The Scent of Apples – A Non-Literary Investigation

Iris Tauber[1], Ulrike Heil[1], Erich Leitner[1],Georg Innerhofer[2], Barbara Siegmund[1]

[1]Graz University of Technology, Institute of Analytical Chemistry and Food Chemistry, NAWI Graz, Stremayrgasse 9/II, A-8010 Graz, Austria iris.tauber@tugraz.at

[2] School for Fruit Growing & Viticulture Silberberg, Silberberg 1, A-8430 Leibnitz, Austria

Introduction

Styria is Austrian's apple cultivation hot spot. About 80% of the annual harvest (corresponding to about 130.000 tons) are harvested in this region. The majority of the apples – mainly new apple varieties as Golden Delicious, Gala, Idared or Braeburn - are cultivated in plantations. However, about 25% of the apples are grown in so-called meadow orchards (Fig. 1). These meadow orchards represent an enormous pool for apple varieties – mainly **old apple varieties** that have been traditionally grown there. In many cases these varieties show completely different sensory properties than fruits from new varieties.

Fig. 1: Example of a traditional meadow orchard
(Source: www.streuobstwiesen-niedersachsen.de)

'The Scent of Apples' is not only the title of a short story by Bienvenido N. Santos, but also the issue of our recent investigations concerning the perceived odour when sniffing intact ripe apples. Therefore, 15 different apple varieties were analyzed with respect to the volatiles emitted by the intact fruit. In this study, we aimed to answer the following to questions:

- **Is it possible to differentiate apple varieties by sniffing the intact apples only?**
- **By means of GC analysis – is it possible to interpret the differences by investigating the primary flavour compounds?**

Materials and Methods

For the characterisation of the scent of the intact apples we used two different techniques that deliver complementary information regarding the primary flavour compounds of the investigated apple varieties.

Apple varieties

- 8 old varieties (***Bohnapfel***, *Boskop, Cox Orange Ilzer Rose,* ***Kronprinz Rudolf****, Leder Renette,* ***Maschanzker*** *Schafsnase*)
- 7 new varieties (***Braeburn***, *Elstar, Gala, Pinova* ***Golden Delicious***, *Rubinette, Topaz*)

Sensory evaluation

- Trained panellists
- Intact apples in glass jars with lids
- Evaluation of the smell after opening the lid
- Descriptive analysis
- Projective mapping

Analysis of the volatiles

- Intact apples in glass jars
- Enrichment of the volatiles after equilibration
- Headspace-SPME of the volatiles
- GC-MS analysis

Results

Sensory evaluation showed that it is possible to differentiate between the 15 apple varieties of interest according to the smell of the intact fruits (results not shown). However, there was no clear separation between old and new varieties. Figure 2 and 3 show the characteristics of three old and two new selected apple varieties that were of special interest for this study. The two old varieties *Bohnapfel* and *Kronprinz Rudolf* were separated from the other varieties of interest mainly due to their expressed fruitiness. Three esters with expressed fruitiness and low odour thresholds (i.e. **ethyl butanoate, ethyl-2-methyl butanoate, ethyl hexanoate**) can only be found in relevant amounts within the primary flavour compounds of *Bohnapfel* and *Kronprinz Rudolf*, explaining the expressed fruitiness of these varieties.

Sensory Analysis

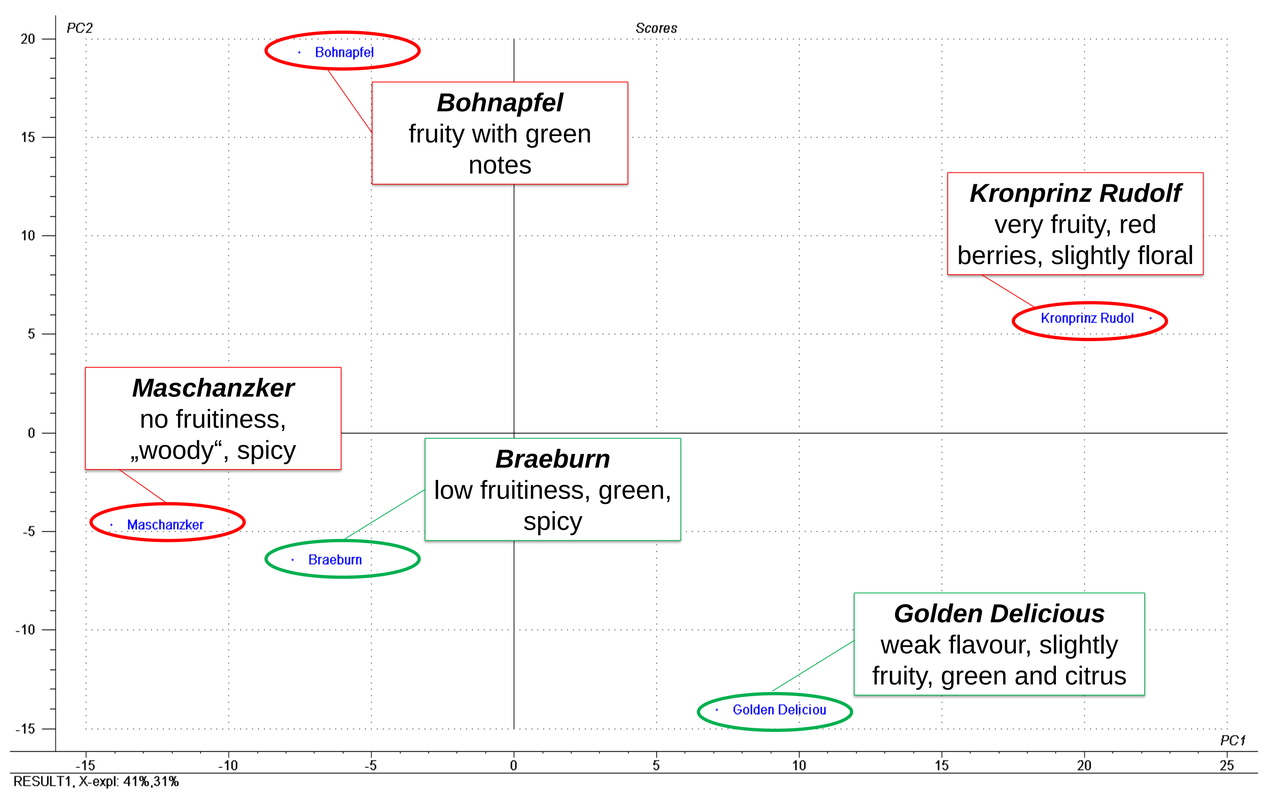

Fig. 2: Projective Mapping: Classification according to similiarities/differences in odour from 5 varieties of Interest
red :old varieties; green: new varieties

GC-MS Analysis

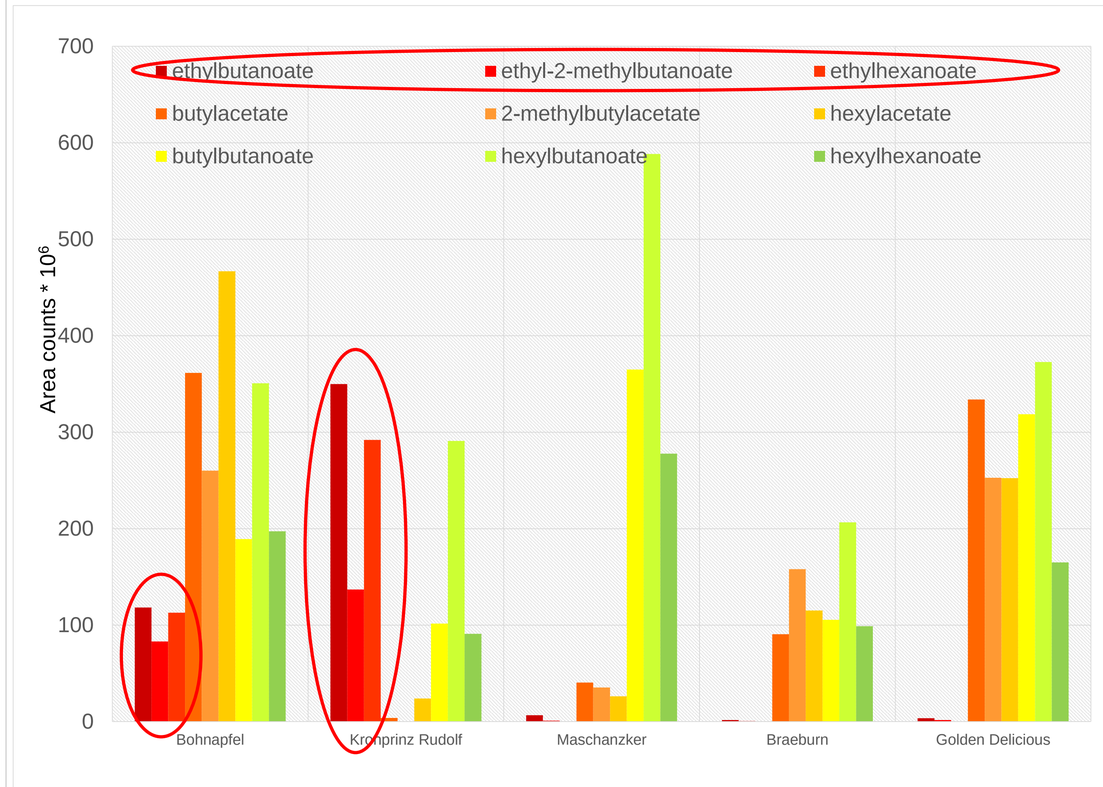

Fig. 3: Comparison of ester patterns of the five apple varieties of special interest

Thanks to…. the members of the sensory test panel for evaluating the apple samples.