From top to bottom, how meristem position affects the regeneration capacity of sweet potato after cryopreservation

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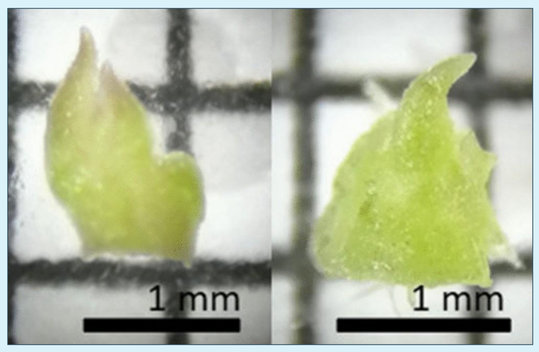
Introduction

Sweet potato (*Ipomoea batatas*) provides many people a **daily meal** with a yearly global production of more than 112 million tons. Continuously new **challenges** such as **diseases, pests and drought** due to climate change arise, upon which farmers need to be able to react. Introducing **improved varieties** is part of the solution, but to be able to do this, farmers and breeders need access to **safely stored germplasm**. Since field banks are vulnerable to the same field conditions, and seed banking clonally propagated crops result in loss of their genetic make up, alternatives for safe **long-term storage** are **needed**. **Cryopreservation** of shoot-tips (meristems) can solve this problem and multiple protocols for sweet potato have been developed. However, most protocols limited themselves to apical meristems and didn't investigate axillary meristems, which often react differently, leaving room for improvement.

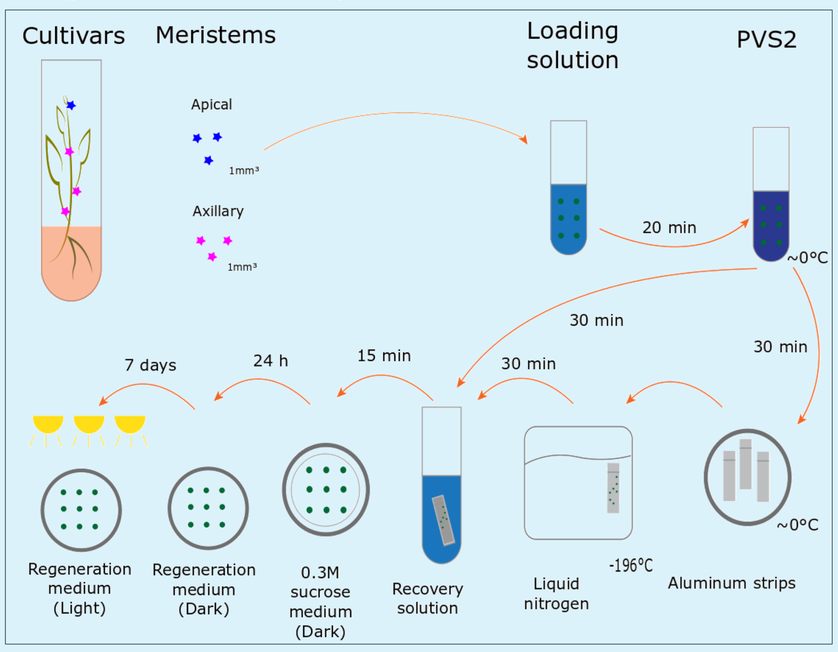
Material & Methods

Apical vs Axillary

- 950 "1 mm³ big" apical and axillary (figure below; Apical left, Axillary right) sweet potato meristems were excised from *in vitro* grown plantlets of 3 cultivars (CIN; CMR and IBA)

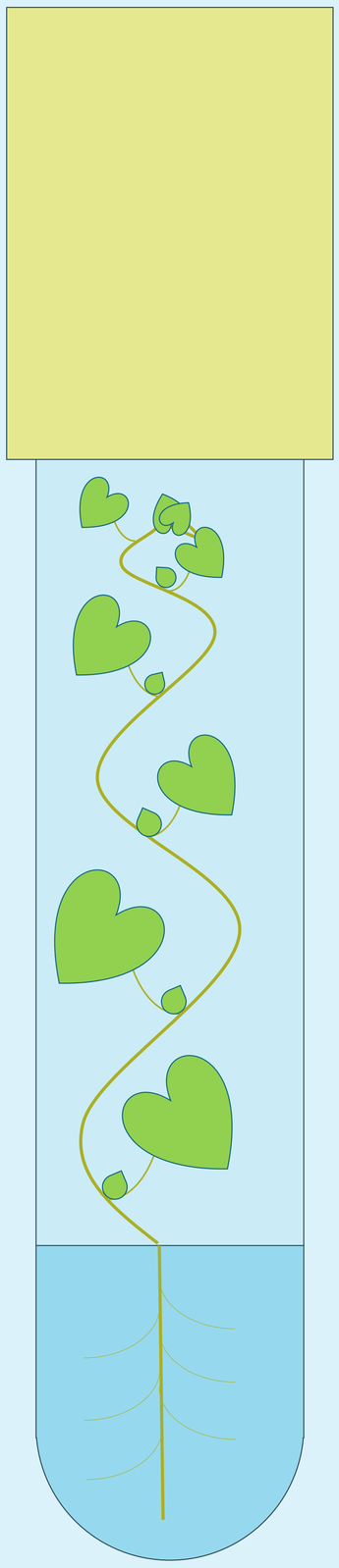


- The Meristems were subjected to the following droplet vitrification protocol



One protocol for all cultivars?

- 900 axillary meristems were excised from 10 different cultivars (CAM; CIN; CMR; ESP; IBA; JEW; MAN; TAN; TIS and TRUJ) and subjected to previous protocol.



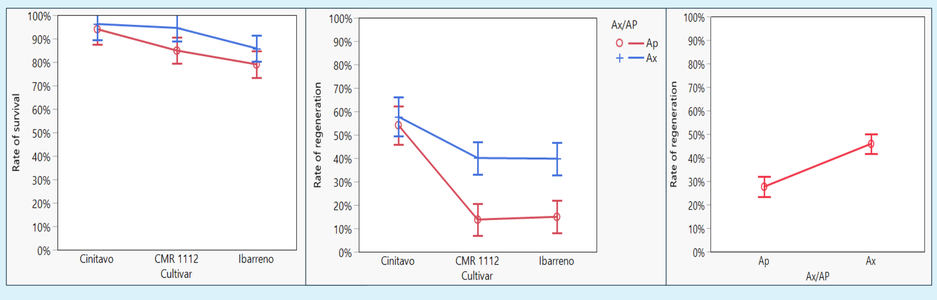
Results

Apical vs Axillary

- No significant differences on **survival** after cryopreservation
- **But** a significant parameter for **regeneration** in 2 of 3 cultivars

➔ Survival ≠ plant growth

➔ Axillary an overall better reaction



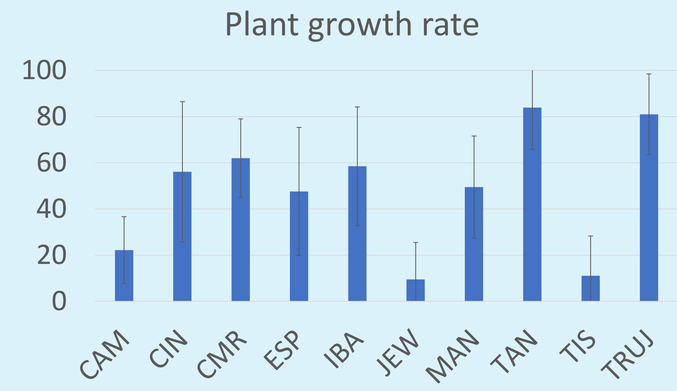
Comparison survival rate after cryopreservation for apical (red) and axillary (blue) meristems

Comparison plant growth rate after cryopreservation for apical (red) and axillary (blue) meristems

Comparison plant growth rate after cryopreservation for apical and axillary meristems

10 different cultivars

- Up to 84% plant growth after cryo
- 7 cultivars had >48% plant growth after cryo
- 3 "bad" cultivars reacted all in a different way (BA sensitive/ cryo sensitive/ overall slow growing)



Seventy percent of accessions (7 out of 10) can be safely stored through cryopreservation

Conclusion

- Cryopreservation is a valuable and trustworthy conservation strategy for sweet potato collections
- Survival is a bad predictor for plant regeneration after cryopreservation
- Axillary and apical sweet potato meristems react differently after cryopreservation
- Using axillary meristems results in more plant growth, with 70% of tested cultivars scoring more than 48%

Acknowledgements

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