Effective method of acclimatization for *In-vitro* propagated hybrid coffee seedlings (*C. arabica* L.) at Jimma, Southwest Ethiopia

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Introduction

- Coffee is a popular beverage around the world, originated in Ethiopia, and is the main source of income.
- The development of hybrid coffee varieties started in the early 1980's (Ameha and Belachew 1983). Ababuna, a first hybrid coffee variety, was released in 1997 (Behailu *et al*. 2008).
- Since then, quite a number of hybrid coffee varieties have developed with a mean yield range of 2340–2680 kg/ha.
- However, lack of efficient propagation hindered hybrid coffee dissemination. Vegetative propagation through somatic embryogenesis appears to be the best option (Etienne *et al*. 2018) to sufficiently multiply and distribute quality seedlings.
- Plant tissue culture laboratory of Jimma have successfully optimized an efficient protocol for mass propagation and dissemination of F1 hybrid coffee clones.
- *In vitro*-produced plantlets need to adapt external conditions under greenhouse before they're dispatched to the field.
- Thus, this study aims to develop an effective method, particularly optimizing *ex-vitro* conditions with regard to soil substrates to grow somatic seedlings in the initial stage of acclimatization under greenhouse.

Methodology

Different soil substrates were evaluated under room temperature as the requirement for primary and secondary acclimatisation. The experiment was composed of three treatments, including top soils, sand soils, & the mixture (top soils + sand+compost), at ratios 100, 100 & 67:33:33 respectively using randomized block design with six replications.

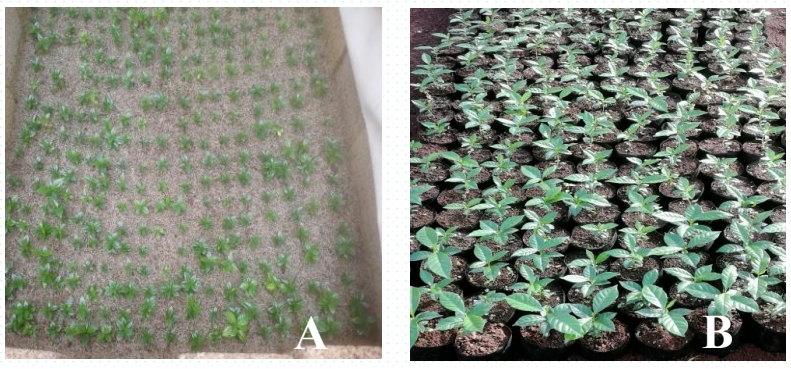

Figure 2. Performance of somatic seedlings. A) primary acclimatization using brick box with sand soils. B) uniformly growing seedlings under secondary acclimatization in polyethlene bag with soil mixtures

Table 1. Mean percent survival of hybrid coffee seedlings under primary acclimatization

	Percent survival (%)		
Treatment	Plastic pots	Brick box	Metal box
Sand soils (only)	96.33a	87.59a	89.00a
Mixtures	78.50b	73.17b	75.33b
Top soil (only)	77.17b	64.33c	66.17c
CV	4.18	4.74	4.14
F-value	55.52	64.86	78.09
Pr(>F)	1.17e-07***	4.114e-08***	1.17e-08***

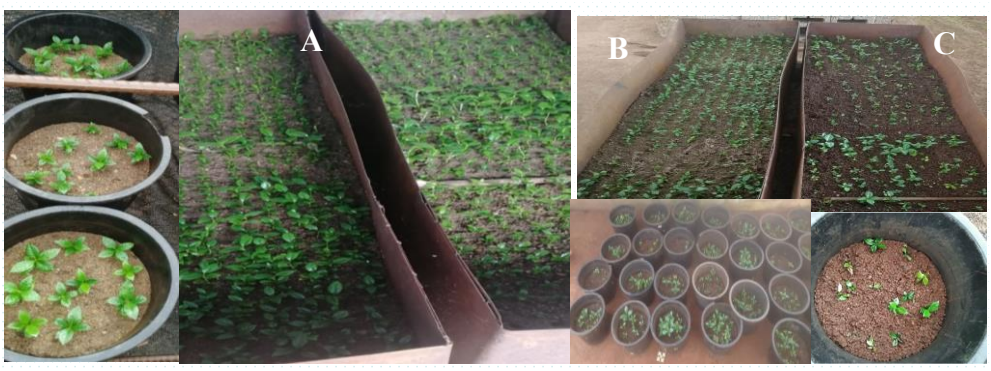

Figure 1. Performance of invitro propagated coffee under greenhouse condition; (A) primary acclimate using sand soils only, (B) Mixture of top soils, sand and compost (C) Only top soils

Results

- Significant differences (p<0.05) among the treatments in terms of plant survival and overall seedling performances.
- Sand gave the best result in all materials being applied, such as under bricks, which had a survival rate of 87.6%, in metal boxes (89%), and in plastic pots (96%) (table 1), while using only top soils, it was 69% survival, and their mixtures, i.e., substrates with 2:1:1 ratios, had a survival range of 73-78.5% depending on the materials applied for hardening off.
- Greater survival was achieved with sand soils, and this might be attributed to larger pore spaces, which facilitate good root growth. Contrary, higher seedling mortality was observed on top forest soils with higher moisture compared to other soil combinations. Such conditions favors fungus development and seedling death caused by damping off.

Conclusion

- ✓ Seedling handling at greenhouse is crucial to ensure the success of invitro propagation and distribution of elite materials
- ✓ Increased efficiency of hybrid coffee multiplication achieved overtime by optimizing proper soil mixtures and growing conditions.

  Our target will be maximizing seedling survival, putting the annual loss just under 10%.
- ✓ Using sand soils gave maximum result to acclimatize highly delicate *invitro* produced plantlets
- ✓ Over 90% plant survival was obtained under primary acclimatization using sand soils medium

References

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