

# MIRROR, MIRROR ON THE WALL, WHICH IS THE BEST TOLERATED APPLE OF ALL?



## BACKGROUND

- Various health benefits are attributed to apples, due to their high content of secondary plant metabolites, e.g. polyphenols
- Simultaneously, an estimated 2.5 million Germans suffer from an allergy against fresh apples
- Cause of this allergy in Northern- and Central Europe is Mal d 1, a cross allergen of Bet v 1, the main allergen in birch pollen

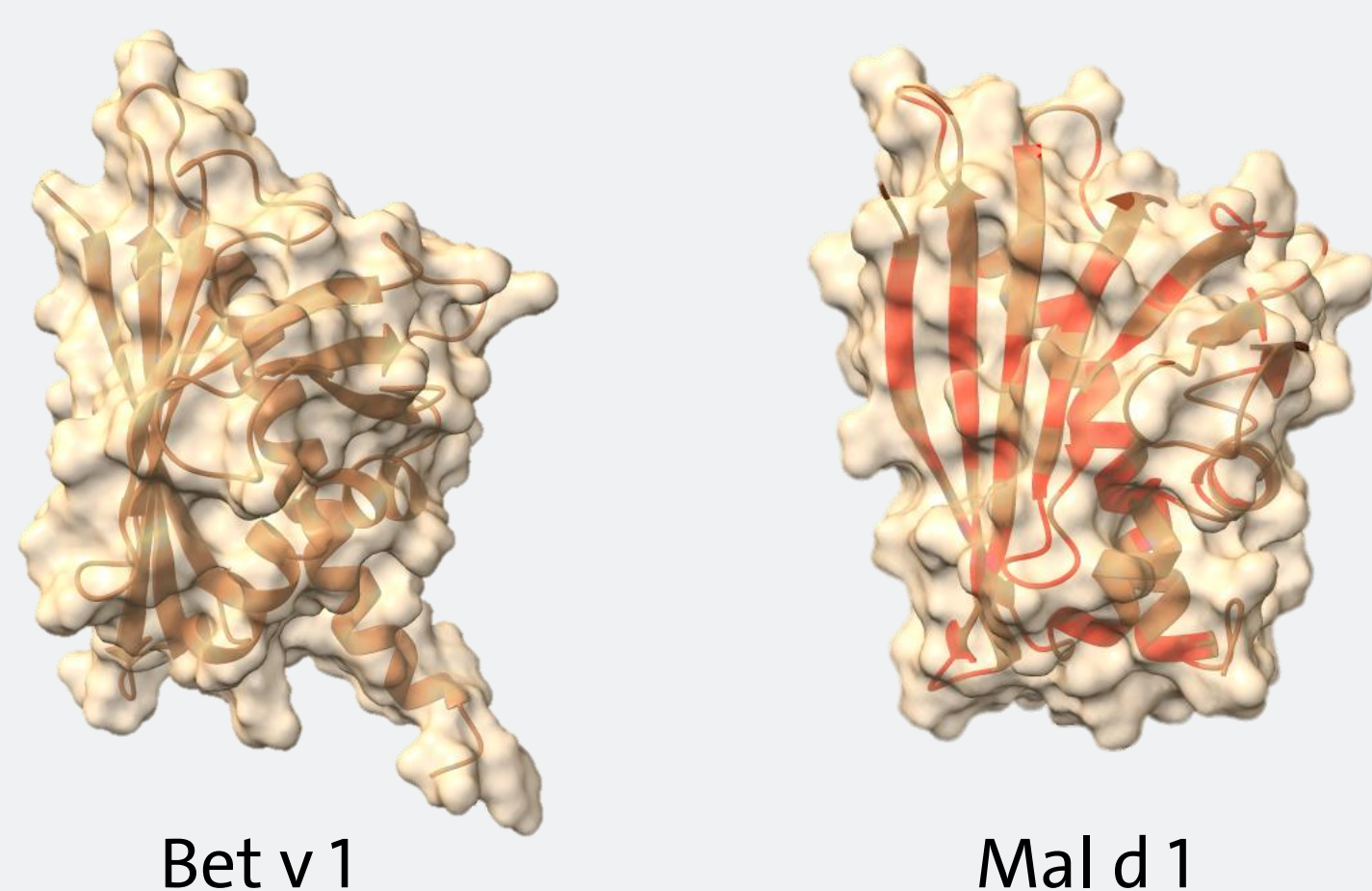


Fig. 1: Overlay of surface- and ribbon model of Bet v 1.0101 und Mal d 1.0101

- Symptoms of an apple allergy are usually mild and restricted to the oral cavity
- Clinical studies indicate a variety specific allergenic potential
- For example: a better tolerability of traditional apple varieties from orchard meadows is reported

**BUND - Lemgo**  
 Info Apfelallergie  
<http://www.bund-lemgo.de/apfelallergie.html>

Statistik - Anzahl der Apfelsorten, die von Allergikern als **verträglich** bzw. **unverträglich** gemeldet worden sind. Erfasst werden in der Zusammenfassung Sorten zu denen mindestens 3 Meldungen vorliegen. Gesamtliste im Internet - Stand Nov. 2022

Sorte*)	ver-träglich	unver-träglich	Poly-phenole	Sorte	ver-träglich	unver-träglich	Poly-phenole
Adamsapfel	09	01	1.310 <sup>3)</sup>	Luxemburger Triumph	06	00	1.155 <sup>3)</sup>
Adams Paräne	08	00		Madame Lesans Kalvill	10	00	
Adersleber Kalvill	05	01		Metzenette	03	00	2.296 <sup>3)</sup>
Alantapfel	06	00		Minister von Hammerstein	07	00	
Alkmene	126	10		Mutterapfel	05	00	
Ananasrenette	27	03	1.372 <sup>3)</sup>	Notarisapfel	09	00	1.585 <sup>3)</sup>
Apfel aus Cronela	06	00	2.003 <sup>3)</sup>	Ontario	40	02	2.790 <sup>3)</sup>
Altländer Pfannkuchenapfel	17	04	1.630 <sup>3)</sup>	Perle von Angeln	03	00	1.022 <sup>3)</sup>
Berlespich, Goldrenette	79	05	756 <sup>3)</sup>	Pilot	09	03	
Berner Rosenapfel	07	00	1.033 <sup>3)</sup>	Pink Lady	07	31	438 <sup>3)</sup>
Biesterfelder Renette	25	01	1.120 <sup>3)</sup>	Pinova	16	05	
Braeburn	10	16	414 <sup>3)</sup>	Prinz Albrecht von Preußen	60	06	1.231 <sup>3)</sup>

Fig. 2 Excerpt of the consumer survey by the BUND Lemgo (source: <http://www.bund-lemgo.de/apfelallergie.html>)



Which apple to choose?

## RESEARCH QUESTION

What are the effects of variety and other parameters, e.g. storage, on the allergenic potential of an apple?

## HYPOTHESES INVESTIGATED

- Differences in the allergen content
- Differences in the Mal d 1 profile and different allergenic potential of isoallergens
- Interactions of polyphenols with Mal d 1 and masking of IgE epitopes

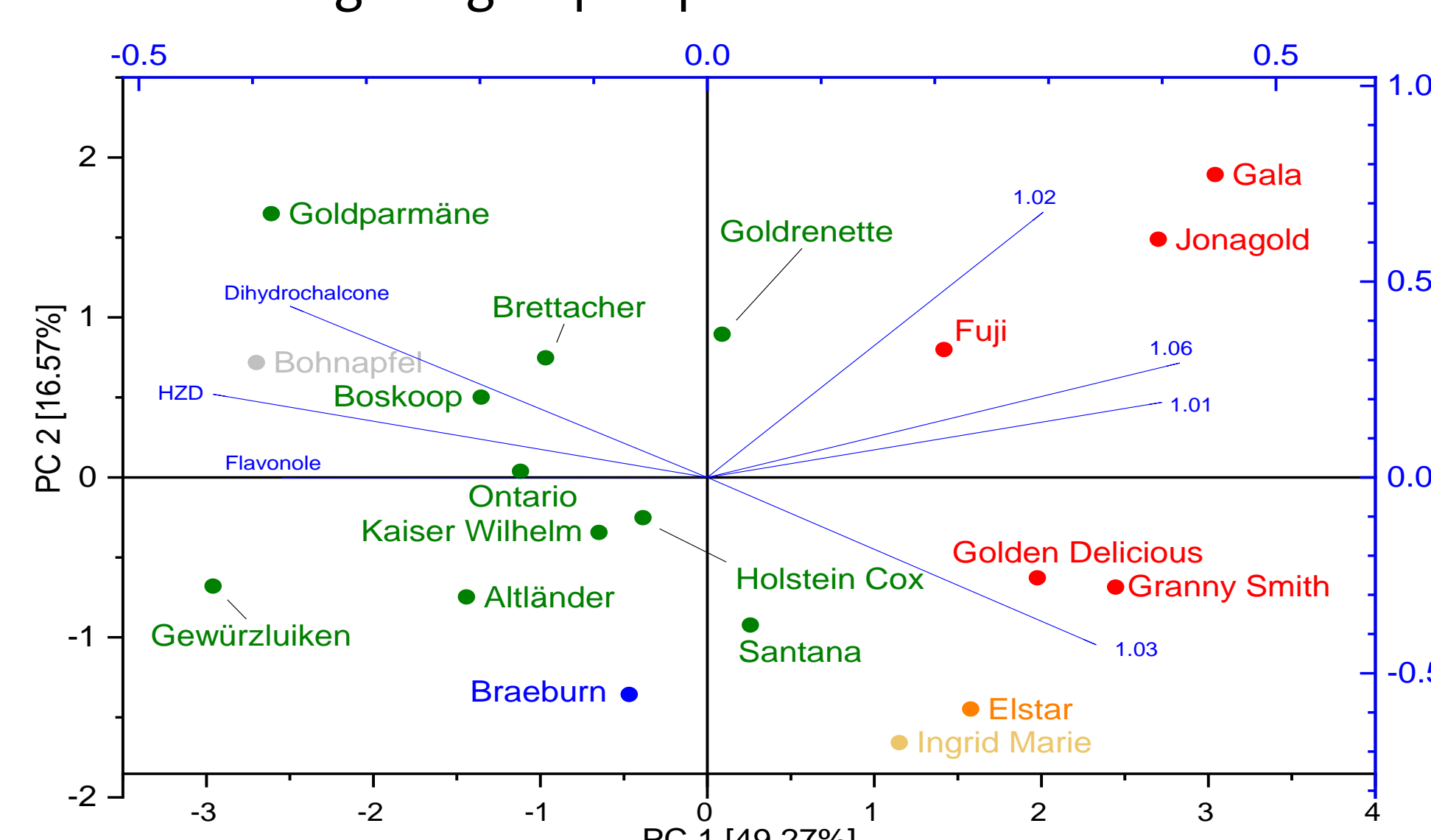


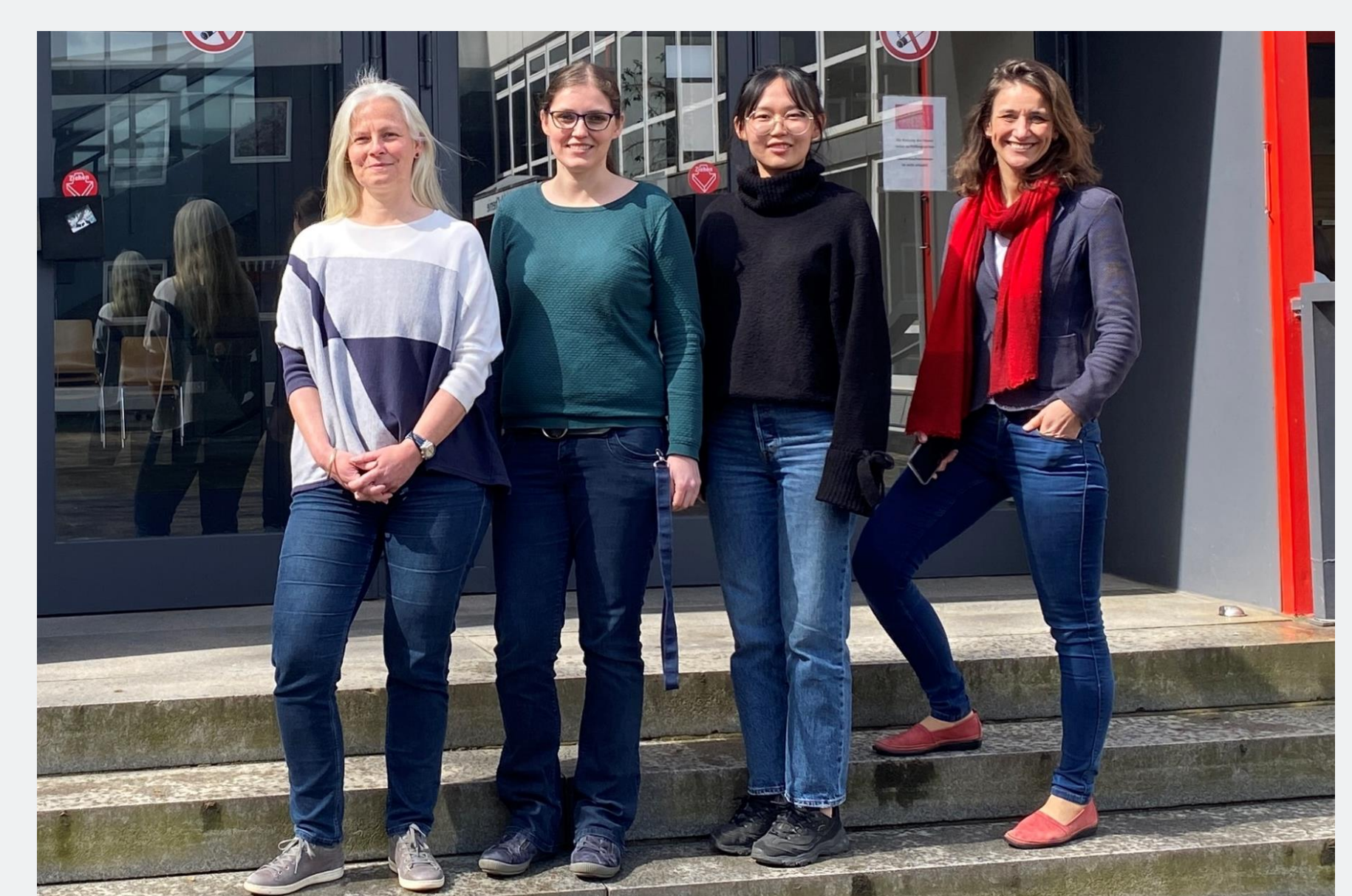
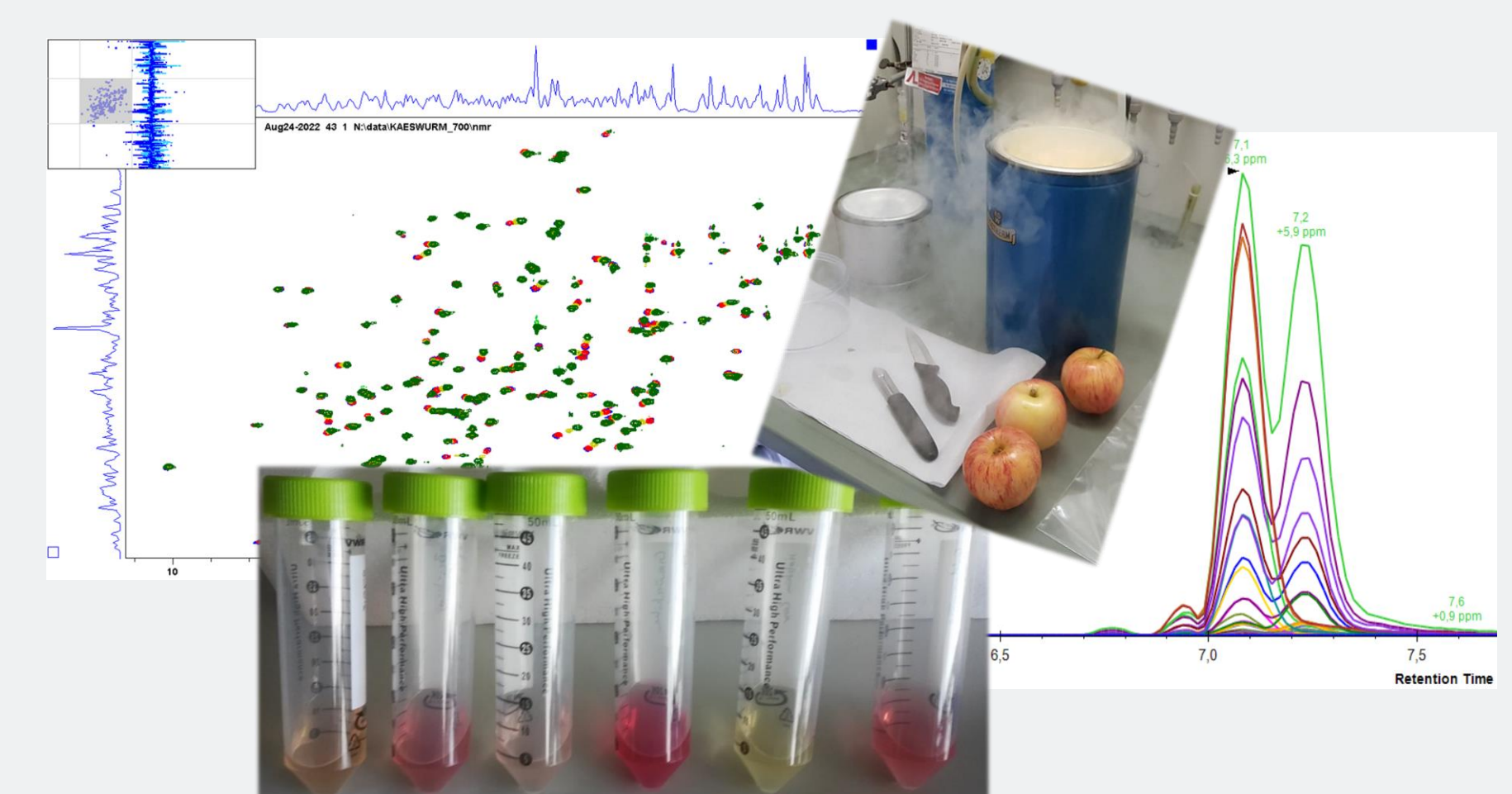
Fig. 4: PCA of the Mal d 1- and polyphenol content of various apple varieties. Samples are color coded based on the reported allergenic potential in the consumer survey of the BUND Lemgo

## METHODS

- Quantification and qualification of Mal d 1 by targeted and untargeted HPLC-MS
- Characterization and quantification of Polyphenols by HPLC-MS and HPLC-DAD
- Interaction studies by ITC, NMR and HPLC-MS HPLC-MS

## TOPICS FOR FINAL THESES

- Study on the bioaccessibility of polyphenols and Mal d 1 during the consumption of fresh apples (oral ex vivo digestion model)
- Investigating impact factors during cropping and storage that affecting the isoallergenprofile and Mal 1 content
- Investigation of possible interactions of apple specific polyphenols and r-Mal d 1 using ITC und <sup>1</sup>H<sup>15</sup>N-HSQC-NMR
- Development of an extraction method for polyphenol-oxidase from apples for studying the browning kinetics of different polyphenolic structures and the influence of matrix compounds using ITC and HPLC-MS
- Own topics :-P



**JULIA KAESWURM**  
 AG Buchweitz – Polyphenol-Matrix Interaktionen  
 Institut für Lebensmittelchemie  
 Fachbereich Chemie

E-Mail: [julia.kaeswurm@uni-hamburg.de](mailto:julia.kaeswurm@uni-hamburg.de)  
 Büro HS 005 – Martin-Luther-King-Platz 6

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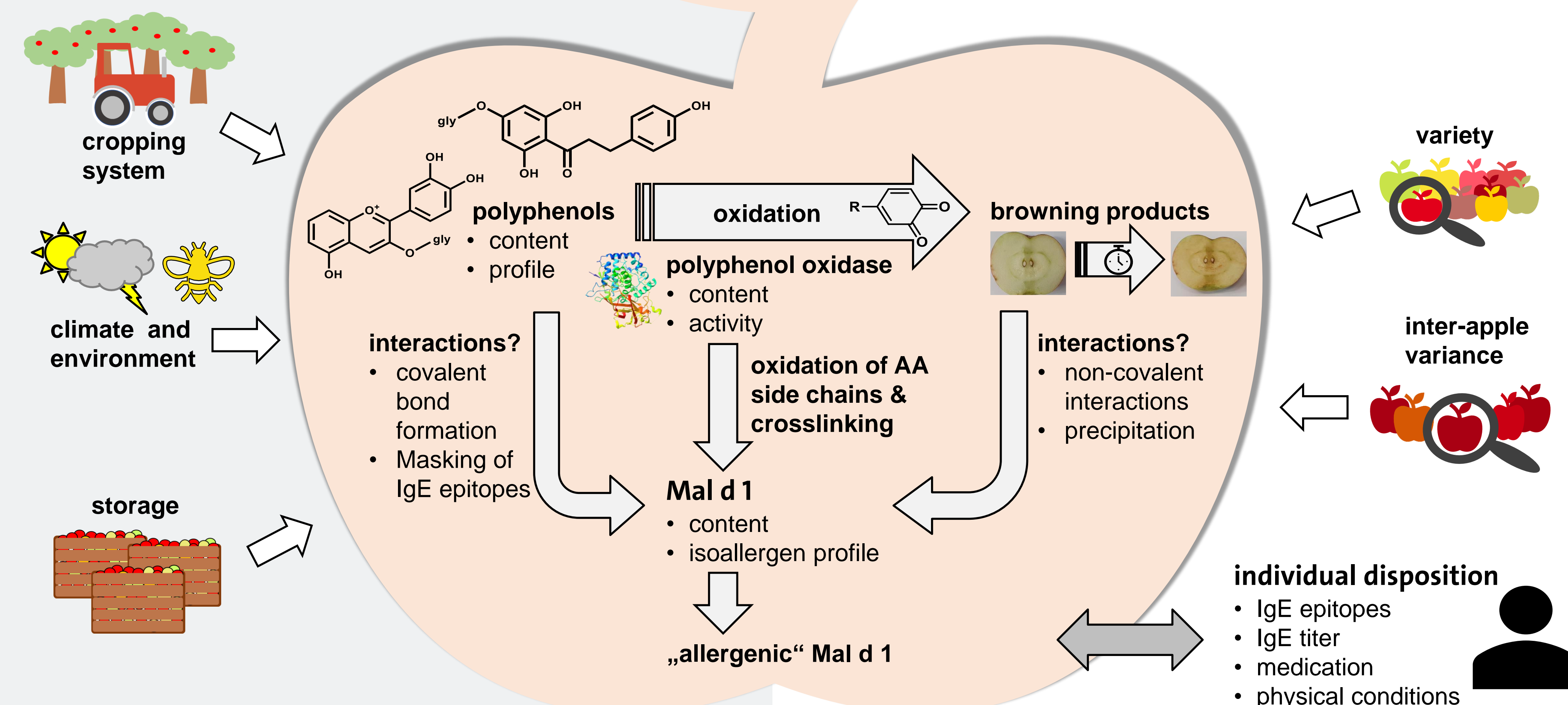


Fig. 3.: Possibel impact factors on the allergenic potential of apples