Genetic Stability in Micropropagation

*From mitigation strategies to epigenomics research?*

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In vitro culture is known to destabilize the genetic program of isolated plant tissue.

Somaclonal variation is:
Phenotypic variation among regenerated plants.
The G X E dilemma

TRUE TO TYPE PHENOTYPE
Genotype X Environment

Mother plant ID
• Pedigree
• Species
• Ecotype

Explant status
Explant identity
Biophysical parameters
• Medium
• Light
• Gases
• Temperature

Genetics X Epigenetics?
Tackling the issue together

In the Production Unit
- Cost assessment: Go/NoGo
- Mitigation strategy
- Quality control
- Field control
- Customer acceptance
- Feedback

In the Research Lab
- Ploidy study
- DNA markers
- Genomics
- Transcriptomics
- Epigenetics
- Proteomics

Certified Micropropagation Process

Simple Cheap Reliable Early Markers
Mitigation strategies

**No/reduced PGRs**
- Growth rates
- Multiplication rates
- Rooting
- Metabolites profile

**Autotrophic/Mixotrophic**
- Lower contamination
- Faster acclimatization
- Metabolite profile
- Automation/Bioreactors

**Short cultivation time**
- Delays in flowering
- Delays in harvesting
- Maturation status
- Rejuvenation
- Availability of explants
The *mantled* somaclonal variation in oil palm
MOLECULAR DETERMINISM OF SOMACLONAL VARIATION

GENOME STRUCTURE
- GENOMICS
  - FLOW CYTOMETRY
  - RAPD
  - RFLP
  - AFLP

GENOME EXPRESSION
- TRANSCRIPTOMICS
  - DNA Methylation
  - Expression of MADS Box genes (flower structure)
  - RNA SEQUENCING
Epigenetic regulation of flower development

Polycomb-group genes

Floral MADS-box genes

- Different epigenetic marks in *mantled* flowers?
  - DNA Methylation
  - Chromatin remodelling

Transposable Elements

- Different mRNA/sRNA levels in *mantled* flowers?
  - Transcriptome sequencing
  - Gene discovery

Transcription factors

Chanderbali et al., 2010