Application of near infrared spectroscopy for the detection of honey adulteration

Mariem Majadi[1] ; Zsanett Bodor[1,2] ; Zoltan Kovacs[1]

[1] Department of Measurements and Process Control, Hungarian University of Agriculture and Life Sciences, Budapest, Hungary

[2] Department of Dietetics and Nutrition, Faculty of Health Sciences, Semmelweis University, Budapest, Hungary

Introduction

- Nowadays, honey, is one of the most likely food products to be a target for adulteration
- Greed, escalating environmental issues and spread of diseases among honeybee populations means that honey is becoming an increasingly rare product and therefore ➜ honey adulteration is on the rise
- Most common honey frauds involves the addition of inexpensive and artificial sweeteners ➜ difficult to detect, owing to the fact that the sugar compositions of these low-cost syrups were sometimes similar to those of authentic honey
- Existing methods for honey authentication are expensive, limited and time consuming ➜ A need for rapid methods

The main goal is to investigate the applicability of near infrared spectroscopy technique to detect the adulteration of honey
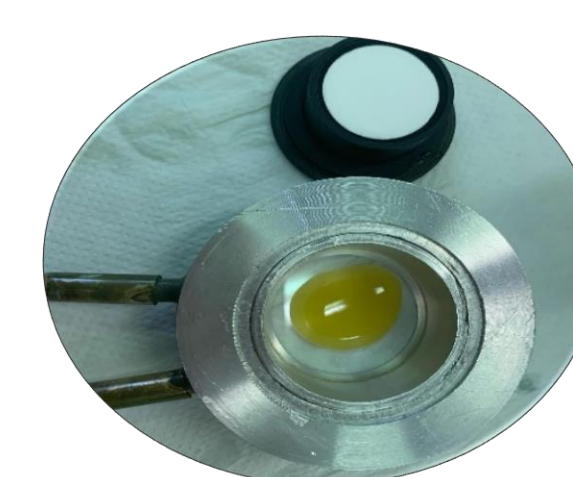
Materials and Methods

Sample preperation

Honey Samples (3):
HA-sunflower honey
BN-rapeseed honey
MC-honeydew honey

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Sugar syrups (3):
RS-rice syrup
FS-high fructose corn syrup
GF-glucose fructose syrup

Adulteration levels : 0% , 3% , 5% , 10% , 100% (w/w)
Each level is performed in **three replicates**
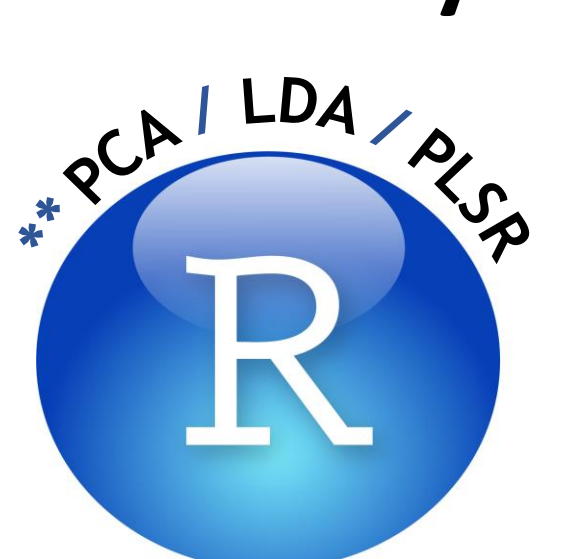**N= 99 samples**

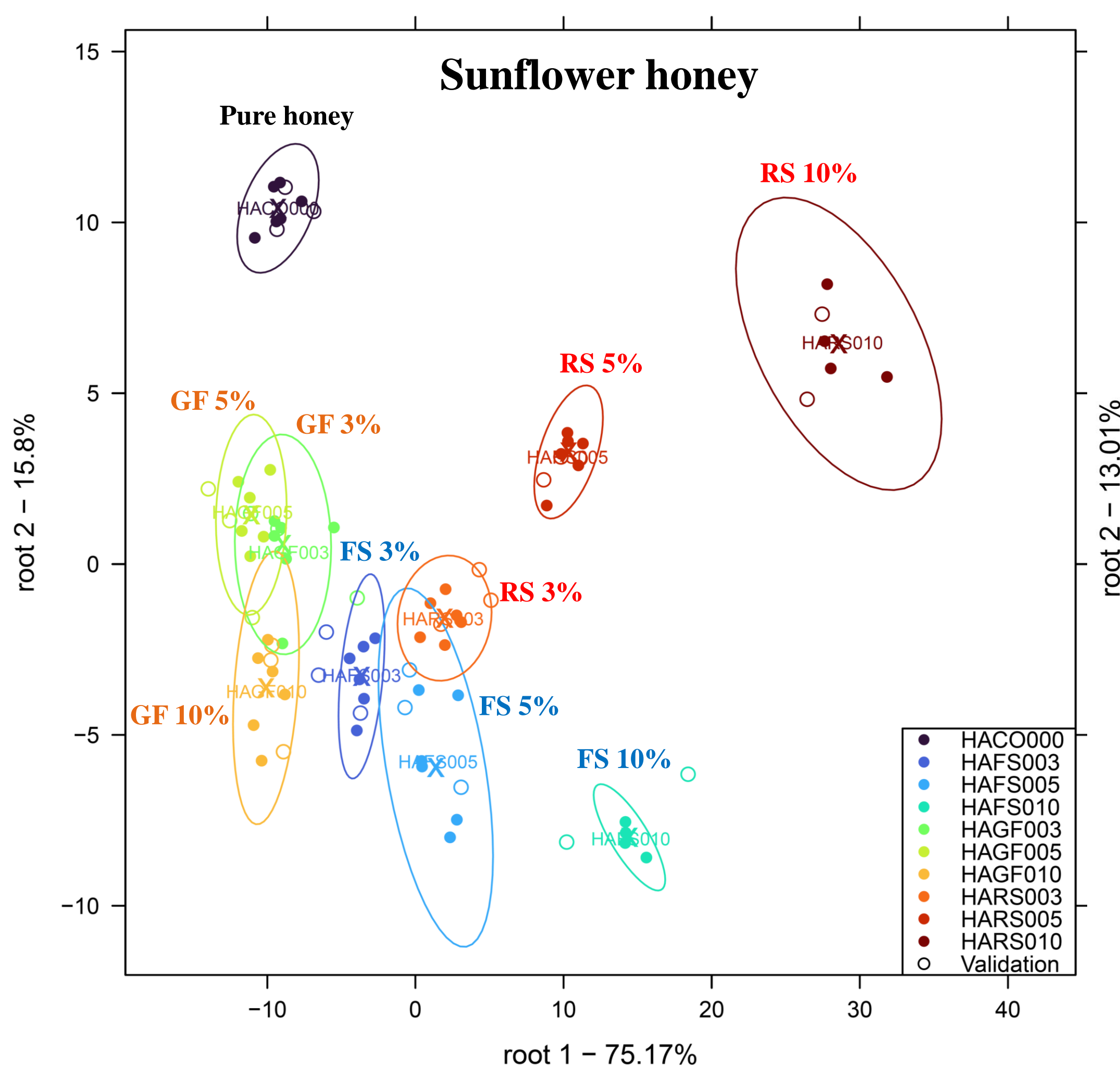**Spectral collection**

Thermoregulated cuvette (25°C)

- Benchtop MetriNIR spectrometer
- **Three consecutive Transflectance** spectra/ each sample

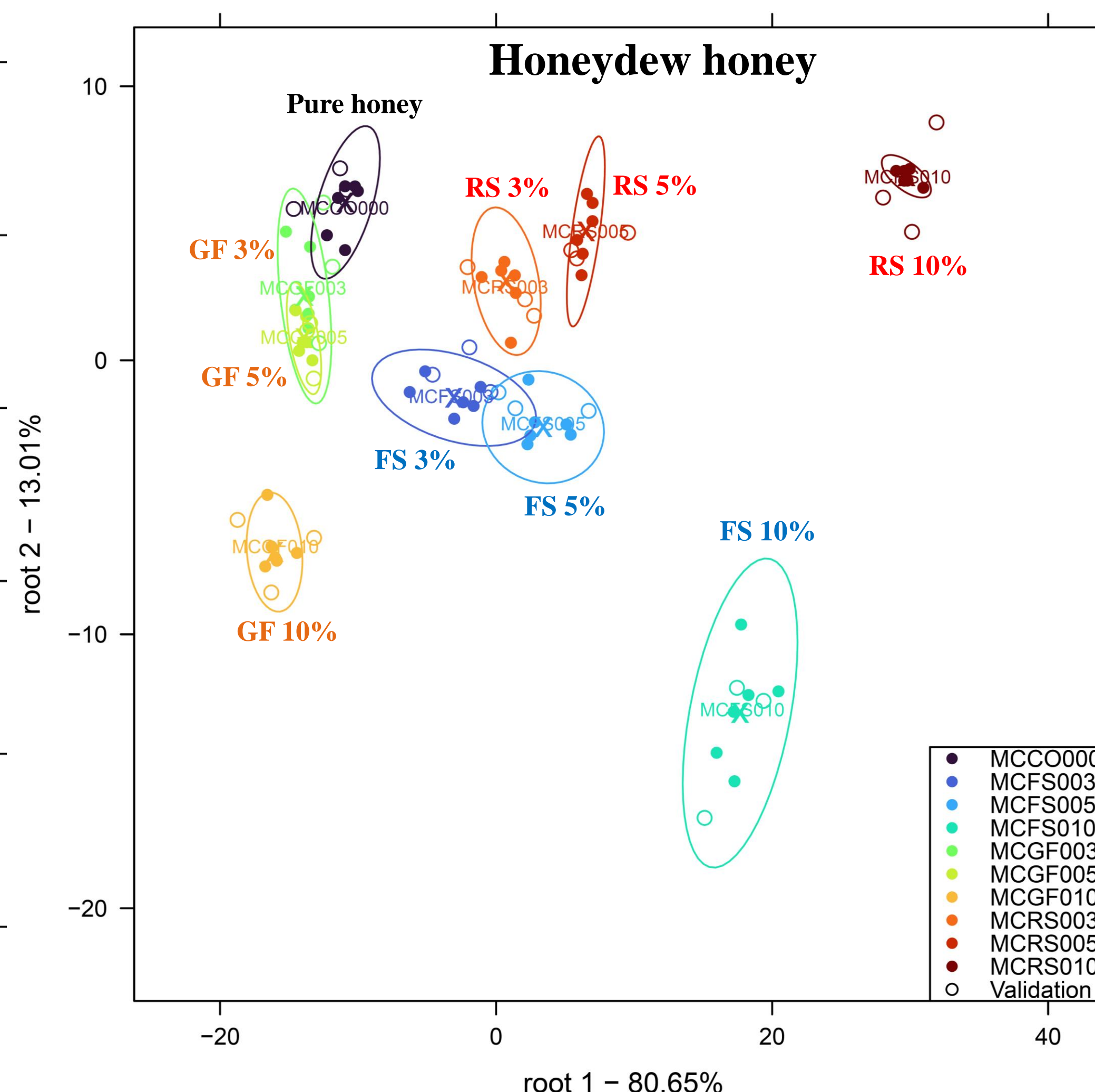**Data analysis**

** PCA / LDA / PLSR

Classification Results

Average Recognition: 100 %
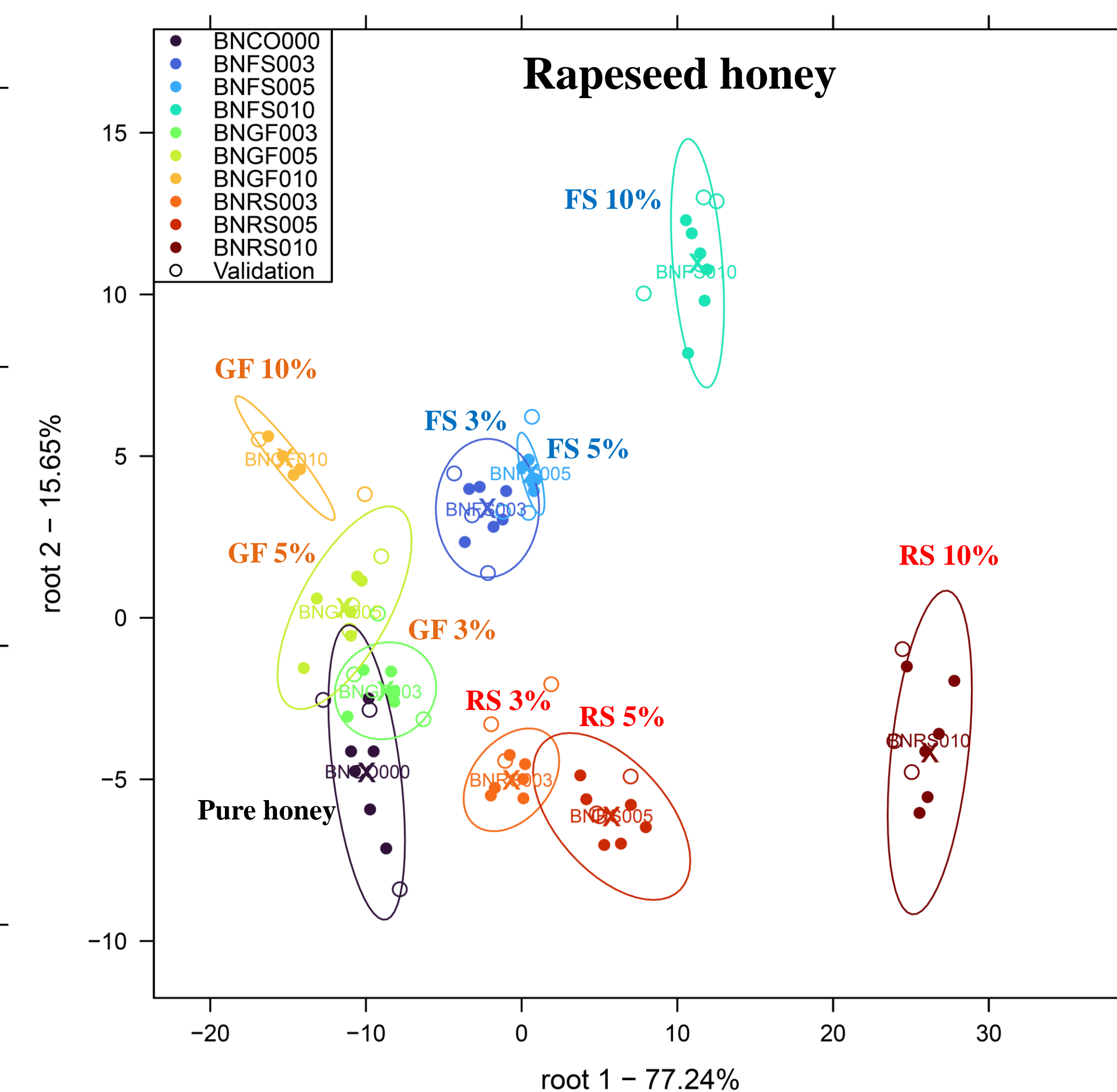**Average prediction: 95.6 %**

Classification of high fructose corn syrup, rice syrup and glucose fructose syrup in sunflower honey

Average Recognition: 99.4 %
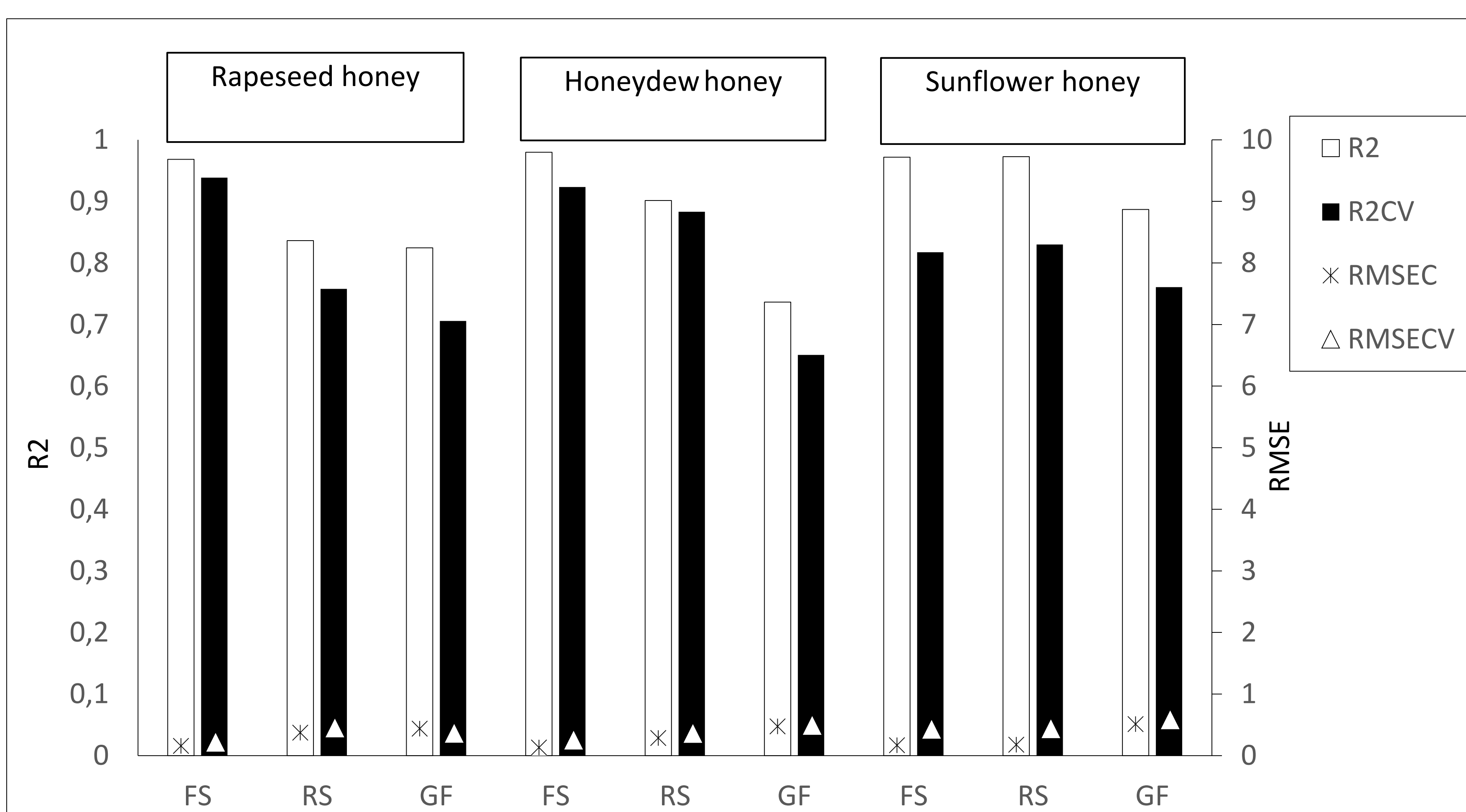**Average prediction: 97.8 %**

Classification of high fructose corn syrup, rice syrup and glucose fructose syrup in honeydew honey

Average Recognition: 100 %
Average prediction: 96.7 %

Classification of high fructose corn syrup, rice syrup and glucose fructose syrup in rapeseed honey

Prediction Results

PLSR prediction of high fructose corn syrup, rice syrup and glucose fructose syrup in rapeseed honey, honeydew honey and sunflower honey

Conclusion

- LDA classification models showed high accuracies in discriminating adulterated and authentic honey types. Misclassifications mostly occurred in the case of honey samples adulterated at level 3% and 5%. On the other hand, sample groups corresponding to 0 % (authentic honey) and 10% of adulteration showed the best classification (100%).

- FS, RS and GF concentrations in all the three different honey types could be predicted in PLSR with good accuracies.

- NIRS showed good potentials for honey authentication that could be explored for quality control purposes