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Tree Improvement



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Main focus areas



1. *Pinus radiata* interspecific hybridisation
2. Frost tolerance of various *Pinus* species and hybrids
3. Domestication & genetic conservation of indigenous spp.
 - a) Domestication strategy: 2030
 - b) Tissue culture as alternative propagation method
 - c) Breeding strategies
 - d) *Strychnos cocculoides* (monkey orange)
 - e) *Pterocarpus angolensis* (kiaat)





Pinus radiata interspecific hybridisation



- *Fusarium circinatum* screening of *P. radiata* families
- Identify interspecific partners for *P. radiata*
- Improve seed set in *P. radiata* interspecific cones

Collaboration with

- Department of Genetics (SU & UFS)
- Department of Plant Pathology (SU)
- FABI (UP)
- Central Analytical Facility (SEM, CT scans etc.)
- ARC (statistical analysis)



MTO | group



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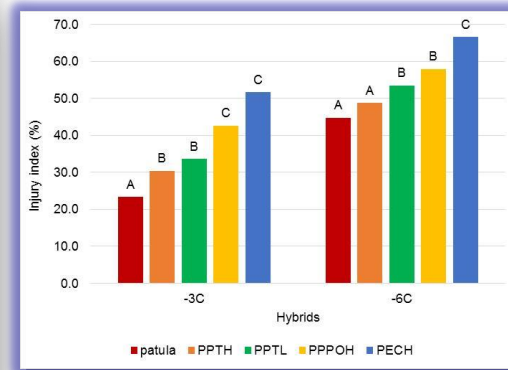
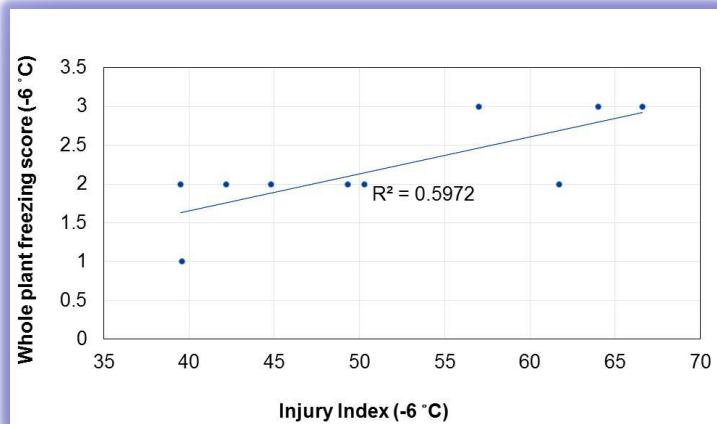


Frost tolerance of *Pinus* species & hybrids



Frost tolerance screening techniques of various *Pinus* species and hybrids

- Develop a reliable, consistent and robust *in vitro* (laboratory) frost tolerance screening protocol to mimic *in vivo* (field) conditions
 - Assist with site species matching and breeding strategies





Frost tolerance of *Pinus* species & hybrids



Genetic control of frost tolerance in *P. patula* x *P. tecunumanii* (LE and HE) hybrid families

- Is frost tolerance under strong genetic control?
- Inheritability: mom or dad
 - General Hybridizing Ability (GHA) & Specific Hybridizing Ability (SHA) from the factorial mating design
 - Assist with site species matching and breeding strategies



$$\sigma_{G\&S\&F}^{2(1)} = \frac{1}{2}\sigma_A^{2(0)} + \frac{1}{4}\sigma_D^{2(0)} + 2 \sum_{i=1}^k \sum_{j=1}^k \left(\frac{r_{ij}}{1-r_{ij}} \right) \Delta_{ij}^{(0)} \alpha_i \alpha_j +$$

$$2 \sum_{i=1}^k \sum_{j=1}^k \left[\left(\frac{1}{1-r_{ij}} \right)^2 - 1 \right] \left[\Delta_{ij}^{(0)} \right]^2 d_i d_j$$

$$\sigma_{G\&W\&S\&F}^{2(1)} = \frac{1}{2}\sigma_A^{2(0)} + \frac{3}{4}\sigma_D^{2(0)} - 2 \sum_{i=1}^k \sum_{j=1}^k \left(\frac{r_{ij}}{1-r_{ij}} \right) \Delta_{ij}^{(0)} \alpha_i \alpha_j -$$

$$2 \sum_{i=1}^k \sum_{j=1}^k \left[\left(\frac{1}{1-r_{ij}} \right)^2 - 1 \right] \left[\Delta_{ij}^{(0)} \right]^2 d_i d_j$$





Frost tolerance of *Pinus* species & hybrids



Genetic control of *Fusarium circinatum* Tolerance in PPTL and PPTH hybrid families

- How does frost and *F. circinatum* tolerance correlate for PPTH and PPTL hybrid families?
- Inheritability: mom or dad
 - General Hybridizing Ability (GHA) & Specific Hybridizing Ability (SHA) from the factorial mating design
 - Assist with site species matching and breeding strategies



$$\sigma_{\text{GaFSF}}^{2(1)} = \frac{1}{2}\sigma_A^{2(1)} + \frac{1}{4}\sigma_D^{2(1)} + 2 \sum_{i=1}^k \sum_{j=1}^k \left(\frac{r_{ij}}{1-r_{ij}} \right) \Delta_{ij}^{(0)} \alpha_i \alpha_j +$$

$$2 \sum_{i=1}^k \sum_{j=1}^k \left[\left(\frac{1}{1-r_{ij}} \right)^2 - 1 \right] [\Delta_{ij}^{(0)}]^2 d_i d_j$$

$$\sigma_{\text{GwFSF}}^{2(1)} = \frac{1}{2}\sigma_A^{2(1)} + \frac{3}{4}\sigma_D^{2(1)} - 2 \sum_{i=1}^k \sum_{j=1}^k \left(\frac{r_{ij}}{1-r_{ij}} \right) \Delta_{ij}^{(0)} \alpha_i \alpha_j -$$

$$2 \sum_{i=1}^k \sum_{j=1}^k \left[\left(\frac{1}{1-r_{ij}} \right)^2 - 1 \right] [\Delta_{ij}^{(0)}]^2 d_i d_j$$





Domestication and genetic conservation of indigenous species



Harvesting and postharvest handling practices of *Strychnos cocculoides* fruit

- Determine harvesting & post-harvest handling practices
- Evaluate market potentials
- Develop breeding strategies
- Assess infrastructure & training needs





Domestication and genetic conservation of indigenous species



Germination Potential of *Pterocarpus angolensis* and *Strychnos cocculoides* using Tissue Culture Techniques

- Assess TC as alternative propagation method
- Evaluate seedling survival
- Develop reliable, consistent and robust TC techniques



NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY





Forestry Development



Agroforestry development and implementation in South Africa



Relationship between Agroforestry and Ecosystem Services: Role of Agroforestry in Rural Communities



Scenic road ahead:



Flight plan:





thank you
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спасибо (Bajaralala) mersi barka welalin tack **tesekkür ederim** mahalo
vinaka (faafetai lava) blagodaram kia ora blagodaram misontra matondo paldies grazzi tapadh leat
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