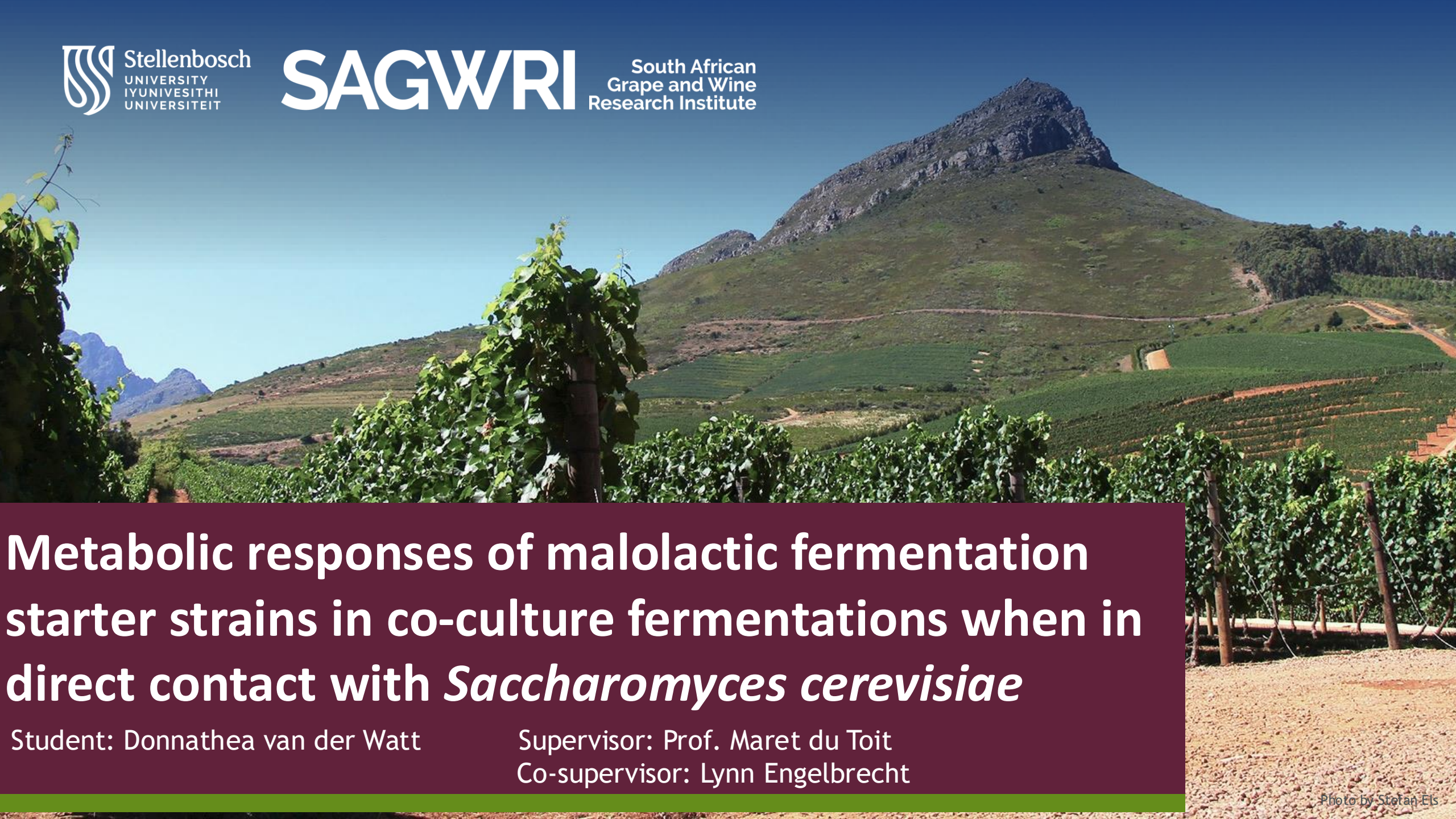

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Metabolic responses of malolactic fermentation starter strains in co-culture fermentations when in direct contact with *Saccharomyces cerevisiae*

Student: Donnathea van der Watt

Supervisor: Prof. Maret du Toit
Co-supervisor: Lynn Engelbrecht

Photo by Stefan Els

Introduction

Co-inoculation fermentations used more frequently

BUT

- What is our true understanding of HOW yeast & lactic acid bacteria (LAB) interact
- Deep dive into yeast x LAB interactions necessary

SOLUTIONS

- Yeast is focus of most studies
- STUDY LAB !!!!
  - What is the impact on the LAB's volatile organic acids (VOC) production
  - What is the LAB molecular response to direct contact with yeast
  - Result = consequences/adaptions to interactions & educated decisions

Aim

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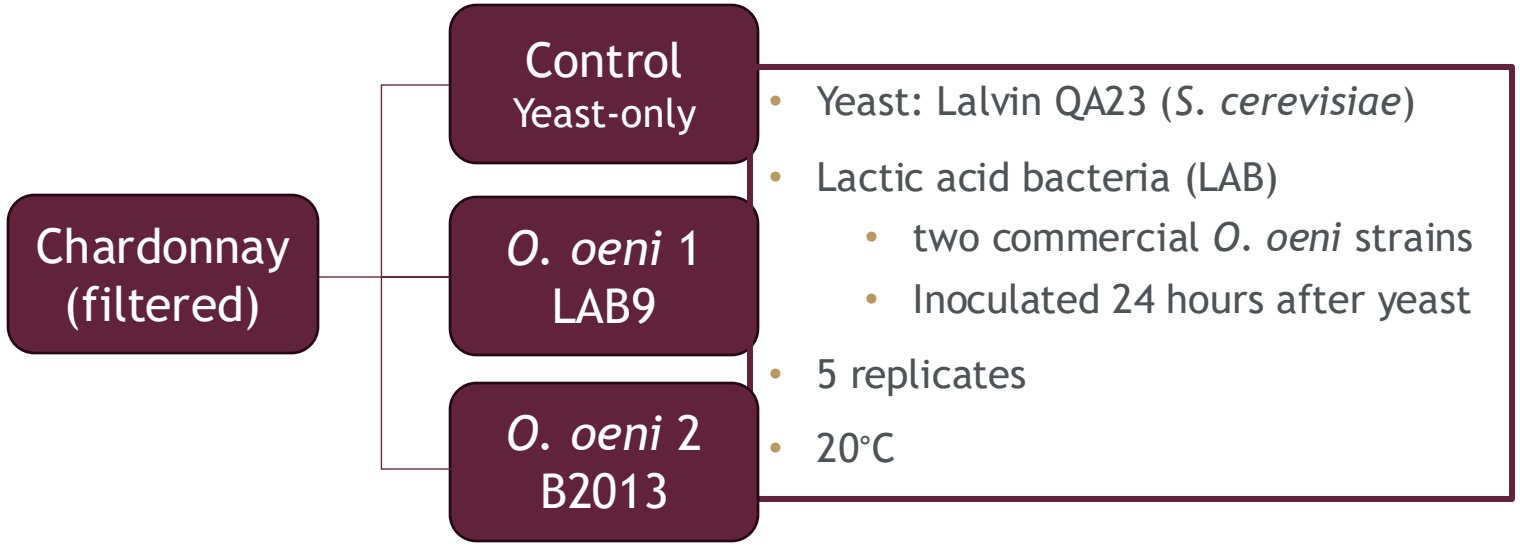
To investigate the transcriptomic & metabolic responses of two *O. oeni* strains in a co-inoculation regime, in direct contact with *S. cerevisiae*.

Methodology

Experimental setup summary



Chardonnay parameters

Component	Concentration
Malic acid (g/l)	1.72 → 2.55
Total acid (g/l)	4.14
pH	3.56
YAN (g/l)	172.58
Glucose (g/l)	102.36
Fructose (g/l)	112.39
Balling (◦B)	20.27

Untargeted GC-MS

Samples taken on day

- Day 1 (LAB inoculation)
- Day 5 (AF midpoint)
- Day 14 (AF complete)

Able to detect compounds without knowing what will be present, therefore can reveal compounds not previously associated with fermentation type.

(Boban et al., 2022)

AF & MLF Fermentation kinetics

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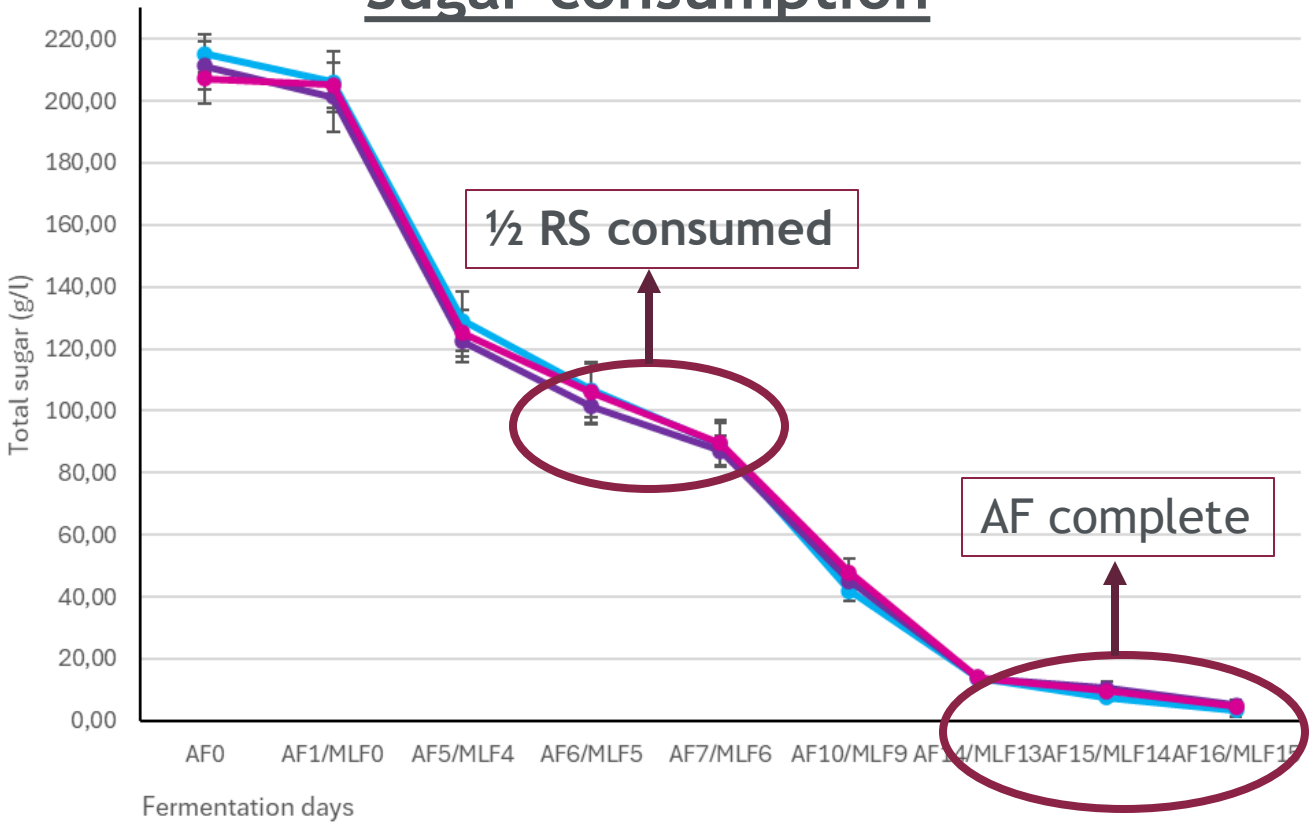
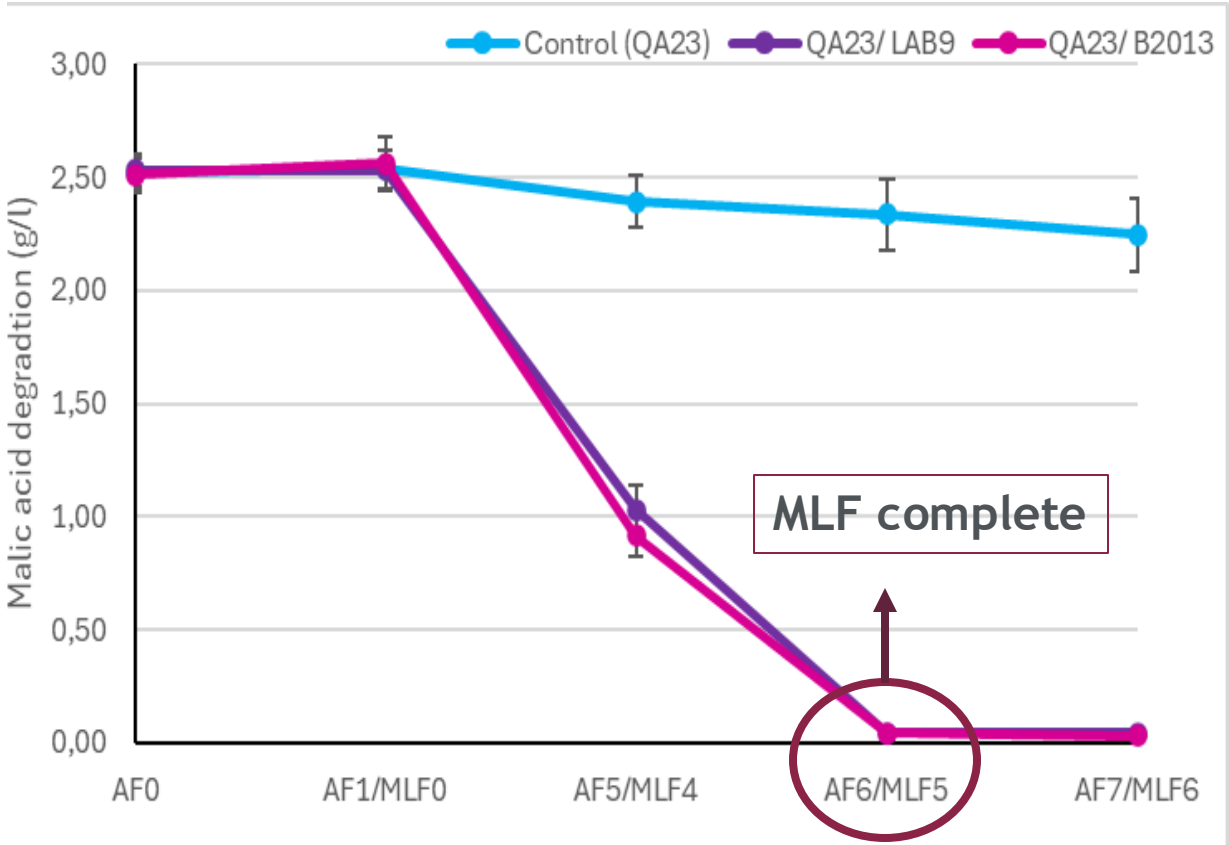
Sugar consumption



Malic acid degradation

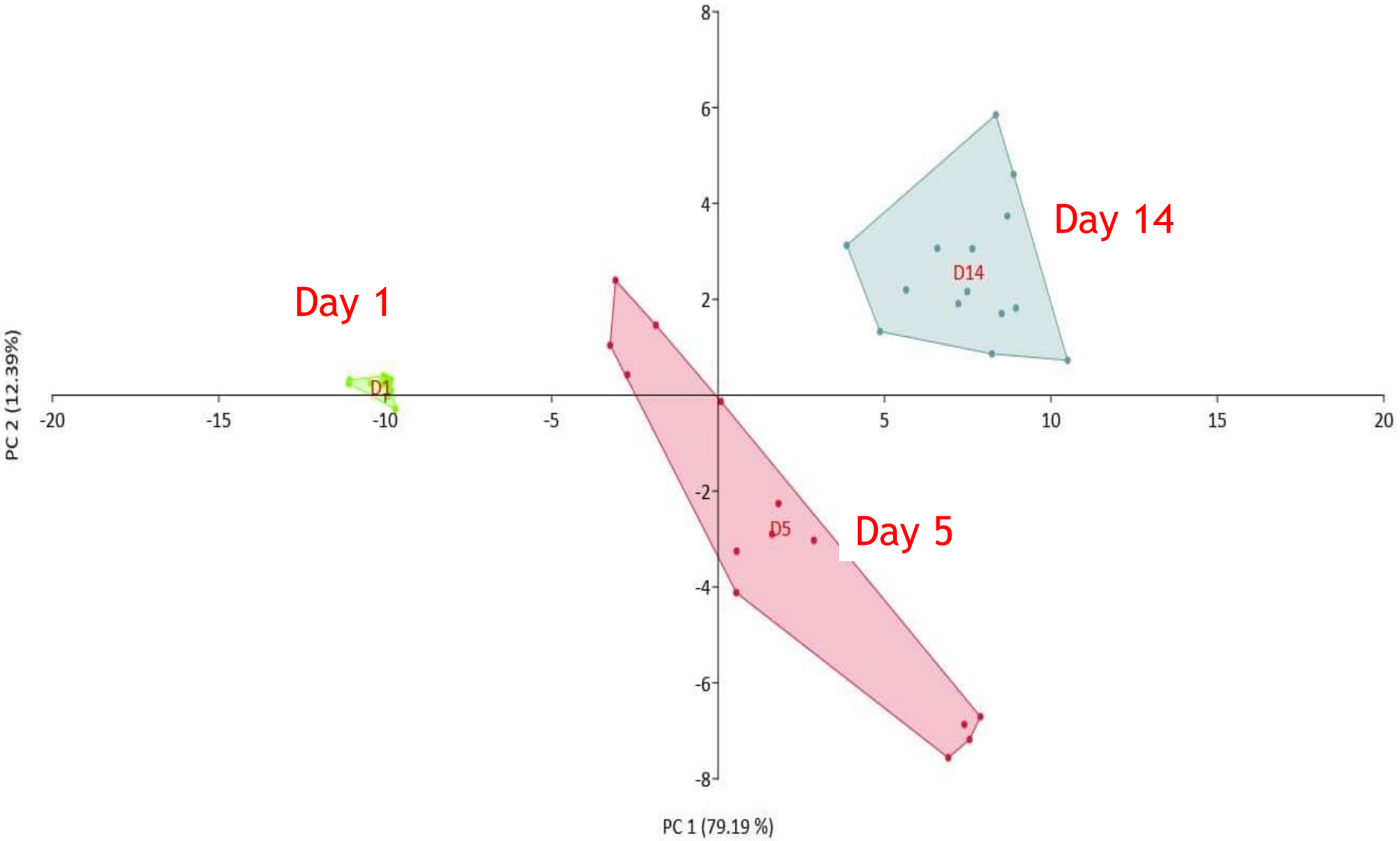


Both LAB strains did not impact alcoholic fermentation (AF) rate

TAKE HOME

Two LAB strains had similar MLF (malolactic fermentation) kinetics

Evolution of aromas profile across fermentations



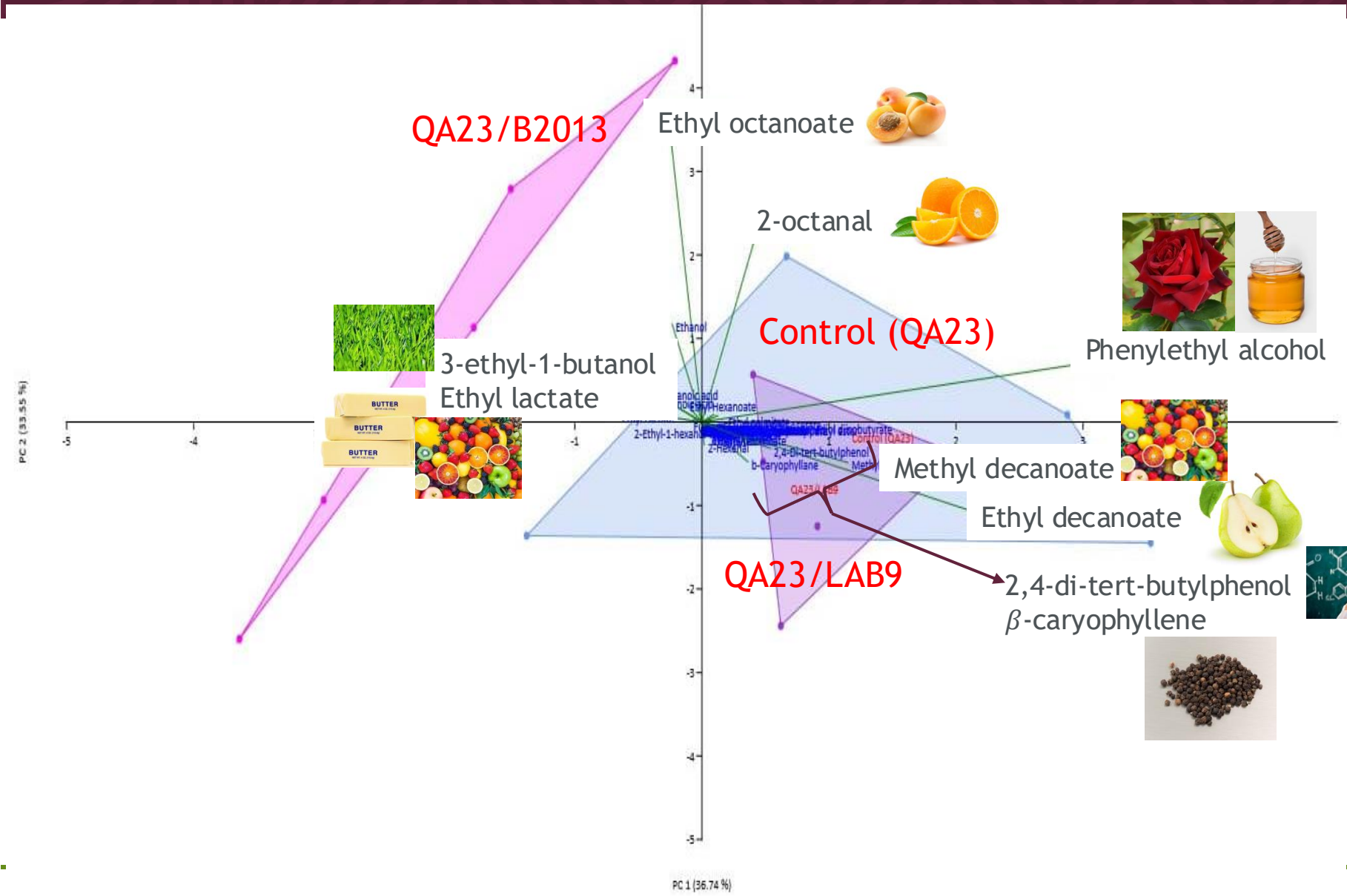
Take Home

111 compounds identified

VOC profile changed throughout fermentation

Focus on day 14

MLF strain distribution of aromas

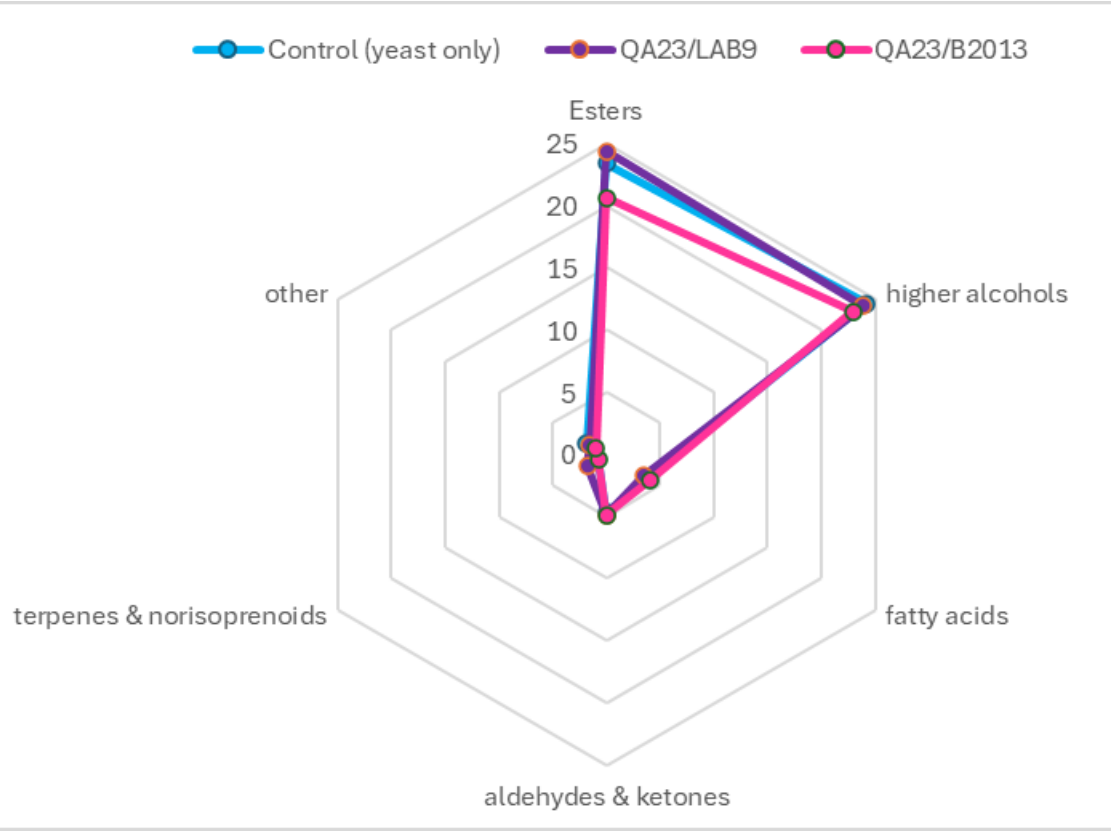


Take Home

- Control & QA23/LAB9 fermentations similar vs. QA23/B2013.
- B2013 genetic makeup & reaction to matrix (including yeast), results in different expression of aromas.

MLF wine aroma contribution

	Control	QA23/LAB9	QA23/B2013
Esters	+	++	-
Higher alcohols	++	+	-
Fatty acids	+	-	++
Aldehydes	-	++	++
Ketones	++	-	-
Terpenes	+	++	-
Norisoprenoids	++	-	+
Other (2.4-di-tert-butylphenol	++	+	-



++ = increases, is more than control & highest amount
+ = increases, but not more than control/ highest
- = less than control & lowest amount

LAB9 vs. B2013

- LAB9 co-fermentations
  - ➢ higher ester, lowe
    concentrations &
  - ➢ β-caryophyllene (β
  - ➢ More floral, fruity,

O. Oeni strain releases terpene from glycosidic precursors
&
Contributes to more conclusive matrix for grape compound release

13)

- LAB9 strain shows matrix detoxification via esterification of MCFA
  - ➢ MCFA inhibitory to *O. oeni* metabolism
  - ➢ Results in increased ester concentrations

(Naselli et al., 2024; Yang et al., 2025; Hernández-Orte et al., 2008; Knoll et al., 2011)

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Thank you
Enkosi
Dankie

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