

# Update- AVRDC Tomato Breeding

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# Roles of AVRDC Tomato Breeding

- Development of tropical tomato inbred lines emphasizing heat tolerance, multiple disease resistance
- Broaden the tropical tomato genetic base
  - Introgression of useful genes from wild tomato
  - “Pre-breeding” to incorporate important traits into near commercial backgrounds
  - Pursuit of stable disease resistance through pyramiding of resistance genes
  - Improvement of nutritional qualities
- Information generation/ publication
  - Studies to better understand critical traits or improve selection efficiency
- Service to “marginal” seed markets
  - Areas with low volume, low value seed markets or high demand for OP varieties

# AVRDC Tropical Tomato Profiles

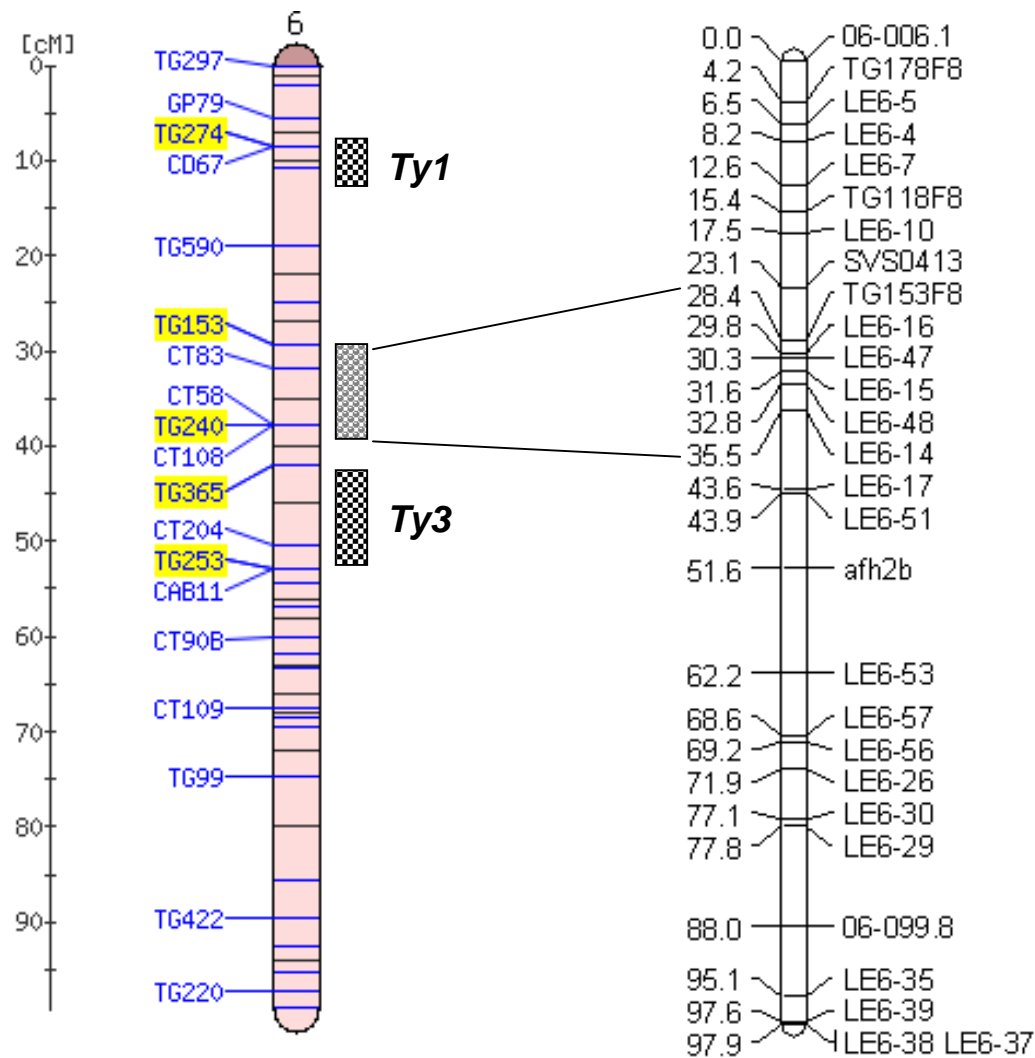
- **Lowland Tropics**
  - Heat tolerance
  - “Stable” begomovirus and bacterial wilt resistance
  - Early blight, fusarium wilt, ToMV, gray leaf spot,
  - Fruit: 80-120 g and firm
  - Excellent internal and external color
- **Highlands**
  - Feature late blight resistance
  - Early blight, fusarium wilt
  - Semi-determinate, indeterminate plant habits
  - Fruit: 120-200 g



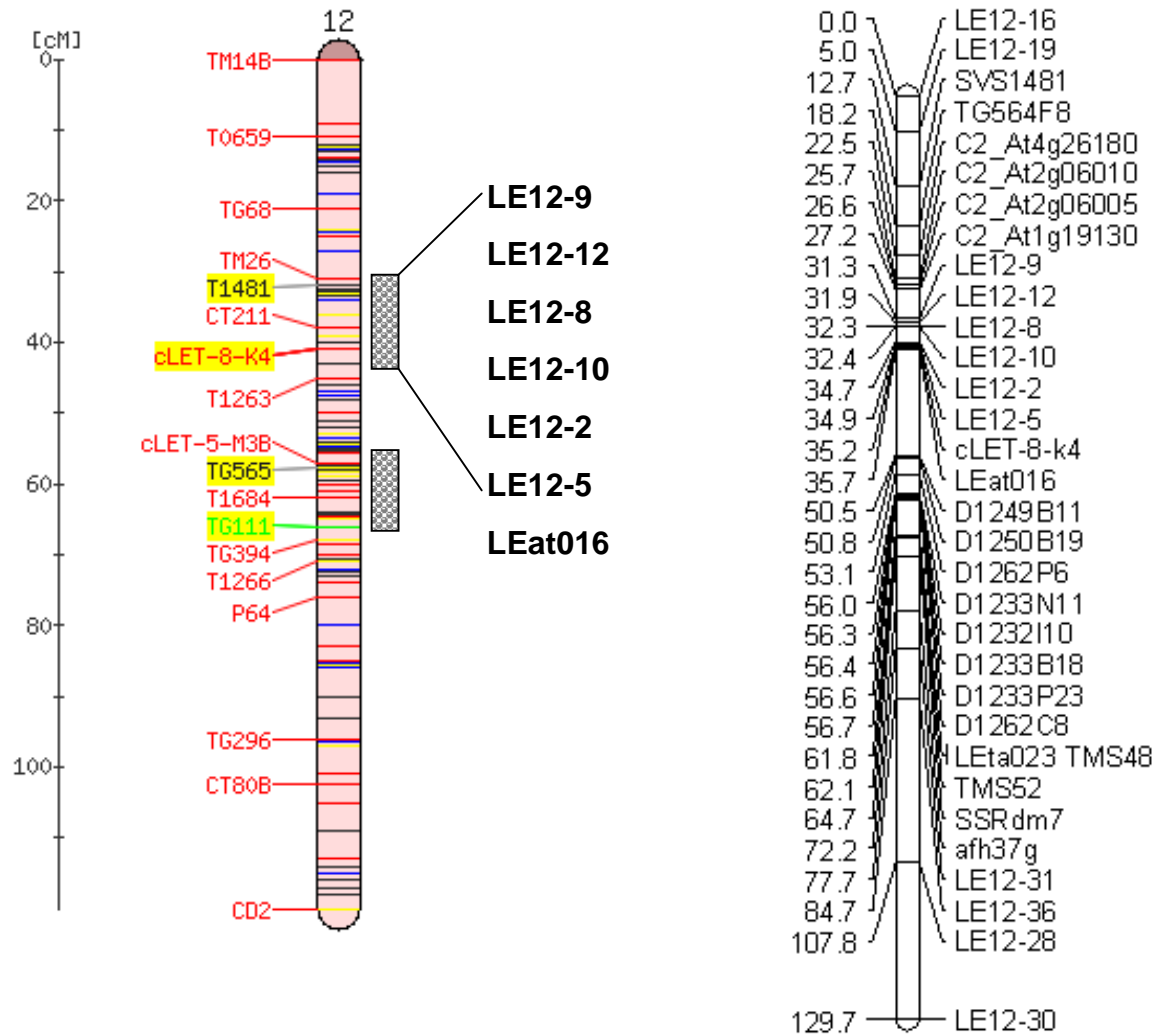
## **BW Mapping at AVRDC**

- **Mapping population: 189 F9 RILs from H7996 x WV700**
- **RIL phenotyping: 10 trials in 6 countries (2005-2006)**
- **Development of linkage map, QTL identification, generation of additional markers on chromosomes 6 and 12, and in regions of interest**

# BW QTLs-Chromosome 6



# BW QTL's- Chromosome 12



## **Future: BW**

- **Confirm utility of SSR markers for BW MAS in other H7996 crosses**
- **Select groups of RILs representing all combinations of BW QTLs and send out for additional multilocation testing- determine relative importance of chromosome 6 versus chromosome 12 QTL**
- **Find markers for gaps on chromosomes 6 and 12**

# Evaluation of Multiple TY Lines in Taiwan

- Objective: determine which combinations of Ty-1, Ty-2, Ty-3 offer high and stable begomovirus resistance
- Entries: 24 F<sub>6</sub> lines, FLA580Yi (Ty-3), FLA595 (Ty-1+Ty-3) and two susceptible lines that together represent most combinations of Ty-1, Ty-2, Ty-3
  - Hybrids ‘Atak’ (Ty-1 + Ty-3b) and ‘Llanero’ (Ty-3a + Ty-4)
- Seedlings exposed to begomoviruses (ToLCTWV) and (TYLCTHV)
- Transplanted to field after exposure, 2 reps in RCBD, 30 plants per plot
- Evaluation of symptom severity 40 and 75 DAT
- PCR testing of 4 plants per plot for each begomovirus 40 DAT

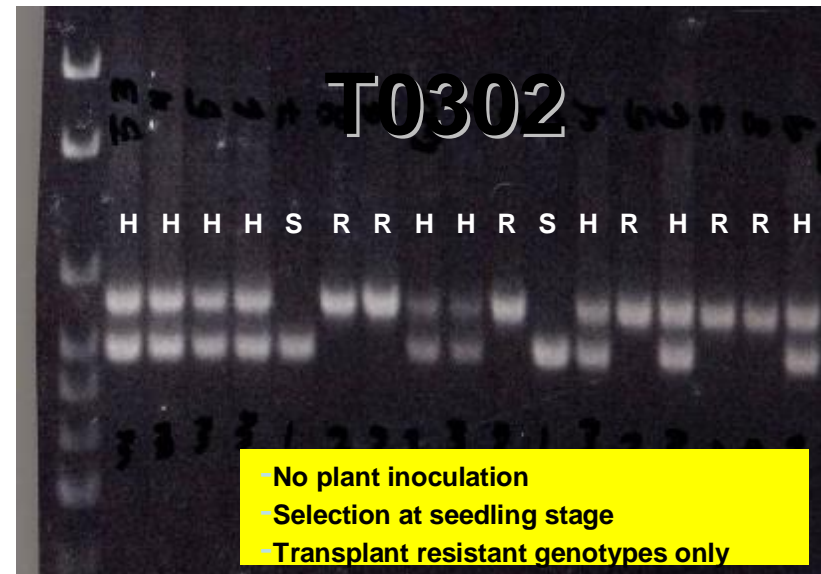
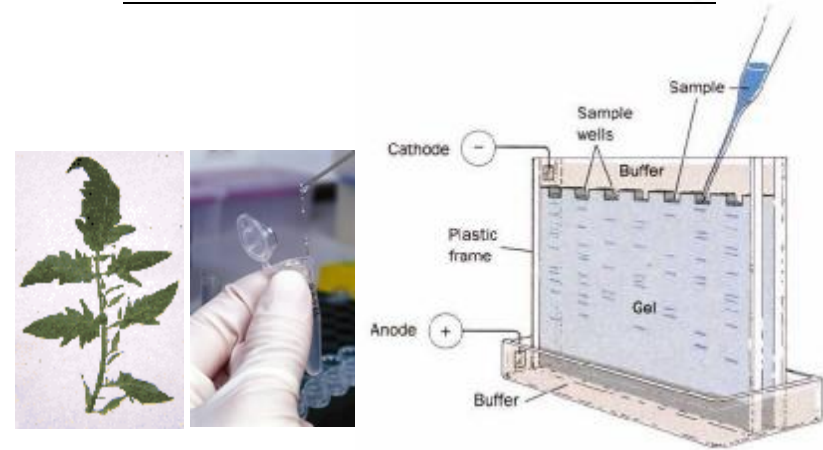


# Selection for TYLCVD Resistance

## Phenotypic Assay



## Marker-assisted Selection



# Severity Scale



**Severe (3): stunting, curling**

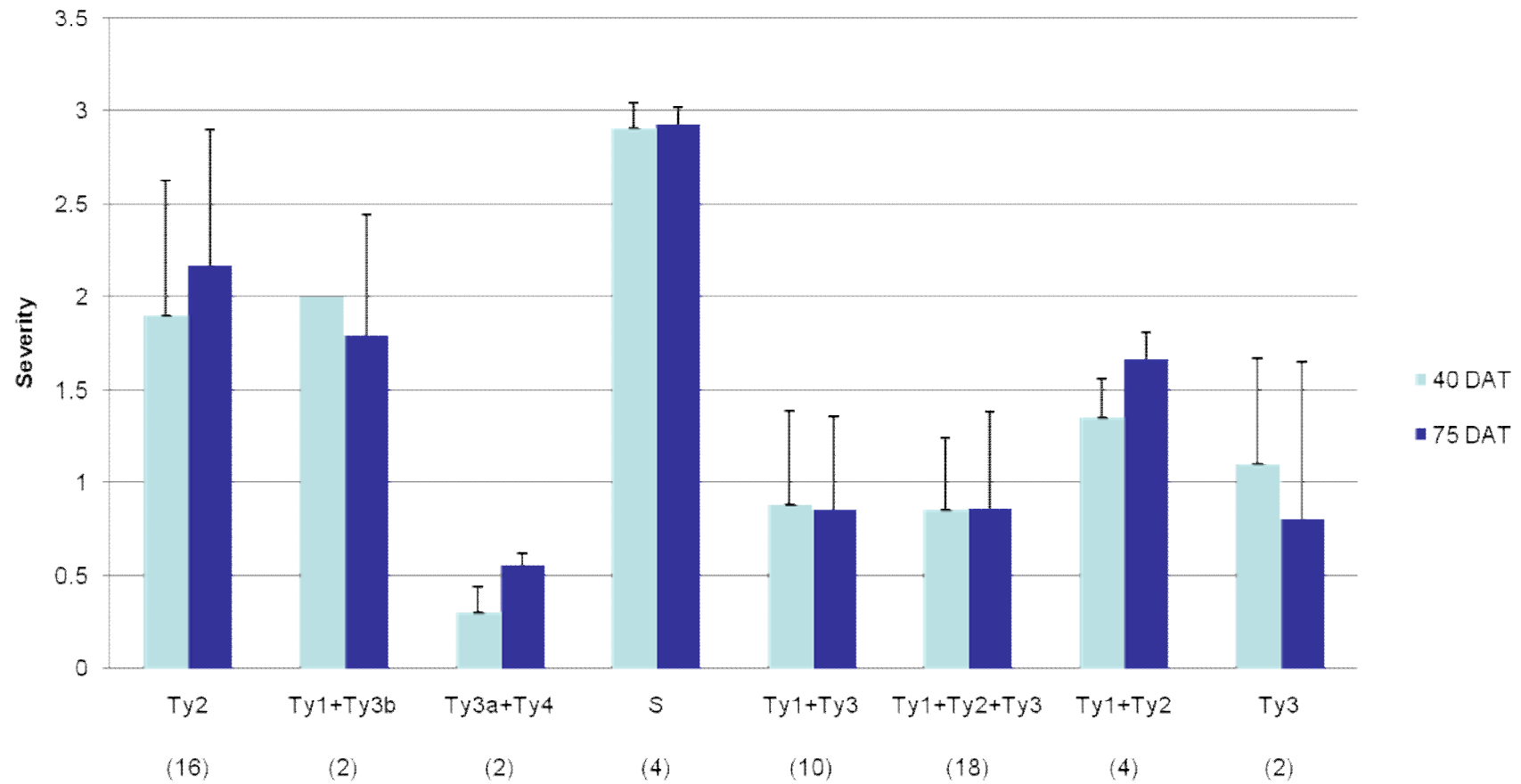


**Moderate (2):  
symptoms obvious but  
not as severe**



**Slight (1): evident only  
after examination**

### Begomovirus Severity Scores of Entries with Single or Multiple TY genes AVRDC, Taiwan, Feb.-June 2009



# Susceptible check CLN2026D (40 DAT) April 2009



# Ty-2 vs Ty-3



# TYLCVD Resistance: multiple TY genes



# TYLCVD Resistance: multiple TY genes



## Taiwan TY Trial: conclusions

- Combination of Ty-1+Ty-2+Ty-3 reduced symptom severity but plants infected with one or both viruses in Taiwan trial
- Presence of Ty-3 critical
- Planned evaluations in West Africa and north India



# Ongoing Activities:

- Mapping of high temperature fruit set in CLN1621L Hot wet season evaluation of 96 F4 lines from CLN1621L x CA4 for fruit-set, pollen viability, yield and yield components (Taiwan and Tanzania)
- Screening of selected *S. peruvianum* accessions for resistance to *Peanut bud necrosis virus* (India)
- Incorporation of acyl sugar insect resistance into multiple Ty lines (collaboration with Cornell University)