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Evaluation of a Worldwide Collection of Safflower for Morphological Diversity and Fatty Acid Composition

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Abstract

Safflower (*Carthamus tinctorius* L.), a member of the family *Asteraceae*, is a multi-purpose crop for oil, medicinal, and industrial uses. A total of 747 accessions were obtained from different genebanks throughout the world and were grown in 2002 in a replicated field trial in Göttingen, Germany. The overall objective of this research was to evaluate agromorphological traits (plant height, days to maturity, flower colour, head size, diseases, and spines) as well as fatty acids (palmitic acid, stearic acid, oleic acid, linoleic acid) and to study geographical patterns of diversity. Only the 193 accessions with best seed production were used for the quality analysis. From these, the 169 accessions with known origin were divided into eight geographical regions: East Asia, South Western Asia, Eastern Europe, Central Western Europe, Southern Europe, Mediterranean, Africa, and North America.

Analysis of variance showed significant differences among accessions for all traits analysed. Oleic acid varied from 7.8% to 29.4%, linoleic acid from 61.2% to 83.6% and palmitic acid from 1.8% to 12.8%. The amount of dominant fatty acid (linoleic acid) and days to maturity showed highly significant differences between regions as well as within all eight regions. In addition to the eight geographical groups, a ninth group with 24 accessions whose origins were unknown was included for clustering and principal component analysis (PCA).

Both cluster analysis (CA) and PCA for agromorphological traits and fatty acids gave comparable results and showed a complex relationship among accessions, characters and geographical origin. However, CA showed no clear grouping of accessions according to their geographical origin. The results displayed large genetic variability among the safflower accessions evaluated, which could be used in future breeding programs and in selecting directly from germplasm collections.

Keywords: Cluster analysis, fatty acid, genetic diversity, geographical origin, *Carthamus tinctorius*, morphological traits, principal component analysis