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Assessment of variability for fruit characteristics in five apple varieties from an ecological orchard

Maia Capotescu, Capotescu S., Adriana Ciulca, Giancarla Velicevici, Ciulca S.

University of Life Sciences "King Michael I" from Timisoara

Abstract: Consequently, apple is among the most economically important fruit crops worldwide, while in Romania occupies about a third of the total orchards, after the plum. The biological material for this study was composed by five apple varieties from an ecological orchard ('Jonathan', 'Florina', 'Gala', 'Jonagold', 'Golden Delicious E') in comparison with 'Golden Delicious C' from an conventional orchard. Ten random selected and mature fruits from each variety have been analyzed for the following traits: diameter, height, firmness, weight soluble solid content, dry matter content. The aim of the study was to assess the phenotypic variability of some fruit characteristics in apple varieties from an ecological orchard in comparison with an apple variety grown under conventional orchard conditions. The 'Golden Delicious C' variety presented the largest fruit sizes associated with lower values of sugar and dry matter content. 'Gala' and 'Jonathan' varieties presented small fruits but with the highest sugar content and firmness of the pulp. On the background of small sizes, the fruits of the 'Golden Delicious E' variety had the highest dry matter and sugar content and a reduced firmness.

• Introduction

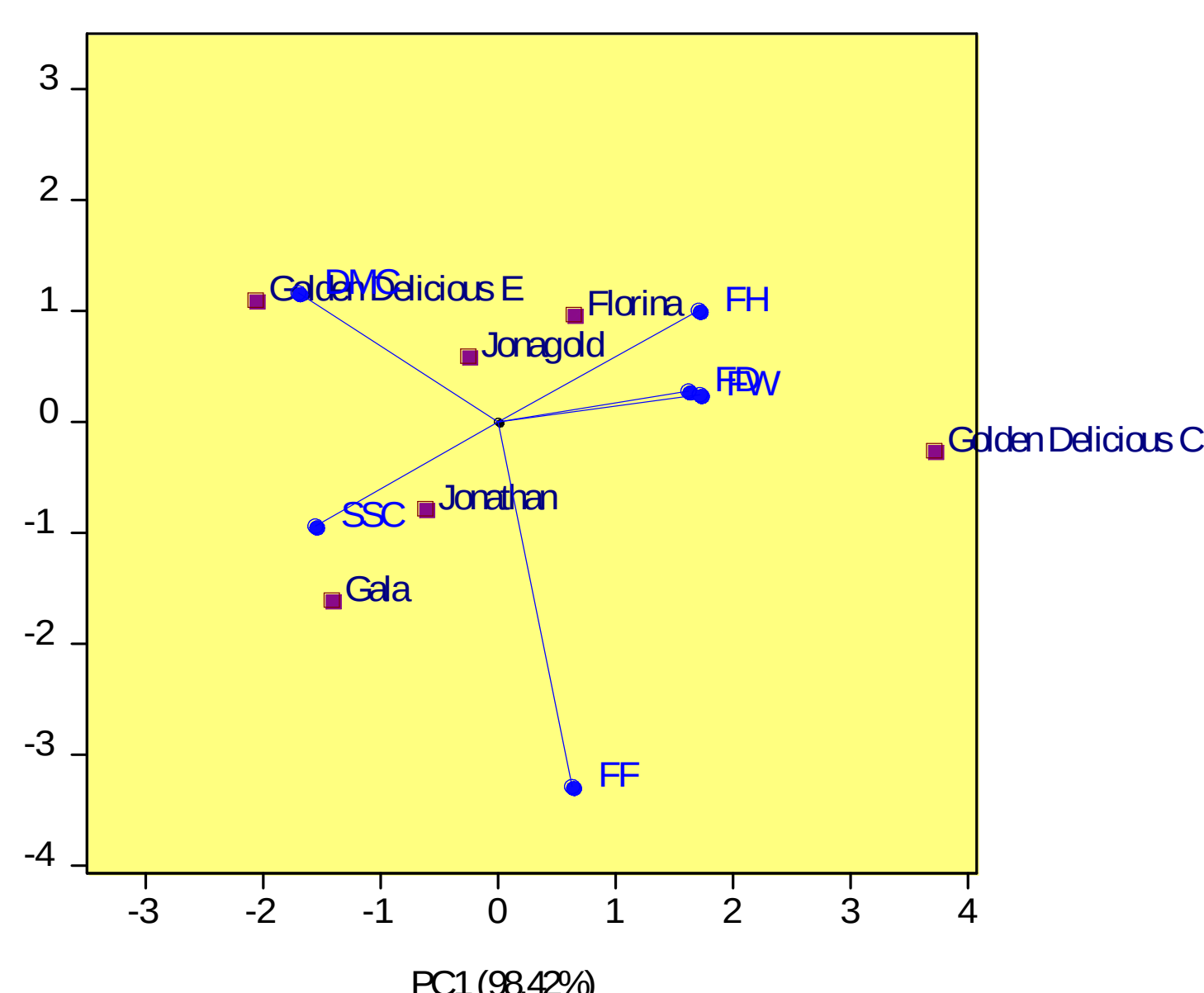
Intensification in apple orchards, however, leads to increased production costs as well as to environmental detriments both within the orchard and in surrounding areas. These detrimental effects have increased the interest in developing more environmentally friendly production, through either integrated production or organic management. The aim of the study was to assess the phenotypic variability of some fruit characteristics in apple varieties from an ecological orchard in comparison with an apple variety grown under conventional orchard conditions.

• Material and method

The biological material for this study was composed by five apple varieties from an ecological orchard ('Jonathan', 'Florina', 'Gala', 'Jonagold', 'Golden Delicious E') in comparison with 'Golden Delicious C' from an conventional orchard. Ten random selected and mature fruits from each variety have been analyzed for the following traits: diameter, height, firmness, weight soluble solid content, dry matter content. The statistical analysis of data was made using analysis of variance and means were separated by Least Significant Difference test. The similarity matrix was used for hierarchical clustering of varieties based of the unweighted pair-group method with arithmetic averages.

• Results and discussions

The highest variability between varieties was observed for sugar content and the lowest for dry matter content. Inter-individual heterogeneity at the level of experience had a small and non-significant influence on the results.

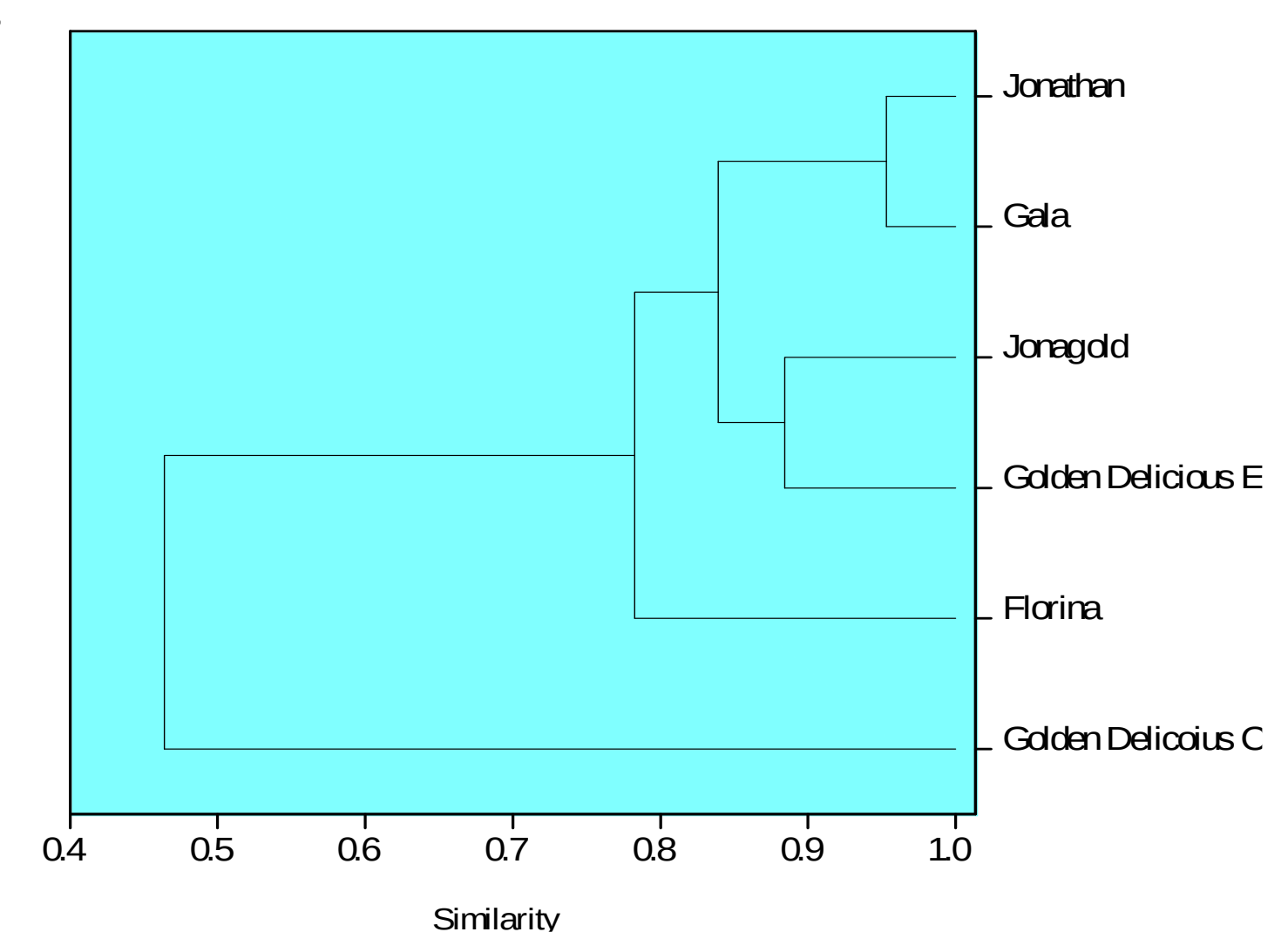


FD-Fruit diameter; FH-Fruit height; FW-Fruit weight; FF-Fruit firmness; SSC-Soluble solids content;
DMC-Dry matter content

Biplot of first two principal components for fruits characteristics in apple varieties



The hierarchical classification of the varieties based on the similarity of the fruits, groups them into two clusters. The first cluster has a complex structure, being made up of five varieties, between which there is an average similarity of approximately 79%. Of these, the varieties Jonathan and Gala, respectively Jonagold and Golden Delicious E form two subgroups that show a similarity of the fruits of approximately 85%. Also included in this cluster is the Florina variety, which presents a diversity of approximately 21% of fruit characters compared to the other four varieties.



UPGMA clustering of apple varieties based on fruits characteristics

Conclusions

The 'Golden Delicious C' variety presented the largest fruit sizes associated with lower values of sugar and dry matter content In comparison with the fruits of other varieties from ecological orchard. On the background of small sizes, the fruits of the 'Golden Delicious E' variety had the highest dry matter and sugar content and a reduced firmness. The Golden Delicious C variety has distinct characteristics, associated with a diversity of approximately 55% compared to the other varieties grown in ecological conditions.

