# Apple Flavour Characterisation from Skin to Flesh – On Basis of the Old Apple Variety ‘Ilzer Rose’


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

[1]Graz University of Technology, Institute of Analytical Chemistry and Food Chemistry, 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

**Fig. 1: An halved ‚Ilzer Rose‘ apple:** intense-red apple with white flesh

Apple cultivation has a long tradition in Austria, especially in Styria. About 25% of Styrian apples are grown in so-called meadow orchards. The traditional meadow orchards have been a specific type of landscape for hundreds of years and accommodate an enormous number of old apple varieties. Even though these varieties have been cultivated in this region for many decades, the flavour properties are not described. For most varieties, a molecular characterisation of the flavour compounds is lacking.

The old apple variety ‘Ilzer Rose’ is one of these varieties which have been described especially from this region near the village Ilz since about 1900. The rather small, intense-red apples with white flesh have a very pleasant, intense fruity and slightly rose-like flavour which makes it interesting for producers of high quality apple juices, ciders and other products thereof.

## Materials and Methods

The formation of flavour compounds is dependent on enzyme activities of the fruits, but also on the conditions used during fruit processing.To be able to focus on primary flavour compounds, apple enzymes were inactivated as far as possible by applying a procedure described in [1].

**Fig. 2: The enzyme-inactivated ‚Ilzer Rose‘ apple:** flesh only , flesh and skin, skin only (left to right)

### Sensory Methods

The inactivated apple samples were evaluated by an expert panel in white cups.
The following methods were used:

- Descriptive Analysis
- QDA Quantitative Descriptive Analysis®

### GC-Methods

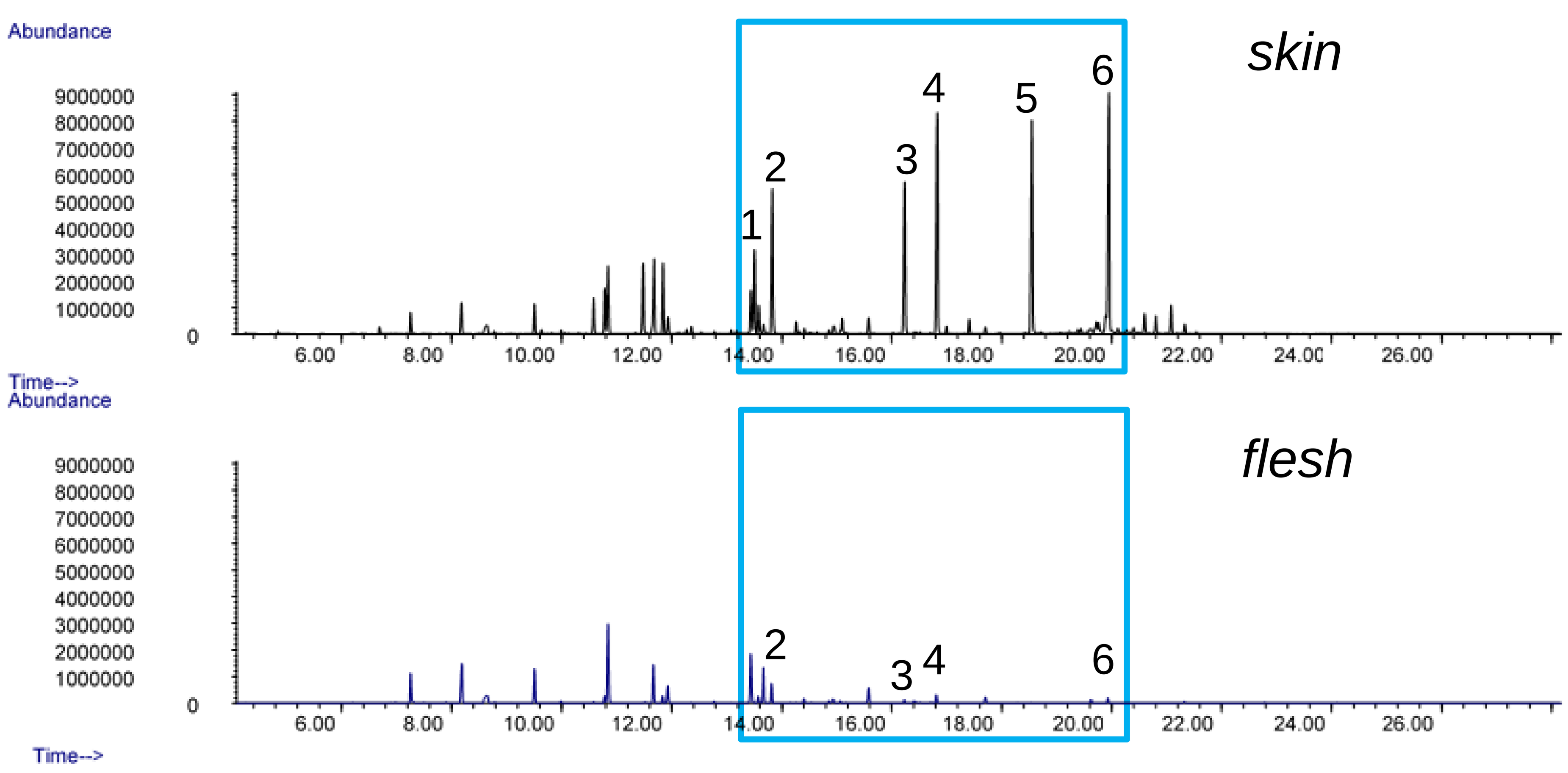
Gaschromatographic analysis were performed by using the following techniques:

- Inactivation of genuine enzymes
- Headspace Solid Microextraction (2 cm 50/30 µm DVB/Carboxen/PDMS)
- 1-dim. Gas chromatography-mass spectrometry GC-MS on HP5
- Comprehensive GC x GC-MS
  1st dim.: 30 m ZB-5MS 0.25mm*0.25µm
  2nd dim.: 2.5 m BPX50 0.15mm*0.15µm

## Results

Descriptive analysis of the enzyme-inactivated sliced ‘Ilzer Rose’ apples showed a distinct flowery/floral flavour with pronounced crispiness and fruitiness. GC-MS analysis of the volatile compounds revealed significantly higher concentrations of a few volatile compounds in the skin compared to the flesh of the apple (Fig.3). Results from Comprehensive GC x GC-MS (Fig.4) show the differences more pronounced between the volatiles of the flesh and the skin. The amount of the sesquiterpenes and of 5 compounds (6-methyl-5-hepten-2-one, hexyl acetate, hexyl butanoate, hexyl-2-methyl butanoate and hexyl hexanoate) is many times higher in the skin than in the flesh. These results are well reflected in the sensory impression – it is the skin of Ilzer Rose showing the typical flowery/floral flavour and not the flesh alone.

### GC-MS Analysis




1: 6-methyl-5-hepten-2-one
2: hexyl acetate
3: hexyl butanoate
4: hexyl-2-methylbutanoate
5: hexyl hexanoate
6: α-farnesene

**Fig. 3: 1 dim. GC-MS Analysis**: Significantly higher concentrations of selected volatile compounds can be found in the skin sample in comparison to the flesh of the Ilzer Rose apple.

### Comprehensive GCxGC-MS Analysis

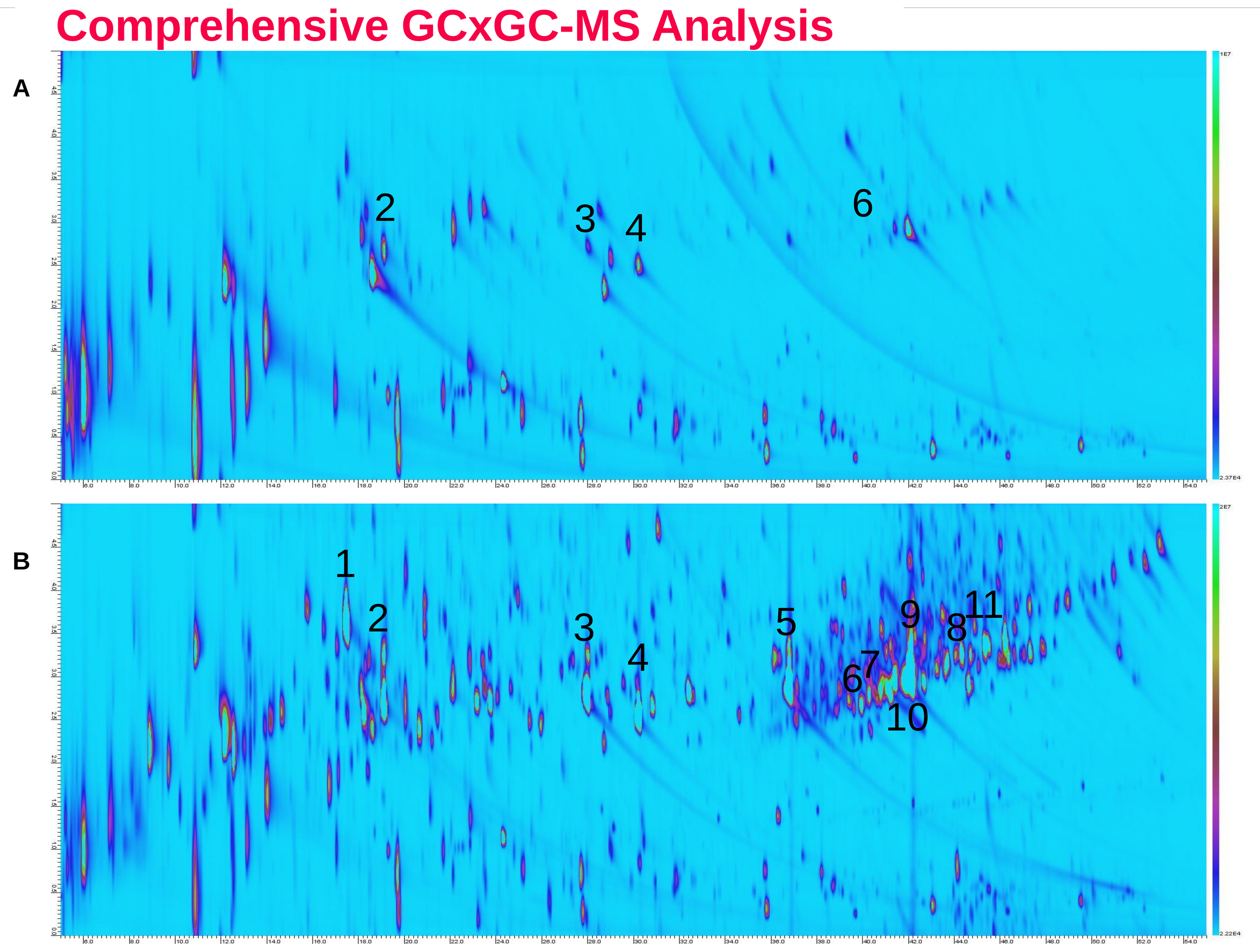



**Fig. 4: Comprehensive GCxGC-MS Analysis**: volatile compounds from Ilzer Rose apple, A: flesh sample; B: skin sample; (1) 6-methyl-5-hepten-2-one, (2) hexyl acetate, (3) hexyl butanoate, (4) hexyl-2-methylbutanoate, (5) hexyl hexanoate, (6) α-farnesene, (7) cis-β-farnesene, (8) cis-thujopsene, (9) β-longipinene, (10) β-Vatirenene, (11) cis- α-Santalol


**Reference:**
1. M.L. Corollaro, I. Endrizzi, A. Bertolini et al. (2013) Postharvest Biology and Technology, 77, 111-120.