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A new computational dereplication method applied to NMR-based metabolomics study on different *Fusarium* species isolated from the rhizosphere of *Senna spectabilis*

Denise Medeiros Selegato, Rafael Teixeira Freire, Ian Castro-Gamboa

1 Nuclei of Bioassays, Ecophysiology and Biosynthesis of Natural Products (NuBBE), IQ/Ar, Chemistry Institute – UNESP – State University São Paulo, Araraquara, Brazil.

2 Center of Imaging and Spectroscopy by Magnetic Resonance (CIERMag) – IFSC, São Carlos Institute of Physics – USP – São Paulo University, São Carlos - Brazil.

denisemselegato@gmail.com

Abstract: The search for new sources of natural products have been responsible for the increased use of chemometric tools that enable a rapid and efficient analysis of these complex matrixes and is of fundamental importance in the current bioprospecting programs. In this context, dereplication methods emerges as a rapid way of identifying known compounds in crude extracts, accelerating the selection of biologically promising samples and the identification of known bioactive chemotypes. Among the vast variety of dereplication tools available, Nuclear Magnetic Resonance (NMR) is one of the preferred spectroscopic state of the art technologies, primarily because of its very high reproducibility, broad coverage of metabolite detection, signal robustness, easiness of data handling for statistic treatment, short time analysis, universal detector for NMR-active nuclei and simple sample preparation [2]. *Senna spectabilis* bellows to the Fabaceae family and refers to an arboreal plant widely used in folk herbal medicine. Among the 600 species distributed throughout the world, more than 350 secondary metabolites have been isolated, majorly flavonoids and alkaloids piperidine (nitrogen compound with high anticholinesterase activity) [3]. *Senna spectabilis* rhizosphere has a well-known cytotoxic potential, little studied towards their chemical composition and microbial interaction. On this small root area, several microorganisms were identified, mainly fungi from the *Fusarium* species, a well-known pathogen associated with several diseases on the Leguminosae family. The aim of this work was to create a new computational dereplication method based on the loadings of PLS-DA (Partial Least Square - Discriminant Analysis) and STOCSY (Statistical Total Correlation Spectroscopy) analysis from the NMR-data of both *Fusarium species*. The results obtained on the method, associated with other NMR experiments (13C, TOCSY, HMBC, HSQC and COSY), allowed the identification of three compounds. (A) Fusaric acid, produced majorly by *F. oxysporum* (CSP-R18), a piridin derivate with a small alkyl chain (meta substituted), a nitrogen compound with the same high anticholinesterase activity as the piperidin alkaloid described on the aerial parts of *Senna*; and two aromatic compounds (b, c), produced by *F. solani* (CSP-5b) and *F. oxysporum* (CSP-19b), respectively. In conclusion, it was possible to identify and mathematically separate the 1H-NMR peaks responsible for the separation of *F. solani* (varieties codes CSP-5b and CSP-R19) and *F. oxusporum* (varieties codes CSP-R18 and CSP-19b) based on this new dereplication method, being a rapid way of identifying known compounds in crude extracts, without the laboring work of purification-isolating.

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Figure 1. 1H NMR Sectra of Fusarium species.