10th Brazilian Conference on Natural Products
XXXVI RESEM
4-7 November 2025, Belo Horizonte, MG, Brazil
Section: 04

# *COMPARATIVE ANALYSIS OF LOW- AND HIGH-FIELD NMR FOR THE QUANTIFICATION OF CANNABINOIDS IN CANNABIS PRODUCTS*

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Quantitative nuclear magnetic resonance spectroscopy (qNMR) is a robust and increasingly used technique for the analysis of products derived from *Cannabis sativa* L., offering a precise alternative to chromatographic methods. However, analytical precision critically depends on factors such as the equipment used (more accessible low-field spectrometers versus more precise high-field ones) and the choice of the internal quantification standard. Therefore, this work evaluated the impact of two internal standards, dimethyl sulfone (DMS) and 1,2,4,5-tetrachloro-3-nitrobenzene (TCNB), on cannabinoid quantification, with the goal of determining the optimal conditions for the use of low-field equipment. *Cannabis sativa* L. oil samples were prepared in deuterated chloroform ($CDCl_3$) and analyzed on 80 MHz and 600 MHz NMR spectrometers. Preparation conditions included the use of DMS and TCNB as standards, with the addition of deuterated water ($D_2O$) in some samples to evaluate the effect on signal suppression and solubility. The data were subjected to Student's t-tests to compare means and, crucially, to Bland-Altman plots to evaluate the individual concordance between measurements from the two instruments. The results showed that the use of the DMS standard resulted in significant differences ($p < 0.05$) between the 80 MHz and 600 MHz NMR, with the Bland-Altman plots revealing a bias and limited concordance. On the other hand, the TCNB standard with $D_2O$ addition showed remarkable results. Under this condition, the differences in mean quantification were not statistically significant ($p > 0.1$), and the Bland-Altman plot confirmed a high concordance and a minimal bias between the two instruments, validating the interchangeability of the methods. We conclude that the choice of an internal standard is fundamental for the optimization of qNMR. The use of TCNB allows low-field NMR to be a viable and accessible alternative for quality control, offering precision and concordance comparable to high-field NMR for the quantification of cannabinoids in oil samples.

***Keywords:*** *Cannabis sativa, qNMR, CBD (Cannabidiol), Cannabinoids, Low-field NMR.*