Preliminary discrimination of commercial extra virgin olive oils from Brazil by geographical origin and olives' cultivar: A call for broader investigations

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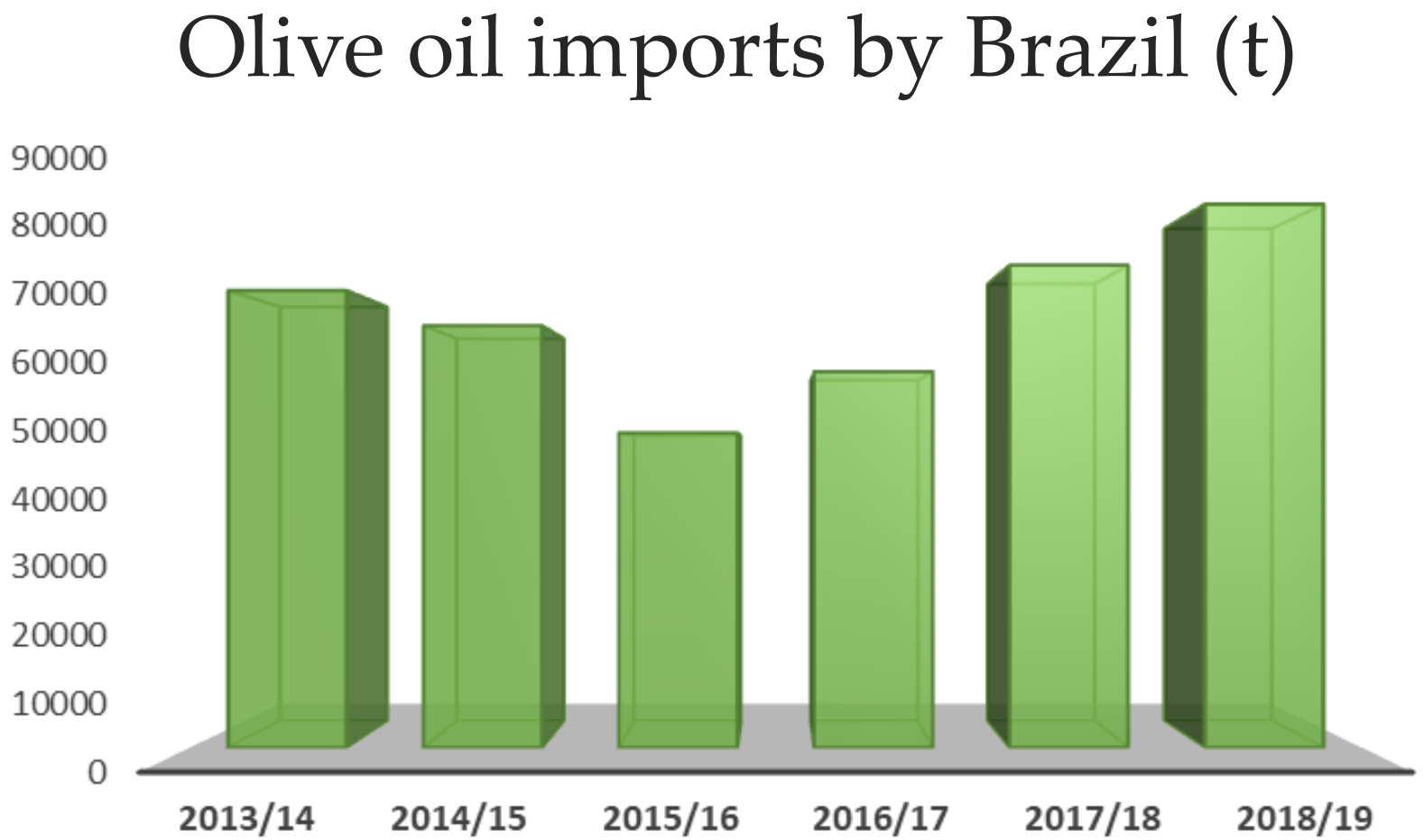
Introduction

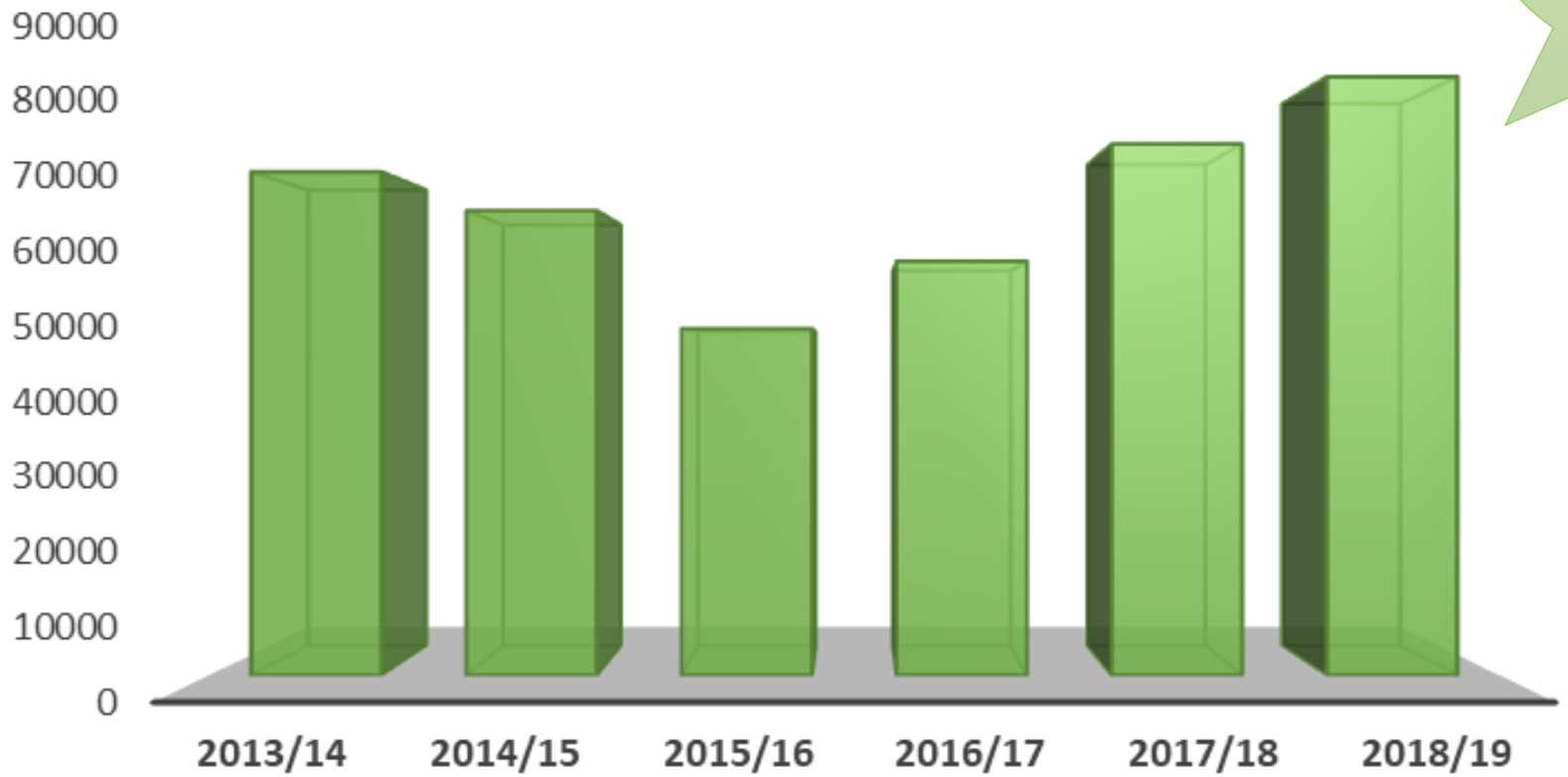
Brazilian EVOO Market, Occurrence, and Production



IOC, 2020

Brazilian EVOO Market, Occurrence, and Production

Olive oil imports by Brazil (t)



More than 86,000 tons of olive oil

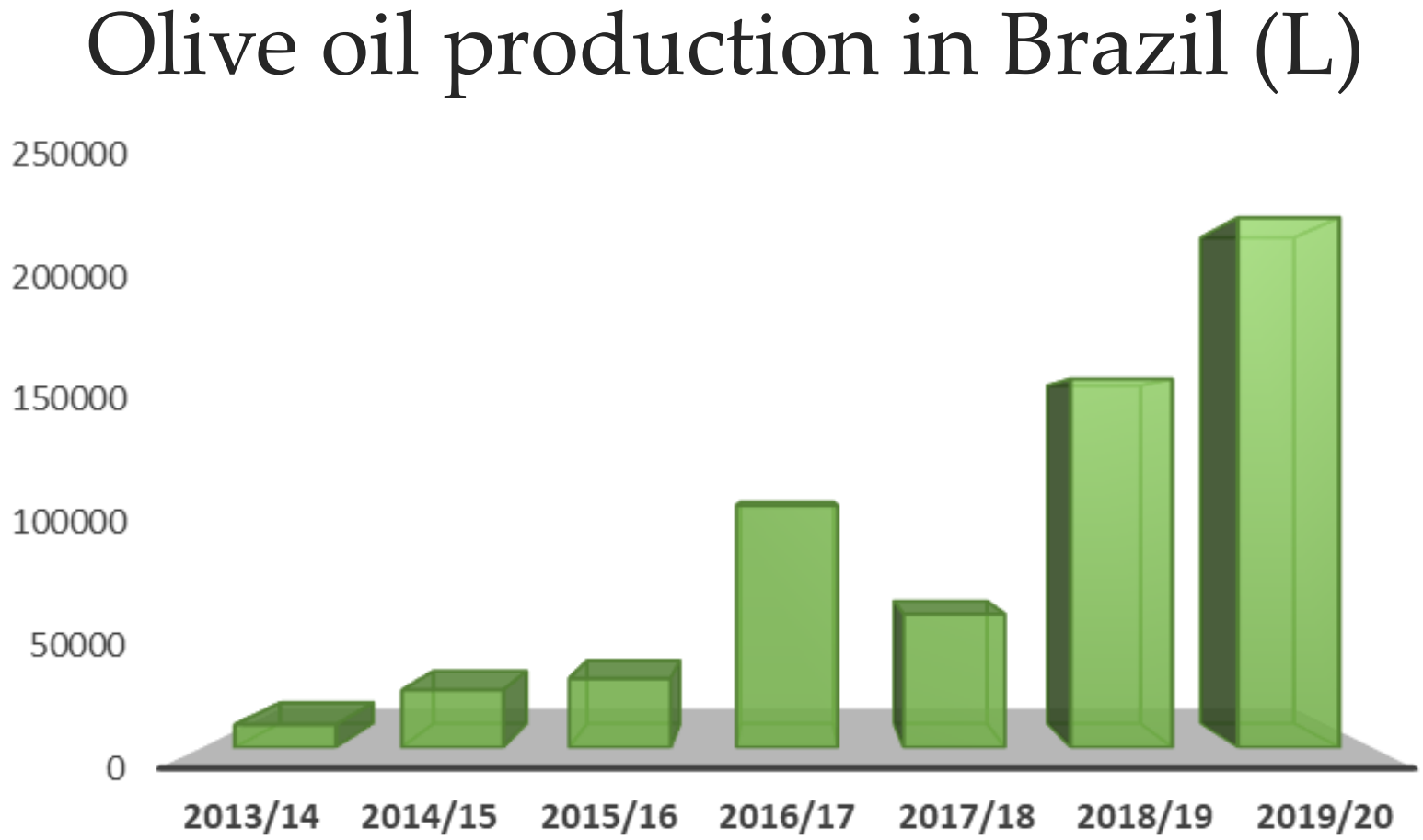
IOC, 2020

Brazilian EVOO Market, Occurrence, and Production

Brazilian EVOO Market, Occurrence, and Production

Mantiqueira mountain range (MG)
Since 2008

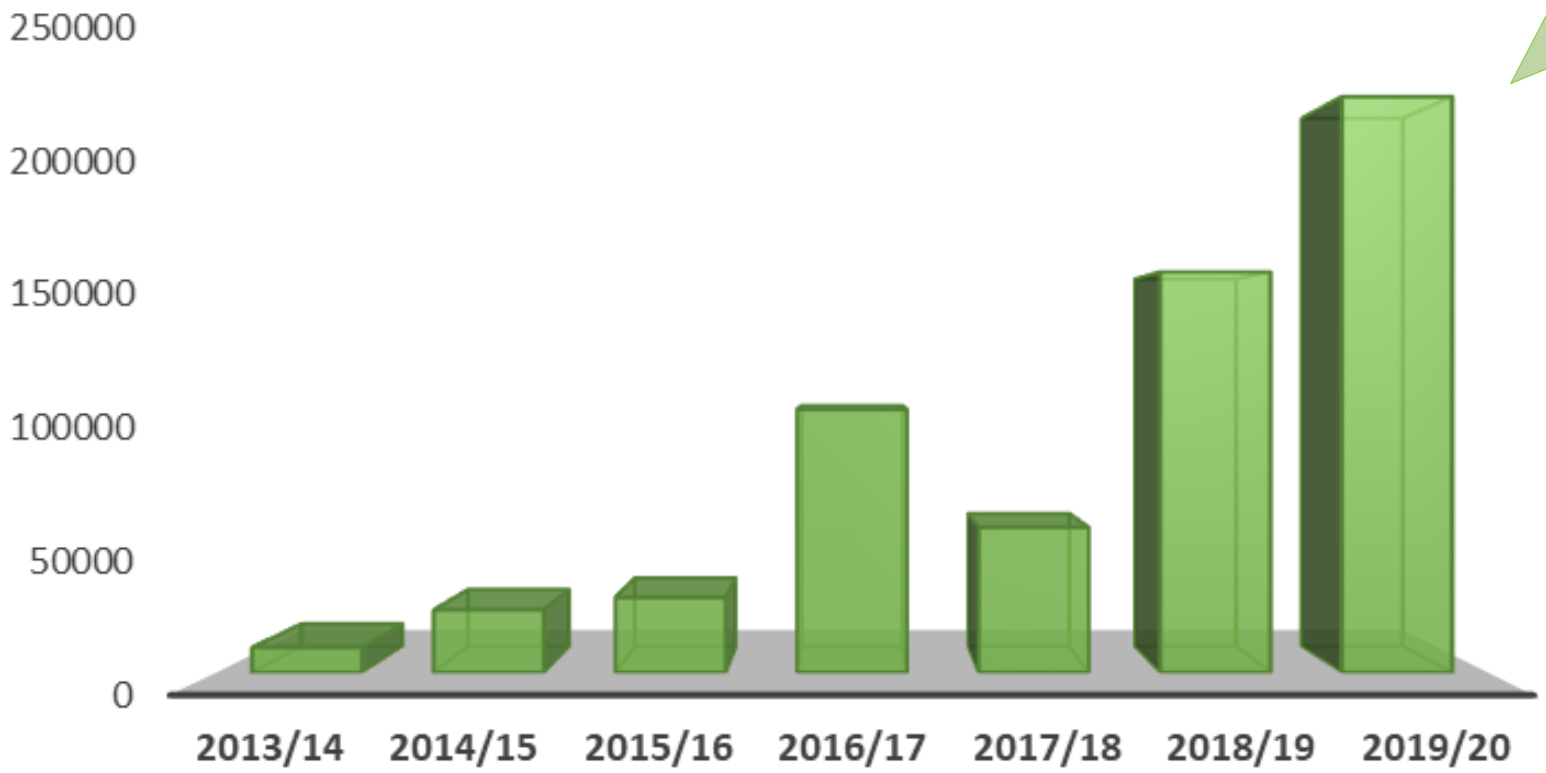
Brazilian EVOO Market, Occurrence, and Production



Carvalho et al, 2020

Brazilian EVOO Market, Occurrence, and Production

Olive oil production in Brazil (L)



Less than 1% of national consumption

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Factors that influence on olive oil composition

- Cultivar and ripening degree
- Edaphoclimatic conditions
- Conditions of olive oil production

Factors that influence on olive oil composition

Cultivar and ripening degree

Edaphoclimatic conditions

Conditions of olive oil production

Multivariate analysis

Objective

To achieve a preliminary discrimination of commercial olive oils produced in Brazil according to olives' cultivar and region of production by applying multivariate analysis to the oils' compositional profiles.

Samples and Methods

EVOO sampling

15 samples

Brazilian Arbequina

3 brands - South
2 brands - Southeast

Brazilian Koroneiki

Spanish Arbequina

5 brands - Catalunya

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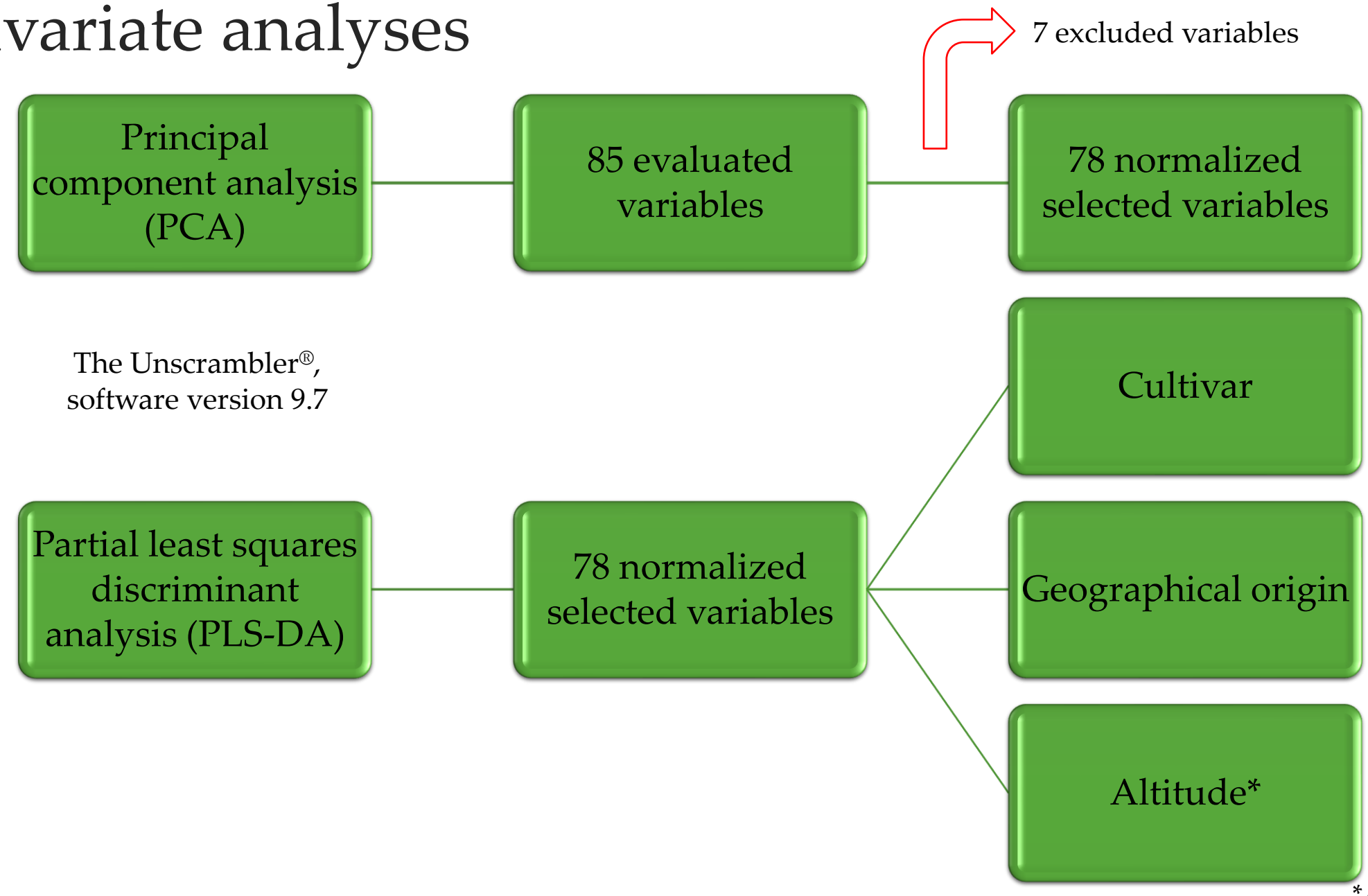
Multivariate analyses



*Altitude quartiles (GraphPad Prism®)

Multivariate analyses variables

All data used to perform multivariate analysis are available in the previously mentioned publication, and ranged among samples as follows:

Quality parameters and other features

- **Free acidity**
  - 0.04 to 0.58 % 18:1
- **Peroxide value**
  - 3.89 to 19.10 mEq O_2/kg
- **k_{232}**
  - 1.47 to 2.88
- **k_{270}**
  - 0.12 to 0.22
- ***p*-Anisidine value**
  - 1.59 to 10.8
- **Antioxidant capacity**
  - 2.27 to 3.29 mmol TE/kg
- **Oxidative stability index**
  - 12.52 to 64.72 h
- **Total phenolic content**
  - 4.31 to 18.9 mg GAE/100 g

Carvalho et al, 2020

Multivariate analyses variables

All data used to perform multivariate analysis are available in the previously mentioned publication, and ranged among samples as follows:

- 16:0
  - 8.54 to 17.1
- 16:1*n*-7
  - 0.04 to 2.05
- 18:0
  - 1.10 to 2.63
- 18:1*n*-9
  - 66.6 to 86.0

Fatty acid profile (g/100g) and $M:P_{ratio}$

- 18:2*n*-6
  - 3.52 to 14.3
- 18:3*n*-3
  - 0.50 to 0.92
- $M:P_{ratio}$
  - 4.44 to 20.6

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Multivariate analyses variables

All data used to perform multivariate analysis are available in the previously mentioned publication, and ranged among samples as follows:

Minor components by RP-LC-MS (mg/kg)

- 27 Secoiridoids and derivatives
  - n.d. to 249
- 3 Lignans
  - n.d. to 49.5
- 10 Simple phenols and derivatives
  - n.d. to 9.20
- 4 Flavonoids
  - n.d. to 3.00
- 3 Triterpenic compounds
  - 2.25 to 92.3
- 3 Free fatty acids content
  - 0.31 to 264

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Multivariate analyses variables

All data used to perform multivariate analysis are available in the previously mentioned publication, and ranged among samples as follows:

Minor components by NP-LC-DAD/FLD (mg/kg)

4 Tocopherols

- n.d. to 267

2 Free sterols

- n.d. to 1739

6 Pigments

- n.d. to 25.1

8 Volatile and semi-volatile compounds (μg/g)

n.d. to 18.5

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Multivariate analyses variables

All data used to perform multivariate analysis are available in the previously mentioned publication, and ranged among samples as follows:

Geographical origin and cultivar

Cultivar

- Arbequina or Koroneiki

Origin

- Brazil (South or Southeast) or Spain

Altitude

- 134 to 1155 m

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Multivariate analyses variables

Representative figure to invite you to get to know our previous work

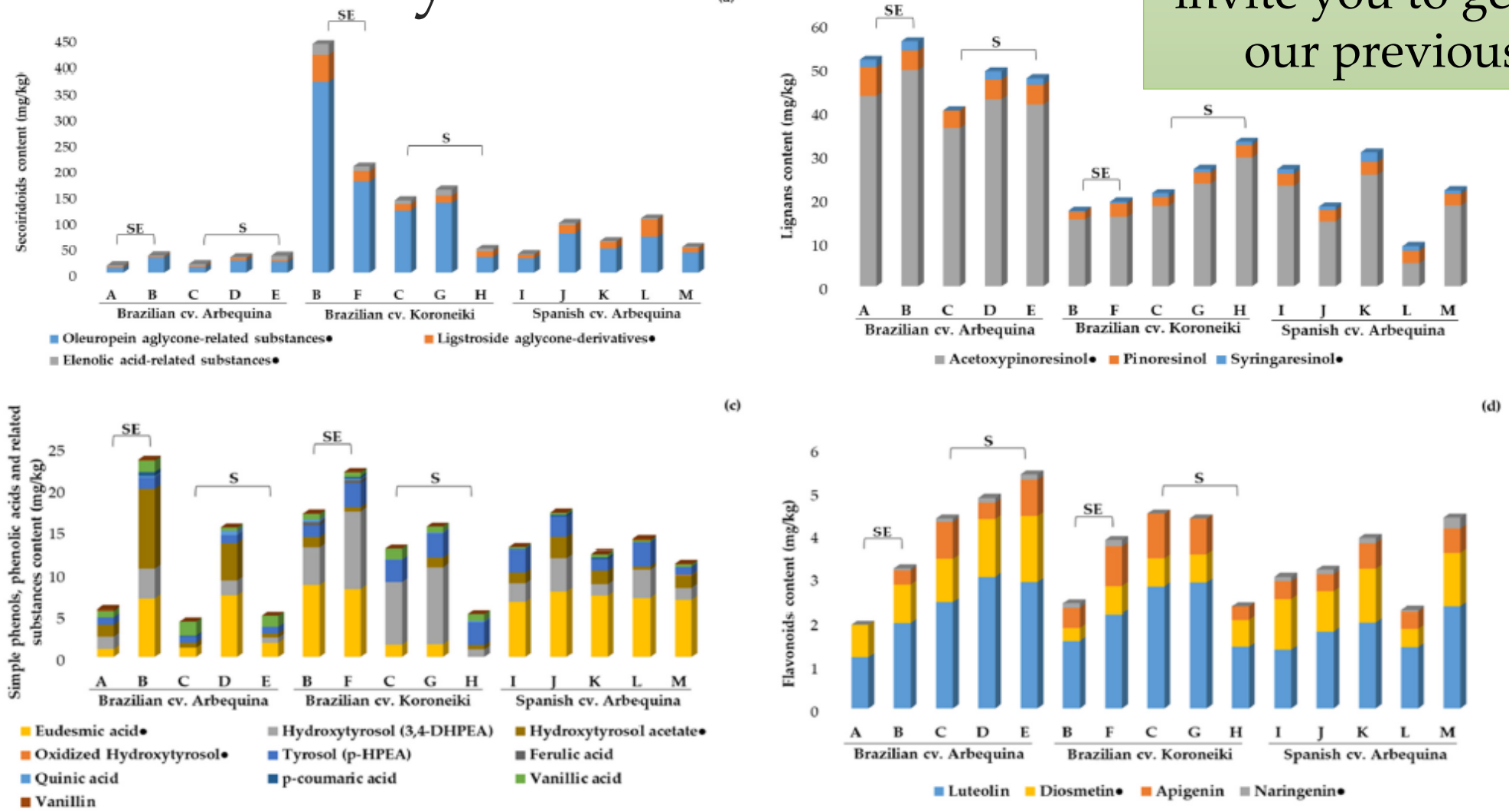

Figure 1. Minor component profiles (mg/kg) of the studied EVOOs determined by reversed phase (RP)-LC-MS (sample identification in Table 3): (**a**) Secoiridoids; (**b**) lignans; (**c**) simple phenols, phenolic acids, and related substances; (**d**) flavonoids; (**e**) triterpenic compounds; and (**f**) free fatty acids. SE, Samples from the Southeast. S, Samples from the South. • Compounds quantified in mg of homologous substance/kg, as shown in Table S5a.

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Results

PCA

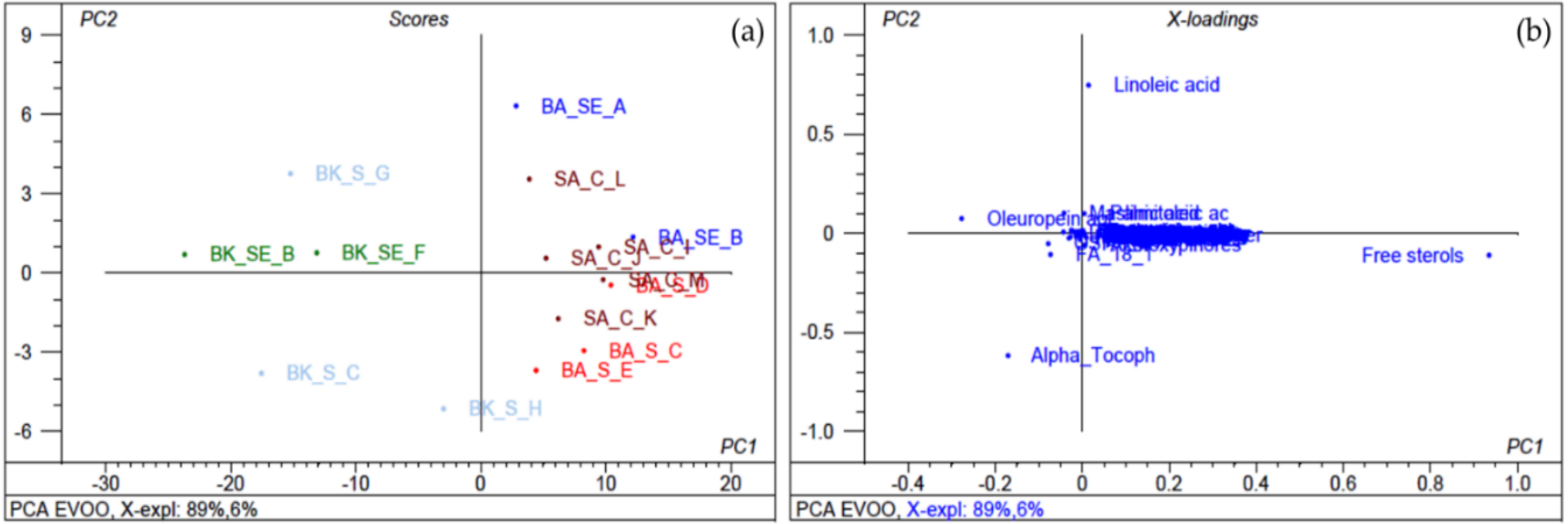
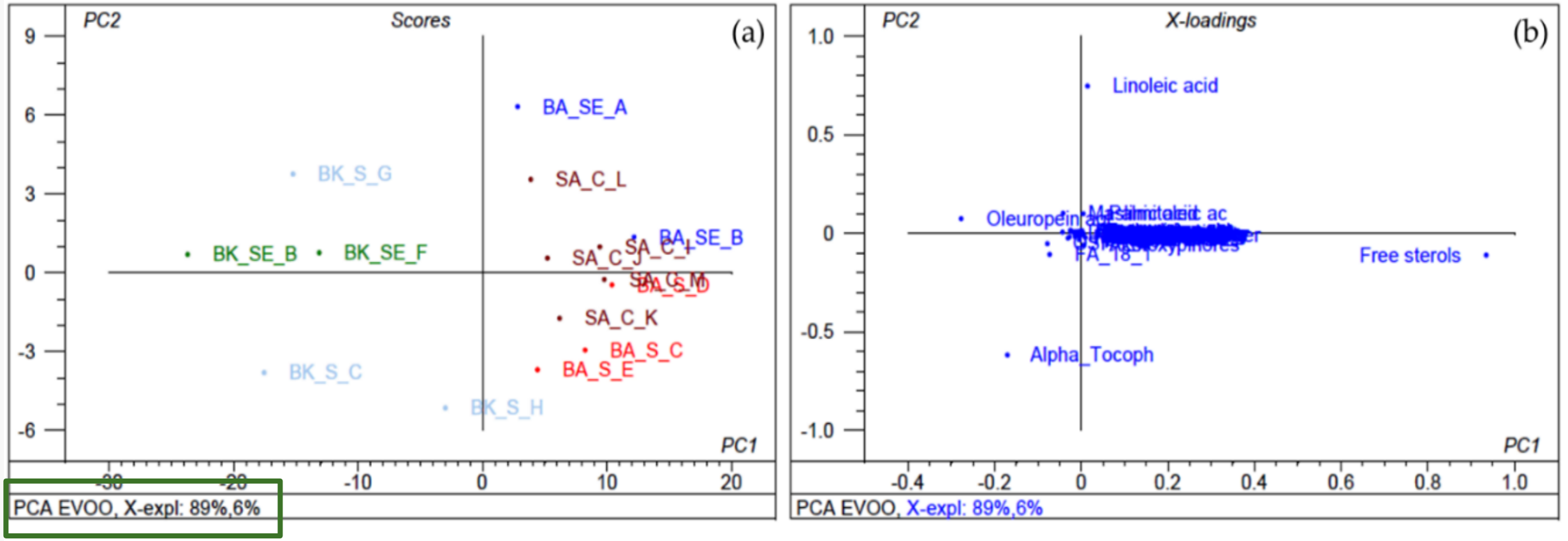


Figure 1. Clustering of EVOO samples: (**a**). Scores plot of the PCA model. (**b**). Loadings plot of the PCA model. (**c**) Scores plot of the PLS-DA model. (**d**). Loadings plot of the PLS-DA model. EVOO samples: BA SE A - Brazilian cv. Arbequina from Southeast, brand A. BA SE B - Brazilian cv. Arbequina from Southeast, brand B. BA S C - Brazilian cv. Arbequina from South, brand C. BA S D - Brazilian cv. Arbequina from South, brand D. BA S E - Brazilian cv. Arbequina from South, brand E. BK SE B - Brazilian cv. Koroneiki from Southeast, brand B. BK SE F - Brazilian cv. Koroneiki from Southeast, brand F. BK S C - Brazilian cv. Koroneiki from South, brand C. BK S G - Brazilian cv. Koroneiki from South, brand G. BK S H - Brazilian cv. Koroneiki from South, brand H. SA C I - Spanish cv. Arbequina from Catalonia, brand I. SA C J - Spanish cv. Arbequina from Catalonia, brand J. SA C K - Spanish cv. Arbequina from Catalonia, brand K. SA C L - Spanish cv. Arbequina from Catalonia, brand L. SA C M - Spanish cv. Arbequina from Catalonia, brand M.

PCA



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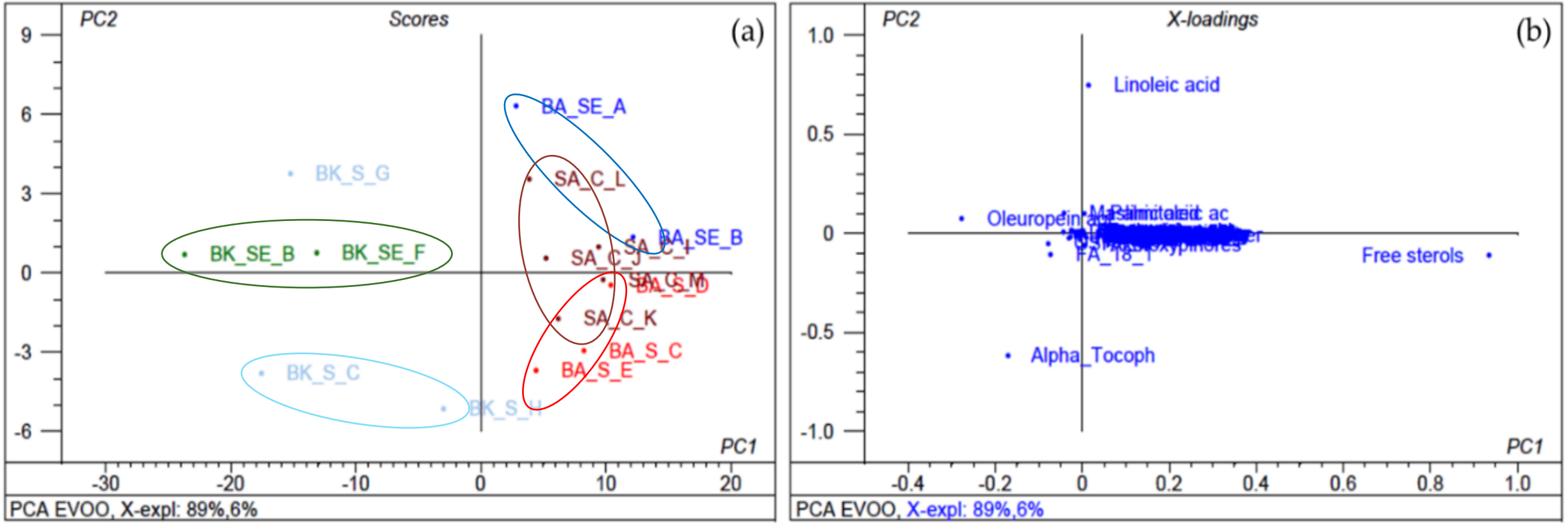
PCA



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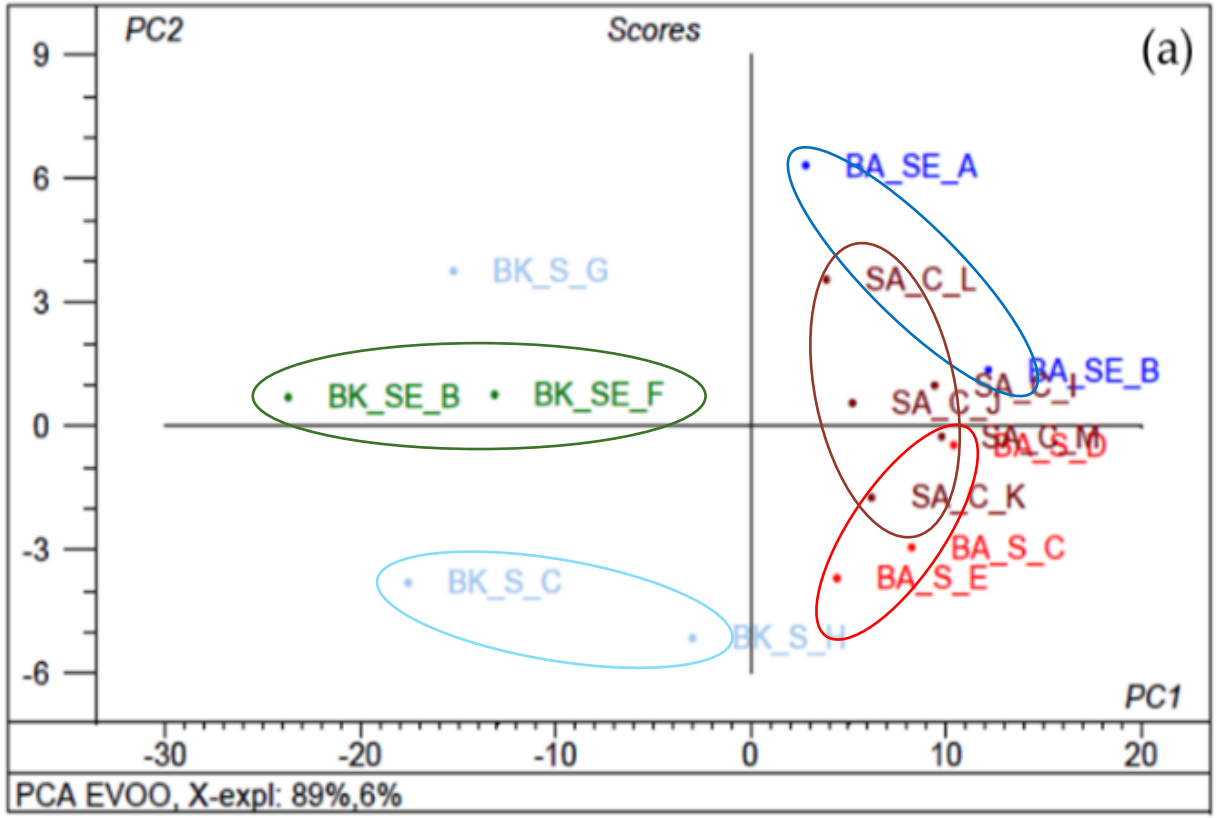
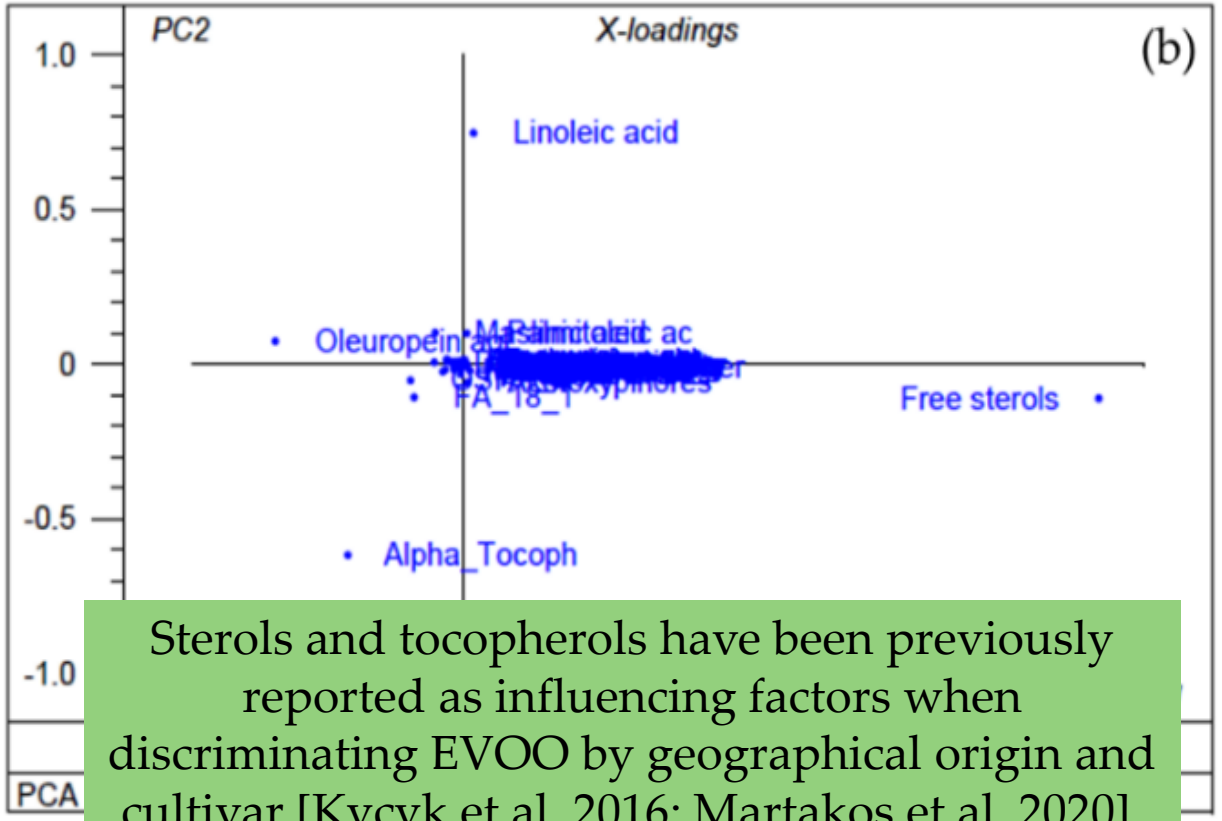
PCA





Sterols and tocopherols have been previously reported as influencing factors when discriminating EVOO by geographical origin and cultivar [Kyçyk et al, 2016; Martakos et al, 2020].

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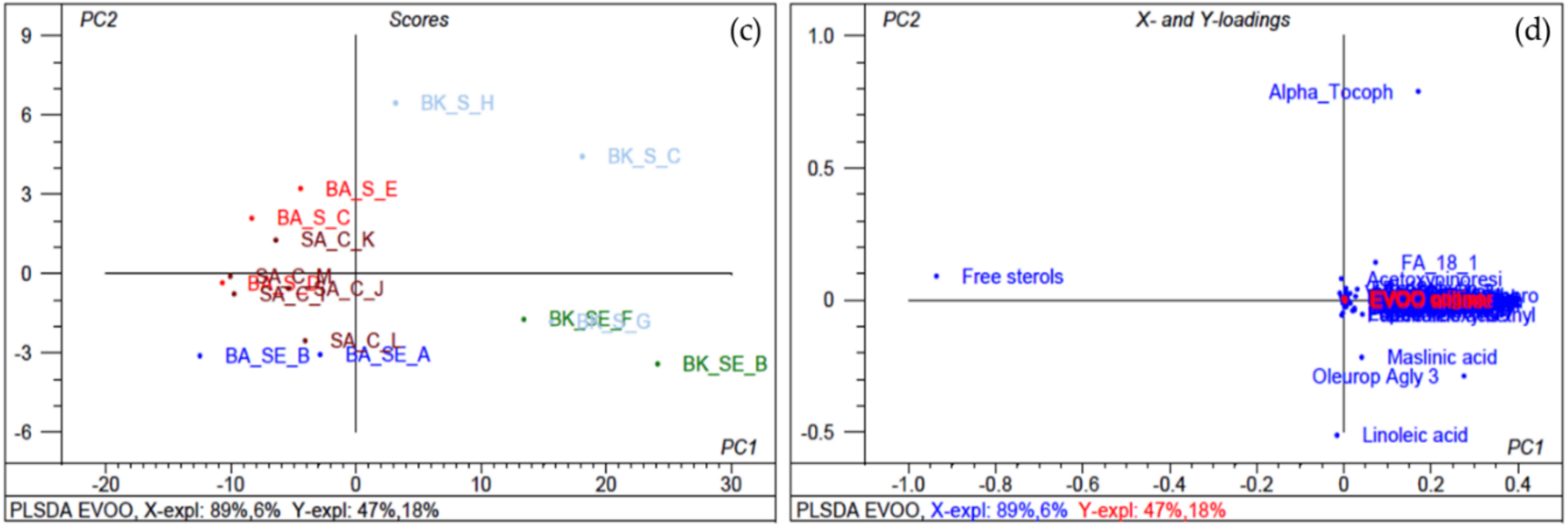
PLS-DA



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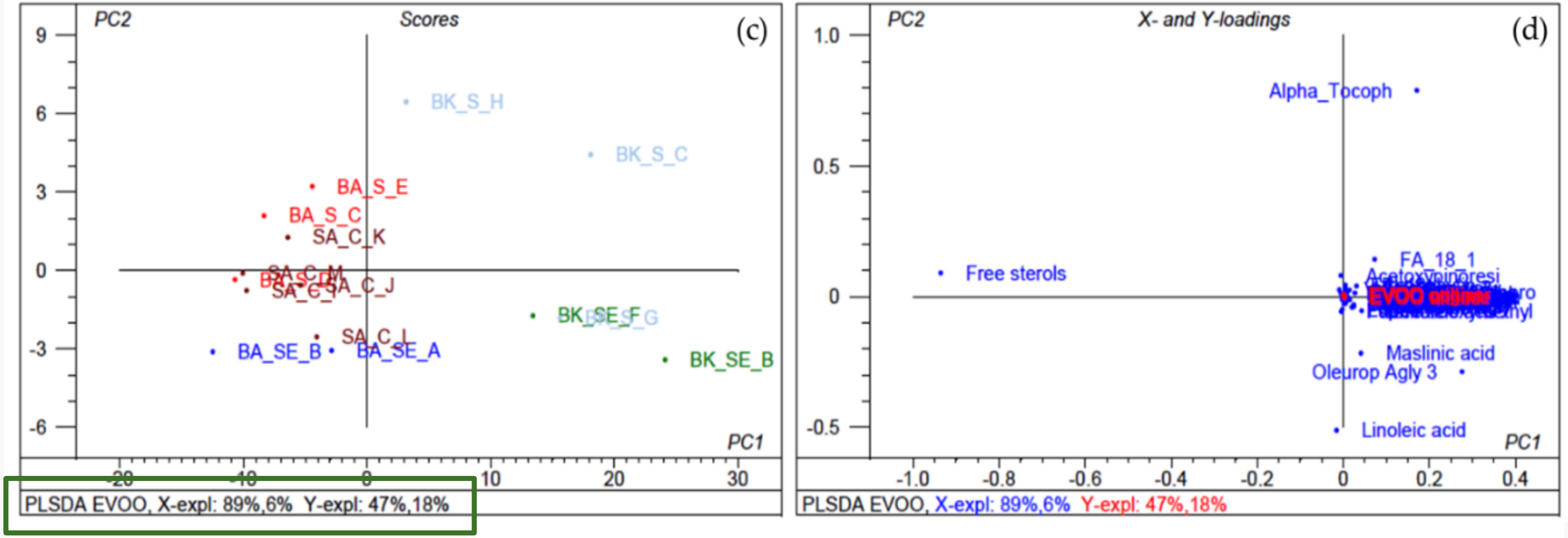

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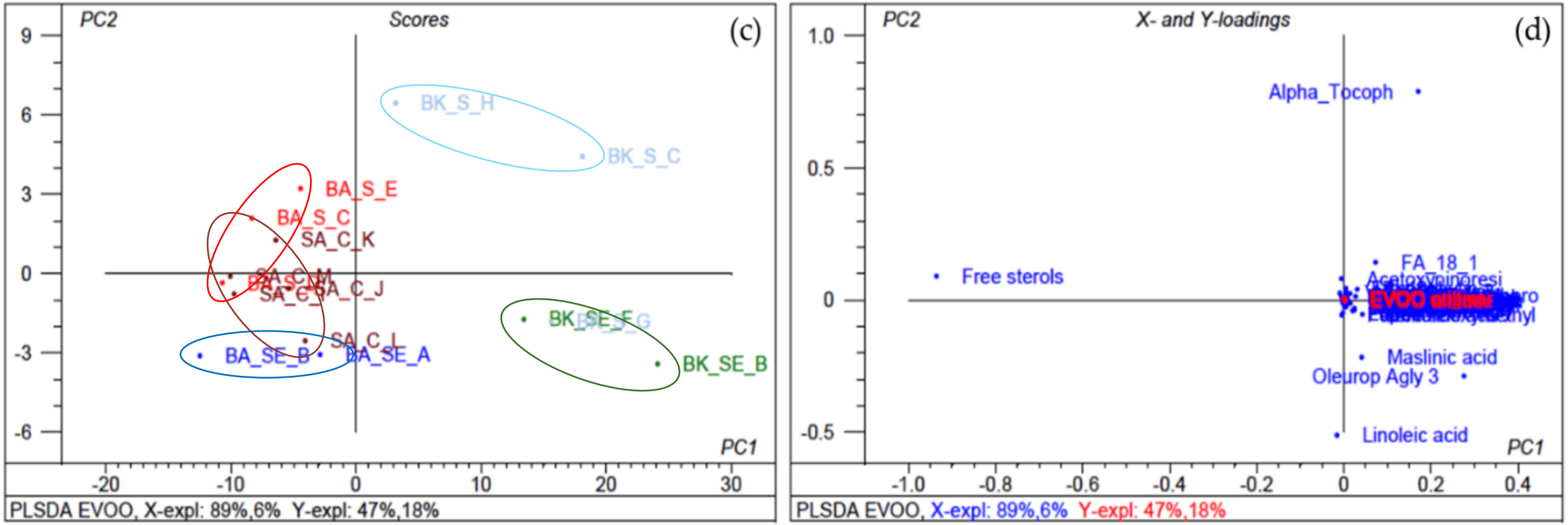

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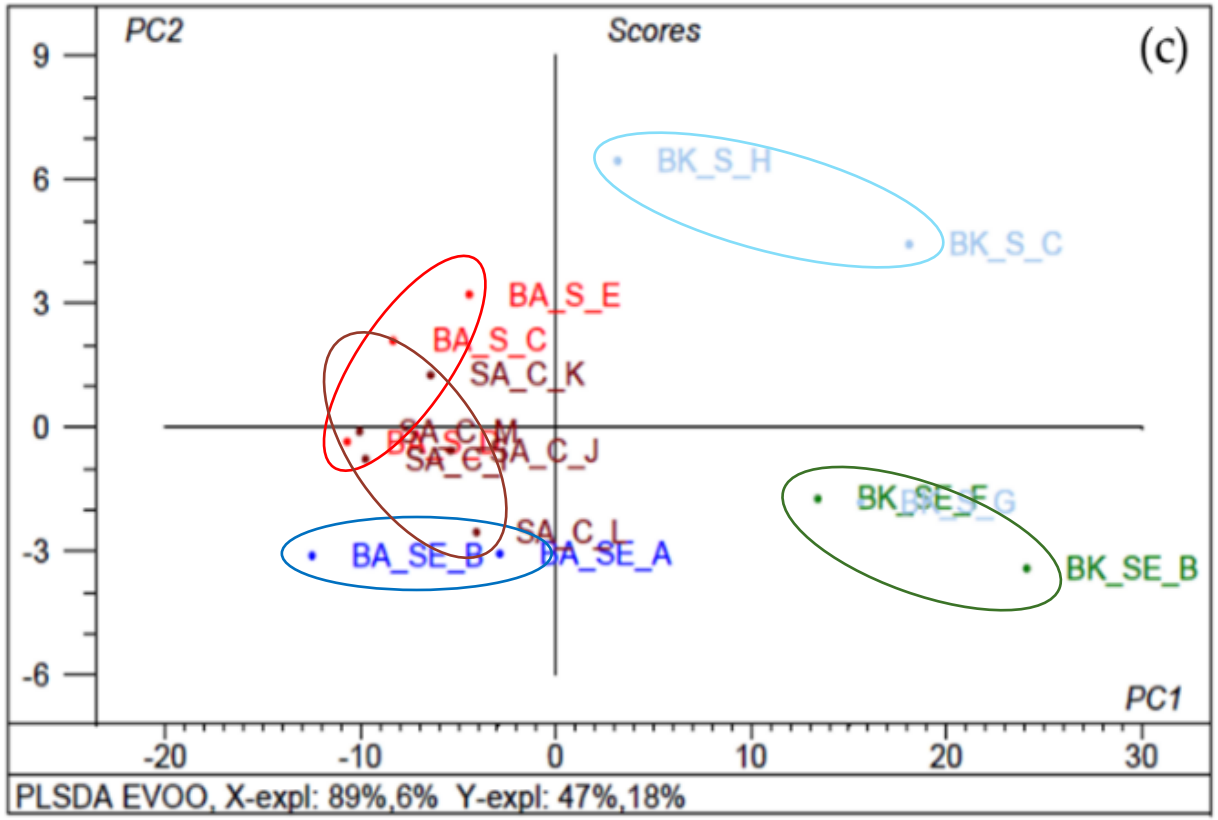

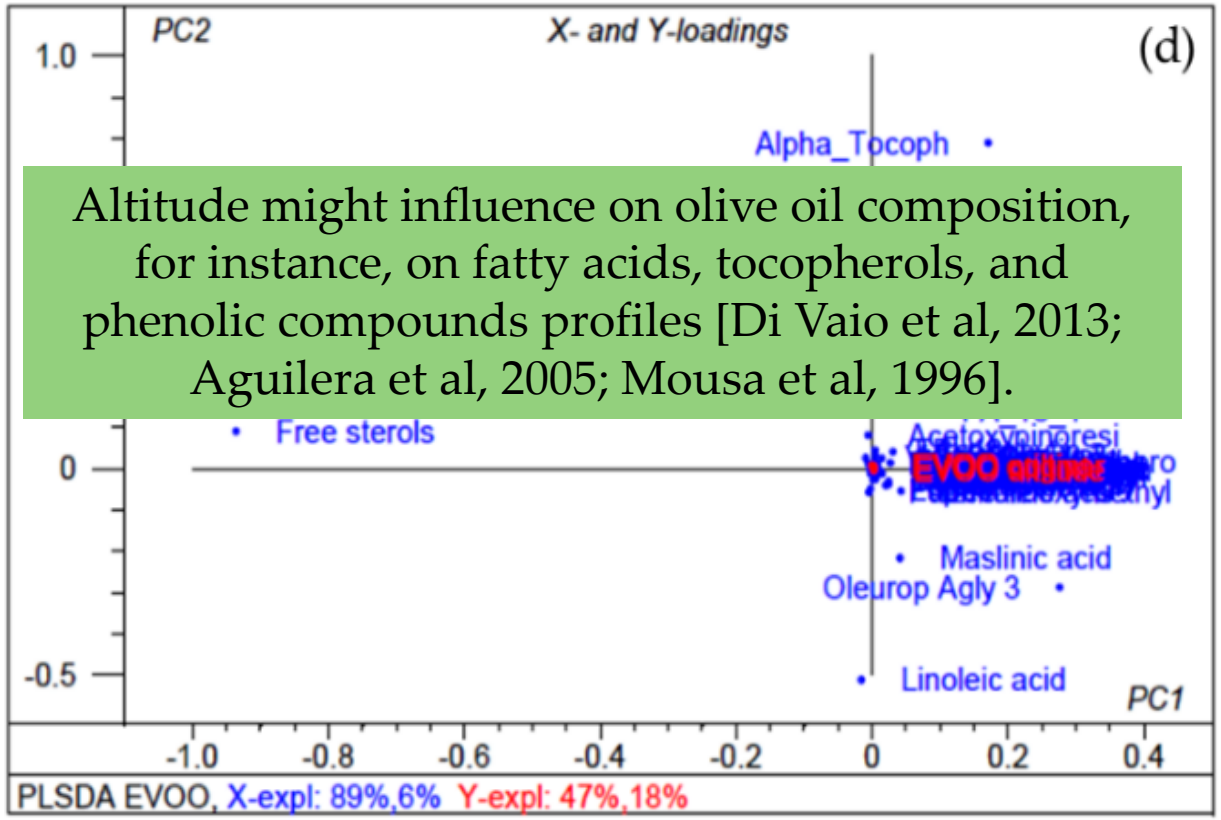

Altitude might influence on olive oil composition, for instance, on fatty acids, tocopherols, and phenolic compounds profiles [Di Vaio et al, 2013; Aguilera et al, 2005; Mousa et al, 1996].

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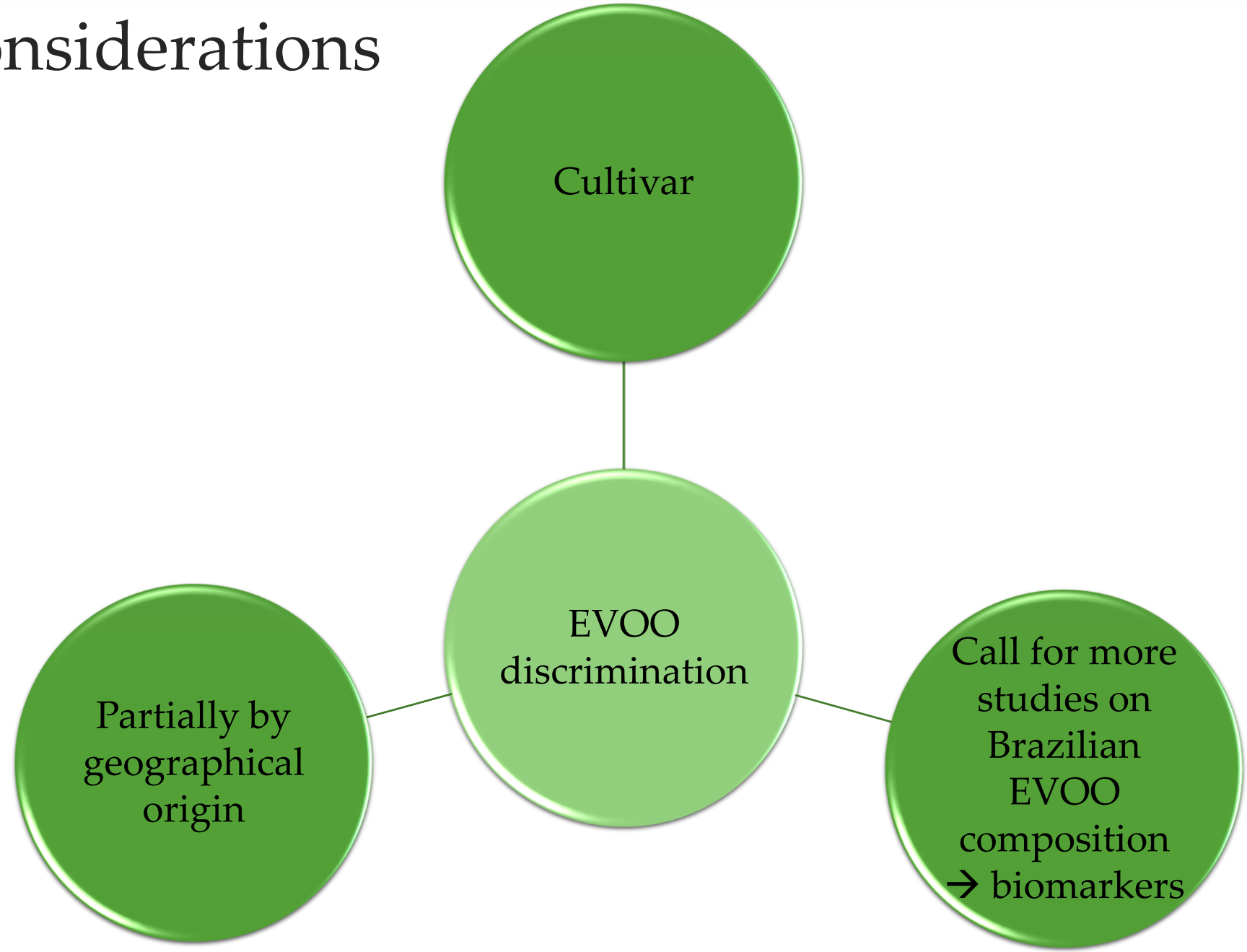
Conclusion

Final considerations



Thank you!

Email: alinegac@gmail.com

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