1er Congreso de Jóvenes Investigadores en Ciencias Agroalimentarias

ciaimbital UNIVERSIDAD DE ALMERÍA

25 AÑOS 1993 | 2018   UNIVERSIDAD DE ALMERÍA

biovegen plataforma tecnológica de biotecnología vegetal

Plataforma Tecnológica Española Food for Life Spain

JUNTA DE ANDALUCIA Ayuda Eventos ceiA3 con la financiación de la Junta de Andalucía a los Campus de Excelencia (PECA)

eventos 2018   (ceiA3)

Application of multiomic technologies to study the environmental impact on berry fruit quality.

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Introduction and Objetives
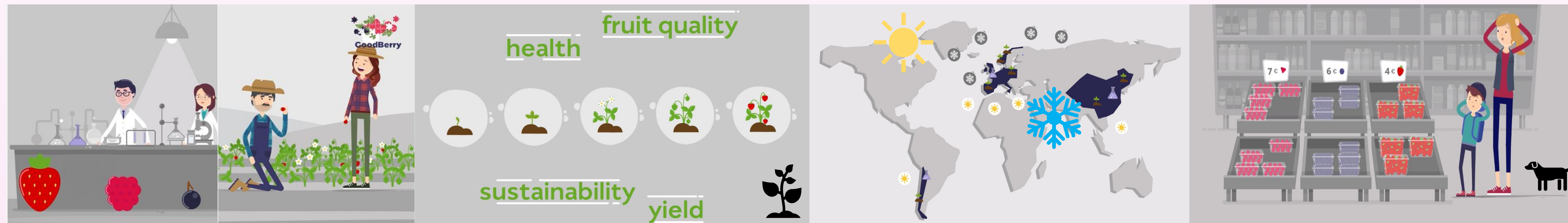
Climate change is affecting berry cultivation. Goodberry Project focuses on the improvement of berry crops, studying fruit quality in different cultivars and climatic zones. Goodberry aims to discover which berry cultivars have the highest quality, in order to produce year-round, tasty, healthy fruits.

Methods

GC-TOF-MS → Primary metabolome
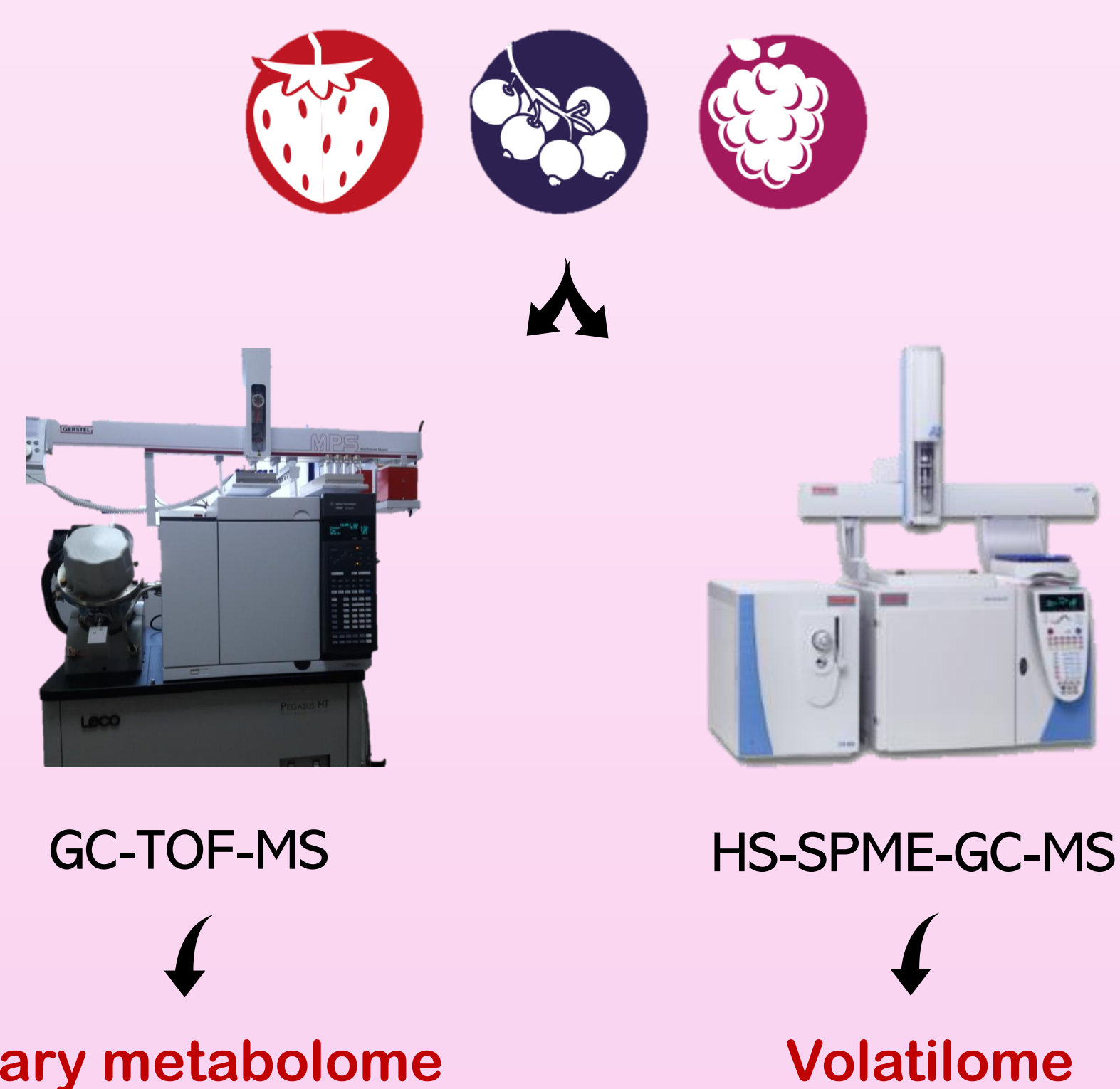
HS-SPME-GC-MS → Volatilome

Figure 1: Schematic representation of gas chromatography-mass spectrometry techniques used in this study (1,2). Several cultivars of strawberry, raspberry and blackcurrant were grown in different latitudes and harvested in 2017 and 2018.
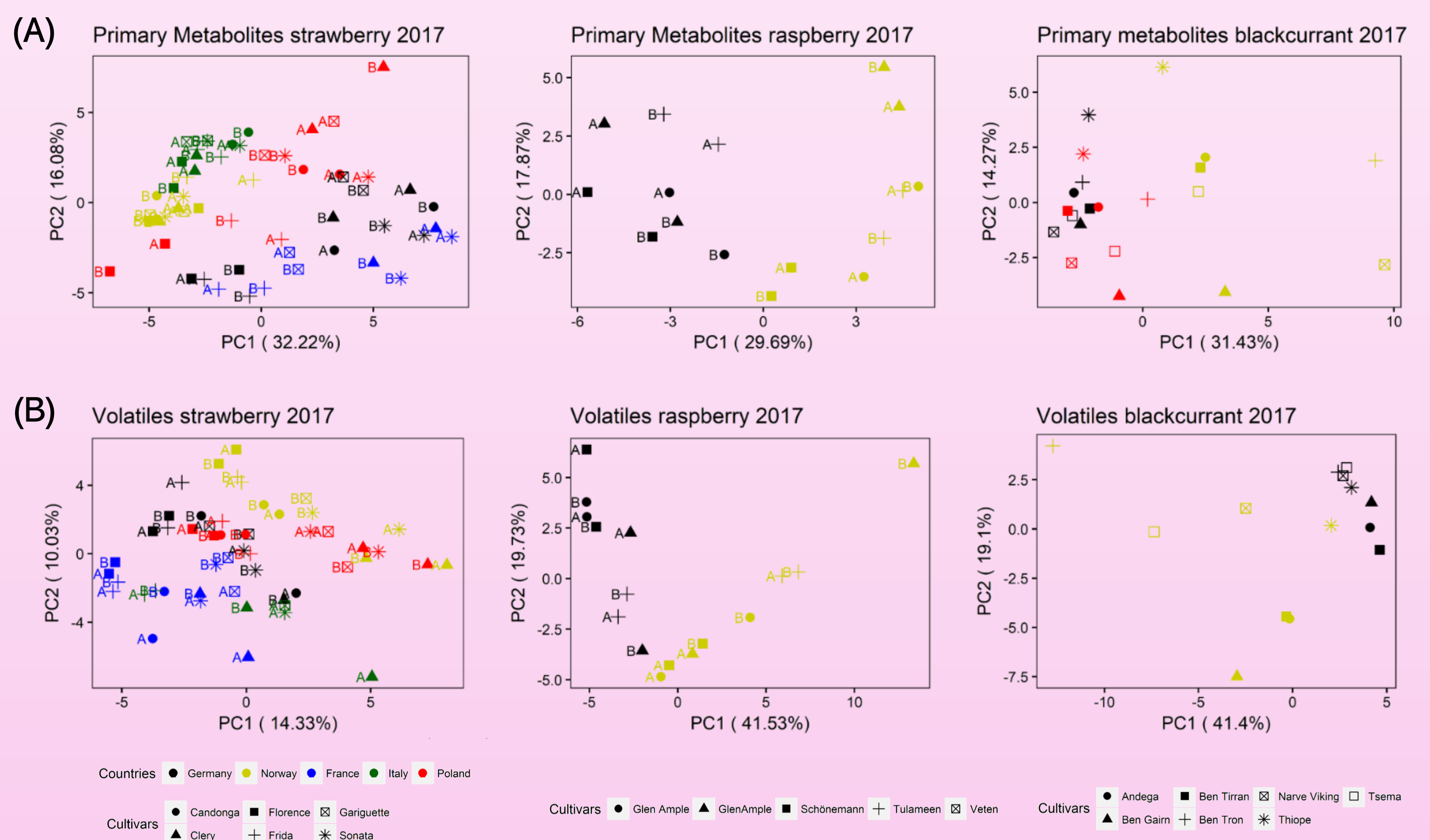
Results

Figure 2: Principal component analysis (PCA) showing samples distribution for primary metabolites (A) and volatiles (B). Shapes indicate different cultivars of strawberry, raspberry and blackcurrant, respectively, while colors represent different countries where the berries were grown in 2017. Labels A and B indicate two different times of harvest during 2017.
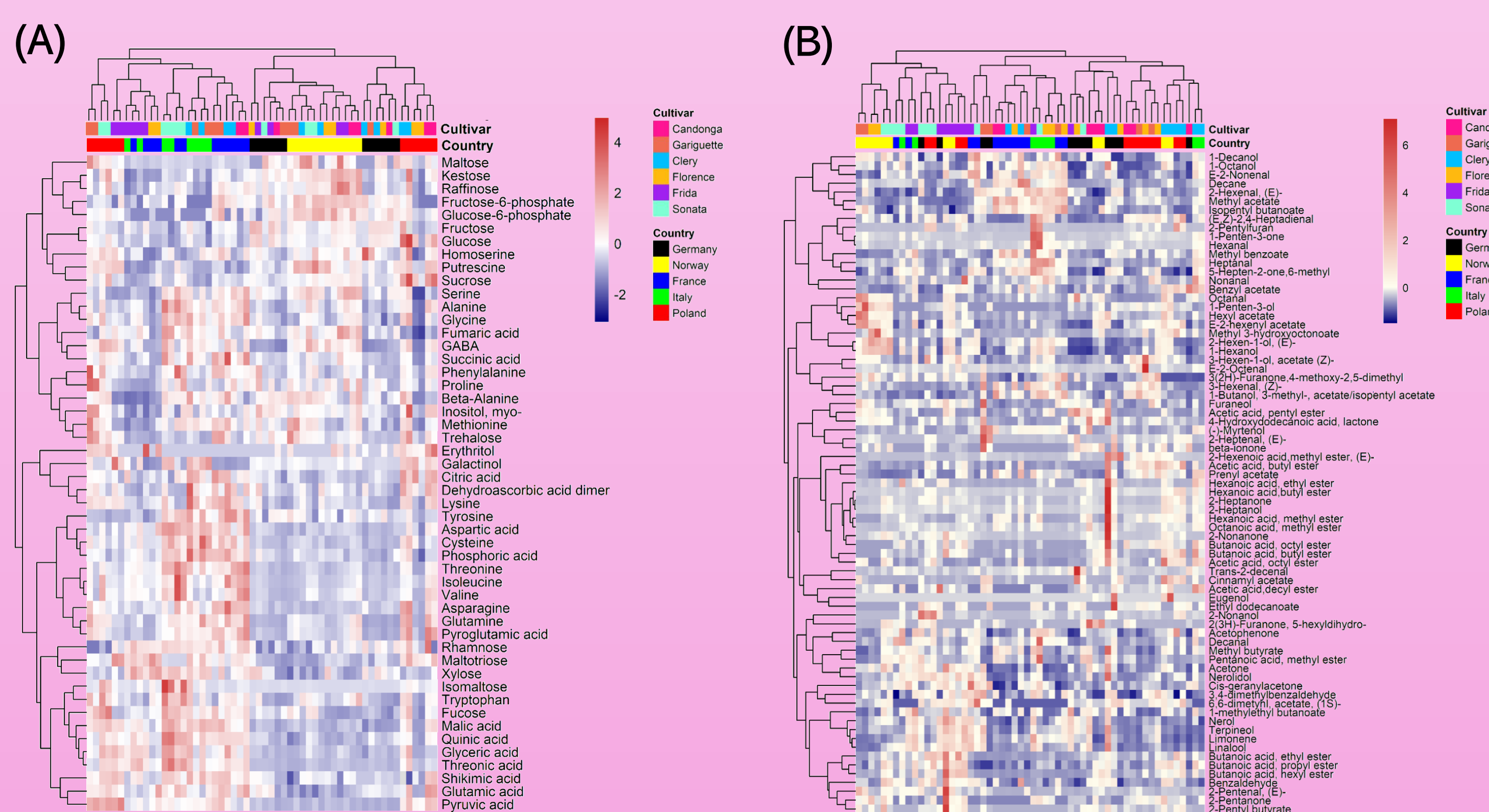

Figure 3: Hierarchical cluster analysis (HCA) showing the content of primary metabolites (A) and volatiles (B) in the strawberry cultivars used in this study. Data were normalized using z-scores and relativized to a strawberry control sample. Both samples and metabolites are grouped by clusters, using Pearson correlation coefficients.

Conclusion

- GC-MS techniques allowed to identify 50 primary metabolites (sugars, amino and organic acids) and 75 volatiles (esters, alcohols, aldehydes, furans, ketones and terpenoids) which have a strong impact in fruit quality traits in different berry species.
- PCA and HCA showed that both climate and genetic factors influence primary metabolite and volatile content.
- However, environment has a stronger impact on primary metabolites.

Next Steps

Metabolomic data integration, followed by transcriptomic analysis of strawberry cultivars will provide complementary information in order to facilitate the production of high-quality berry fruits, capable of bearing the climate change.

Watch the Goodberry project promotional video using this QR!

References
Osorio et al., (2012) Methods Mol Biology 860: 101-109
Rambla et al- (2015) Metabolomic Profiling of Plant Tissues: 221-35.