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File: ■ Sceletium (*Sceletium tortuosum*)
■ *Sceletium crassicaule*
■ Hyperspectral Imaging

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RE: Use of Hyperspectral Imaging to Accurately Differentiate and Identify Related Species

Shikanga EA, Viljoen AM, Vermaak I, Combrinck S. A novel approach in herbal quality control using hyperspectral imaging: discriminating between *Sceletium tortuosum* and *Sceletium crassicaule*. *Phytochem Anal*. 2013;24(6):550-555. doi: 10.1002/pca.2431.

Sceletium (kanna; *Sceletium tortuosum*) is a succulent shrub native to South Africa. It has become popular for its adaptogenic properties and for use in treating psychological, psychiatric, and inflammatory conditions. Increase in demand has prompted large plantations of *S. tortuosum* to be grown in South Africa. *S. tortuosum* contains the psychoactive compounds mesembrine, mesembrenol, mesembranol, and mesembrenone. However, *S. tortuosum* looks very similar to the related species *S. crassicaule*. The geographical range of these 2 species in the wild is overlapping and both contain 4 psychoactive alkaloids of interest. Quality control is needed to ensure that commercial products contain authentic *S. tortuosum*. The purpose of this in vitro study was to evaluate a novel quality control tool (hyperspectral imaging [HSI]) for authentication of botanical identity.

Aerial parts of *S. tortuosum* and *S. crassicaule* plants were collected from various localities in the Cape region of South Africa in October 2009. The *S. tortuosum* samples were collected from different localities, while *S. crassicaule* samples were collected from one locality because it has a more limited distribution. Voucher specimens for each shrub sampled were retained. From the collections, 5 *S. tortuosum* samples, each representative of 1 of the 5 identified chemotypes, and 5 *S. crassicaule* samples were selected for the analyses. The aerial parts were dried, pulverized, and a sub-sample of each was extracted for chemical profiling using ultrahigh-performance liquid chromatography (UPLC). The powdered samples were analyzed using shortwave infrared HSI, an imaging technique that collects and processes information across a vast span of the electromagnetic spectrum and divides it into multiple bands. Objects leave unique fingerprints or magnetic spectra which can be used for identification.

The UPLC results show that the alkaloid profiles of specimens of both species were variable. This is in agreement with another study that used a different technique and

demonstrated intra- and inter-population variations in mesembrine-type alkaloids. Because of this variability, the UPLC method was not adequate for distinguishing *S. tortuosum* from *S. crassicaule* specimens despite the fact that chromatographic methods are widely accepted for fingerprinting or profiling of secondary metabolites in plants. HSI demonstrated that the reflectance intensities of the *S. tortuosum* spectra were higher than those for *S. crassicaule* for each wavelength investigated. This difference enables the species to be differentiated.

The authors conclude that HSI can be used to accurately classify a sample as *S. tortuosum* or *S. crassicaule*. The HSI method is a non-destructive and time-saving technique with potential application for on-line quality monitoring of *S. tortuosum* raw materials. HSI is increasingly being used in the food processing industry to rapidly detect foreign material and defective raw materials, so it is not a highly unusual technique. The article does not address the issues surrounding intra- and inter-population variations in the total alkaloid content and alkaloid composition of mesembrine-type alkaloids.

—Heather S. Oliff, PhD

The American Botanical Council has chosen not to include the original article.