

Laila Seppä¹, Jutta Varis¹, Risto Tahvonen², Hely Tuorila¹

¹Department of Food and Environmental Sciences, University of Helsinki

²MTT Agrifood Research Finland, Piikkiö, Finland

HERITABILITY OF THE SENSORY CHARACTERISTICS OF APPLES – A CASE STUDY WITH TRADITIONAL CULTIVARS AND NEW CROSSES

INTRODUCTION

Breeding of fruit aims to transmit the favourable properties of the progenitors, whether related to productivity, resistance or sensory properties to the offspring. In the present study, we did a preliminary examination on the heritability of appearance, odour, texture and flavour of apple cultivars and their crosses currently cultivated in Finland.

DATA COLLECTION

APPLES

Three cultivars ('Huvitus', 'Melba', 'Lobo') alongside their eleven crosses bred by Agrifood Research Finland (MTT) were included in the study (Table 1). All three are widely used in the breeding programs in Finland.

Early season cultivar 'Huvitus' (H) is an old local seedling of domestic origin. 'Lobo' (L) is a late and 'Melba' (M) a mid season cultivar. Both originate from Canadian cultivar 'MacIntosh'.

EVALUATION

The apples were evaluated with generic descriptive analysis (n=13 x 4). The lexicon consisted of 15 attributes: three related to appearance (*red, green, surface wax*), two to odour (*intense, fruity*), five to texture (*hard, toughness of the skin, crispy, mealy, juicy*) and five to flavour (*intense, diverse, sour, sweet, astringent*). These are coded in Figures 2 and 3 with prefix A, O, T and F, respectively.

Table 1. Cultivars in the study. The codes are used in Figures 2 and 3.

| Cultivar | Code # | DD5* | Origin |
|-----------|--------|------|---------|
| Pirja | HM | 972 | MTT |
| Vuokko | MH1 | 1100 | MTT |
| Huvitus | H | 1026 | Finland |
| Maikki | MH2 | 1080 | MTT |
| Petteri | LH1 | 1120 | MTT |
| Big Melba | MH3 | 1140 | MTT |
| Samo | MH4 | 1159 | MTT |
| Melba | M | 1192 | Canada |
| Sandra | LH2 | 1195 | MTT |
| Jaspi | LH3 | 1200 | MTT |
| Heta | LH4 | 1200 | MTT |
| Pekka | LH5 | 1230 | MTT |
| Tobias | LH6 | 1235 | MTT |
| Lobo | L | 1302 | Canada |

H = 'Huvitus', M = 'Melba' and L = 'Lobo'.
* DD5, the cumulative heatsum needed during growing season.

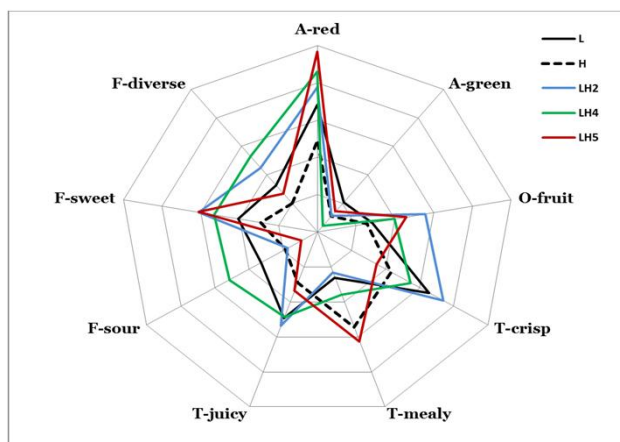


Figure 2. Profiles with selected attributes of three crosses of 'Lobo' x 'Huvitus', n=13 x 4, except for 'Huvitus', n = 13 x 2. Cultivar codes are explained in Table 1.

REFERENCES

- Seppä L, Railio J, Mononen R, Tahvonen R, Tuorila H. 2012. From profiles to practice: Communicating the sensory characteristics of apples to the wider audience through simplified descriptive profiles. *LWT-Food Science Technology* 47:46-55.
Seppä L, Peltoniemi A, Tahvonen R, Tuorila H. 2013. Flavour and texture changes in apple cultivars during storage. *LWT-Food Science Technology* 54:500-512.

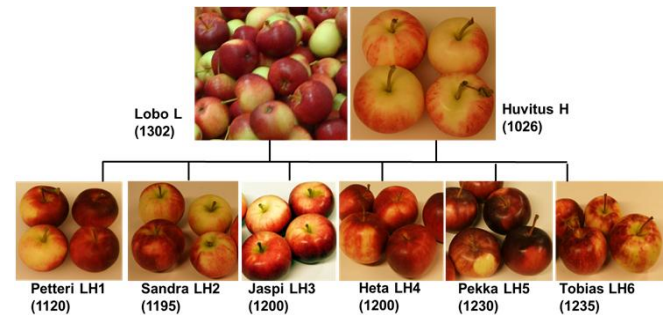


Figure 1. Crosses of 'Lobo' x 'Huvitus' with their DD5, the cumulative heatsum needed during growing season.

RESULTS

The crosses LxH were high in redness (Figures 1, 2). The intensities of fruity odour and most of the flavour attributes were higher than in the parent cultivars while texture attributes varied more.

The textural attributes loaded mainly on the first and third principal components (PC) and the odour and flavour attributes in the second PC (Figure 3). In most of the crosses of LxH, odour and flavour intensities were higher than in the parents. Except for LH3, all crosses were sweeter than the parents L and H. L and the cross LH6 resembled each other greatly.

The crosses MxH were sweeter and less sour than M, although all were fairly similar to M. Their texture was juicy and crispy and less mealy than most of the crosses LxH. The families of LxH and MxH loaded in two separate groups in the graph (Figure 3).

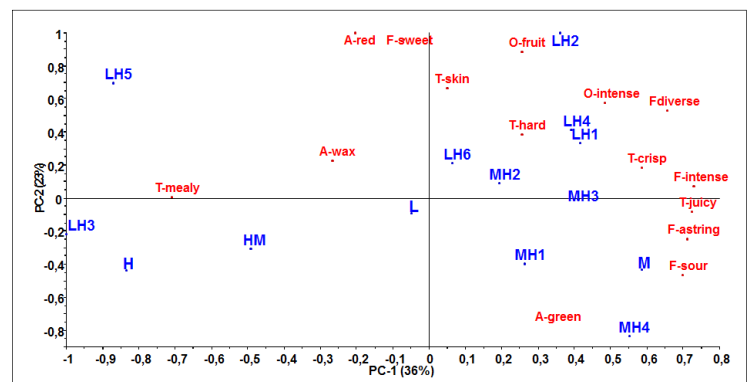


Figure 3. Score plot obtained from principal component analysis of profiling data (PC1 and PC2). Cultivar codes are explained in Table 1.

CONCLUSION

This preliminary study shows a great diversity of attributes across the crosses and their progenitors. Sensory attributes may appear in the offspring in a stronger or weaker intensity than in either of the parents.

ACKNOWLEDGEMENT

Financially supported by the Ministry of Agriculture and Forestry, project "Domestic apple varieties: sensory attributes and consumer acceptance", and project "Monipuolinen omena".