

Novel, single treatment application to seeds increases germination with positive impact on crop growth and development under both optimum and stress conditions

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ABSTRACT

- Early seed germination and seedling establishment, enhanced root development under Low Temperature (LT) stress are all critical factors to increasing yield through advanced flowering and avoidance of heat/drought stress in mid-summer in Canada and globally.
- This novel, inexpensive, single treatment application to seeds has significant effect on all three critical factors and can be applied in both developed and developing countries through soaking, priming or spray.
- Over 30 crops/cultivars have been assessed under optimum and LT stress. While further research is required, sufficient evidence indicates significant short and long term effect on plant growth and development in a range of crops.

OBJECTIVE

To determine if a single seed treatment can advance germination under low temperature stress conditions and evaluate impact on subsequent plant growth and development across a range of crops.

MATERIALS & METHODS

MATERIALS: Over 30 crops/cultivars were tested from cereals, pulses, oilseeds, forage, to horticulture crops
TREATMENT: The seed treatment is based on a catalytic reaction (CAT™) using a transition metal catalyst combined with H₂O₂. Water control.
METHODOLOGY: Seed treatment was optimized for each crop based on concentration, soaking time (1 – 4 hrs), spray (0 to 3X the dose). Germination, root and shoot growth under 20, 15, 10, and in some cases, 5°C under controlled environment conditions, as well as nodulation and yield of specific crops has been assessed. Results presented based on 5 – 10 replications.

CONCLUSIONS

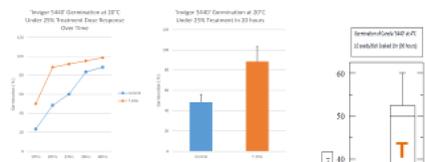
A single application of a seed treatment can induce enhanced germination under BOTH optimum and LT conditions and has long term impact on increasing root and shoot growth and nodulation in certain legumes. Distinct cultivar - dependent responses are apparent.

FUTURE WORK

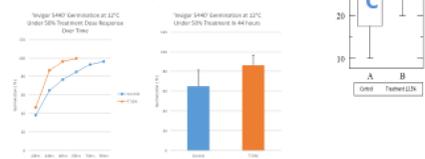
- Field-based responses should be evaluated for emergence, plant growth and development and yield.
- * Treatment effects under salinity stress validating initial results and moisture stress should be evaluated.
- * Mechanism of the observed seed treatment should be investigated.

RESULTS

Germination of Canola 'Invigor 5440' at 20°C (6 replications)



Germination of Canola 'Invigor 5440' at 12°C (6 replications)



4°C Germination

Germination of 'Invigor 5440' at 4°C constant temperature, under dark conditions after 90 hours.

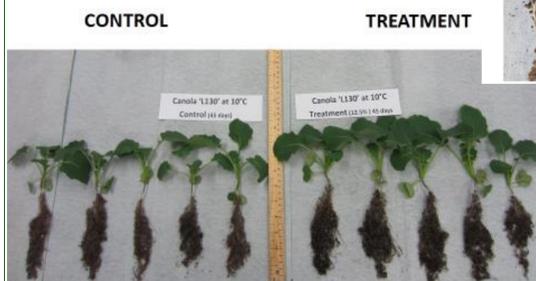
Seed was soaked for 1 hour in 12.5% catalytic treatment solution. Control was soaked for 1 hour in water. Both solutions were pH'd to 4.9.

Pea 'CDC Golden' Strong interaction with fungicide. Note induction of multiple basal stems and increased rooting under treatment (right).

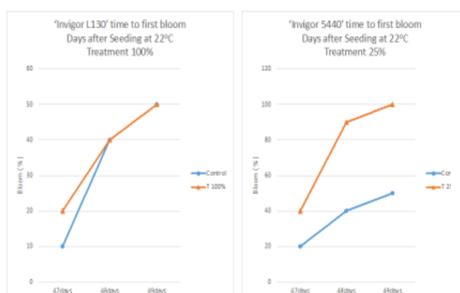
CONTROL + FUNGICIDE (APRON MAX) SEED TREATMENT + FUNGICIDE (APRON MAX)



Canola 'Invigor L130' at 10°C

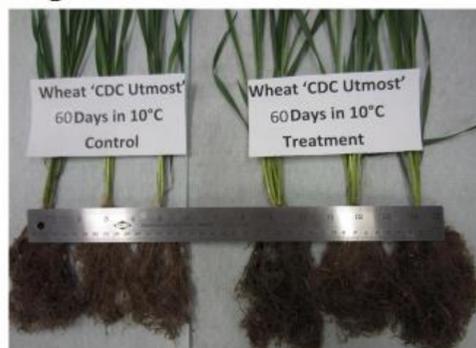


Canola Time to First Bloom, greenhouse (Ten, 11 Litre pots per treatment)



Lentil 'CDC Maxim' of plant roots grown from treated seeds harvested at 59 days in 10°C. Note the large number of nodules even at this low temperature. Control plants had virtually no nodules.

Spring wheat 'CDC Utmost' at 10°C



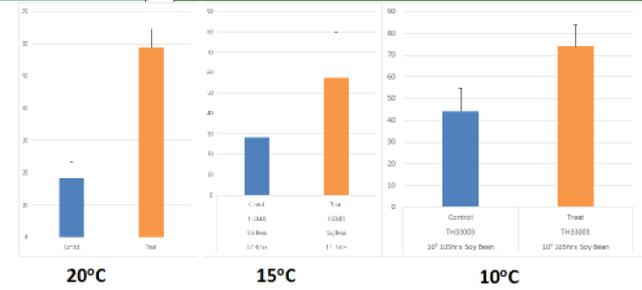
Three representative samples of Spring Bread Wheat 'CDC Utmost' harvested after 60 days of growth at 10°C. Note the larger root mass and tiller number in the plants grown from treated seeds (right) compared to the control plants (left).

Treatment sterilizes seed surface

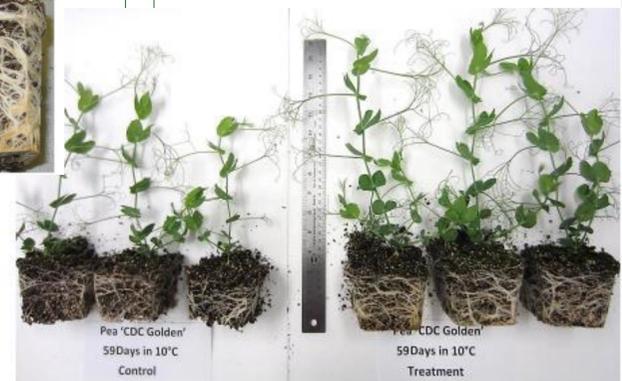
Lentil 'CDC Maxim' 10°C



RESULTS



Soybean Germination at 20, 15 and 10°C taken at one point in time. Treatment increased rate of germination.



Pea 'CDC Golden' harvested after 59 days at 10°C. Note the root ball of control plants (left) has broken off after removal from the pot since there were fewer roots to hold the soilless mix together. Both root and shoot growth higher in the plants grown from treated seeds (right).

Spring wheat 'CDC Utmost' 15°C



ACKNOWLEDGEMENTS & CONTACT

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