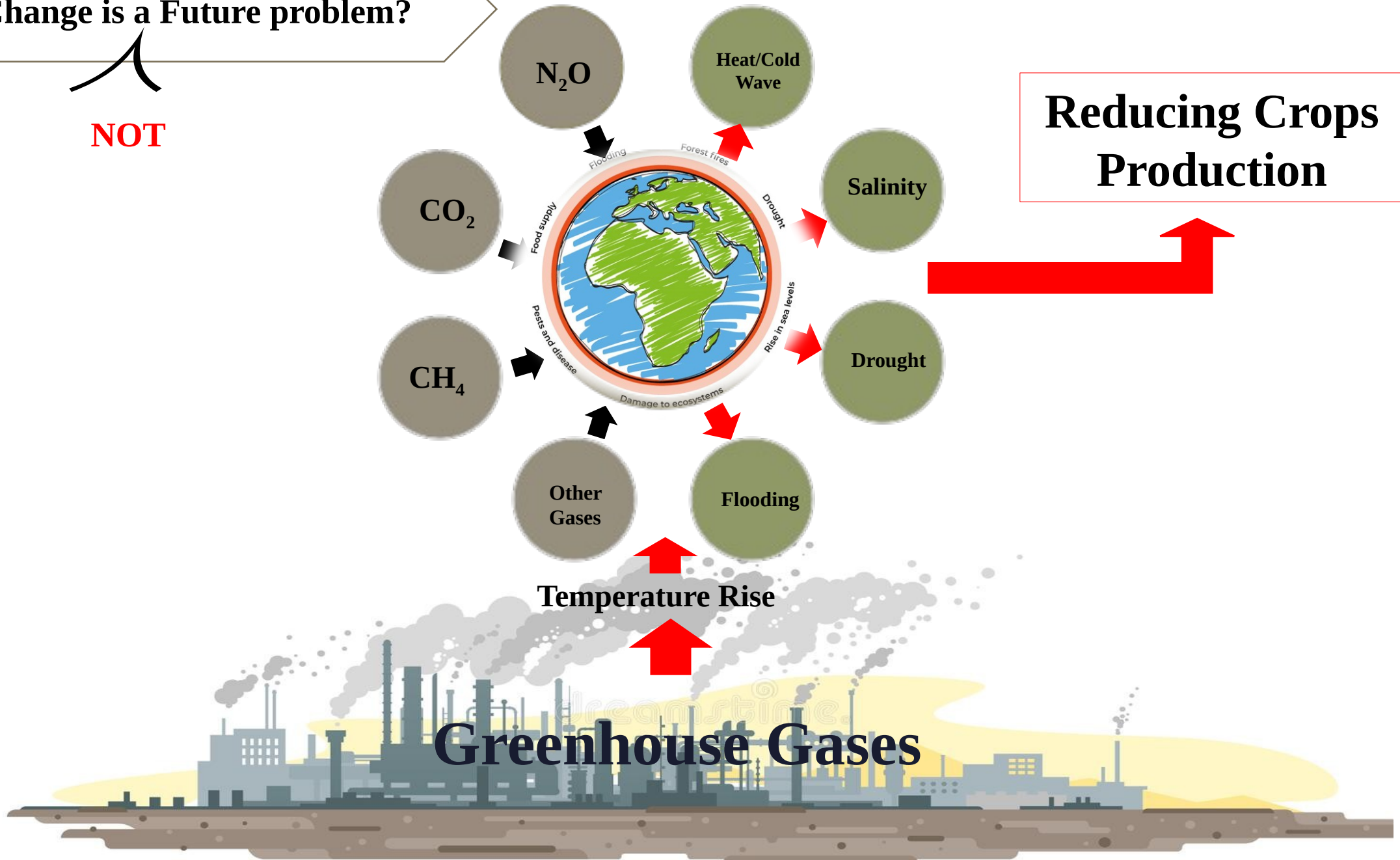
Cell-free Supernatants (CFSs) of Beneficial Bacteria as a Sustainable Solution to Enhance Crop Resilience under Environmental Stresses

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McGill University)
Supervisor : Prof. Donald L. Smith



Climate Change is a Future problem?

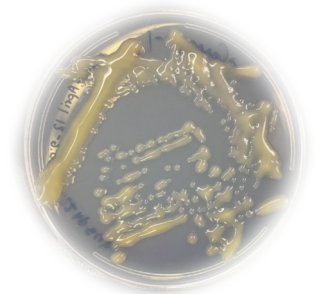
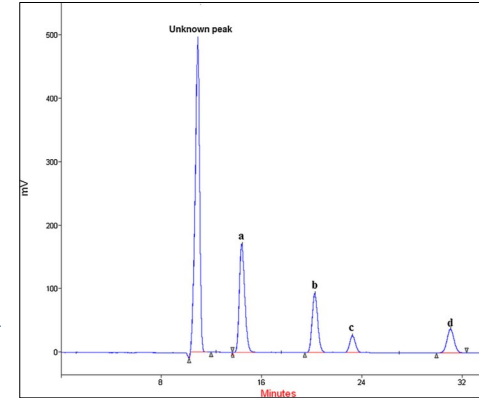
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Objective

To identify a set of “super strains” that can:

- ✓ Enhance plant stress tolerance
- ✓ Increase crop biomass and food productivity
- ✓ Improve pathogen control



These strains will be evaluated for their potential to support a wide range of crop plants in overcoming environmental and biological challenges.

Devosia sp. SL43: Enhancing Soybean Growth under Salt Stress

- ✓ SL43 increased soybean germination by up to 170% and significantly improved salt tolerance.
- ✓ Three HPLC peaks identified as the most effective candidates, boosting soybean germination under salinity stress.
- ✓ Further studies are needed to determine the chemical structure of potential bacterial bioactive compounds.



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Cell-free supernatant of *Devosia* sp. (strain SL43) mitigates the adverse effects of salt stress on soybean (*Glycine max* L.) seed vigor index

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Soil salinity is a major constraint for soybean production worldwide, and the exploitation of plant growth-promoting bacteria (PGPB) and their bioactive metabolite(s) can improve plant salinity tolerance. With this objective, two experiments were performed, aiming to test 4 culture media (YEM(A), TYE(A), TS(A), and LB(A)) for growing a novel *Devosia* sp. (strain SL43), and then evaluating cell-free supernatants (CFS) from the *Devosia* sp. on germination of soybean (*Glycine max* L.) seeds under salinity stress. Soybean seeds were subjected to three salinity levels (0, 100, and 125 mM NaCl) and 6 levels of *Devosia* sp. CFS dilution (0, 1:1, 1:100, 1:250, 1:500, 1:1000). The results indicated that 125 mM NaCl concentration caused the greatest reduction in the total number of germinated seeds (15%), germination rate (43.6%), root length (55.2%), root weight (39.3%), and seed vigor (68%), and it also increased mean germination time by 71.9%. However, *Devosia*-CFS improved soybean germination, and the greatest effect was obtained at 1:1 dilution. Under the highest salinity level, application of CFS at 1:1 dilution increased final germination (17.6%), germination rate (18.6%), root length (162.2%), root weight (239.4%), seed vigor index (318.7%), and also shortening mean germination time by 19.2%. The results indicated that seed vigor index was positively correlated with other traits except for mean germination time. Our study suggested that the highest productivity of *Devosia* sp. was obtained from the YEM medium. Results also suggested that CFS produced by the novel *Devosia* sp. (SL43 strain) can successfully alleviate salt stress effects on soybean seed germination and manipulating the chemical composition of the growth medium can influence the effectiveness of these bioactive metabolites.

KEYWORDS

soybean, salinity, *Devosia* sp., cell-free supernatants, seed germination, vigor index, culture medium optimization

Identify 'super strains' that enhance plant stress tolerance, biomass, productivity, nutrient mobilization, and pathogen control across crops.

- ❑ Isolated **800 strains** from 16 winter and 5 summer plants
- ❑ Screening for salt stress tolerance in progress:
 - Three strains shown to improve soybean germination:
- ❑ Antibacterial Activity & Potato Growth Enhancement in progress:
 - Two strains show potential against the *V. dahliae* MbVd23 pathogen:



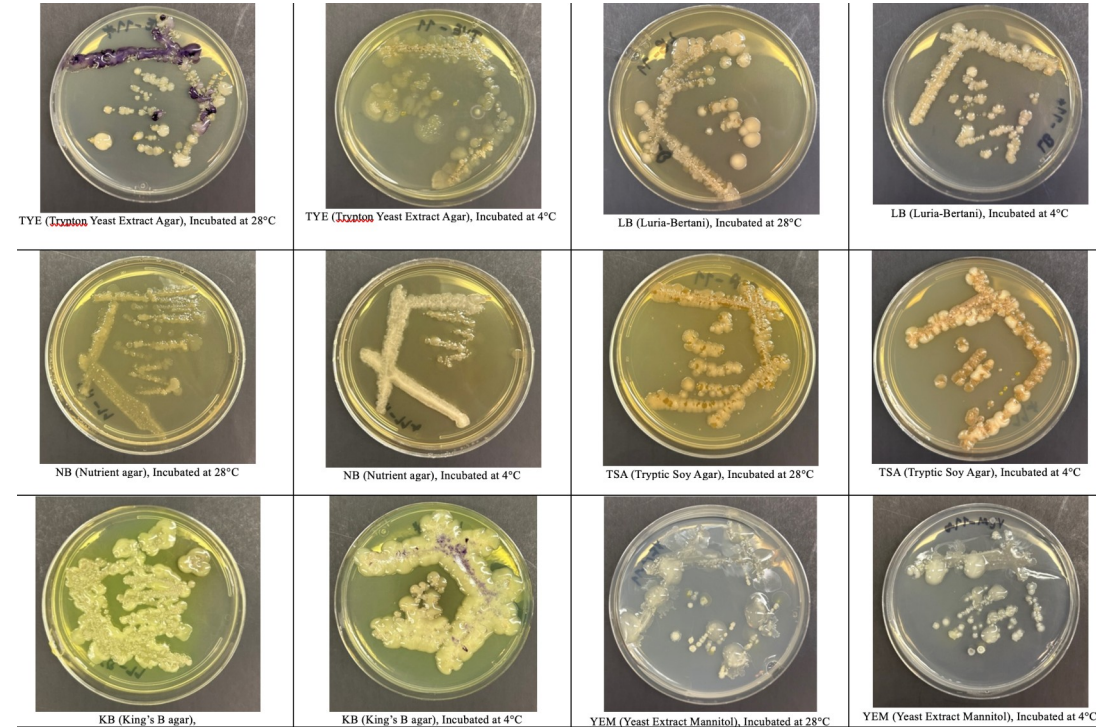
Progress & Results

❑ Screening for salt stress tolerance in progress:

- **Three strains** shown to improve soybean germination:
 - ✓ **Strain TYE (Root 4):** 10% increase at 75 mM NaCl; 69.23% to 76.92% at 100 mM NaCl.
 - ✓ **Strain NB (Root 4):** 76.92% to 107.69% increase at 100 mM NaCl.
 - ✓ **Strain NB (Root 3):** 53.85% to 169.23% increase at 100 mM NaCl.

❑ Antibacterial Activity & Potato Growth Enhancement:

- **Two strains** show potential against the *V. dahliae* MbVd23 pathogen:
 - ✓ Strain 11 (Root 2, TYE media): 79.37% increase in early potato growth under field conditions.
 - ✓ Strain 21 (Root 3, NB): 60.32% increase in early potato growth.
 - ✓ Strain mix (11 & 21): 119.05% increase in early potato growth



Thank You!



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