



Tropentag, September 15-17, 2021, hybrid conference

“Towards shifting paradigms in agriculture  
for a healthy and sustainable future”

## Genetic and Morphological Stability of Autopolyploid *Thymus vulgaris* L. and Changes in its Anatomy and Physiology

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### Abstract

*Thymus vulgaris* L. is a species of the Lamiaceae family endemic to the West Mediterranean Basin. It is well known as an aromatic and culinary herb, but thyme also has important medicinal properties. The plant produces essential oils rich in monoterpene phenols which are expressed by a wide range of chemo-diversity. The high chemical polymorphism of its essential oils provides various biological activities. Which allows their implementation as a biosphere-friendly and biodegradable substance for plant protection in agriculture. Variety selection and plant breeding techniques such as *in vitro* induced somatic polyploidisation can improve the quality and yield of essential oils in plants. This research aims at assessing the genetic and morphological stability as well as physiological and anatomical changes in a new tetraploid genotype ( $2n = 2x = 60$ ) of *T. vulgaris* obtained from a diploid control ( $2n = 2x = 30$ ) using *in vitro* induced polyploidisation. The genetic stability was tested using chromosome counts and repeating the flow cytometric analysis. Chlorophyll fluorescence analysis was performed to show the photosynthesis variability between the tetraploid and diploid plants. The antioxidative activity was determined by analysing the total polyphenol, flavonoids and phenolic acid content. Morphological characteristics such as plant height, number of shoots and plant/branch thickness, length, internodal distances, leaf length and leaf thickness were measured. The anatomical assessment was performed by wood anatomical analysis for the variability of xylem anatomy features in cross-sectional view. Stomata and guard cell size and stomatal density microscopic measurements were also performed. Preliminary results showed that the newly obtained tetraploid genotype of *T. vulgaris* proved to be genetically and morphologically stable. The physiological and anatomical changes varied between the tetraploid and its diploid counterpart. After a two-year assessment, we also aim to patent the new genotype and introduce it as a capable variety to satisfy the growing demand of *T. vulgaris* essential oil.

**Keywords:** Ex vitro, flow cytometry, *in vitro*, polyploidy, stomata, *Thymus vulgaris*, xylem