

FSL 6: Evaluation of lemon balm (*Melissa officinalis*) collections**Johannes Kittler¹, Hans Krüger², Detlef Ulrich², Otto Schrader¹, Bärbel Zeiger², Ute Kästner¹, Wolfgang Schütze², Ulrike Lohwasser³, Gennadi Gudi², Andrea Krähmer², Christoph Böttcher², Frank Marthe¹**¹Institute for Breeding Research on Horticultural Crops and²Institute for Ecological Chemistry, Plant Analysis and Stored Product Protection of the Julius Kuehn Institute (JKI), Erwin-Baur-Str. 27, D-06484 Quedlinburg, Germany,³Leibniz Institute for Plant Genetics and Crop Plant Research (IPK), Corrensstr. 3, D-06466 Gatersleben, Germany. e-mail: frank.marthe@jki.bund.de. (corresponding author)

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Abstract

Lemon balm (*Melissa officinalis* L.) is a well-known medicinal and aromatic plant and of increasing importance resulting in rising growth area in Germany. Because of its proven sedative, spasmolytic and antiviral effects, it is often used in watery or alcoholic extracts for self-medication or pharmaceutical and medical purposes. This therapeutic effect is due to the content of essential oil and phenolic carbon acids, like rosmarinic acid. Improved knowledge on the genome structure, number of chromosomes in connection with the taxonomical structure of balm is indispensable for improved new varieties. A set of 120 balm accessions was evaluated for the variability of essential oil content and composition as well as the content of rosmarinic acid. These accessions came from the Bavarian State Institute for Agriculture at Freising, Germany (LfL), the federal *ex-situ* collection of agricultural and horticultural plants of the Leibniz Institute of Plant Genetics and Crop Plant Research at Gatersleben, Germany (IPK) and the N.I. Vavilov Institute of Plant Industry at St. Petersburg, Russia (VIR). Out of these 120 accessions 40 balm accessions (*M. officinalis*) were characterized by flow cytometry and FISH (18/25S and 5S rDNA) to determine the chromosome number and ploidy level. Three different types were found: diploid genotypes with $2n = 2x = 32$ chromosomes; tetraploid $2n = 4x = 64$ chromosomes and triploid $2n = 3x = 48$ chromosomes. Therefore a haploid base number of $x = 16$ chromosomes is likely. For the first time triploid accessions are described, which were sterile but cytologically and morphologically stable for many years. Triploids express better winter hardiness and regeneration after harvesting cuts as well as bigger leaves and internodes. We characterized three chemotypes (ct.) of essential oil: ct. citral, ct. germacrene D and ct. β -caryophyllene oxide. In addition autotetraploid material from diploid ct. citral was developed for this characterization and belongs also to ct. citral.

Keywords: Balm, chemotype, haplotype, FISH

ReferencesKITTLER, J., SCHRADER, O., KÄSTNER U., MARTHE F. (2015) Chromosome number and ploidy level of balm (*Melissa officinalis*). *Molecular Cytogenetics* 8:61