OVERVIEW OF NAIT CENTRE FOR BOREAL RESEARCH SHRUB AND GROUND VEGETATION PROPAGATION WORK

ITAC EXTENSION MEETING

JANUARY 17-18, 2024

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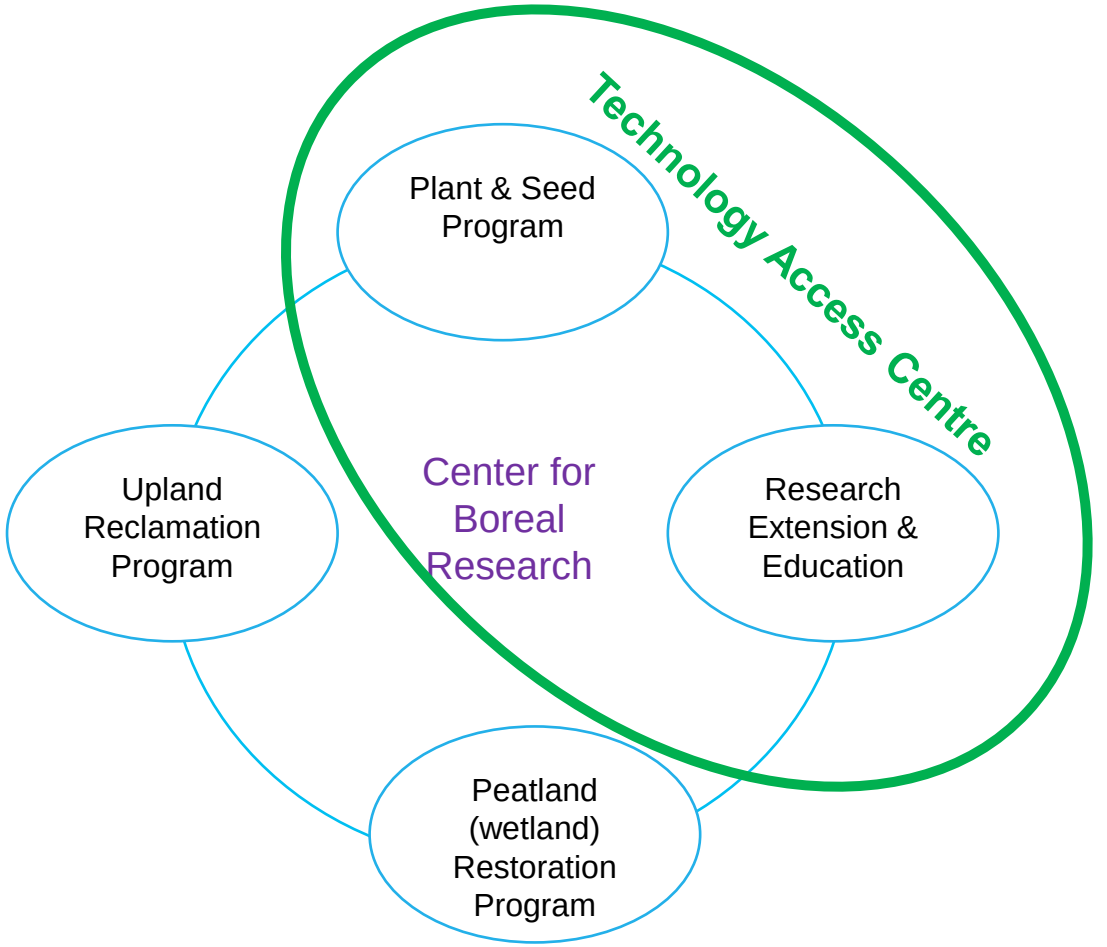
APPLIED RESEARCH | NAIT

OUTLINE

- Who we are
- Selected native boreal shrubs and graminoids
  - Red osier dogwood (*Cornus sericea*)
  - Canada buffaloberry (*Shepherdia canadensis*)
  - Low bush Cranberry (*Viburnum edule*)
  - Lingonberry (*Vaccinum vitis-idaea*)
  - Blueberry (*Vaccinum myrtilloides*)
  - Green alder (*Alnus viridis*)
  - Sedges (*Carex spp*)

CENTRE FOR BOREAL RESEARCH (CBR)



NAIT

INDUSTRY SOLUTIONS

CENTRE FOR BOREAL RESEARCH

Mandate:

Provide scientific findings, methods, and technologies to advance the capacity of industry to lessen its environmental footprint through front-end planning, interim reclamation, and the ecological restoration of disturbed lands.

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BOREAL FOREST PLANT & SEED TAC

- Provide scientific guidance, develop methods and protocols for seed harvesting, handling, enhancement, and determine optimum storage conditions to maintain long-term seed viability.
- Develop systems to deploy and improve seed delivery at a large scale.
- Develop plant and seed delivery businesses within Indigenous communities to reduce barriers to reforestation and reclamation.
- Strengthen the industry-business supply chain within the region through a Seed Consortium.

INDIGENOUS COMMUNITY ENGAGEMENT

The purpose is to assist communities to:

- Establish successful seed supply and reforestation businesses.
- Build capacity through hands-on training and mentoring.

SELECTED BOREAL NATIVE SHRUBS

- Red osier dogwood (Cornus sericea)
- Canada buffaloberry (Shepherdia canadensis)
- Low bush Cranberry (Viburnum edule)
- Lingonberry (Vaccinum vitis-idaea)
- Blueberry (Vaccinum myrtilloides)
- Green alder (Alnus viridis)
- Sedges (*Carex spp*)

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RED OSIER DOGWOOD (*Cornus sericea*)

- Fast-growing, deciduous shrub native throughout North America
- Vital food source for many wild animals, including ruminants and birds
- Thrives on different soil types and performs well in moderately wet soils
  - tolerate high pH levels
  - Able to minimize ion transport of either Na+ or Cl- from the roots to leaves
- Enables resilience and a strong performance on disturbed sites

RED OSIER DOGWOOD - PROPAGATION

- While production from seeds may be economical, a long period of stratification, and a low germination rate have been quite challenging in the propagation of the species.

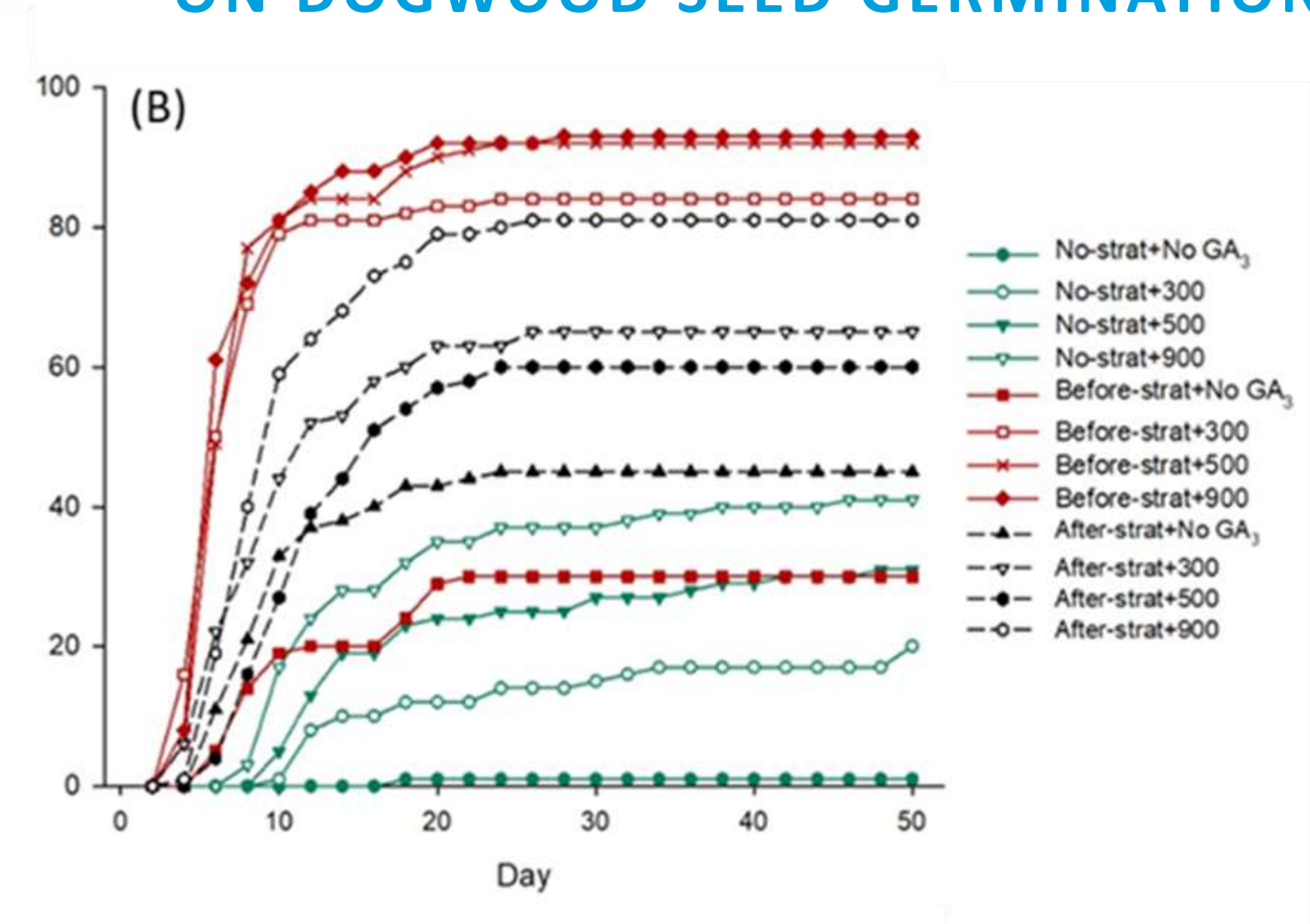
- Vegetative propagation by stem cuttings has been favored as an alternative method to seedling production.

DOGWOOD: SEED-BASED PROPAGATION

Combination of cold-stratification and Gibberellic acid (GA_3) treatments:

- Seed were treated with GA_3 before or after stratification
- GA_3 concentration: 0, 300, 500, and 900mg/L
- Seed primed for 24 hours in GA_3
- Seed stratified for 8 weeks at 4^0C
- 4 replicate dishes, 25 seeds each dish
- Seed incubated in a germination chamber for 45 days
- Germination temperature 25˚C, relative humidity 75%

EFFECTS OF GIBBERELLIC ACID AND MOIST CHILLING ON DOGWOOD SEED GERMINATION



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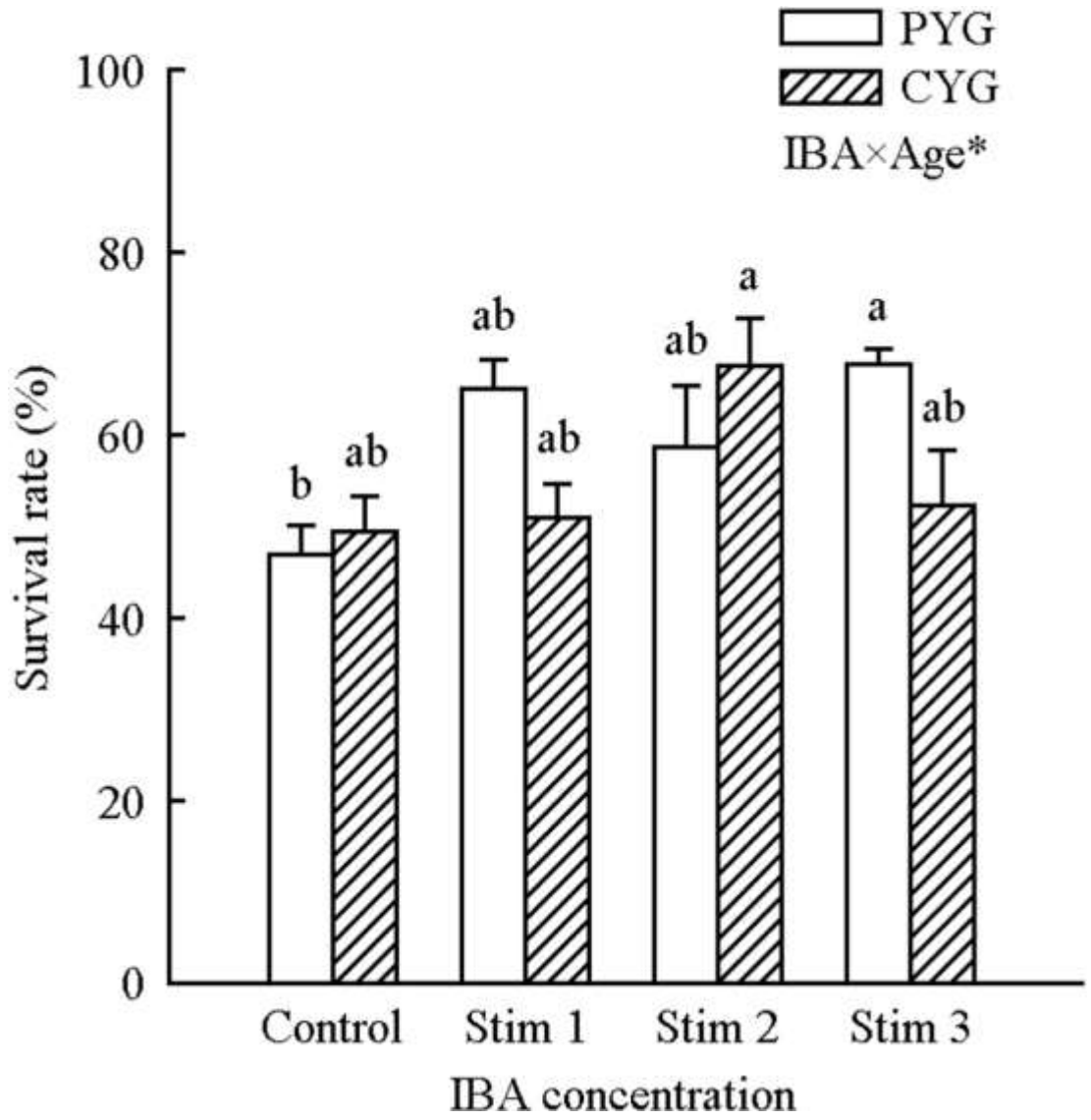
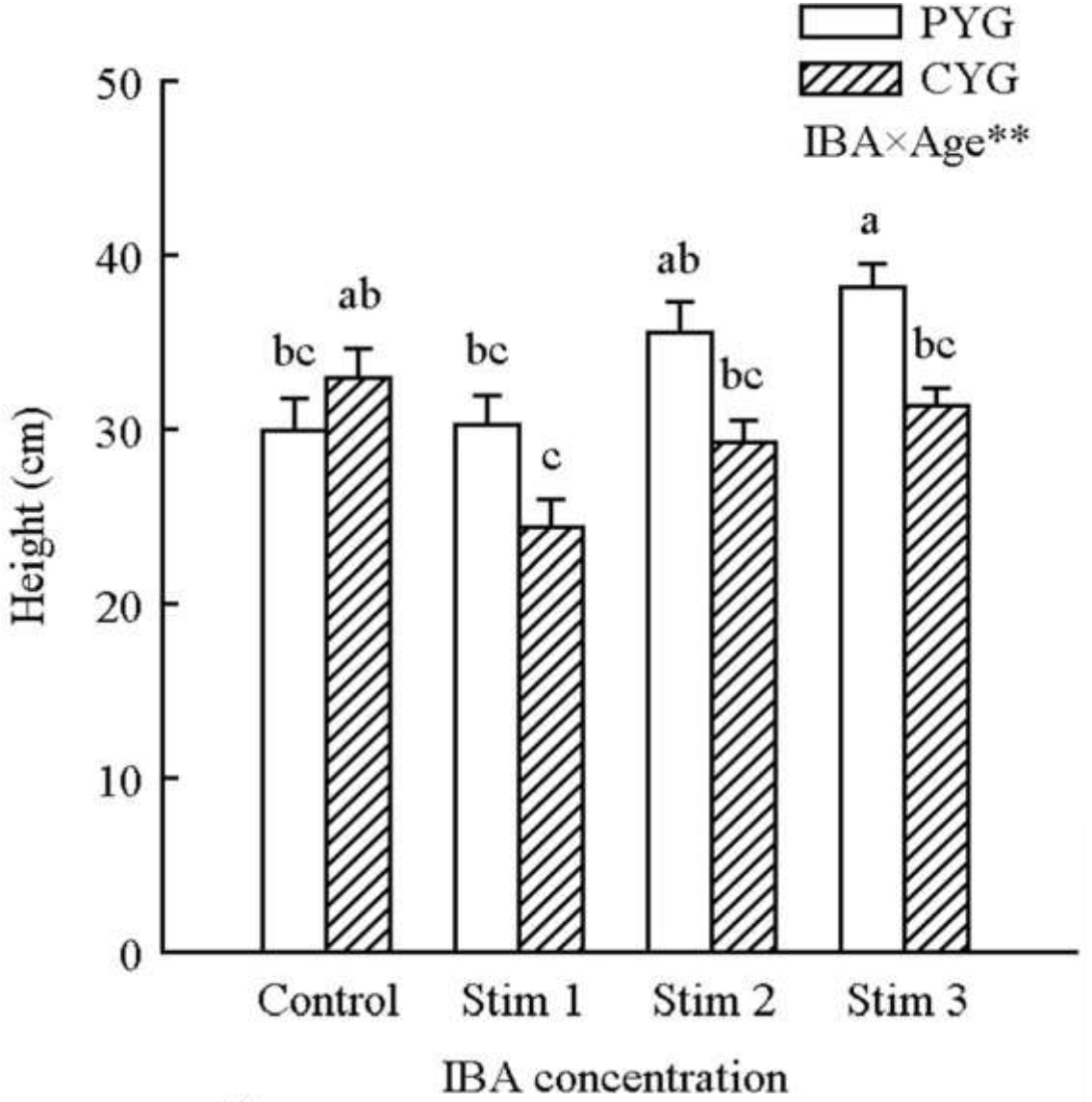
EFFECTS OF INDOLE-3-BUTYRIC ACID ON DOGWOOD STEM CUTTINGS

- Cuttings age:
  - previous year's growth (PYG) ~1–2 years old stem
  - current year's growth (CYG) ~ approximately 2-months- old
- The basal end (2–3 cm) of each cutting was dipped in one of the concentrations of rooting powder Plant-Prod® (Stim Root® 0.1%, 0.4%, or 0.8% IBA)
- Treated cuttings inserted into the prepared growth media.
- Cutting were grown for 4 months

APPLIED RESEARCH | NAIT

EFFECTS OF INDOLE-3-BUTYRIC ACID ON DOGWOOD STEM CUTTINGS





BUFFALOBERRY (*Shepherdia canadensis*)

- Widely distributed from Alaska to Maine, South Dakota, and the mountains of Arizona and indigenous to Alberta
- Nitrogen-fixing, drought-resistant perennial deciduous shrub.
- Tolerate inhospitable conditions
- Recommended for land reclamation and revegetation of nutrient-poor industrial disturbed soils

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BUFFALOBERRY - PROPAGATION

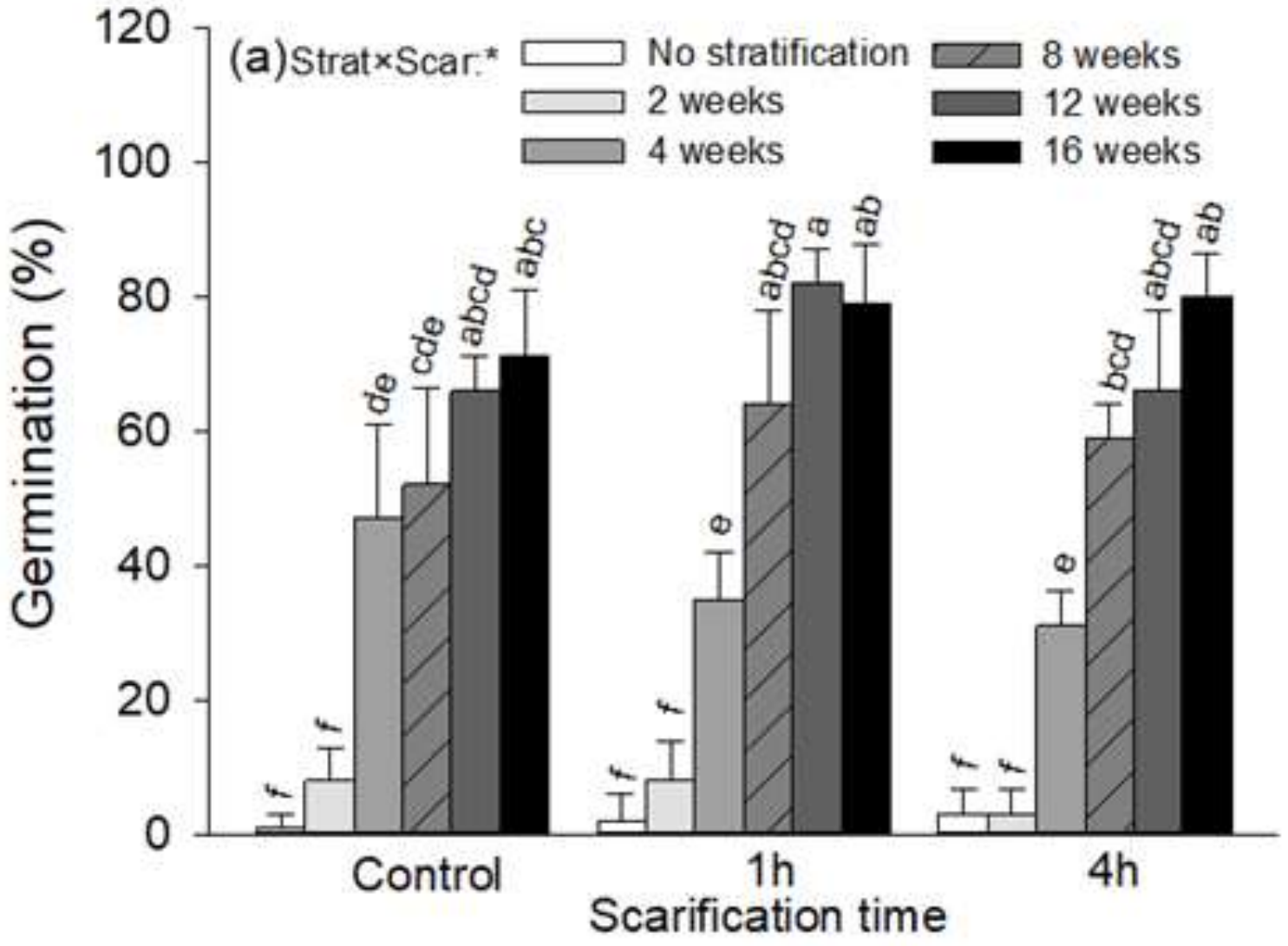
- Essential role as a food resource for:
  - wild animals, such as grouse, black bears, grizzly bears, and snowshoe hares

- No cost-effective methods to propagate buffaloberry

EFFECT OF SCARIFICATION & STRATIFICATION ON BUFFALOBERRY

- Seeds were from 7 populations
- Factors:
  - six cold stratification durations (0, 2, 4, 8, 12, and 16 weeks)
  - two scarification times (1 hour and 4 hours) with 5% sulfuric acid
- Seed Treatments:
  - Cold stratification alone
  - Acid scarification with cold stratification

EFFECT OF SCARIFICATION & STRATIFICATION ON BUFFALOBERRY



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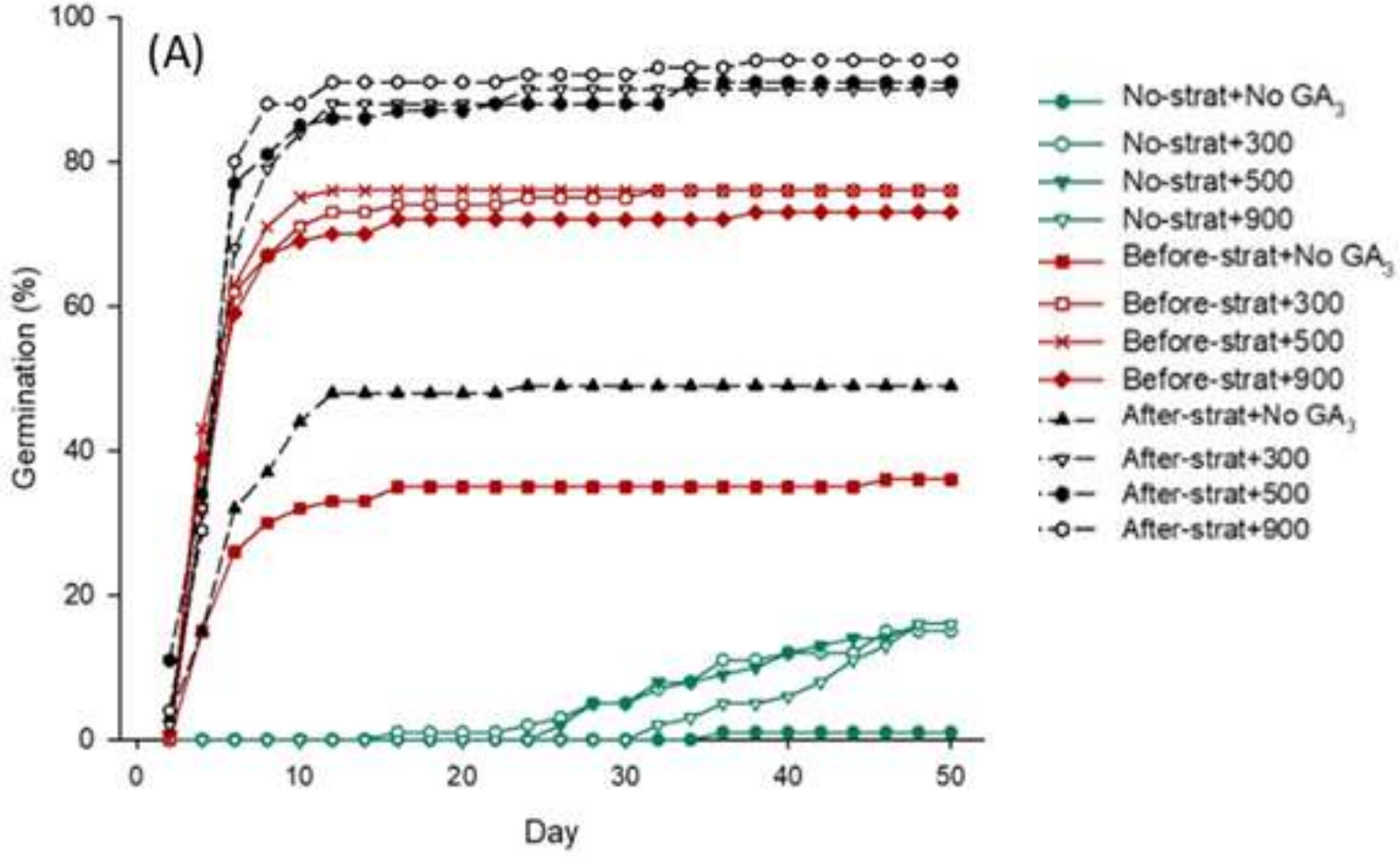
EFFECT OF CONCENTRATION OF GIBBERELLIC ACID ON SEED GERMINATION BEFORE & AFTER STRATIFICATION

Evaluation of the interactive effects of GA3 concentration (0, 300, 500, and 900 mg/L) and the timing of application (Before and After cold stratification) on buffaloberry seed germination.



LOWBUSH CRANBERRY (*Viburnum edule*)

- Moderately shade tolerant species
- Common in moist woods, thickets, margins of wetlands and stream banks
- Prefers rich moist soils in heavily wooded areas
- May dominate understory of spruce forests

LOW BUSH CRANBERRY - PROPAGATION

- LB cranberry can be propagated vegetatively or by seed
- Seed from 6 LB cranberry populations were used
- Five replicates of 200 seeds each were moved through a warm-cold (20/4°C) or cold-warm (4/20°C) temperature sequences:
    - Three months warm-two months cold (**3mw+2mc**)
    - Two months cold-three months warm-two months cold (**2mc+3mw+2mc**)
    - Two months cold-three months warm-three months cold (**2mc+3mw+3mc**)
    - Two months cold-three months warm-four months cold (**2mc+3mw+4mc**)
    - Two months cold-three months warm-five months cold (**2mc+3mw+5mc**)
- After stratification, seeds were incubated in the greenhouse

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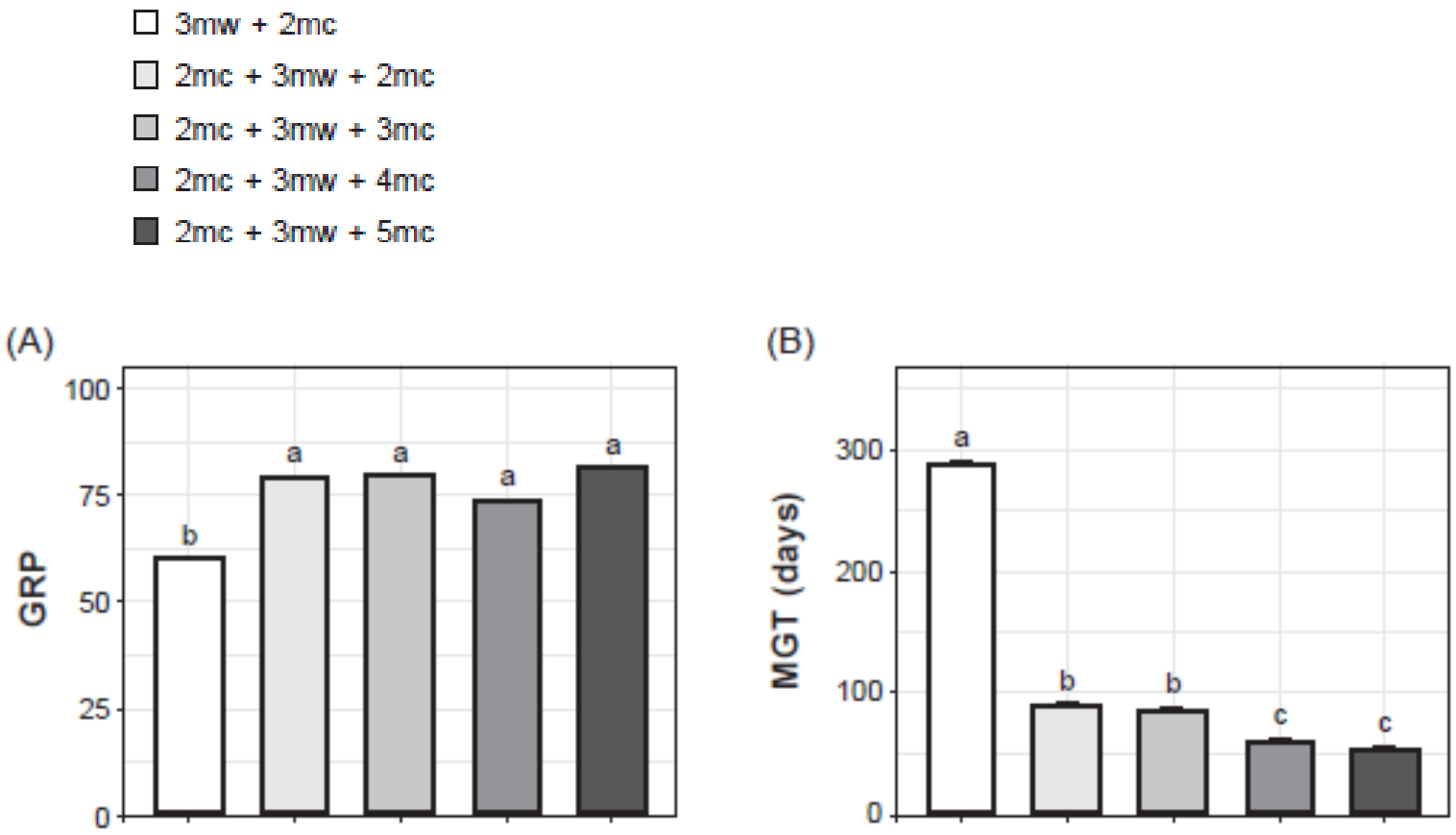
EFFECTS OF MOIST CHILLING AND WARM STRATIFICATION ON SEED GERMINATION



LINGONBERRY (*Vaccinum vitis-idaea*)
BLUEBERRY (*Vaccinum myrtilloides*)

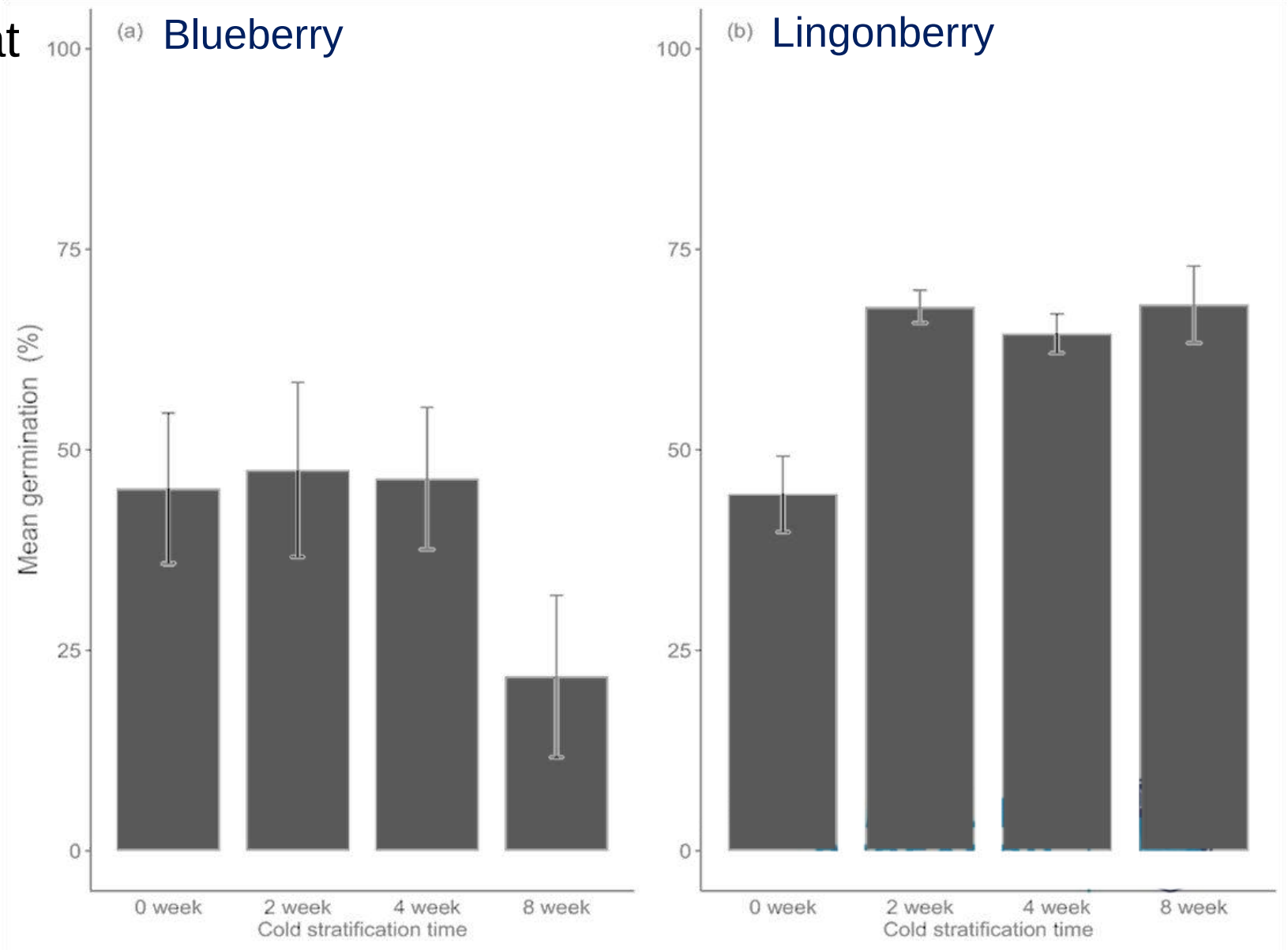
- Economic and ecological significance of both has resulted in their domestication.
- Blueberry has been cross bred with other blueberry species to obtain higher yield of berries for agricultural purposes.
- Vegetative approaches are used to propagate both.
- Yet comprehensive strategies regarding seed germination are lacking.

Lingonberry

Blueberry

LINGONBERRY & BLUEBERRY – GERMINATION TRIAL

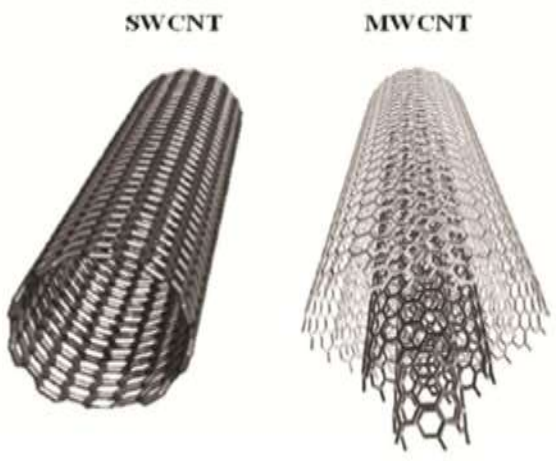
- Seeds were cold-stratified at 4°C for 0 2, 4, and 8 weeks.
- Within each treatment, 4 replicate trays (Petri plates filled with pure silica sand) were utilized with 50 seeds in each tray.
- Seeds were incubated in a germination chamber at 25°C (77°F).

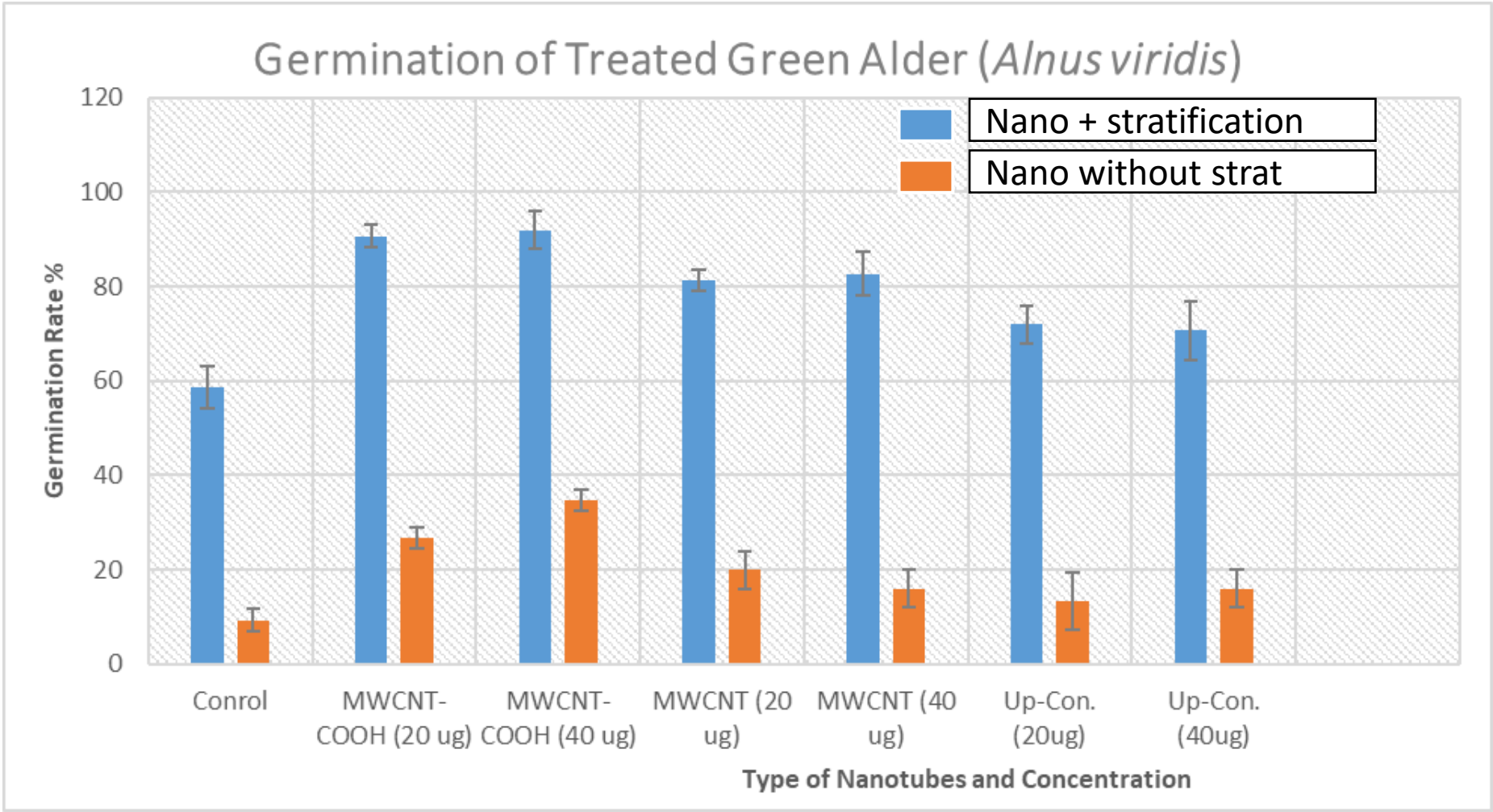


GREEN ALDER – EFFECT OF CARBON NANOPARTICLES

Evaluate the effect of priming with selected Carbon Nanoparticles on green alder seed germination

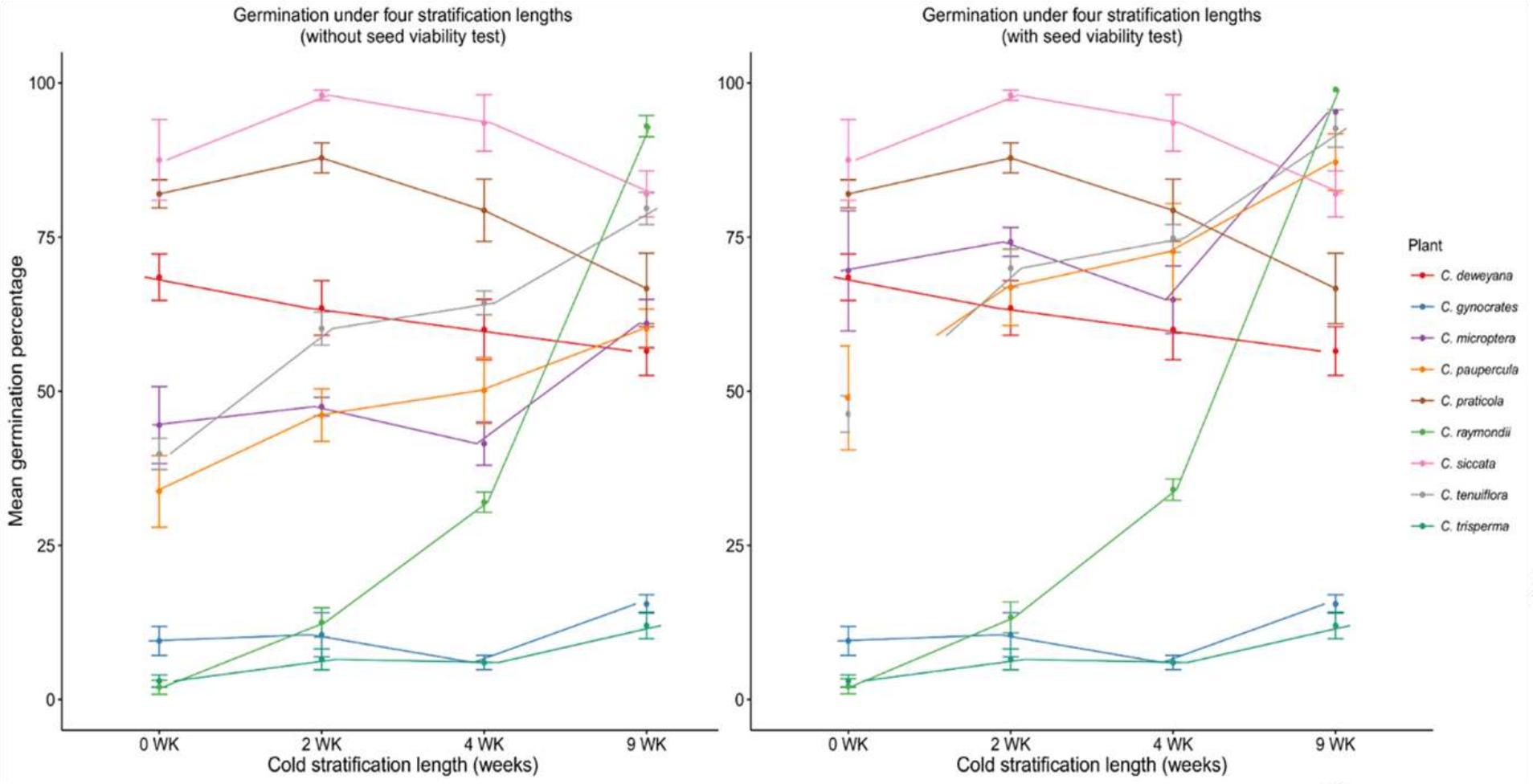
Carbon nanotubes





SEDGES – EFFECT OF STRATIFICATION ON GERMINATION

Asses the Effect of cold stratification on germination of nine boreal sedges



ACKNOWLEDGEMENT

Technical Staff

- Research Associates
- Research Technicians
- Summer Assistants

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FOREST RESOURCE IMPROVEMENT
ASSOCIATION OF ALBERTA (FRIAA)


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Weyerhaeuser


West Fraser


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