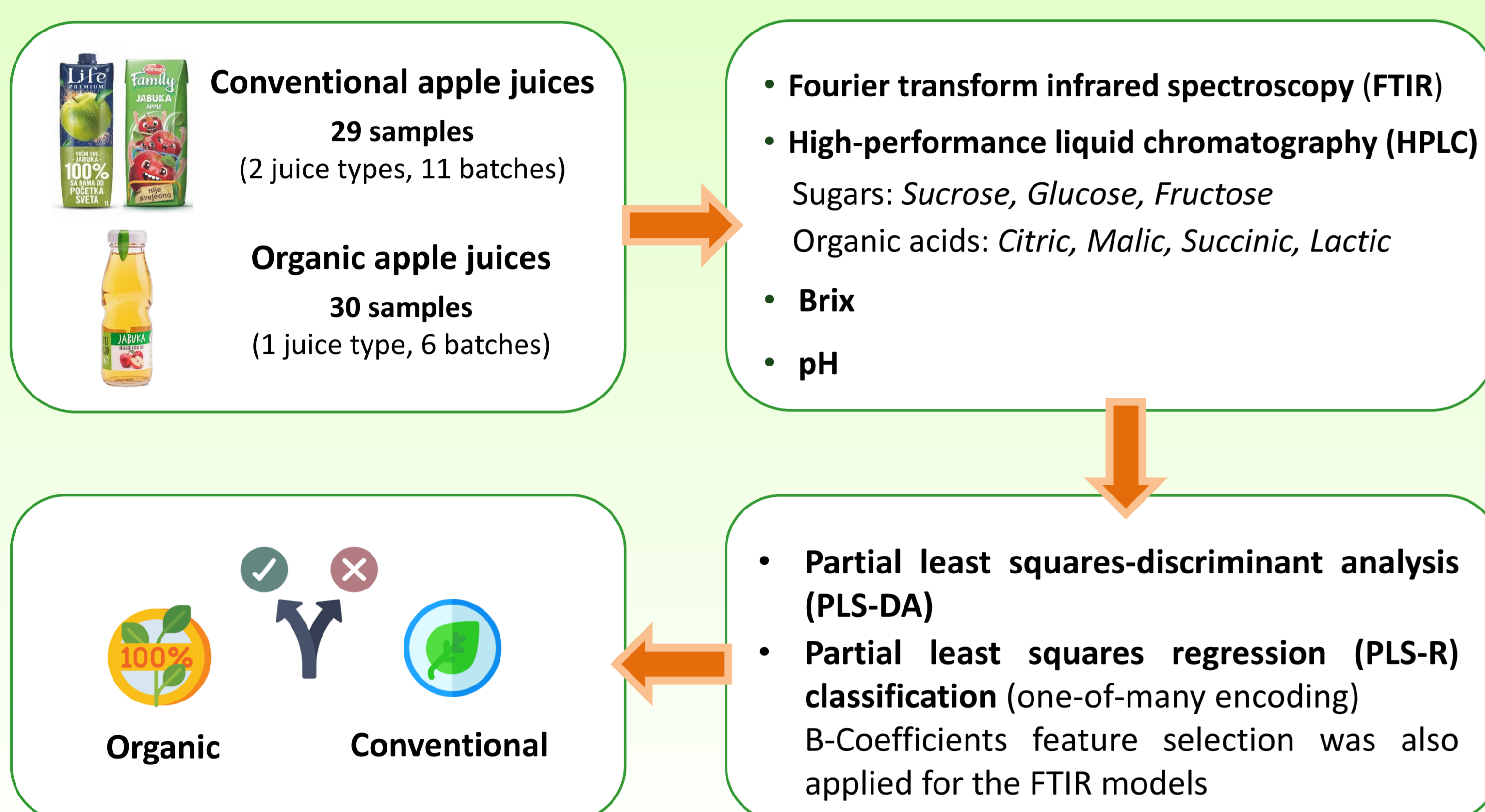


INTRODUCTION

Apple juice is one of the most common sources of food fraud, highlighting the necessity of developing targeted methods for organic and non-organic apple juices discrimination. Therefore, this study aimed to develop and implement rapid analytical techniques for the discrimination between organic and non-organic apple juice.

METHODS



RESULTS

Typical FT-IR spectra of organic and non-organic apple juice samples can be seen in Fig. 1. Further analysis of the spectra was performed by PLS-R modelling.

The results indicated that the PLS-R classification models using the FTIR data showed a discrimination accuracy between organic and non-organic apple juices, up to 73.48% correct classification after cross validation.

When feature selection was applied on PLS- FTIR models, the classification accuracy reached 85.45% (Table 1), with only 1 non-organic sample being classified as non-organic.

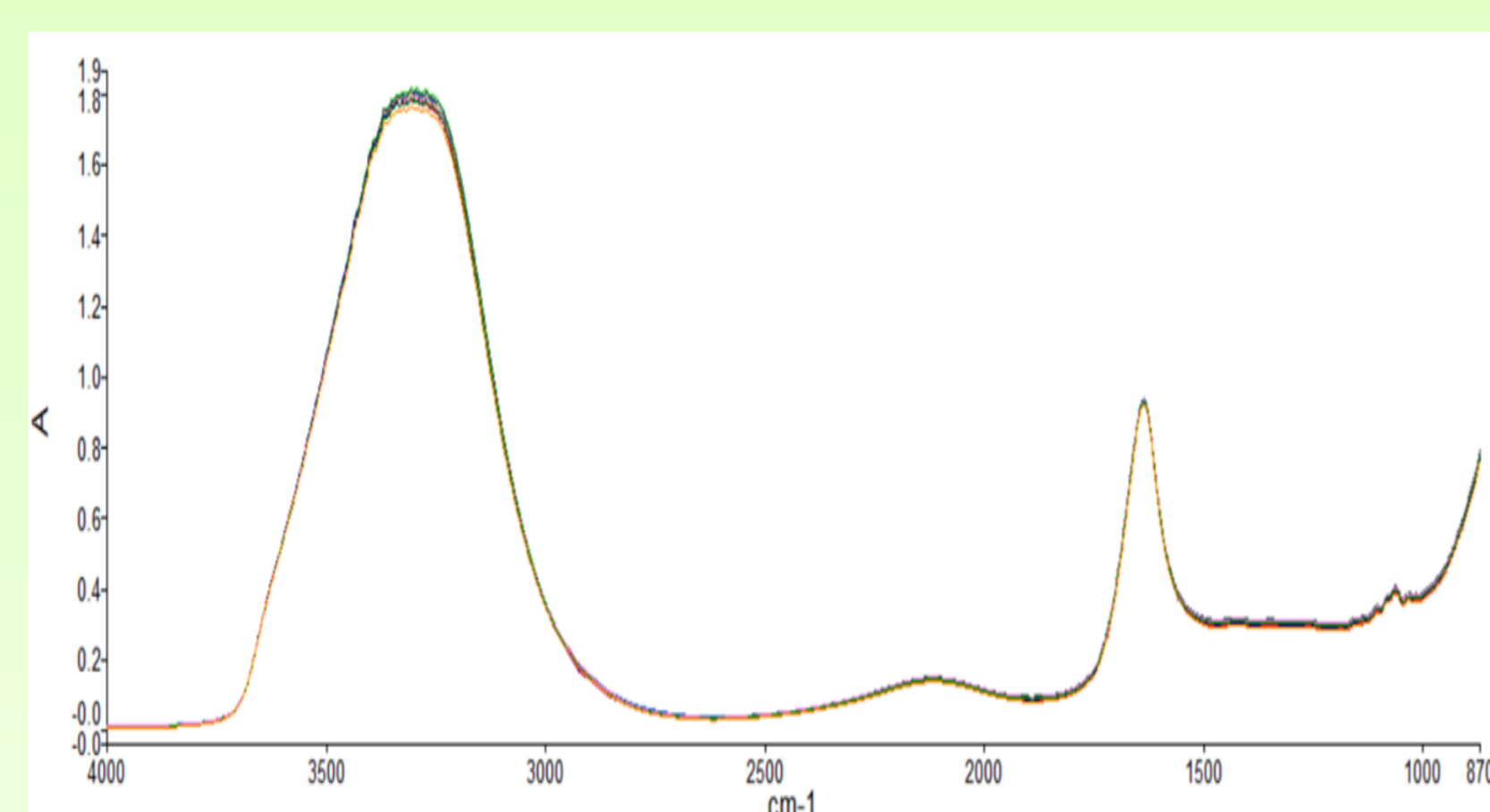


Fig. 1. Raw FTIR spectra of organic and non- organic apple juices

Table 1. Confusion matrix of the PLS-FTIR model for the validation dataset after feature selection

True Class	Predicted Class		Correct classification
	Non-organic	Organic	
Non-organic	23	1	95.83
Organic	7	24	77.42
	Total		85.45

RESULTS

The PLS-DA models with the HPLC data offered high accuracy in discriminating between organic and non-organic apple juices with R^2 reaching values up to 0.983 (Fig. 2). Additionally, it was shown that the most important variables were citric acid, followed by malic and succinic acids and sucrose, indicating them as possible key markers for future applications.

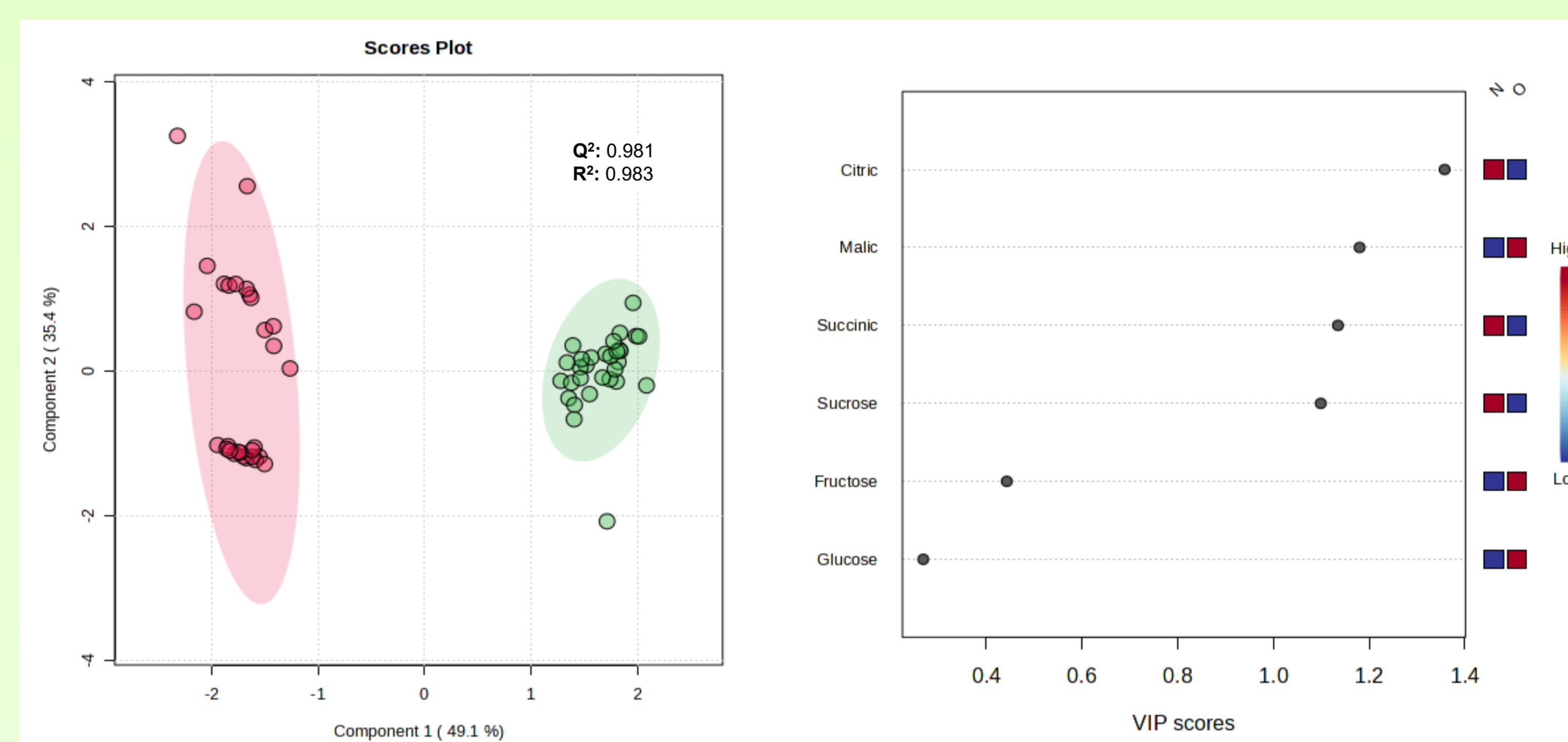


Fig. 2. PLS-DA analysis of the HPLC data for the discrimination between organic and non-organic apple juices (● Organic, ● Non-organic)

Similar results were obtained when Brix and pH values were included in the PLS-DA model along with the HPLC data (Fig. 3). It was shown that the most important variables were citric acid, followed by malic and succinic acids, sucrose and Brix.

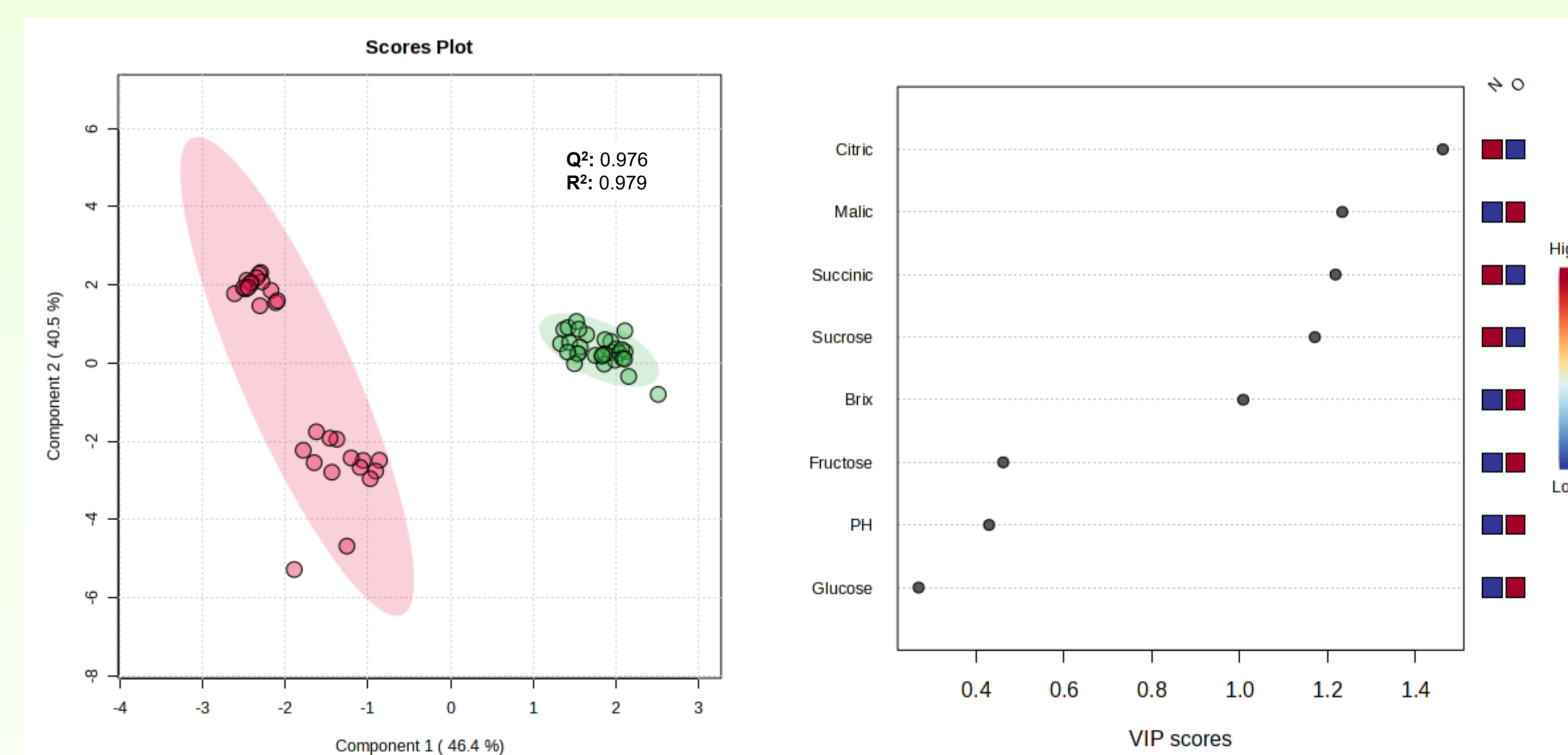


Fig. 3. PLS-DA analysis of the HPLC, Brix and pH data for the discrimination between organic and non-organic apple juices (● Organic, ● Non-organic)

SIGNIFICANCE

This research contributes to the development of more efficient methods for ensuring the quality and integrity of apple juice in both the organic and conventional markets and prevent fraud.