

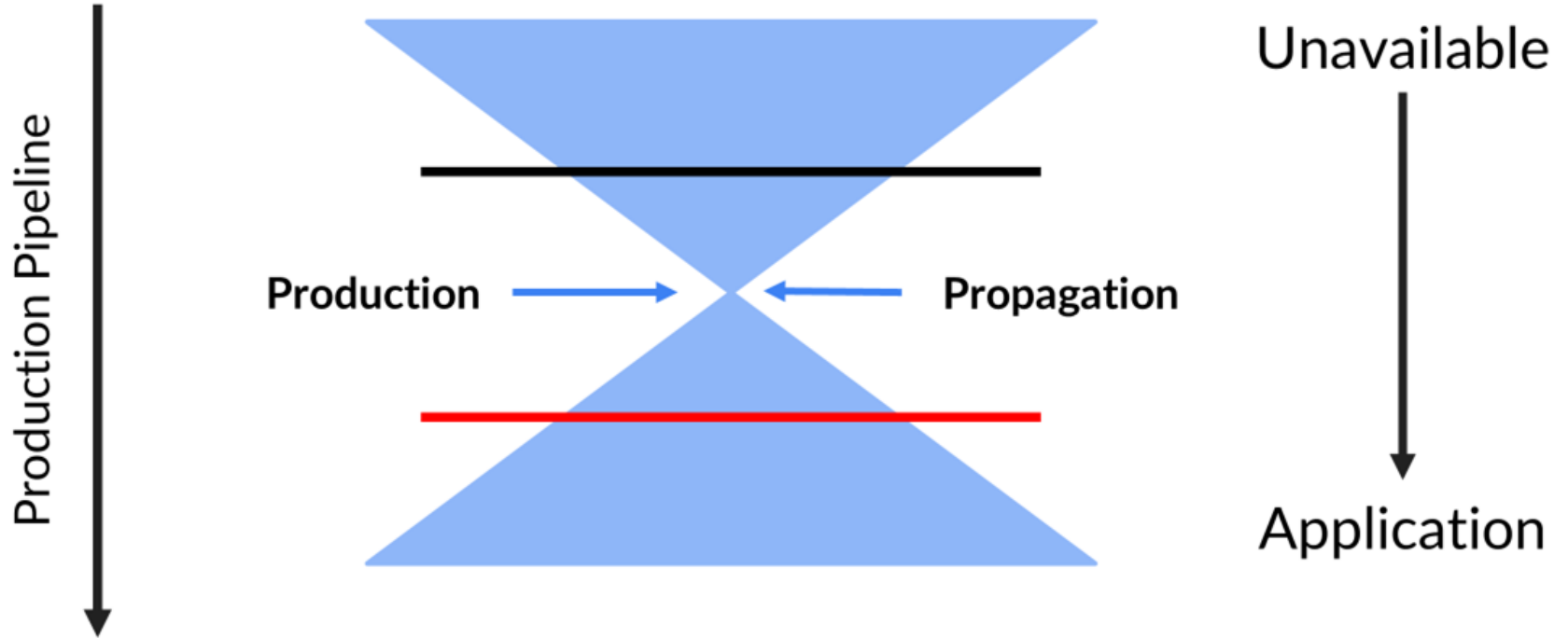
Addressing propagation and production bottlenecks of hybrid hazelnuts

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Bottlenecks in the Production Pipeline



Mouse Ear Disorder

- Mouse Ear Disorder is the term for nickel deficiency in woody plants
- MED affects hazelnuts as well as pecans, river birch, persimmons, and potentially many other species.
- Nursery production and crop production issue
- MED symptoms typically occur on new growth, especially in spring



Image above (left to right): Symptomatic C. americana, asymptomatic C. americana

Mouse Ear Disorder

- The pH of soil or substrate contributes to availability of nickel (pH >6.5)
- Most likely to occur in high organic matter soil-less potting mixes, solution culture, high pH soils, or where excessive amounts of heavy metals have been applied
- Early indicator: chlorosis similar to Fe or S deficiency
- More severe symptoms: rounding or blunting of leaflet tips, dwarfing of foliage



Above: *C. americana* (Sheffield's Seed Co.) showing symptoms of MED



Severe symptoms of MED on a hybrid hazelnut in Wisconsin (image credit to Brent McCown of Knight Hollow Nursery)

How to treat for MED

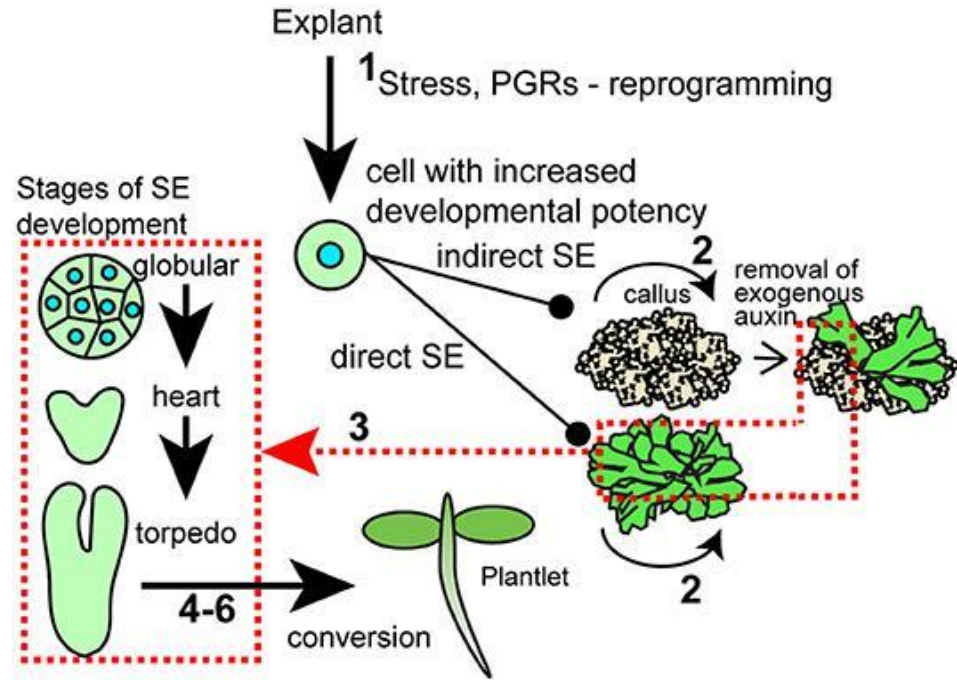
- Nickel Plus® (5-0-0)
 - Urea and nickel lignosulfonate
- Protocol from Nickel Plus® label
 - Spray during rapid growth stage of foliage and shoots
 - Spray if Ni in previous year 'leaf analysis' was <5 ppm Ni
 - 1-2 pints per 100 gallons of water (9.465 ml/gal)
- Recommendation
 - Spray until droplets form on all leaf surfaces (beading)



Propagation - Somatic embryogenesis of hybrid hazelnuts

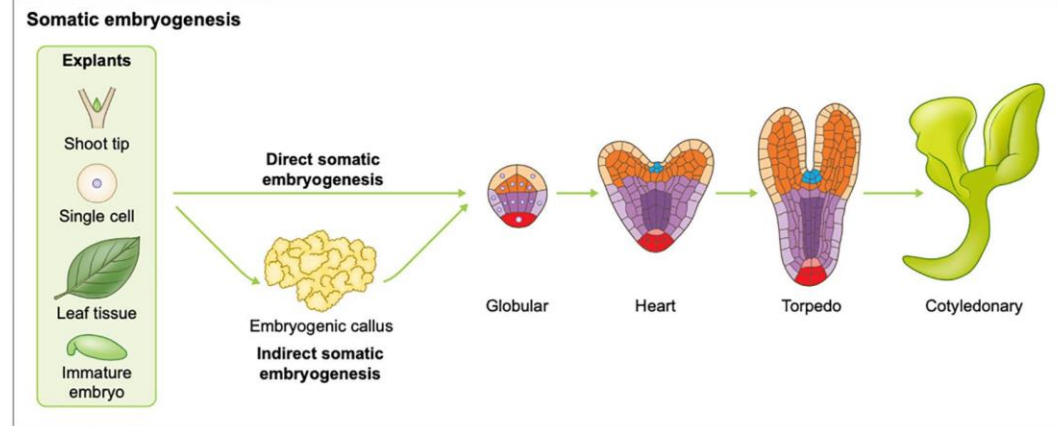
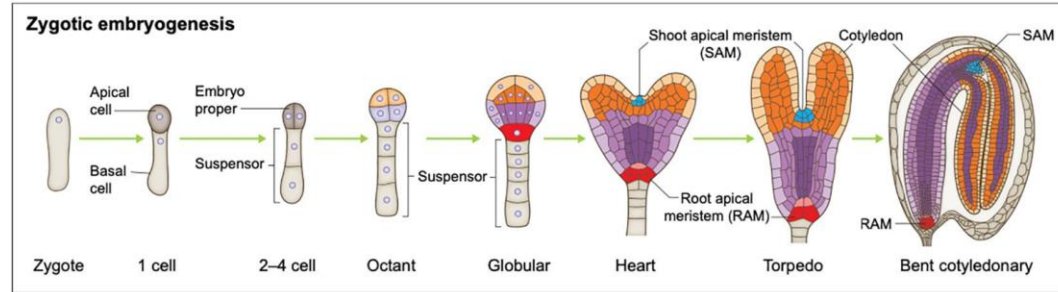
Objectives:

- 1) Obtain suspension cultures with single cells growth
- 2) Confirm growth in high auxin media
- 3) Test potential to form embryos by transferring to auxin free media
- 4) Develop procedures to grow seedlings that can be field-transferred

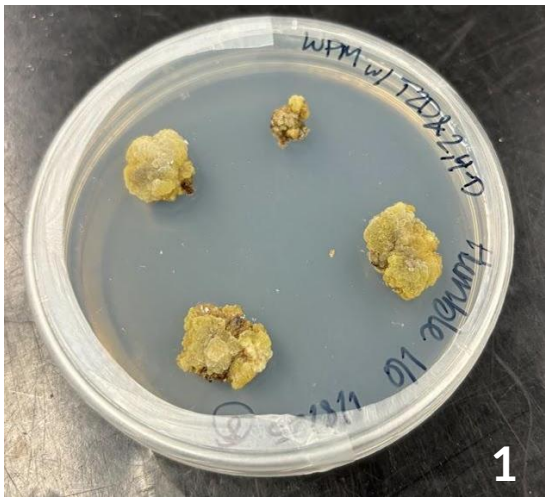


Why somatic embryogenesis as a means for propagation?

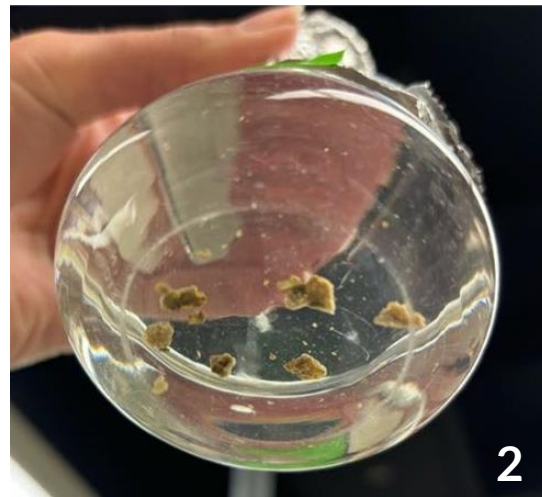
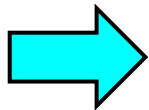
- Allows for large-scale clonal propagation
- Not labor intensive in comparison to other methods
- Can be stored long-term (cryopreservation)
- Cost effective



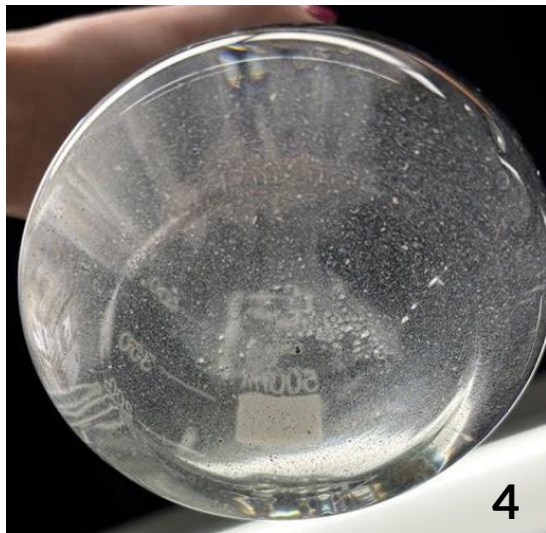
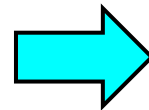
(Yuan et al. 2024. Front. Plant Sci.)



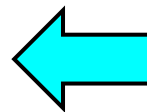
Initiation of callus in flask



4-6 weeks on shaker



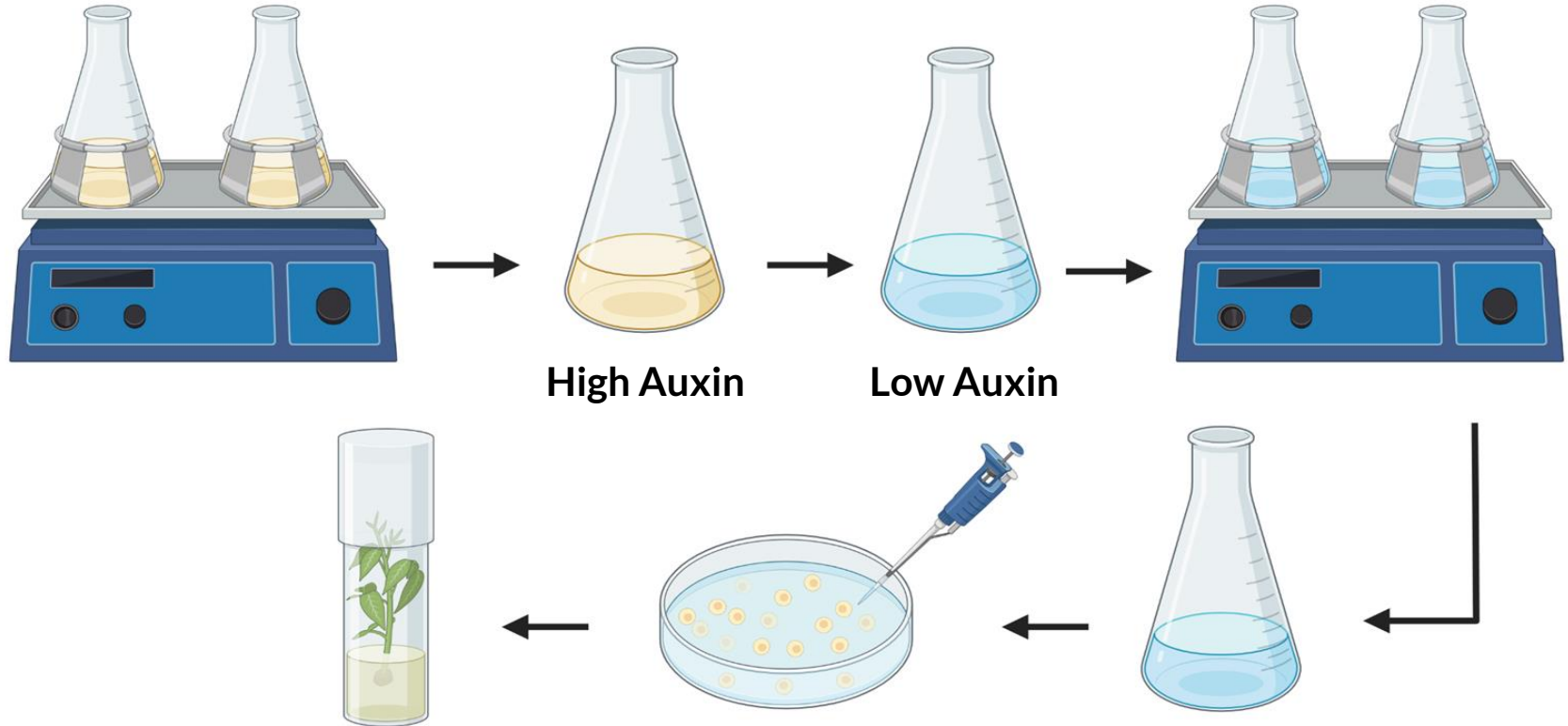
Preliminary Results



Callus removed and continues on shaker



Next Steps



Outlook

- A clear and reproducible protocol for the production of somatic embryos from hybrid hazelnuts
- A procedure for transfer of somatic-derived embryos into the greenhouse for growth
- A method that would produce large numbers of clonal plants that can be moved to the field



Conclusions

- Production and propagation bottlenecks prevent hybrid hazelnuts from entering the greater market
- If you suspect your plants are showing symptoms of MED, perform a leaf tissue analysis if able, and apply Nickel Plus[®] at the label recommendation
- If sufficient propagation can be achieved through somatic embryogenesis, hybrid hazelnut production could be bolstered



Acknowledgements

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Contact

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- If you suspect your plants are showing symptoms of MED, perform a leaf tissue analysis if able, and apply Nickel Plus[®] at the label-recommended rate
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