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Genetic variability in apricot cell wall texture components



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Genetic improvement of fleshy fruit organoleptic characteristics by marker assisted selection requires that the variation of pertinent traits be quantitatively measured in hybrid progenies. Concerning texture, sensorial perceptions result from complex combinations of variables affecting fruit mechanical properties among which are tissue histology and cell wall chemistry. The variability of the latter factors have rarely been studied in apricots and are now reported from several genotypes: Harogem, Goldrich, Hargrand, Iranien, Moniqui, Orangered, Stark Early Orange, Ravicille and Rouge du Roussillon.

Materials and methods

Compression tests were realized at 20 mm/min with a 1KN sensor on 0.9 cm diameter cylinders sampled at the equator of one cheek of the fruit. A cube of ~1-1.5x0.5 cm surface area was sampled from the other cheek at the equator for histology characterization. Sectioning, image acquisition and treatment followed Devaux et al (2008). The rest of the fruit was freeze-dried and cell wall were prepared as alcohol insoluble materials. Sugar composition and β -glucanase hydrolysis for fine structural analysis of hemicelluloses was done as described (Quemener et al. 2007). Hemicellulose oligosaccharides were characterized on a M@ALDI-LR Waters using DHB-6ATT matrix (Lewandrowski et al. 2005). Data treatment and statistics were done on MATLAB (histology) and R. Number of fruits (n) is indicated in figures

Compression tests

- large variability within genotypes probably reflecting different ripening status
- different densification and failure behaviors

Apricot strain/stress smoothed curves

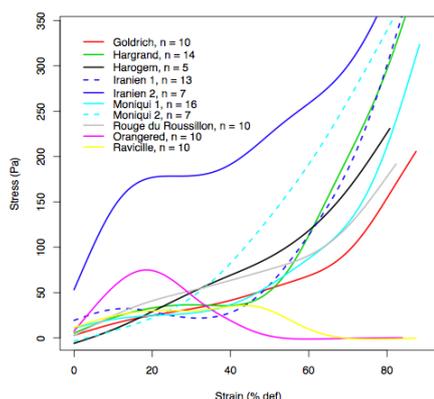
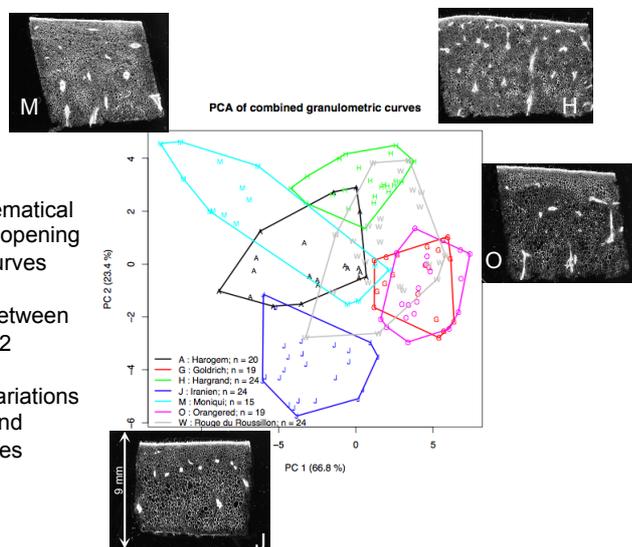


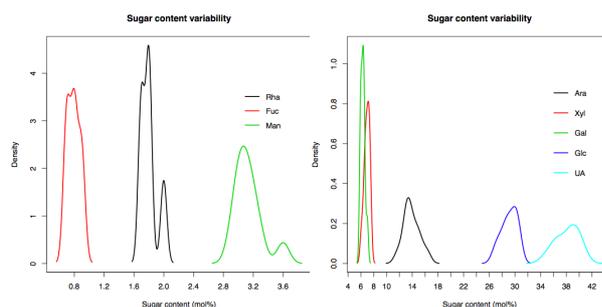
Image texture analysis (mathematical morphology): PCA of combined opening and closing granulometric curves

- highly significant differences between genotypes on both PC1 and PC2 (ANOVA)
- representative images show variations in cell sizes, vascular bundles and distributions according to PC axes

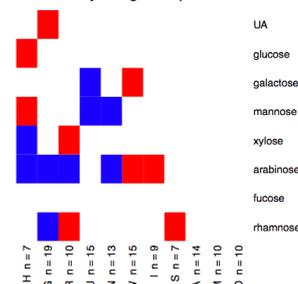


Cell wall sugar composition

- variability in composition between genotypes (density plots)
- significant differences in components mean between individual genotypes and the whole collection (t.test; blue < and red > collection mean, p < 0.05)

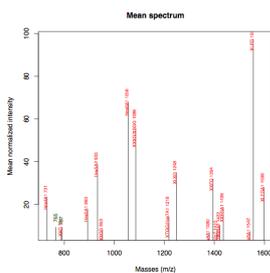


Variability in sugar composition

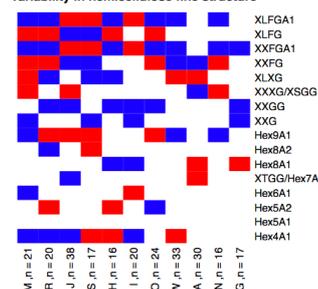


Hemicelluloses fine structure

- mean mass spectrum shows xyloglucan (X-series) and partially acetylated "glucomannan" (Hex-series) oligosaccharides
- significant differences in oligosaccharides mean proportion between individual genotypes and the whole collection (t.test; blue < and red > collection mean, p < 0.05; n : number of analysis)



Variability in hemicellulose fine structure



A: Harogem
 G: Goldrich
 H: Hargrand
 I-J: Iranien
 M-N: Moniqui
 O: Orangered
 S: Stark Early Orange
 W: Rouge du Roussillon

Conclusions

- large variability in compression behavior, histological and cell wall chemical characteristics among apricot genotypes
- relations between these variations with texture and ripening status remain to be established
- tools are available to quantify variations of cell wall components of texture in fruit collections