Micropropagation of *Solanum tuberosum* varieties using low-cost alternative inputs

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INTRODUCTION

Micropropagation is used to produce large numbers of clones from a desirable stock plant. It is an established process in many areas of horticulture and has proven useful in addressing issues related to crop stability and conservation of endangered species.[1] As it stands, this biotechnology is positioned as an expensive out-of-reach option for smaller markets, enterprises, and individuals due to the high costs associated with it, which presents an opportunity cost to progress in the field.[2]

The aim of this study was to investigate if economical alternatives to laboratory-grade inputs can be used without detrimental effect on outcome in micropropagation .

METHODS

Three varieties of *S. tuberosum* were initiated using economical input alternatives to agar, laboratory-grade sucrose, magenta pots, and laminar flow cabinets.

48 samples were prepared using 4 treatments (n=6); 24 containers were prepared with growth media at a laminar flow cabinet and the rest at a Bunsen burner. Growth results were taken 23 days after explant material placed on growth media and put into propagation incubator.

Figure 1: Shoot with useable nodes grown in treatment containing caster sugar as carbon source.

RESULTS

Sterile working areas at Bunsen burners are as effective as laminar flow cabinets:
After seven days in a propagation incubator no samples showed any sign of contamination.

More affordable plastic sample containers and zip-loc bags can replace magenta pots:
All containers displayed zero contamination prior to explant placement, and zip-loc bags could support plant material in growth media containing Gelrite™ but not Bacto™ Agar.

Economical inputs produced better outcomes than laboratory-grade products in most areas:
Treatments containing the cost-effective gelling agent Gelrite™ produced better results across all metrics of growth compared to Bacto™ Agar. Samples containing store-bought caster sugar outperformed those containing laboratory-grade sucrose in producing shoots and shoots with useable nodes, but sucrose resulted in more callus.

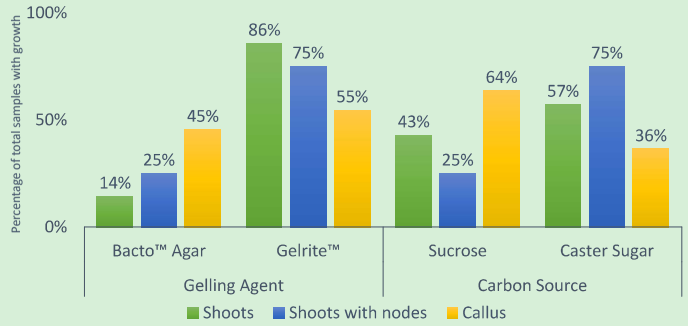

Figure 2: chart showing percentage of samples displaying growth type indicated that contained either of the the gelling agents or carbon sources, where n = 4, 7, or 11.

Combination of Gelrite™ and caster sugar performed better than Bacto™ Agar and sucrose:

When the treatments containing both economical inputs of Gelrite™ and caster sugar are compared to those that contain Bacto™ Agar and laboratory-grade sucrose, a quarter of those containing the cheaper alternatives produced shoots, whereas the more expensive inputs produced no shoots, but produced more callus.

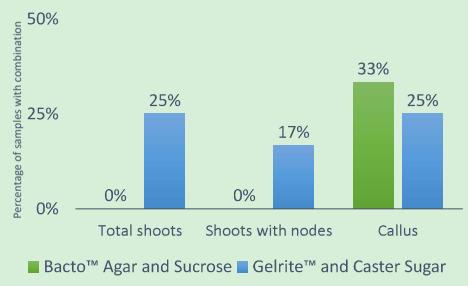

Figure 3: chart showing the percentage of samples displaying growth-type indicated containing either combination of gelling agent and carbon source, where n = 24.

CONCLUSION

Laboratory-grade micropropagation inputs can be replaced with economical alternatives without affecting outcomes. Containers and carbon sources can be replaced with consumer-grade products, and cost-efficient alternative gelling agents can be used.

IMPACT

These results position micropropagation as an accessible subject with reduced financial risk for nonprofessional researchers. This can in turn broaden access to the tools and knowledge required for amateur research to contribute to progress in the area.[2]

FUTURE WORK

Repeat with larger sample number and refined sterilisation and training protocol. Investigate autoclave alternatives, using Bunsen burner instead laminar flow at all steps, and test reusability of containers. The growth effects of chemical compounds created in growth media at the autoclave stage will also be examined.[3]

Figure 4: *S. tuberosum* chits rooting after three days in Gelrite™-based treatment in inexpensive zip-loc bag.

References:
1. Sonnino, Andrea; Dhlamini, Zephania; Santucci, Fabio Maria; Warren, Patrizia, 2009. 3.1 Micropropagation. In: *Socio-economic Impacts of Non-transgenic Biotechnologies in Developing Countries*. Rome: Food and Agriculture Organization of the United Nations. pp. 13-15.
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