



Tropentag, September 11-13, 2024, hybrid conference

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## Effectiveness of thermotherapy and cryotherapy in eliminating viruses from *Ullucus tuberosus* Caldas

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### Abstract

*Ullucus tuberosus* Caldas, an Andean root and tuber crop, is the second most cultivated crop in the Andean region of South America. The crop plays a vital role in food security and is of great importance to the region. The morphological and genetic diversity of ulluco is extensive and holds significant potential for addressing future challenges. Therefore, preserving, storing, and making this diversity accessible is crucial. The genebank at the International Potato Centre conserves ulluco, but distribution is restricted due to the potential presence of unresolved viral infections and the absence of phytosanitary protocols for testing plant health. Since ulluco is clonally propagated, maintaining genetic diversity requires conserving virus-free vegetative plant material, particularly as secondary virus infections from mother tubers can cause significant yield losses of up to 38 %.

Thus, in this study, we investigate the effectiveness of two virus elimination methods – thermotherapy with meristem culture and cryotherapy using eight ulluco accessions with up to three lines (repetitions) per accession. Our findings revealed that, after one cycle of therapy, thermotherapy combined with meristem culture resulted in at least one virus-free line for six out of the eight accession which is an effectiveness of 75 %, whereas cryotherapy led to one virus-free line for only two out of the eight accessions (25 % effectiveness). Despite its high labor and resource requirements, thermotherapy with meristem culture proved to be the more effective method for eliminating viruses from ulluco plant material. However, as not all crop species respond equally to thermotherapy, continuous assessment and exploration of new methods remain crucial to identify and adopt more efficient virus elimination techniques.

**Keywords:** Andean region, food security, genebank, *in vitro* plant material, meristem culture, phytosanitary protocol, root and tuber crop, vegetatively propagated crop, virus elimination