

Role of fruit flesh cell morphology and *MdPG1* allelotype in influencing juiciness and texture properties in apple

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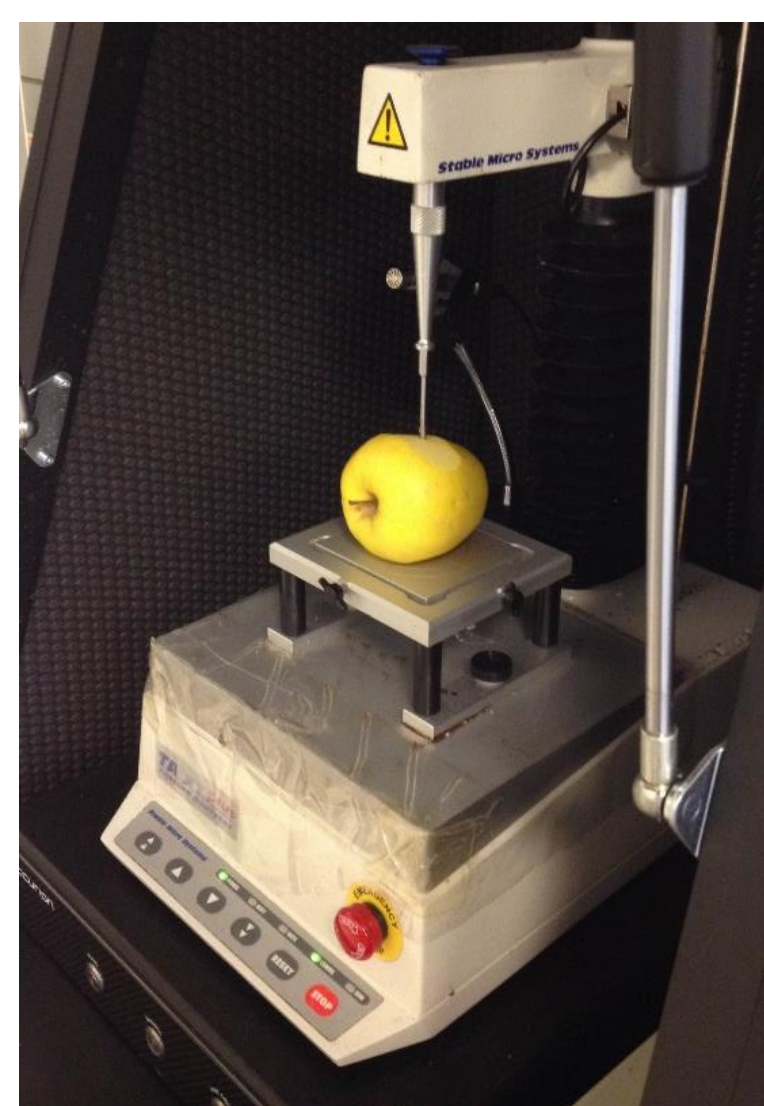


Apple fruit quality is strongly influenced by the interplay between juiciness and texture. To better decipher the complexity underneath the control of such quality traits, a multidisciplinary approach was carried out:



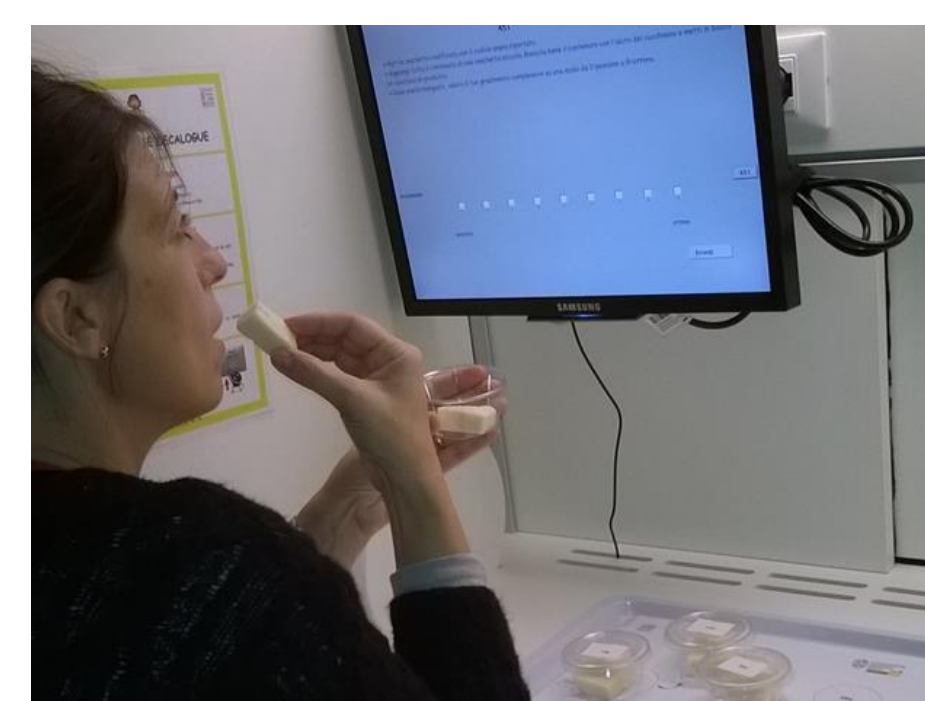
Texture and Juiciness

The texture analyser measured **12 parameters** related either to the force needed to the probe to penetrate fruit flesh or the resulting **acoustic response**



Sensory Analysis

15 pannelists evaluated the fruit texture, juiciness and flavour defining **34 sensory descriptors**.



MdPG1 genetic profile

An SSR markers targeting the **Polygalacturonase gene** (*MdPG1*; known to control the regulation of fruit texture in apple) enabled the identification of the allelic state (*AA* o *Aa*) for each cultivar.

Cell morphology

Focusing on both the **cell size (CA)** and **cell shape (CS)** (employing an optical microscope) and the **intercellular space** (using an X-ray computed microtomography scanner).

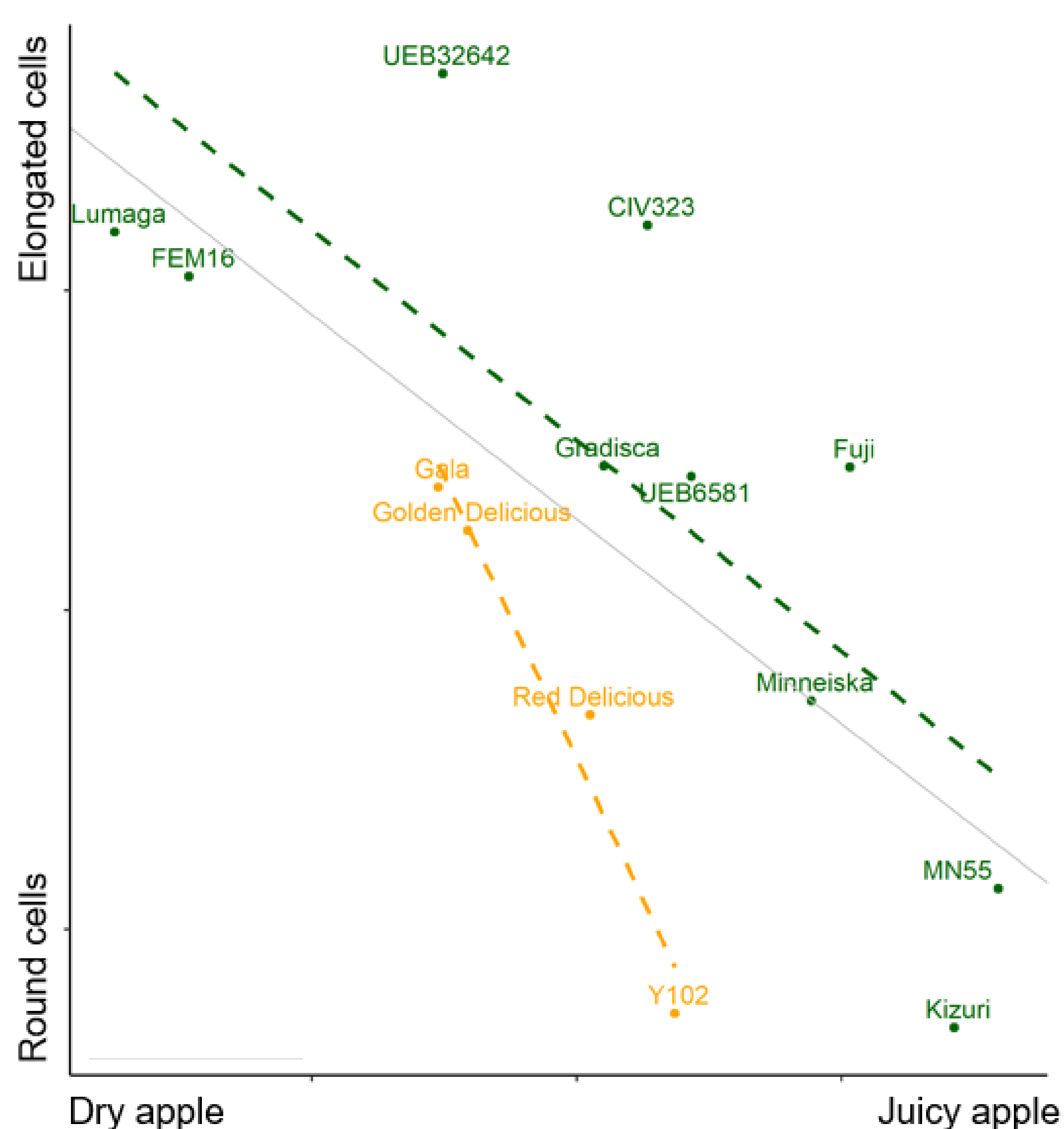
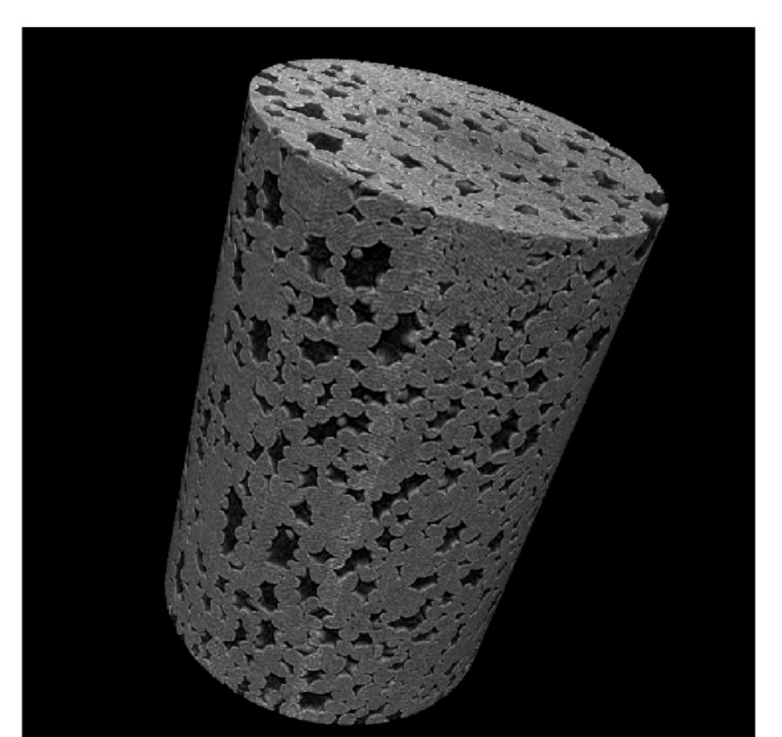


Fig.1: Plot representing the correlation between CS and 'juiciness'. Samples are colored according to their genetic configuration at the PG locus (green = AA, both positive alleles, yellow = Aa, heterozygous genotype). The overall linear regression linking the two variables is represented by a continuous grey line while the linear regression made on the base of the two PG genotypes were represented in green and yellow dashed lines respectively.

- ✓ A high fraction of **round cells** is associated with **small intercellular spaces** (Fig.1 and Fig.2)
- ✓ Round cells (Fig.1) and small intercellular spaces (Fig.2) are associated with **higher juiciness response**
- ✓ Similar values of juiciness could be achieved, either with a **high fraction of round cell and Aa** or with a **relatively lower fraction of round cell and AA**. Thus, if not adequately considered as a cofactor, *MdPG1* could ultimately act as a confounding variable masking a real correlation between cell morphology and texture or juiciness (Fig.1-2).

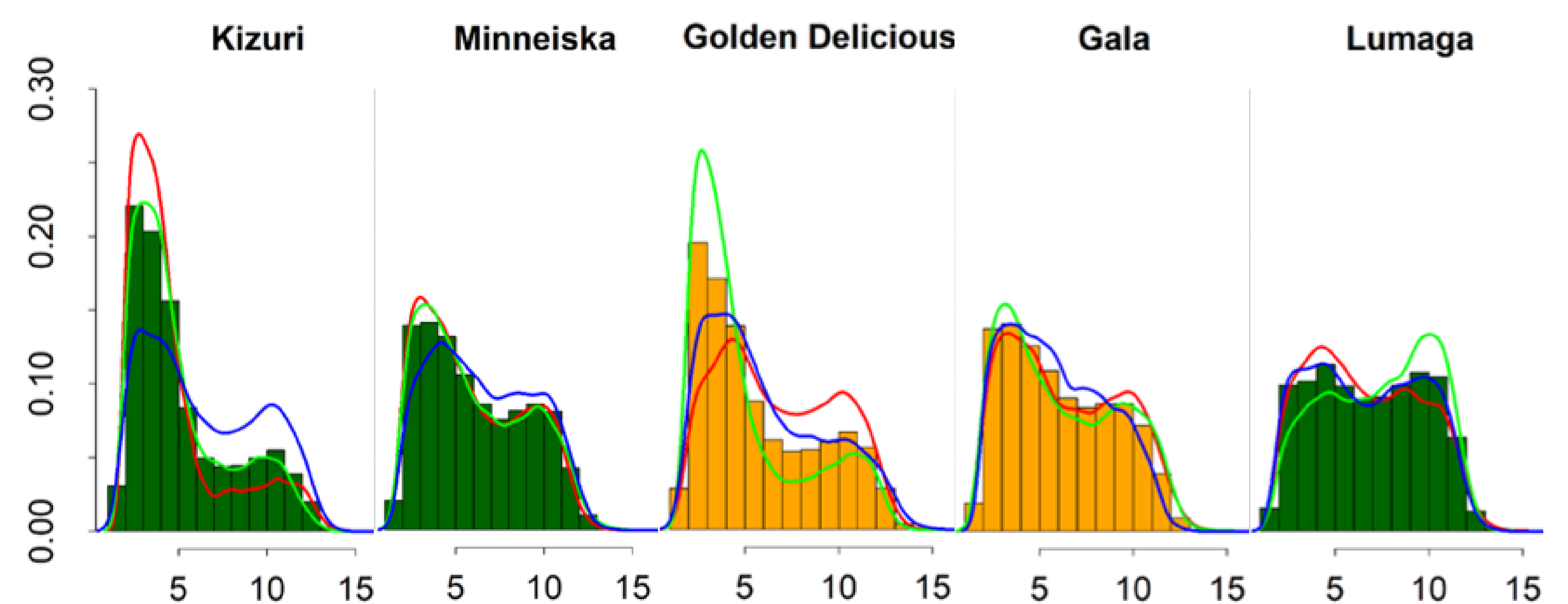


Fig.2: Histograms of the log volume of the intercellular space. Samples are ordered from the juiciest (Kizuri) to the driest (Lumaga) and colored according to their genetic configuration at the PG locus (green = AA, both positive alleles, yellow = Aa, heterozygous genotype). For each accession, the density distribution of the three biological replicates analyzed for each cultivar is depicted as blue, green and red continuous lines



Supplementary material can be found on the published paper (<https://doi.org/10.1016/j.posth.2020.111161>) or through the QR code