Chemotaxonomic Evaluation of Mandarin Orange Hybrids

Juliana Viera[1], Beatriz Vignale[2], Eduardo Dellacassa[3]

[1] Unidad de Análisis de Agua. UdelaR - Montevideo, Uruguay.
[2] E.E.F.A.S.- INIA Fruticultura, Facultad de Agronomía - Salto, Uruguay.
[3] Laboratorio de Biotecnología de Aromas. UdelaR - Montevideo, Uruguay.
jviera@fq.edu.uy

Keywords: essential oils, GC-MS, polymethoxyflavonoids, mandarin-orange hybrids, chemotaxonomy.

The citrus fruit production is one of the most important agricultural activities in Uruguay, where 52% of the fruit production is represented by oranges followed by mandarins (36%) (1). Citrus can be propagated, in addition to natural forms of propagation (asexual nuclear or chance seedlings, by crossing, and by mutation), by artificially crossed cultivars created by citrus breeders. In Uruguay, these activities are developed by the E.E.F.A.S–INIA citrus development program, which is based on hybridization strategies. In mandarins, activities are focused on widening the harvesting period, thereby allowing for a more extensive fruit production season, providing fresh fruit to the market all year. As a consequence of genetic improvement, the essential oils (EOs) usually present different chemical and organoleptic profiles (2). The main goal is creating new fruit varieties that fulfill different consumer quality requirements, relating to fruit composition and sensory characteristics, thickness of albedo, size, color, and aroma (2). EOs components can be used as efficiency markers of the hybridization process, enabling the identification of potential specimens. In this work, a chemotaxonomic approach was used to differentiate mandarin hybridization assays through their EO composition. Seven commercial varieties (Clementina de Nules, Nova, Mandarina Común, Afourer, Murcott, Page, Ortanique) and seven experimental hybrids (CCMIII, VII-3, A 172, A 201, B 47, M 9, M19) were selected for analysis. EOs were manually extracted from the skins and then analyzed using gas chromatography–mass spectrometry (GC-MS). Eighty-nine components were identified, many strongly associated with mandarin aroma (thymol, methyl N-methyl anthranilate) (3). Many oxygenated compounds showed differences for several different hybrids (B47, A201, IV-13, VII-3) and for two commercial varieties (Nules, Murcott). Typical citrus volatile compounds (neral, geraniol, citronellol) were detected in 4 of the hybrids (ccm-III, M9, B47, IV-13) and Ortanique. The use of long-time-temperature GC-MS programs allowed identifying five polymethoxyflavonoids (PMFs): nobiletin, tangeretin, sinensetin, hexamethoxyflavone, and heptamethoxyflavone. Common Mandarin, Nova, and VII-3 showed all five PMFs in their oil composition. Through a chemometric analysis, the parental-hybrids relationships were evaluated using the volatile compositions studied. Three clusters were identified, showing the Common mandarin as a unique variety, while A172, B47, and ccm-III were defined as Satsuma mandarin-orange crossing derivatives.

1. DIEA-MGAP. Encuesta citrícola. Montevideo, Uruguay, 2015.
2. Rivas, F. et al. Revista INIA, 2013, **33**, 44-48.
3. Dellacassa, E. et al. Flav. Frag. J., 1997, **12**, 247-255.
4. Viera, J., Vignale, B., Dellacassa, E., Pistón, M. Revista ADEQ, 2014, **2**, 50-56.

ISBN: 978-85-66836-11-0