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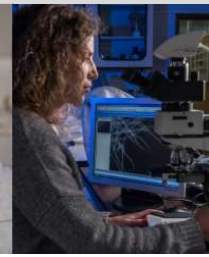


Eucalypt clonal forestry in Portugal

Nuno Borralho

Topics

1. Why clonal forestry in eucalyptus
2. Some statistics
3. Propagation technology
4. New developments worth mentioning

Why clonal forestry

Significant non-additive genetic effects

- NonAdd effects half- to as- important as additive effects: can double the genetic gains

Specially in inter-specific hybrids:

- Strong *non-additive* segregation occurs
- Hybrids cannot be deployed based on seed strategies because of high frequency of hybrid breakdown in seedling progeny

Quick exploitation of clonal advantages for targetted traits

- Tolerance against specific pest & diseases
- Special resilience against drought, frost or waterlogging

Clonal forestry

Same silviculture

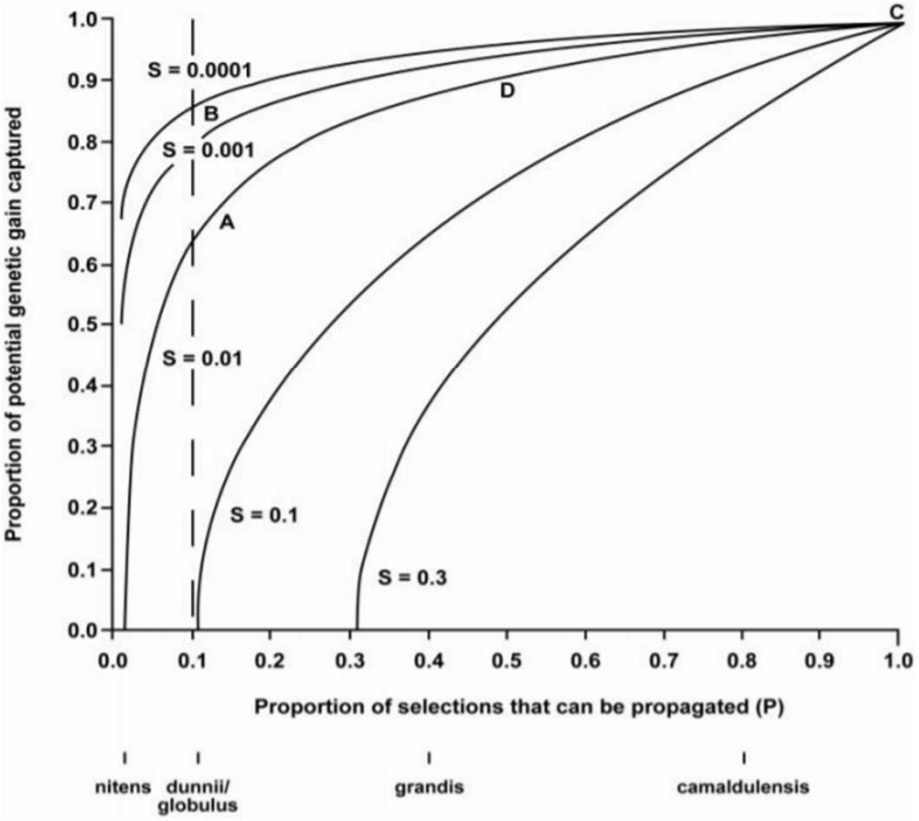
- Similar spacing and nutriente requirements
- Less pest control measures
- Same rotation length

Major caveat has been the low rooting ability

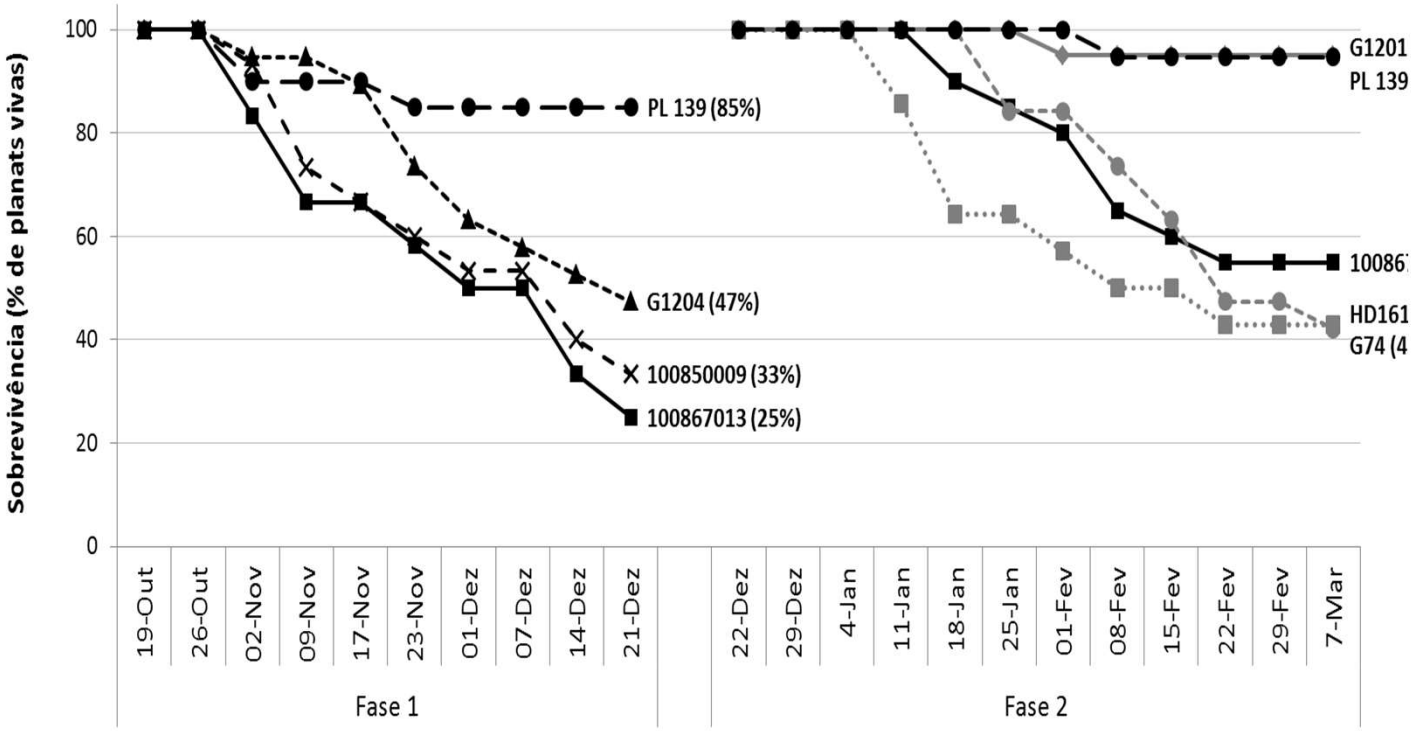
Only about 10% of the desirable genotypes can be produced operationally

FIGURE 2 *Expected capture of potential genetic gain with varying overall selection intensities (S) and proportion of propagable individuals (P) (after Figure 2 Haines and Woolaston (1991)). Average rooting % of some important species is indicated*

This results in only 60 to 80% of all the potential gains is captured



Tolerance against pest & diseases



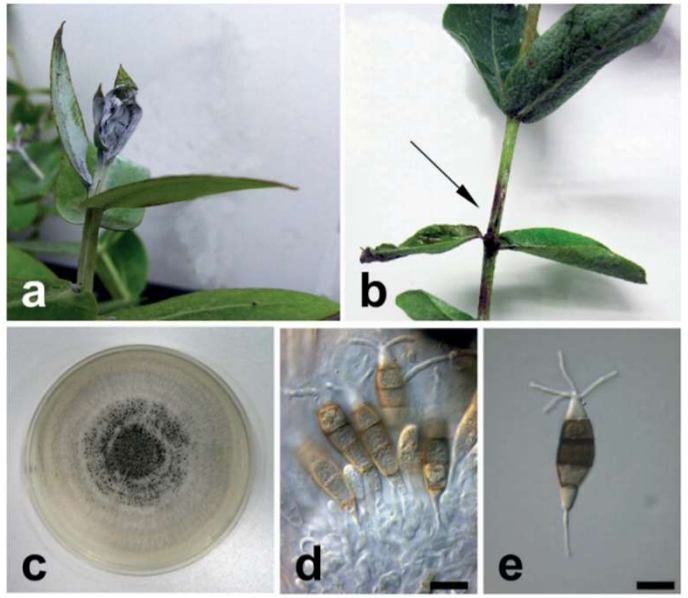
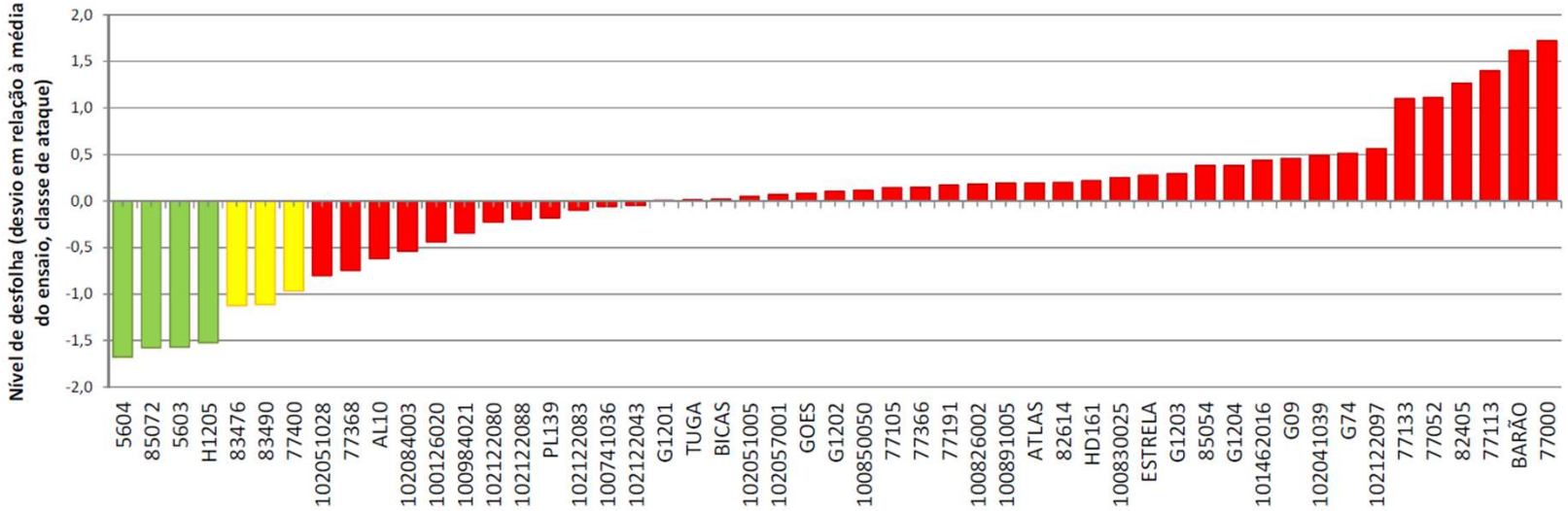


Figura 2 – *Neopestalotiopsis* spp. em eucalipto; a) necrose das folhas do ápice de planta jovem; b) necrose no caule; c) d) e e) *Neopestalotiopsis lusitanica*, c) placa de Petri com cultura; d) e e) esporos com três células centrais castanhas, sendo a inferior de cor mais clara (barra = 10 µm).

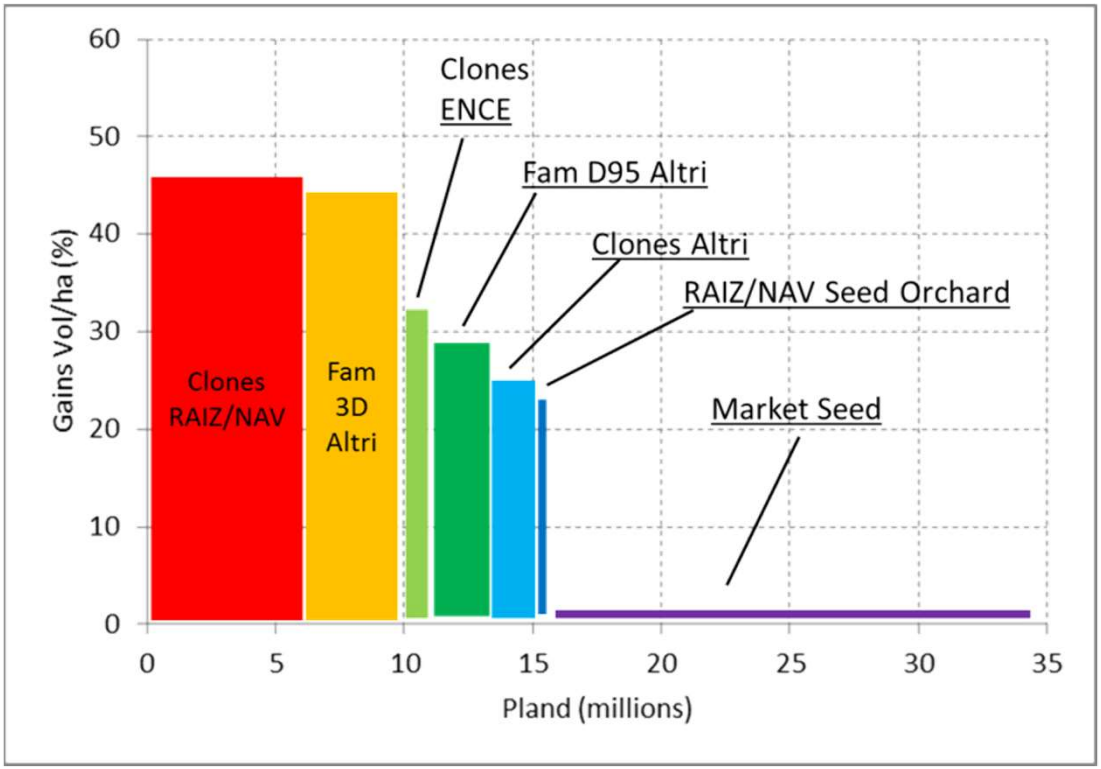
Clonal diferences in mortality after innoculation with *Neopestalotiopsis* (a nursery disease)

Gonipterus



Clonal diferences in defoliation rates from Gonipterus (the major pest in Portugal)

Clonal forestry in Portugal



Ca 50,000ha of clonal forestry

- ~10% of total eucalypt area in Portugal
- ~55% of the company's estate

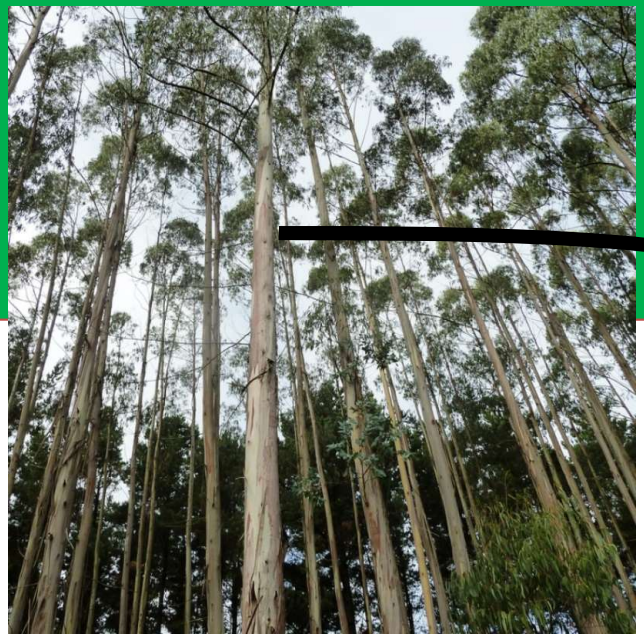
Top 3 clones (of a total of 30+) cover ~10,000ha.

7M cuttings/year are delivered

- about 20% of the country's anual demand.
- Top genetic gains around 45% (over unimproved seedlings) in pulp/ha/year

Origin of the clones

Plus trees selected in local stands (1970s and 80s)



N=740

Seeds or **cuttings** from outstanding trees in local plantations

Some degree of selection

Origin of the clones

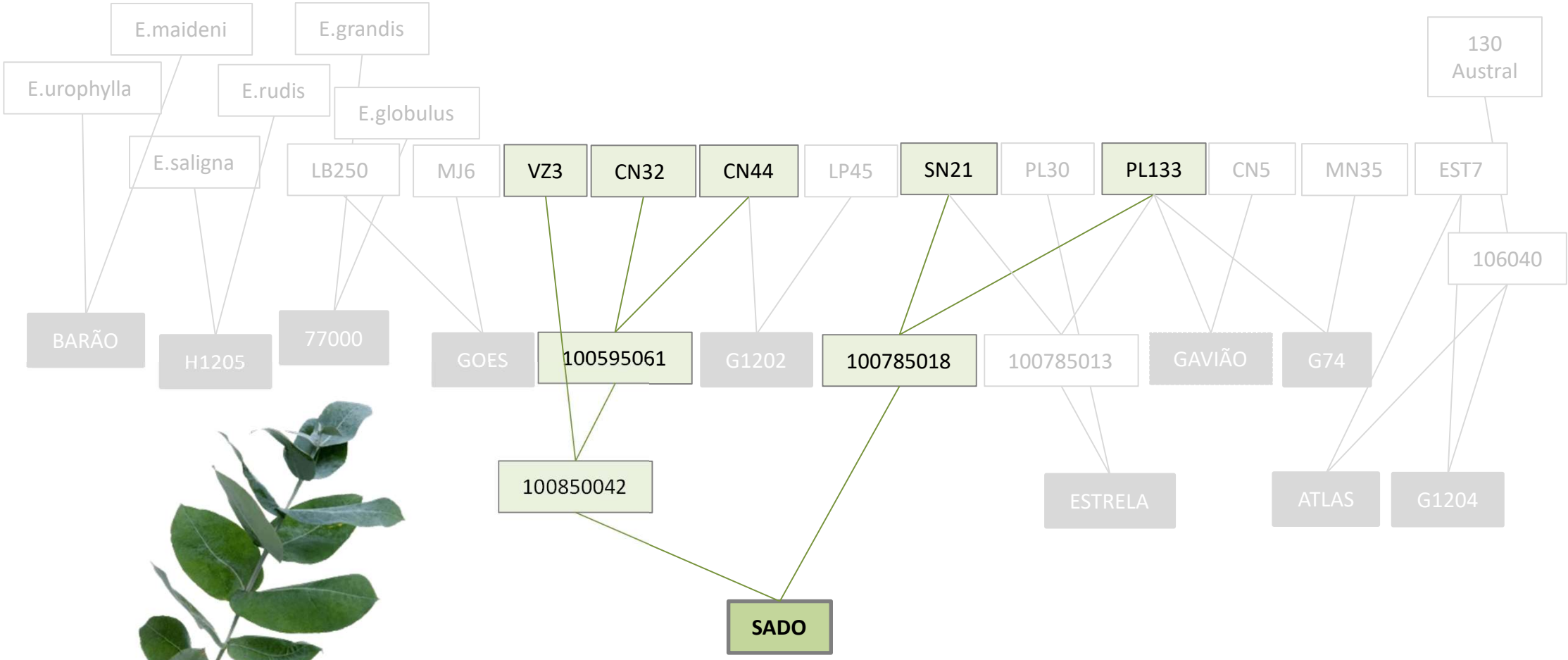
Wide-range seed collections from Australia (late 80s)

Seeds from known mothers in native stands

No precious selection

N=600

Example of a recent clone (SADO): 4th generation



Propagation technology: traditional macro-cuttings

Propagation technology: traditional macro-cuttings

Propagation technology: mini-cuttings

Propagation technology: mini-cuttings

Propagation technology: tissue culture and embriogenesis

1997 ***IN VITRO* STUDIES ON *EUCALYPTUS GLOBULUS* ROOTING ABILITY**

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(Received 30 January 1996; accepted 5 August 1996; editor G. C. Phillips)

2008

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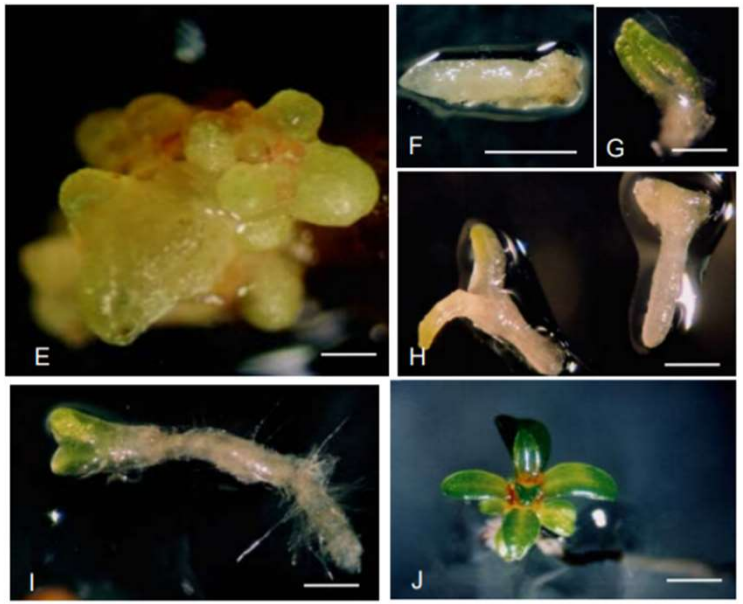
DOI 10.1007/s00299-008-0532-y

GENETICS AND GENOMICS

Genetic control of somatic embryogenesis induction in *Eucalyptus globulus* Labill.

G. Pinto · Y. -S. Park · L. Neves · C. Araújo · C. Santos



Legal framework

According to National legislation, *Clones* are classified as *Tested Material* (top genetic quality status)

IP of some clones have been registered in the CPVO

CPVO
Community Plant Variety Office

But it is not a common practice, protocols are poorly defined and merits are dubious

Some challenges and developments worth mentioning

Rooting conditions require tight control of nursery environment (high CAPEX)
High labour intensity and strong seasonality (high OPEX)

To produce 10M cuttings 60 workers are required, mostly spent to prepare and set the cuttings to root

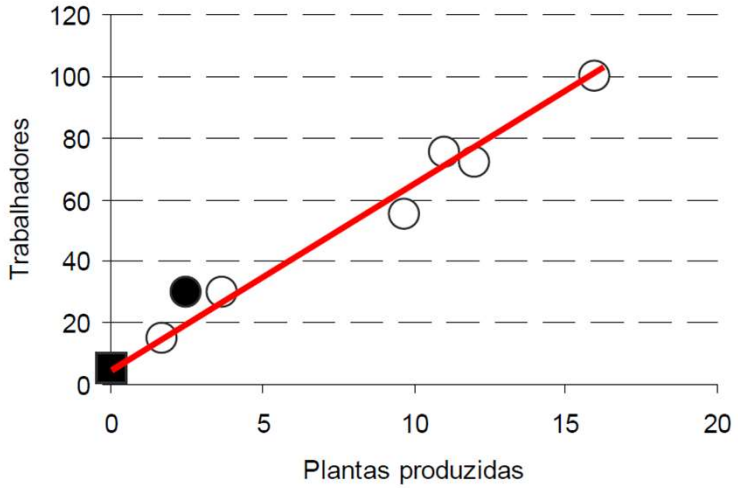


Figura 13. Relação entre o número de trabalhadores e o numero de plantas produzidos (em milhões, anualmente), para viveiros de eucalipto clonal no Brasil. Os VA (●) e o RAIZ (■) também se apresentam.

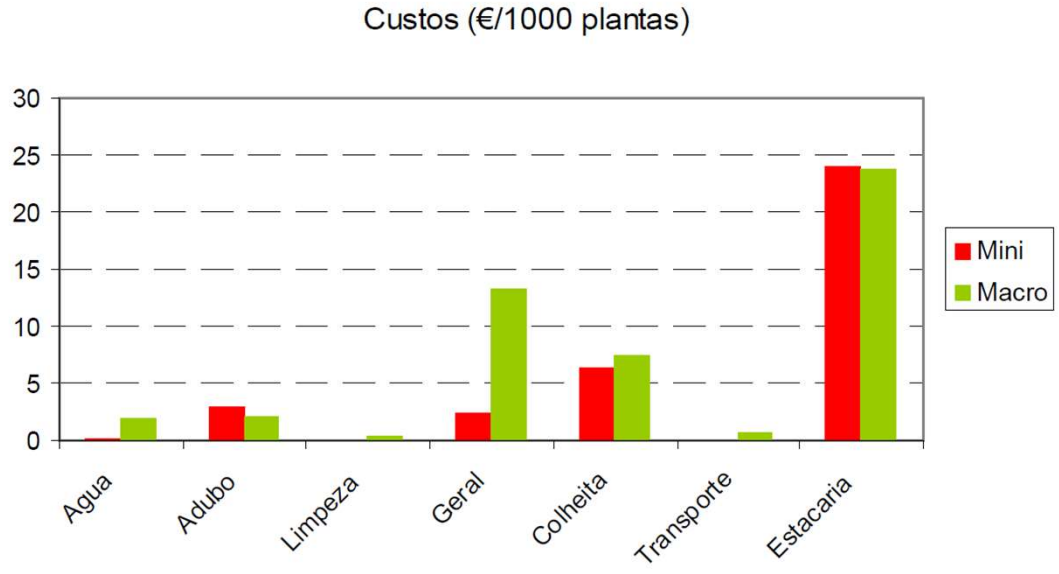
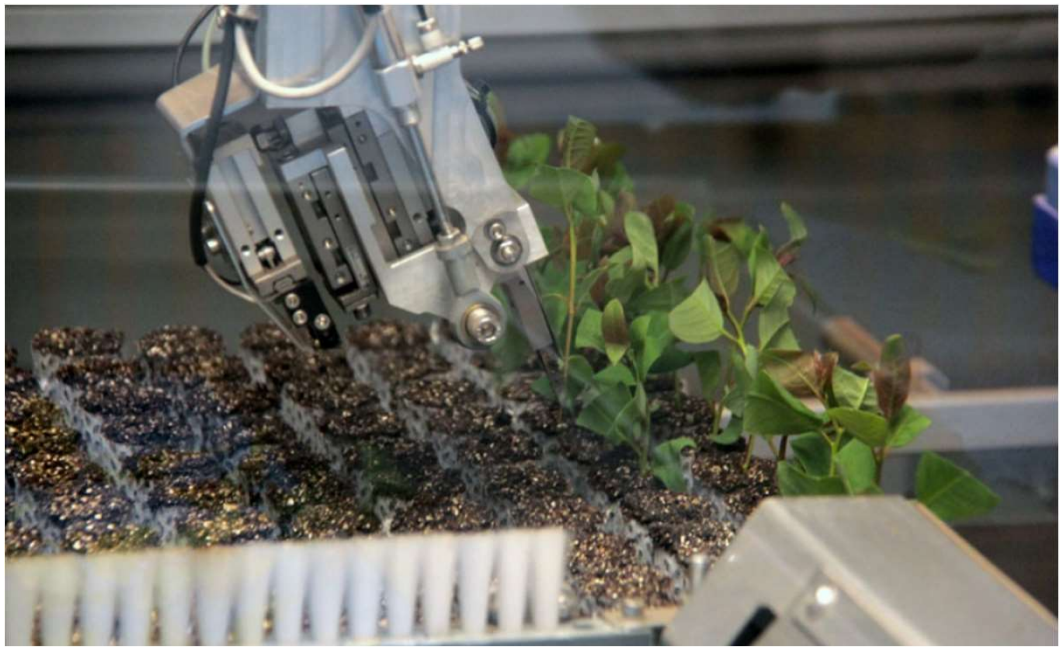


Figura 14. Custos de produção aproximados incluindo apenas parque e estacaria, (em €/1000 plantas enraizadas) para o sistema de miniestacaria em bancada de areia e para o sistema tradicional.

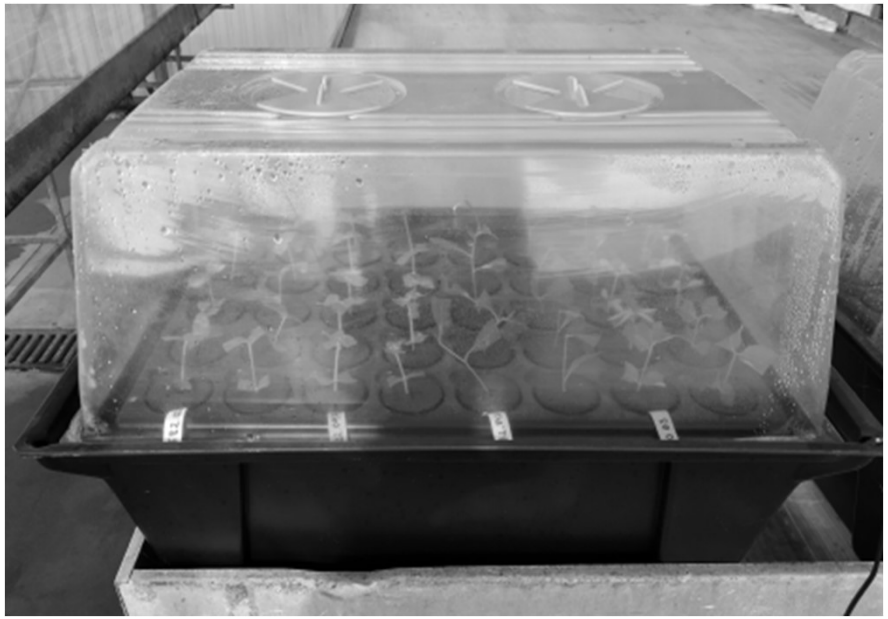
Some developments worth mentioning

Possibilities in mechanization (viz robotics)



Some developments worth mentioning

Aeroponics to simplify CAPEX nursery requirements and various operational costs



Some developments worth mentioning

Deployment strategies: clonal composites instead of monoclonal plantations?

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Thank you