

# Saffron (*Crocus sativus* L.) characterization: an analytical integrated approach

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Dried red stigmas of *Crocus sativus* L. are a very expensive spice known as saffron, used as a food flavoring and coloring agent and as a traditional herbal medicine [1]. The purpose of this paper is to report the analyses of stigmas from different samples of *C. sativus* cultivated in Italy (2 samples from Tuscany and 2 from Umbria, provided by Associazione Zafferano Italiano) in order to characterize this product from a quality point of view [2]. The identification of crocins, safranal, picrocrocin, and flavonols was carried out by HPLC/DAD analyses of the hydroalcoholic (EtOH:H<sub>2</sub>O 70:30, pH 3.2) extracts. In stigma samples crocin contents ranged from 341.90 to 523.58 mg/g; flavonols from 15.71 to 20.00 mg/g; safranal from 0.66 to 0.98 mg/g, and, finally, picrocrocin from 36.32 to 55.22 mg/g. The following parameters, moisture, ash, fiber, protein, fat, sugars and minerals (Na, K, Mg, Ca, Fe, C, Zn, Mn) were evaluated to draft a nutritional table for the label of commercial saffron. Moreover, the quantitative analyses of an aqueous extract was carried out by spectrophotometric analyses (ISO/TS 3632-2:2003). This method allowed the determination of picrocrocin (71.97 - 102.93 mg/g), safranal (25.04 - 34.81 mg/g) and total crocin (163.29 - 210.01 mg/g) contents. Moreover, a qualitative HPLC/DAD analysis of the aqueous extracts was performed for an in depth knowledge of biomolecules. Saffron aqueous extracts (ISO/TS 3632-2:2003, enriched with D<sub>2</sub>O 10% vol. for the locking signal and DSS 0.01 mM as internal standard) were also analyzed by high resolution NMR (400MHz), to further characterize this product [3-5]. Two kind of <sup>1</sup>H experiments were carried out, both gradient-based and both using excitation sculpting by water-selective 180° shaped pulse to achieve solvent suppression: a one-dimension experiment (size of FID 65535, 256 scans or more, depending on the sample) and a two-dimension total-correlation experiment (TOCSY, with size of FID 2048-512\*256-512, 128-256 scans, depending on the sample). The building of database is in progress, to integrate and correlate the information derived from the different applied analytical methods [6].

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