Innovative propagation methods in potato production

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1. Microtuber production through: Temporary Immersion System (TIS)

2. True potato seed production through Diploid Hybrid Breeding
Microtuber production through:

Temporary Immersion System (TIS) in the ProPhyTIS Bio-reactor

Not mini-tuber production in the open, but: micro-tuber production, in sterile conditions
Conventional mini-tuber: cutting, vitro plantlets in solid medium, aeroponics,
Micro-tuber production: cutting, plantlets in TIS, microtubers
TIS system advantages

- Sterile conditions throughout, minimal contamination
- Automated media exchange, potential for full automation
- Enriched CO2 environment, rapid growth, larger tubers
- Smaller lab size: more tubers/m2
- Shorter growth cycle than mini-tubers 5 cycles/yr instead of
- Reduction of production cost
- Mass production allows reduction of number of field cycles
Results in the field
Potato hybrid breeding

Potato Seeds: Diploid F1 hybrid breeding, production of homogenous TPS

Not tetraploid TPS (CIP system), not conventional tetraploid new clonal variety (breeding companies) but F1 from selected male and female inbred lines
Comments

- Tetraploid True Potato Seed
  - Cheap method, low tech, for low-input systems
  - Heterogenous products not for all markets
  - Lower yield potential than selecting the best clone (variety)
  - Healthy material, not contaminated

- Tetraploid new variety multiplied clonally (seed potatoes)
  - High tech (marker assisted breeding)
  - Lengthy process 11 years after cross
  - Slow bulking once variety is created (4 years)
  - Contaminated with diseases
**Diploid F_1 hybrid breeding pathway**

- **Female germplasm pool**
  - **Elite female lines**
  - **Female parent lines**
  - **Diploid F_1 hybrid cultivar**

- **Male germplasm pool**
  - **Elite male lines**
  - **Male parent lines**

**Line selection**

- 2 years
- 3 years
F1 hybrid seeds, advantages

- Rapid creation of a new F1 variety (5 yrs)
- Rapid combination of various traits
- Vaster introduction of new varieties (Russet Burbank is 140 years old)
- Seed is devoid of diseases
- Rapid bulking compared to seed potatoes
- Ease of distributing (200 g seeds as many individuals as 25 t seed tubers)
Deployment of f1 hybrid seed

1. Seed
   - nursery → ware crop
   - TIS → Micro tubers
   - direct sowing → ware crop

2. Seedling
   - seedling tubers → ware crop
   - nursery → ware crop
Options to explore in Chinese potato production systems

- Conventional varieties through **mini-tubers** and seed potato programme
- Conventional varieties through **micro-tubers** and shortened seed potato programme
- F1 **hybrid seed** from inbred male and female parent lines: 1) direct seeding, 2) seedlings from nursery 3) seedlings tubers replacing mini-tubers, 4) seedlings to TIS, 5) other?
- Tetraploid **TPS** from selected parents
Thank you

謝謝