

# Optimizing Tissue Culture for Germination and Growth of Drought-Tolerant Wild Tomato

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## Introduction

- Wild tomato species from Peru and Argentina have drought-tolerant traits but are difficult to germinate and transition into flowering.
- Tissue culture techniques using plant growth regulators can help improve germination and seedling establishment.
- Seeds were received from the Tomato Genetics Resource Center (TGRC) and tested under different media compositions to determine optimal germination conditions.

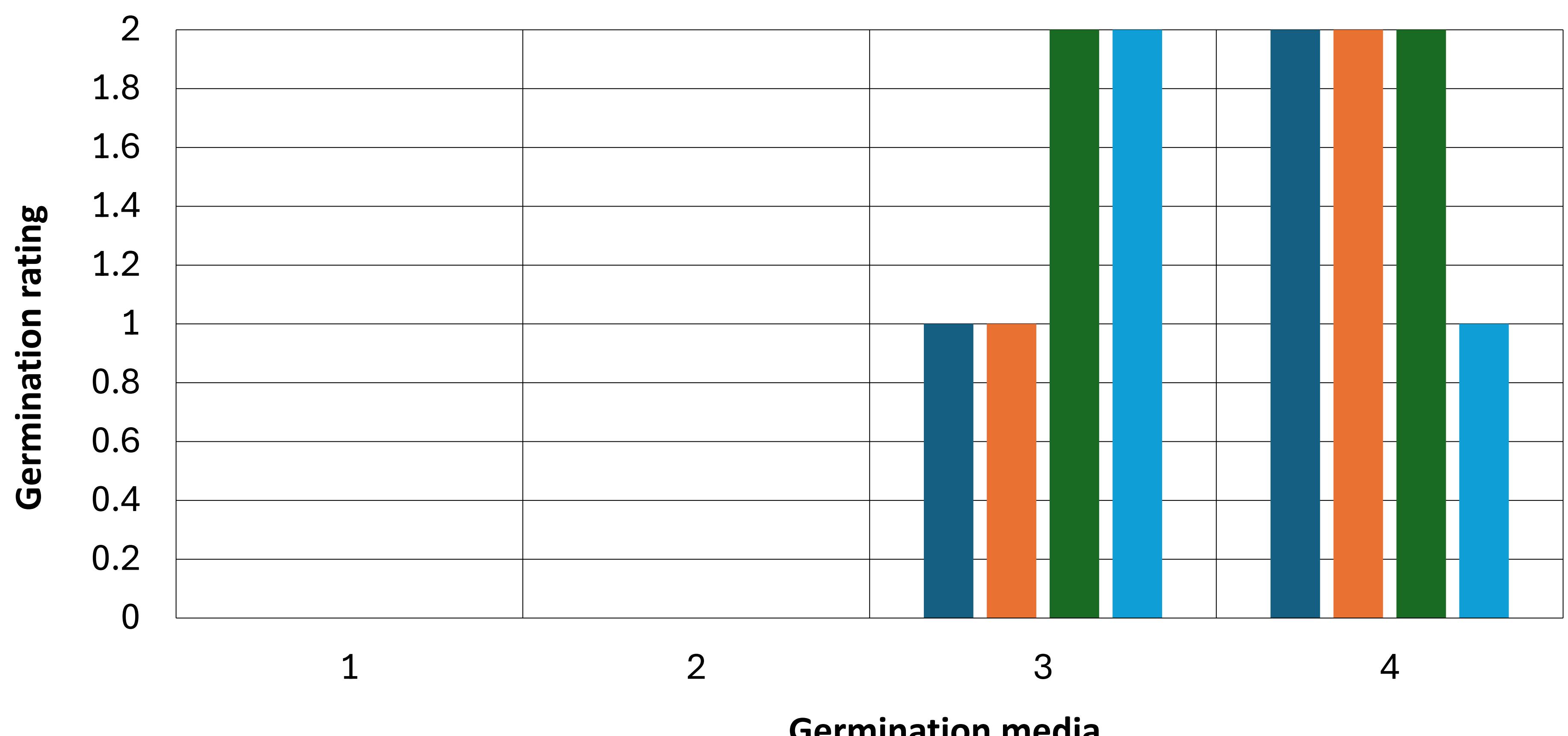


**Figure 1 & 2:** (Left) Map highlighting the native range of wild tomato species in South America. (Right) *S. chilense* growing in its natural arid habitat, illustrating its adaptation to extreme drought conditions.

Accession:	Type:	Species name:	Reason:	Source:
LA1958	Wild	<i>S. chilense</i>	Drought tolerant	TGRC
LA1703	Cultivated	<i>S. lycopersicum</i> var. <i>cerasiforme</i>	Yellow, tastes good	Harvested
LA2885	Wild	<i>S. sitiens</i>	Drought tolerant	TGRC
LA3320	Cultivated	<i>S. lycopersicum</i> cv. <i>Hotset</i>	Heat tolerance	TGRC

**Table 1:** Tomato accessions used in the study, including two wild and two cultivated species. Seeds were sourced from TGRC and harvested collections.

## Results



**Figure 4.** Germination ratings of four tomato accessions (LA1958, LA1703, LA2885, LA3320) across four different tissue culture media. Media 3 and 4 showed the highest germination success, while Media 1 and 2 resulted in little to no growth. Germination was graded on a scale of 0 (no growth), 1 (roots only), and 2 (roots + shoots).

### Media performance:

- Media 1 and Media 2: No germination occurred across all accessions, indicating that these media were ineffective in breaking dormancy.
- Media 3: Moderate germination was observed, with most accessions reaching roots only (1) or roots + shoots (2).
- Media 4: Showed the highest germination success, with all accessions except LA3320 reaching full root and shoot development (rating = 2).

### Accession Performance:

- LA1958 and LA1703 showed similar trends, with improved germination in Media 3 and 4.
- LA2885 had the best overall germination, reaching full root and shoot development in both Media 3 and 4.
- LA3320 exhibited slightly lower germination in Media 4, suggesting species-specific responses to the media.

## Methods

### Tomato Accessions:

- Four tomato genotypes were selected based on drought tolerance and fruit characteristics.

### Seed Sterilization:

- Seeds were sterilized using a 10% bleach solution for 10 minutes.
- Rinsed multiple times with sterile distilled water before placement in magenta boxes.

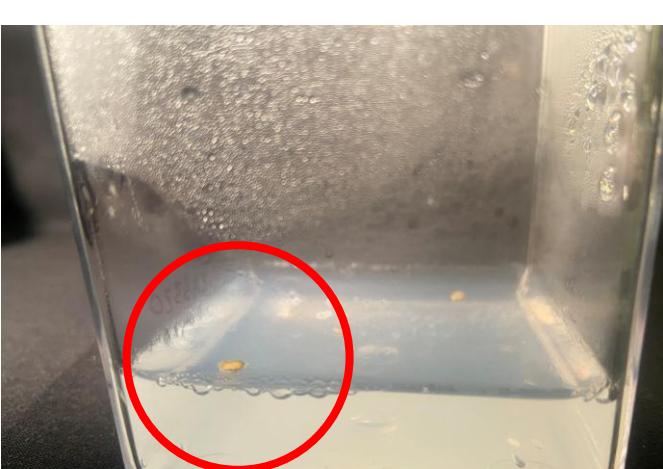
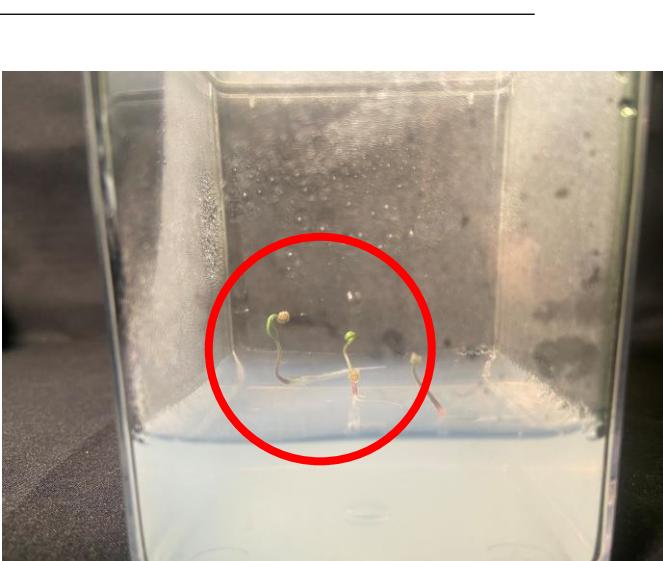
### Tissue Culture Setup:

- 16 magenta boxes were prepared, with each accession placed in all four media types.
- Cultures were incubated under controlled conditions.
- Germination rates and seedling vigor were recorded.

### Tissue Culture Treatments:

- Four different media compositions were tested:
  - Media 1 (Control):  $\frac{1}{2}$  Murashige and Skoog (MS) medium
  - Media 2 (GA Treatment):  $\frac{1}{2}$  MS medium + Gibberellic Acid (GA)
  - Media 3 (BAP Treatment):  $\frac{1}{2}$  MS medium + 6-Benzylaminopurine (BAP)
  - Media 4 (Combined Treatment):  $\frac{1}{2}$  MS medium + GA + BAP

### Germination rating:

<b>Grade 0:</b> No growth	
<b>Grade 1:</b> Only root growth	
<b>Grade 2:</b> Root and shoot growth	

**Figure 3.** Germination ratings of four tomato accessions (LA1958, LA1703, LA2885, LA3320). Germination was graded on a scale of 0 = no growth, 1 = roots only, and 2 = roots + shoots.

## Transition to Greenhouse

### Successful Transition to Greenhouse:

- Seedlings from Media 3 and Media 4 were successfully transferred from sterile magenta boxes to greenhouse conditions.
- Despite the expected challenges of adapting from a controlled environment, most seedlings continued to grow healthily with minimal transplant shock.
- Both *S. chilense* and *S. sitiens* developed strong root systems, making them ideal candidates for further evaluation in drought tolerance testing.
- The optimized tissue culture treatments improved germination rates and supported strong seedling establishment, ensuring long-term viability.



**Figure 5.** Successful transition of LA1703 into greenhouse.