DIGITAL BREEDING

Book of Abstracts

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Use of digital image analysis for the flower color evaluation in ornamental sunflower

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Sunflower (*Helianthus annuus* L.) is broadly used as an ornamental plant in landscape gardening, but also as a potted plant and a cut flower. Since aesthetic traits, including color, are most important for newly developed ornamental plants, sunflower petal (ray floret) color has a high value for the development of new genotypes and its position on the horticulture market. The most common methodology for the evaluation of sunflower petals is based on UPOV guidelines for sunflower. By the guidelines, the color of sunflower ray florets can be described as *yellowish white, light yellow, medium yellow, orange yellow, orange, purple, reddish brown* and *multicolored.* Although there are photographs to define these color categories, the provided material does not give clear information on the color definition, especially the *multicolored* category. The main obstacle of this methodology is its high subjectivity and necessity of high expertise for evaluators. In order to make the process of evaluation of sunflower petal color more objective, we propose a new methodology that combines image segmentation (pixel-based classification), and UPOV sunflower guidelines for the definition of color groups (classes). Images of six sunflower genotypes (Ring of Fire, CMS1-30, Heliopa, Dwarf, Neoplanta and Pacino Gold) were used in the software analysis. Visual results of this process of image segmentation presented different colors for the examined varieties. This visual presentation serves as a guideline for an evaluator to determine whether there is more than one dominant color in the examined genotypes. Of the examined genotypes, Heliopa and Pacino Gold only have one dominant color, while results of other examined genotypes show more than one dominant segmented color. The proposed method groups pixels of segmented ray florets into two dominant clusters and graphically presents the position of their mean vectors in Lab color space regarding mean vectors of UPOV color classes. Moreover, the nearest neighbor classifier is used to classify pixels into UPOV classes and the percentage of pixels belonging to each class is given. Due to the early stage of this research, there is also an opportunity for development and adaptation of the proposed image analysis methodology for similar tasks in different fields of plant research.