

INTRODUCTION

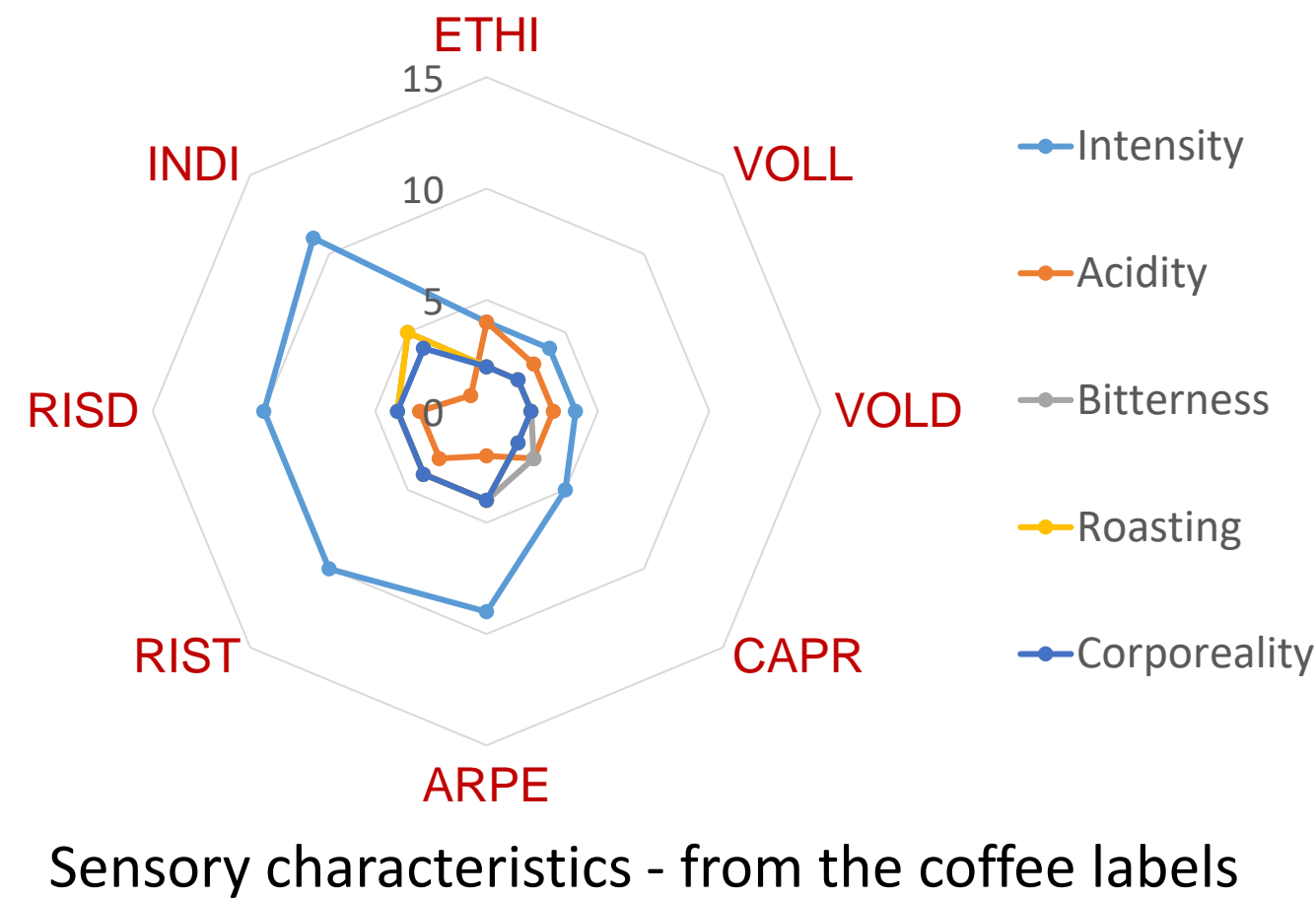
An ever changing market has brought the development of “coffee capsule”. A product which providing single serving doses, adjusts to the necessity of convenience and the new consumer habits. This brings the need to evaluate if this changes meet with the quality organoleptic parameters characteristic of coffee.

AIM

The aim of this study is to determine the applicability of electronic tongue (e-tongue) for the characterization of different types of coffee capsules and the prediction of their organoleptic properties.

MATERIALS AND METHODS

8 types of capsules of Nespresso



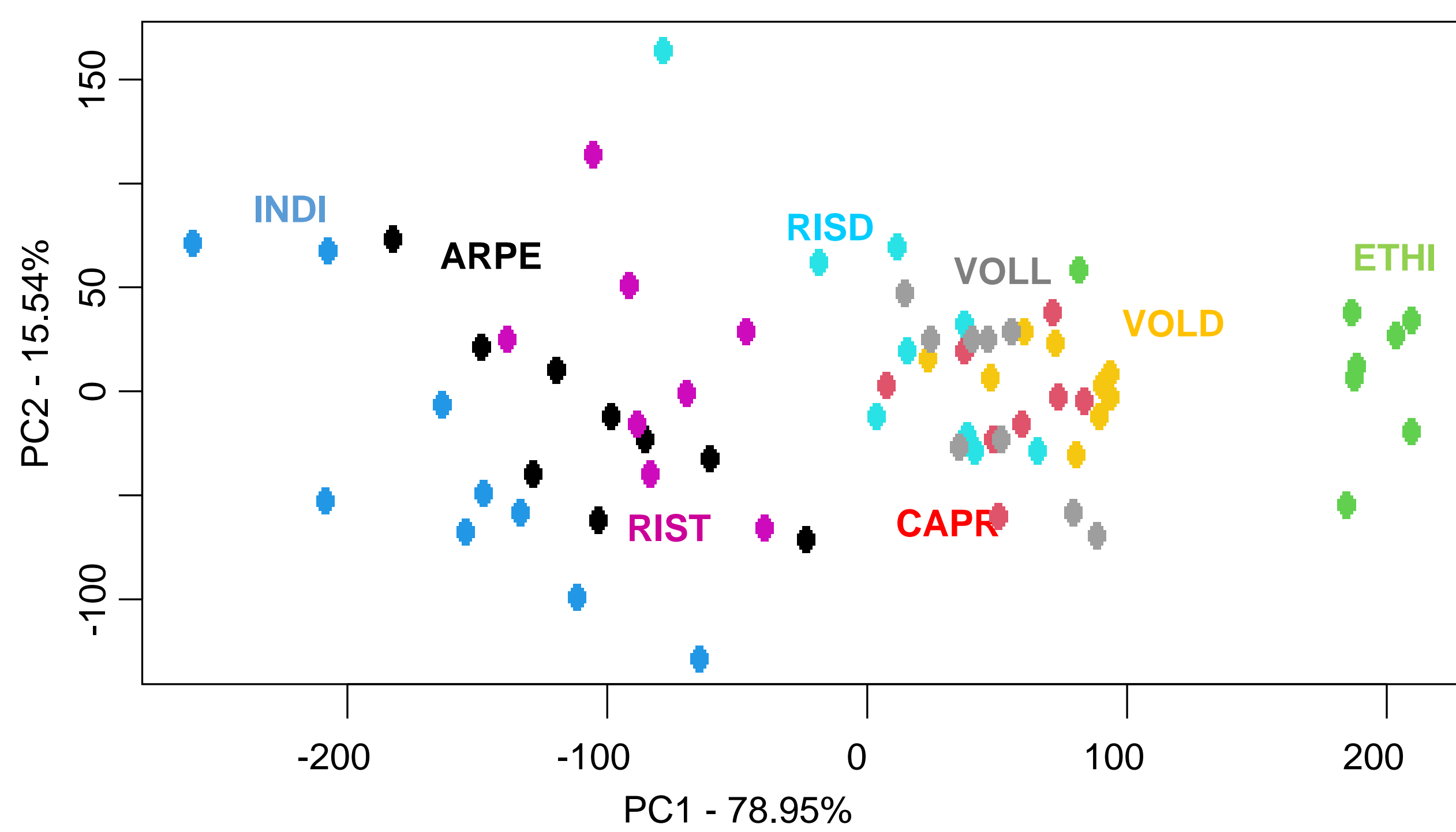
Sample preparation

- Coffee was brewed in De'Longhi Nespresso U coffee machine .
- 40 ml liquid/sample was 10 times diluted for e-tongue measurements.
- Each types of coffee was brewed in three replicates ($n_{\text{sample}} = 24$).
- Three measurements/sample with the e-tongue ($n_{\text{measurement}} = 72$).

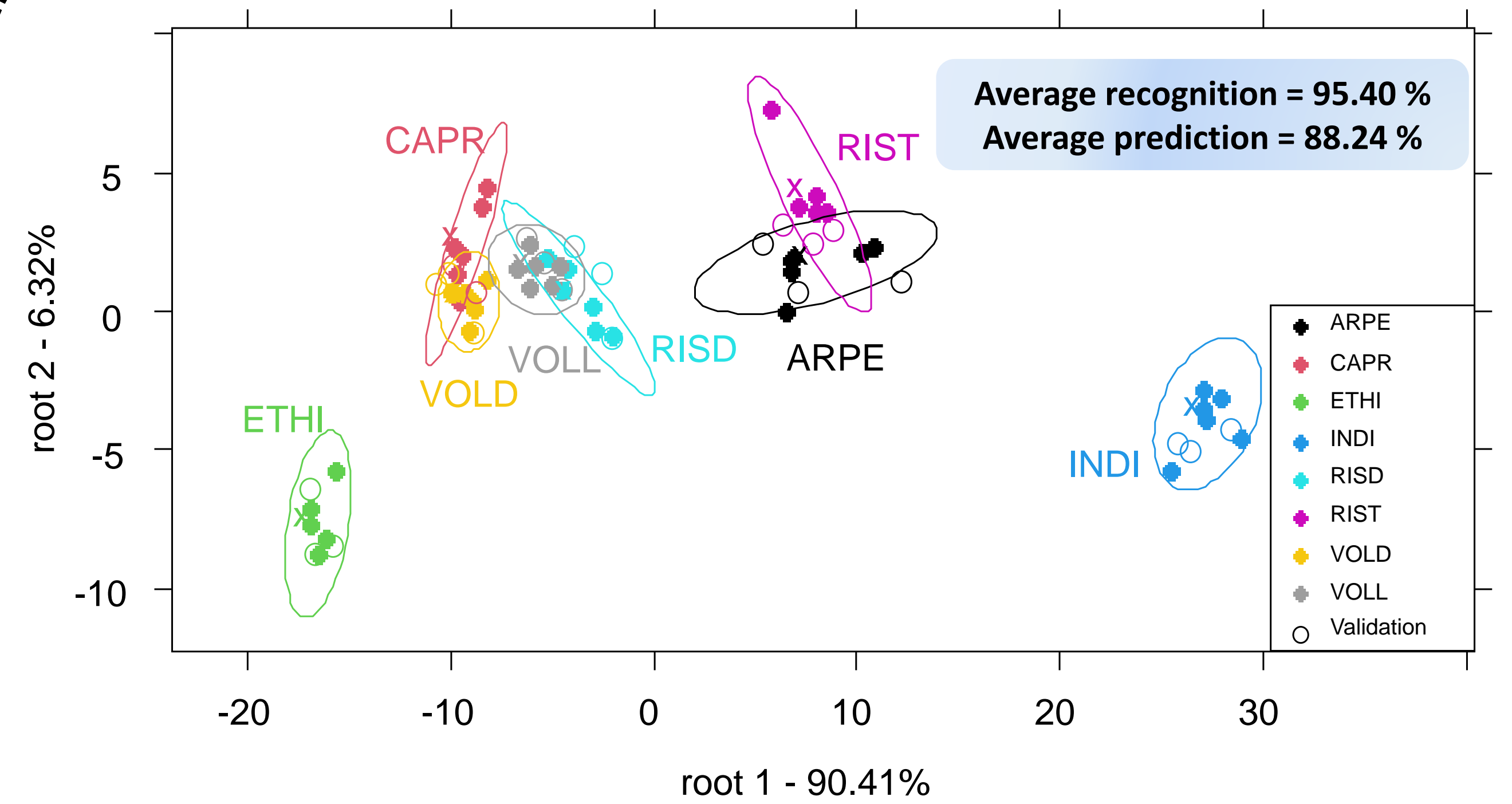
Data Analysis

- Drift correction, PCA, LDA, PLSR.

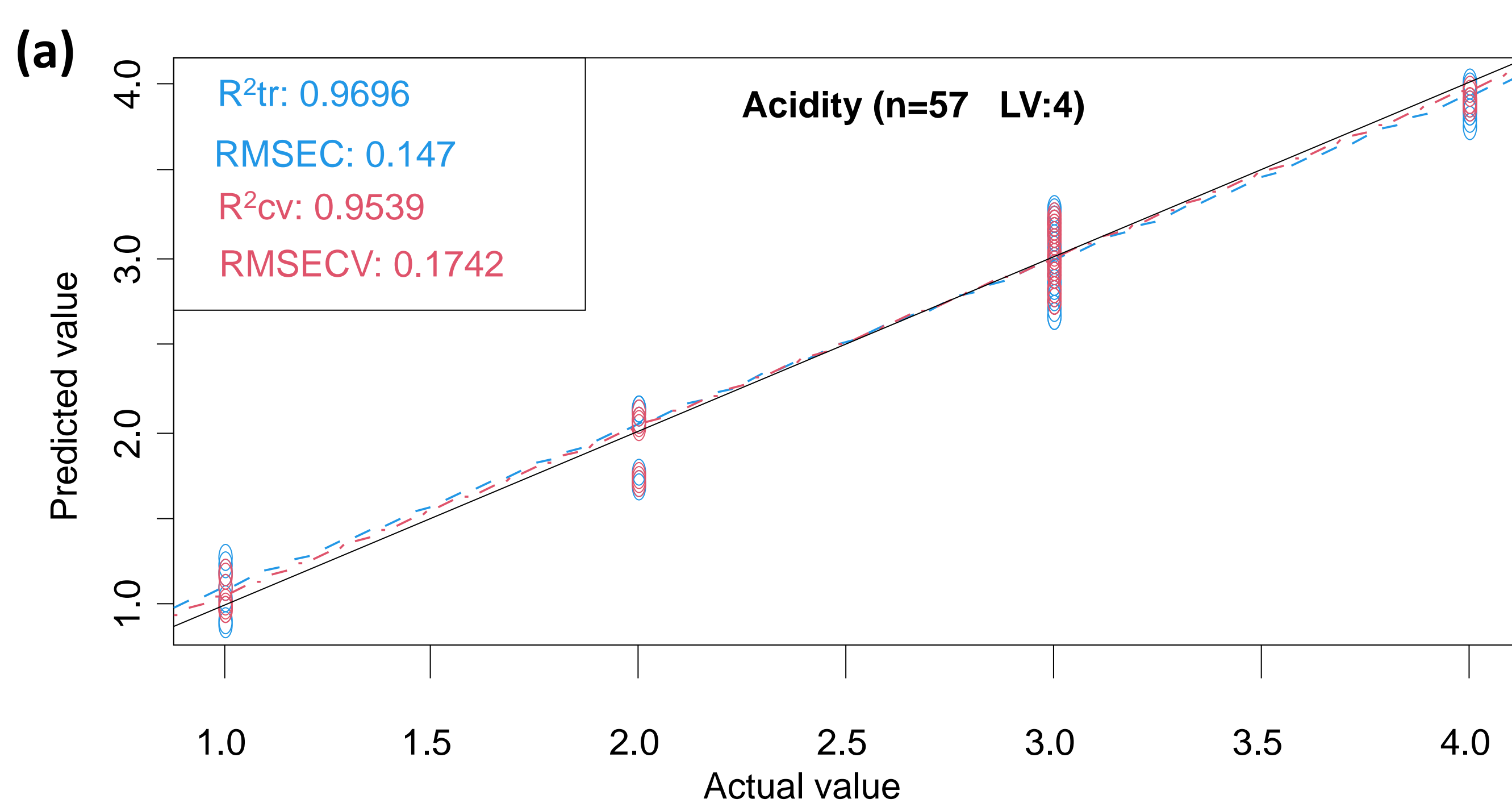
RESULTS



Principal component analysis (PCA) score plot of 8 coffee drinks (N=69).

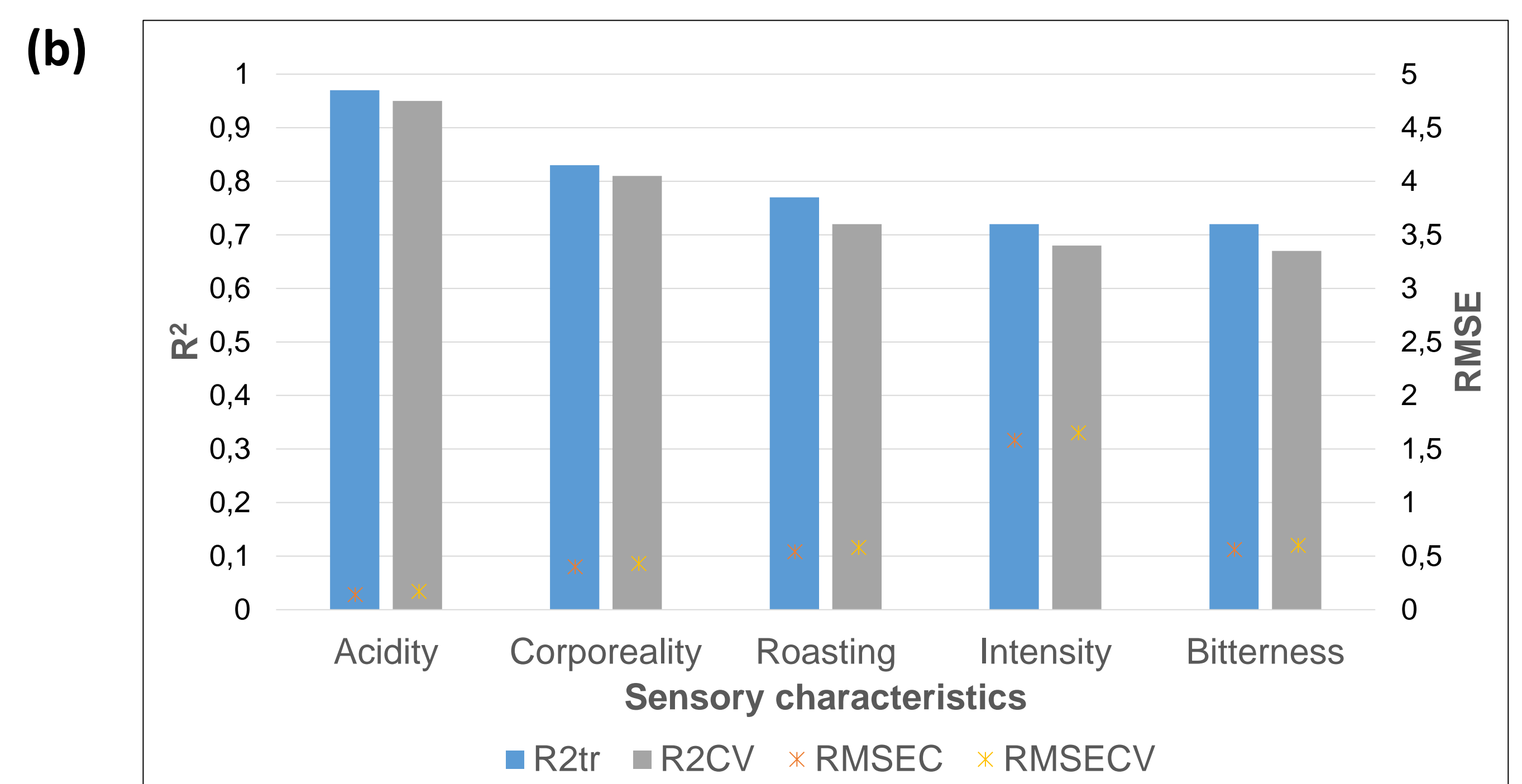


Linear discriminant analysis (LDA) of 8 coffee drinks (N=69).
Average recognition = 95.40 %
Average prediction = 88.24 %



Partial least square regression (PLSR) models for capsule coffee samples according to sensory characteristics .

(a) PLSR for coffee capsules according to Acidity (the best model found). (b) PLSR summary for coffee capsules according to sensory characteristics (described in label of the package): Acidity (n= 57, Lv= 5), Corporeality (n=50, Lv=1), Roasting (n=56, Lv=3), Intensity (n= 64, Lv= 5), Bitterness (n=62, Lv=3).



CONCLUSIONS

- The results from E-tongue analysis showed good discrimination of samples belonging to 8 different types of coffee capsules, reaching recognition accuracy 95.40% and prediction 88.41%. The INDI, ARPE, RIST, and ETHI types presented totally discrimination. In contrast, CAPR-VOLD, RIST-CAPR, RISD-VOLL, and VOLD-CAPRI were misclassified.
- Moreover, PCA and LDA models presents a separation pattern of the coffee drinks. This patten follows the sensory characteristics of the samples. INDI is the most Intense, Bitter, Roasting and with highest Corporeality. Meanwhile, for ETHI these characteristics have the lowest value. In the case of Acidity this value has a negative correlation with the other sensory characteristics (INDI presents the lowest value and ETI the highest) .
- Additionally, the PLSR models showed variable prediction capacity for each evaluated attribute; showing good prediction capacity (R^2_{CV} : 0.95; $RMSECV$: 0.17) for “Acidity” and (R^2_{CV} : 0.81; $RMSECV$: 0.43) for “Corporeality”. Meanwhile, the ability for prediction of rest of the sensorial attributes “Roasting”, “Intensity” and “Bitterness” was close to R^2_{CV} =0.7.
- Overall, E-tongue showed to be a useful instrument for characterization of different types of coffee capsules and prediction of their characteristic sensory attributes.