



= BIER OP FLES =

DE PRAEL	7 DEUGDEN	MALT
• HEHELSWATER (5,70) €5,-	• RUM + HARIG (5,90) €5,-	• JUPILER (0,07) €2,80
• IPA (6,50) €5,-	• SCHEEPSRECHT (7,5) €5,-	• FRANZISKANER (0,02) €5,-
• DORTMUNDER (6,00) €5,-	• WUBS + NEUZIG (5,00) €5,-	
• AAN LAGERWAL (3,50) €5,-	• ZY + ZON (5,00) €5,-	
	• BECKS (5,00) €4,-	
	• CORONA (1,50) €5,-	
	• RADLER (2,70) €4,-	

Jupiler



= BIER OP TAP =

PILS	STUONSBIER
• BRAND OZEL (2,80) €2,80	• BRAND IPA €4,00
• AFFLIGEN BLOND €3,80	• PHILANER €3,80
• WIECKE WITTE €3,80	• BRAND BOCK €3,50





The Br

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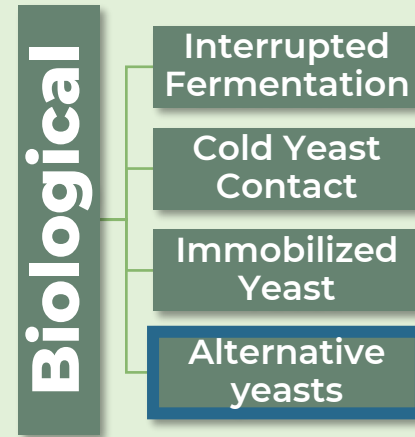
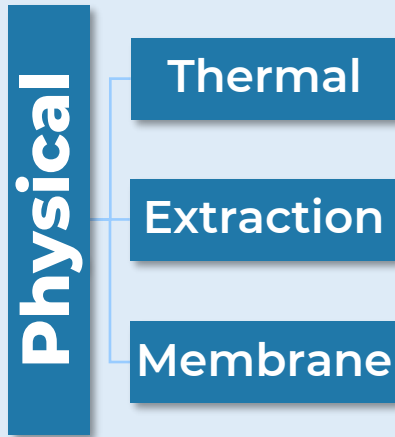


Prime Minister Alexander De Croo enjoyin
Credit: Belga/Nicolas Maeterlinck

Belgium's various health mi
plan" with 75 measures to c
consumption in the country
Vandenbroucke on Wednes



How to produce NABLAB?



Traditional brewery equipment
Retention of volatiles
Sustainable
Cheap

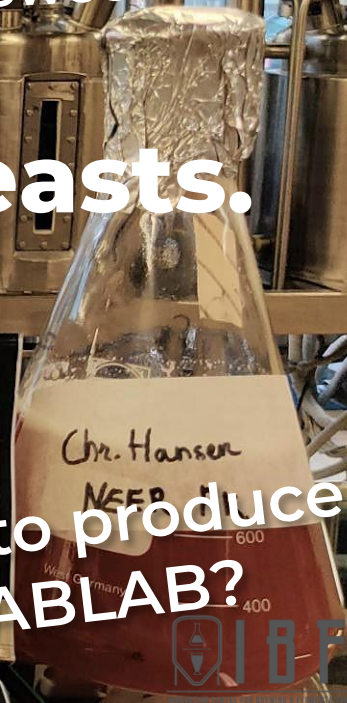
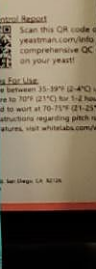
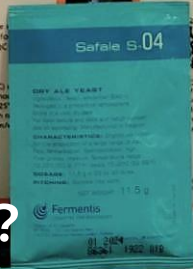
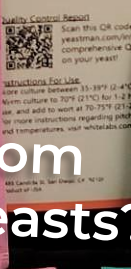
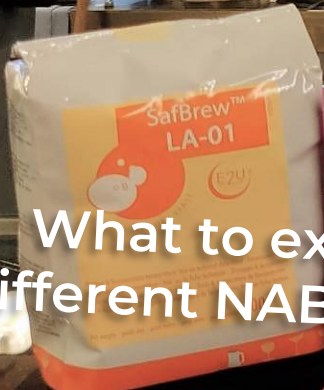
Lack of technical know-how

Flavour challenges
Worty
Watery
Sweet

Commercial alternative yeasts.

What to expect from different NABL AB yeasts?

How to produce NABL AB?



Lack of technical know-how

Flavour challenges

Watery

Worty

Sweet



What to expect from different NABLAB yeasts?

How to produce NABLAB?

A Taste Test of Yeasts.

Comparing Commercial Options for Low-Alcohol and Alcohol-Free Beer Production

Elia Myncke
IBF | Ghent University



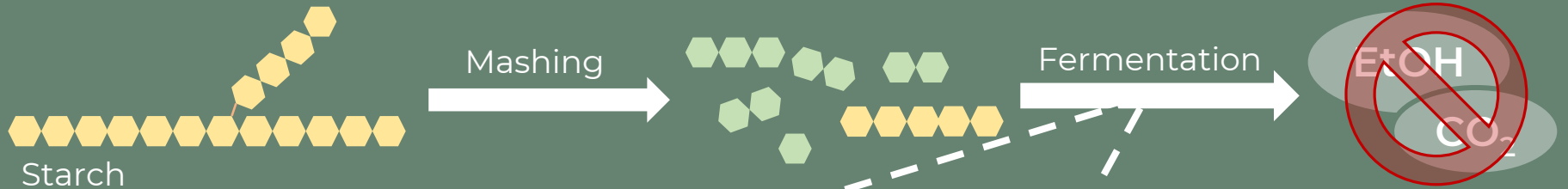
This research was funded by Flanders Innovation and Entrepreneurship (VLAIO) project HBC.2021.0120.



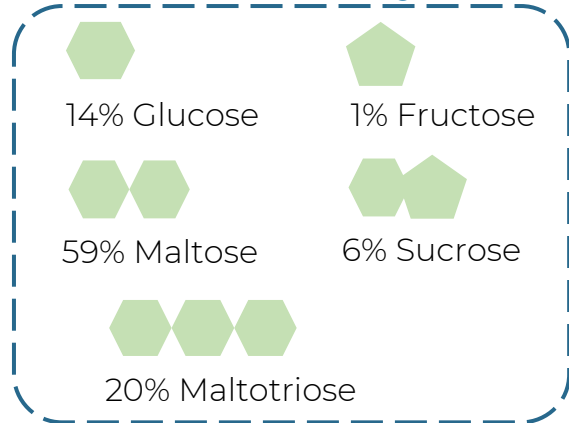
Outline.

- 1. Practical learnings**
- 2. (Physico)chemical beer properties**
- 3. Sensory fresh beer flavour**

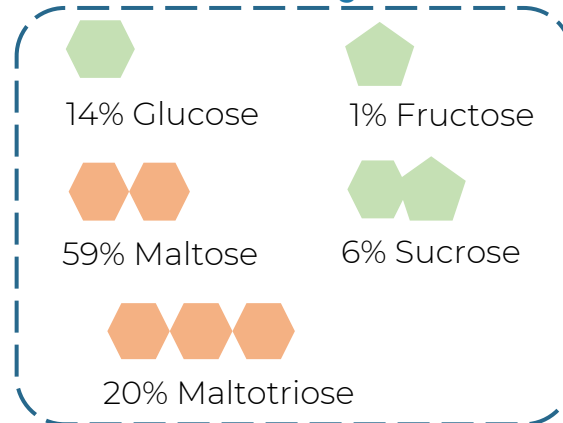
Basic principle.



Conventional yeasts



NABLAB yeasts

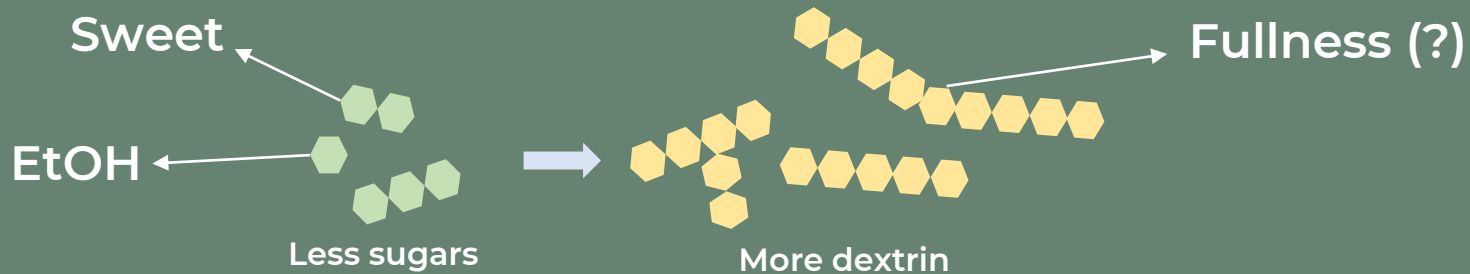


Commercial NABLAB yeasts available.

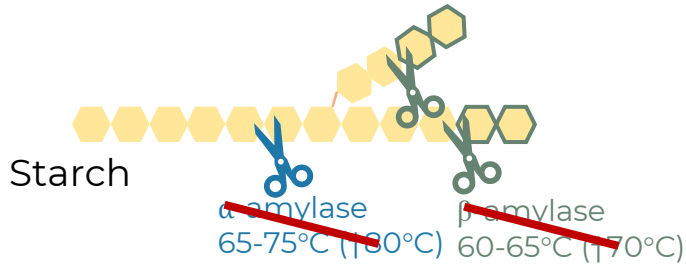
Yeast	Product	Supplier	Properties
<i>Pichia kluyveri</i>	NEER™ NEER™ Poly NEER™ Punch	Chr. Hansen	Maltose ⊖
<i>Saccharomyces cerevisiae</i> <i>var. chevalieri</i>	SafBrew™ LA-01	Fermentis	Maltose ⊖
<i>Saccharomycodes ludwigii</i>	WSL17	Hefebank Weihenstephan	Maltose ⊖
<i>Saccharomycodes ludwigii</i>	WLP618	White Labs	Maltose ⊖
<i>Torulaspora delbrueckii</i>	WLP603	White Labs	Maltose ⊖
<i>Zygosaccharomyces lentus</i>	WLP686	White Labs	Maltose ⊖
<i>Saccharomyces cerevisiae</i>	LaBrew® Windsor	Lallemand	Maltotriose ⊖
<i>Saccharomyces cerevisiae</i>	LaBrew® London	Lallemand	Maltotriose ⊖
<i>Saccharomyces cerevisiae</i>	LaBrew® NOLA™	Lallemand	Maltose ⊖
<i>Torulaspora delbrueckii</i>	WLPEXP3	White Labs	Maltose ⊖
<i>Pichia kluyveri</i>	WLPEXP1 WLPEXP2	White Labs	Maltose ⊖



Limited wort fermentability.



**By increasing mashing-in temperature /
alternative (un)malted cereals.**





Experimental Wort production.

Pilot mashing 100 L

100% pilsner malt

60 min @ 72°C

10 min @ 78°C

90 min boiling

6.5°P pitching wort

20 EBU

6.5°P pitching wort

Experimental wort production.

100 L Pilot mashing

100% pilsner malt

60 min @ 72°C and 10 min @ 78°C

90 min boiling

6.5°P pitching wort

20 EBU



20 L Brew Monk™

NEER™: tannic acid

+ 10 g/hL during mashing

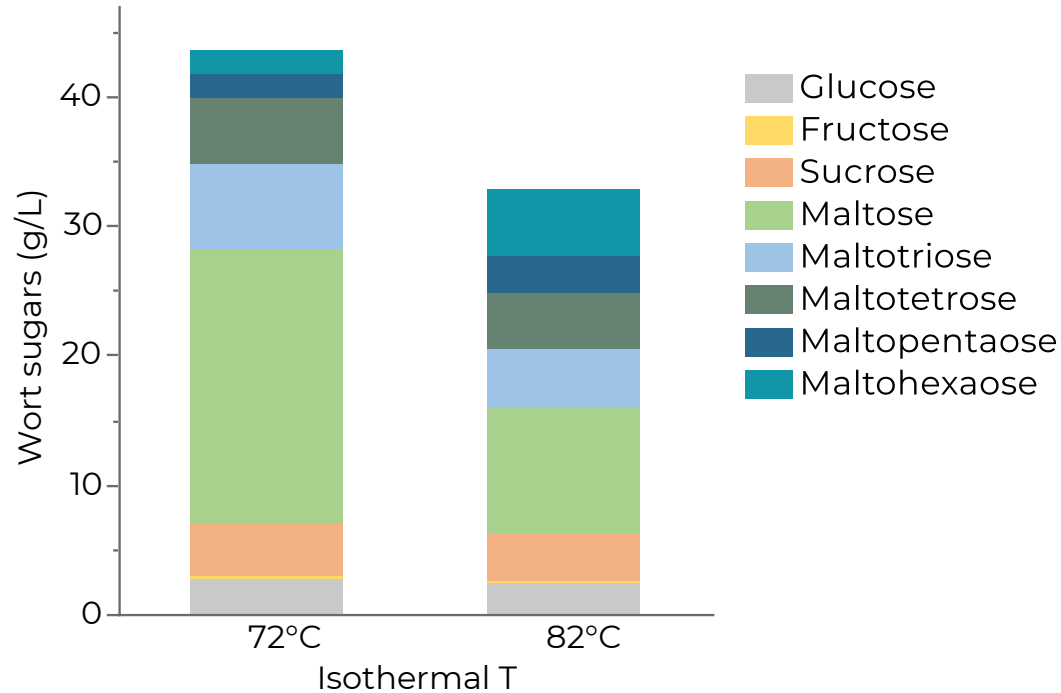
+ 4 g/hL 15 min before end boiling

LaBrew® London and Windsor

60 min @ 82°C



Shift from maltose to dextrins.



Sensitive to contamination.

Remaining maltose
Little EtOH
Low pH drop
No vigorous fermentation



Pasteurisation



Experimental fermentation.

NABLAB yeast	Pitching	Fermentation		Maturation	
	Rate (CFU/mL)	Temp. (°C)	Time (days)	Temp. (°C)	Time (days)
SafAle™ S-04	6 x 10 ⁶	20	7	0-4	14
SafLager™ W-34/70	4 x 10 ⁶	15	10	0-4	14
NEER™	2 x 10 ⁵	20	6	0-4	7
NEER™ Poly	2 x 10 ⁵	20	6	0-4	7
NEER™ Punch	2 x 10 ⁵	20	6	0-4	7
SafBrew™ LA-01	3-4.8 x 10 ⁶	20	2	0-4	7
WSL17	6.5 x 10 ⁶	15	5	0-4	7
WLP618	2 x 10 ⁵	20	6	0-4	7
WLP603	2 x 10 ⁵	20	6	0-4	7
LaBrew® Windsor	2.5-5 x 10 ⁶	20	3	0-4	14
LaBrew® London	2.5-5 x 10 ⁶	20	3	0-4	14



- ✓ **pH correction** prior to fermentation: *Pichia*'s and WSL17
- ✓ **Mixing** during fermentation: *Pichia*'s
- ✓ **Sterile beer filtration**

- ✓ **Carbonation:** 5.6 g CO₂/L
- ✓ **Pasteurisation:** 50 PU

Contaminations.

<u>Yeast</u>	<u>Product</u>
<i>Zygosaccharomyces lentus</i>	WLP686

Unable to use due to slow growth

<u>Yeast</u>	<u>Product</u>
<i>Saccharomyces ludwigii</i>	WSL17
<i>Saccharomyces ludwigii</i>	WLP618

All beers contaminated with
Pectinatus & *Megasphaera*

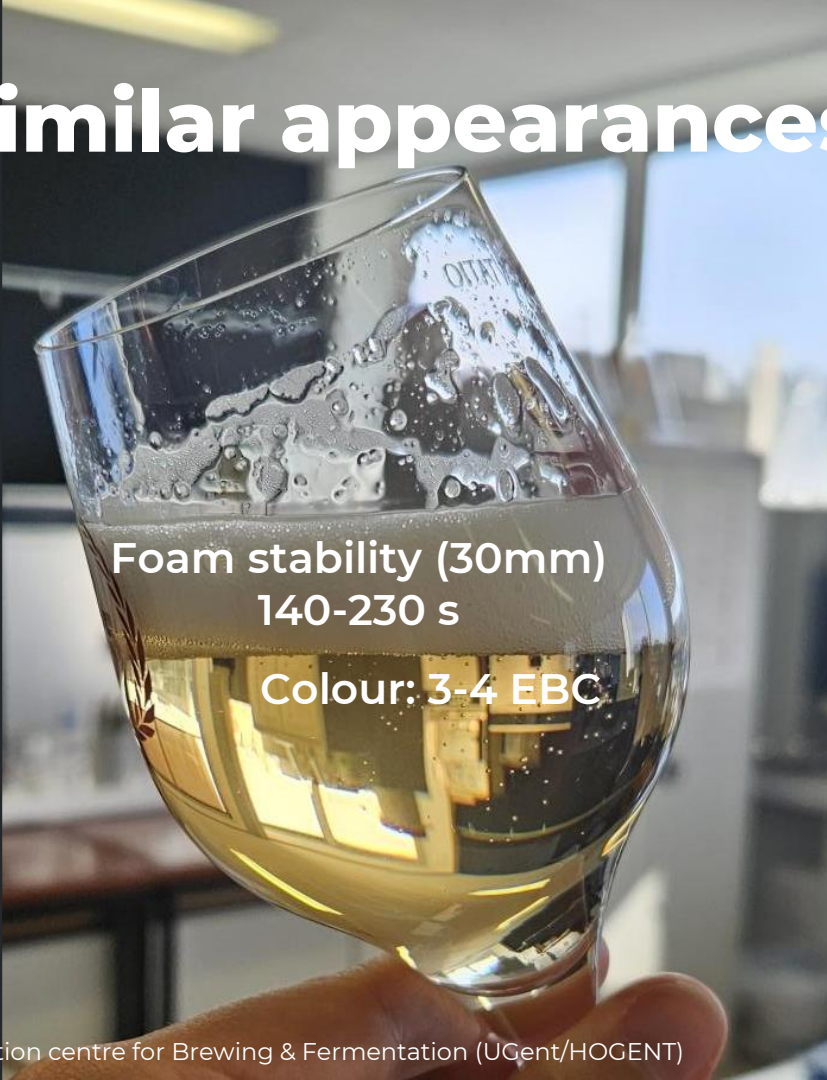




2. Physicochemical properties.

Characterisation and comparison of commercial NABLAB yeasts.

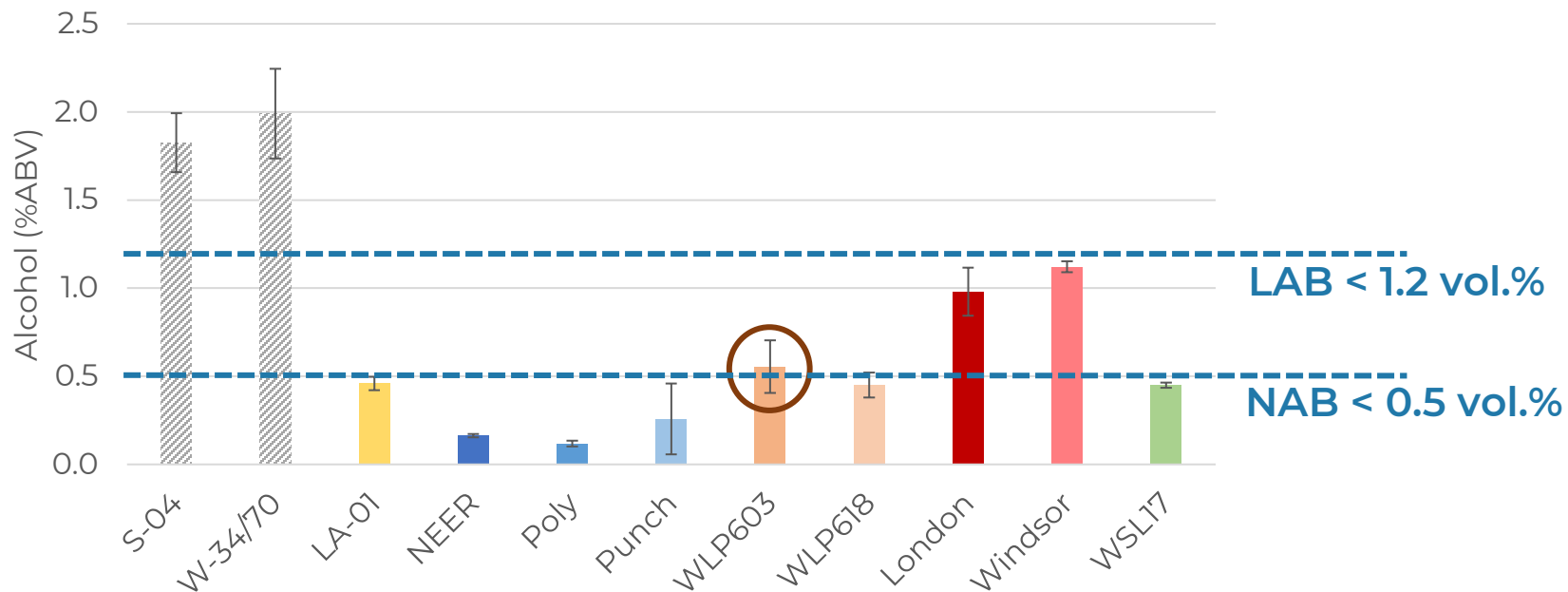
Similar appearances.



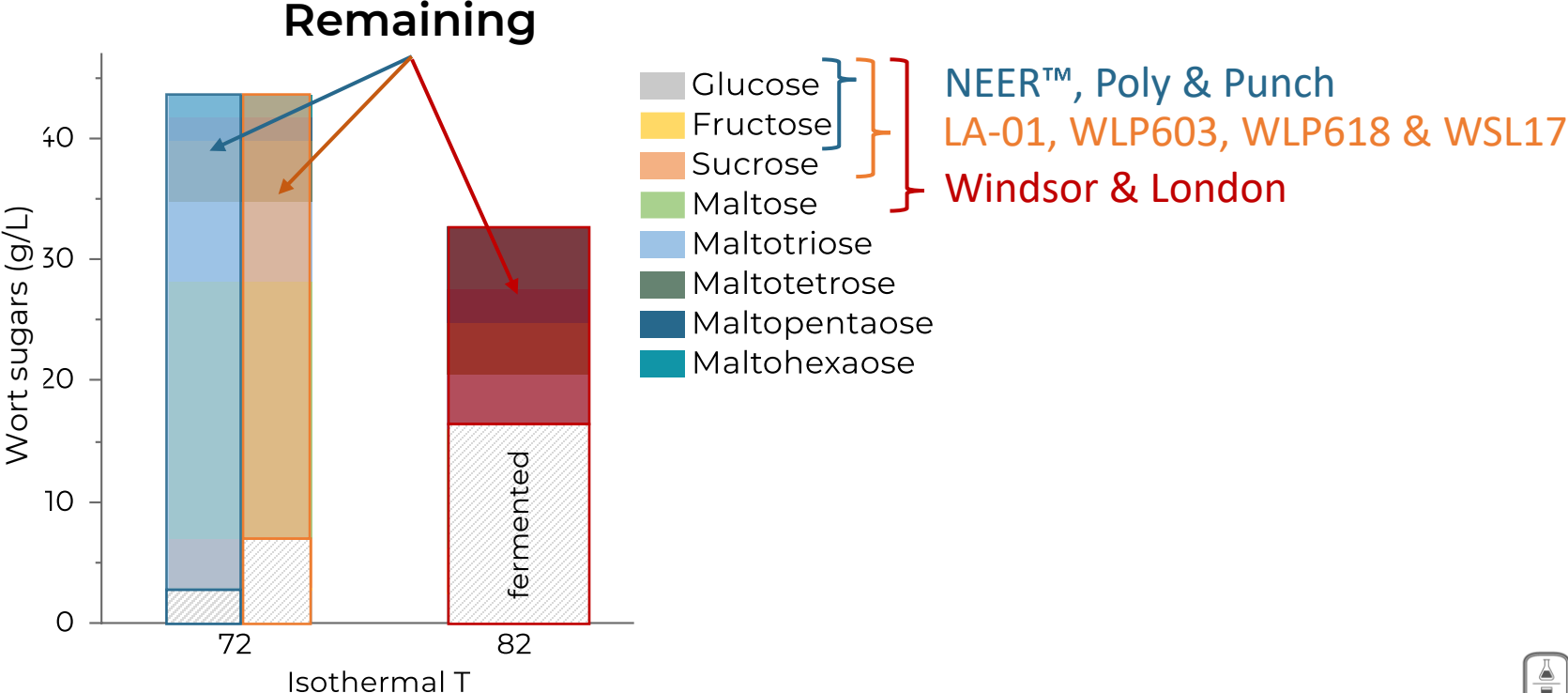
Foam stability (30mm)
140-230 s

Colour: 3-4 EBC

Different alcohol levels.



Different remaining sugars.



pH adjustment needed.

Wort pH: 5.5 ± 0.2

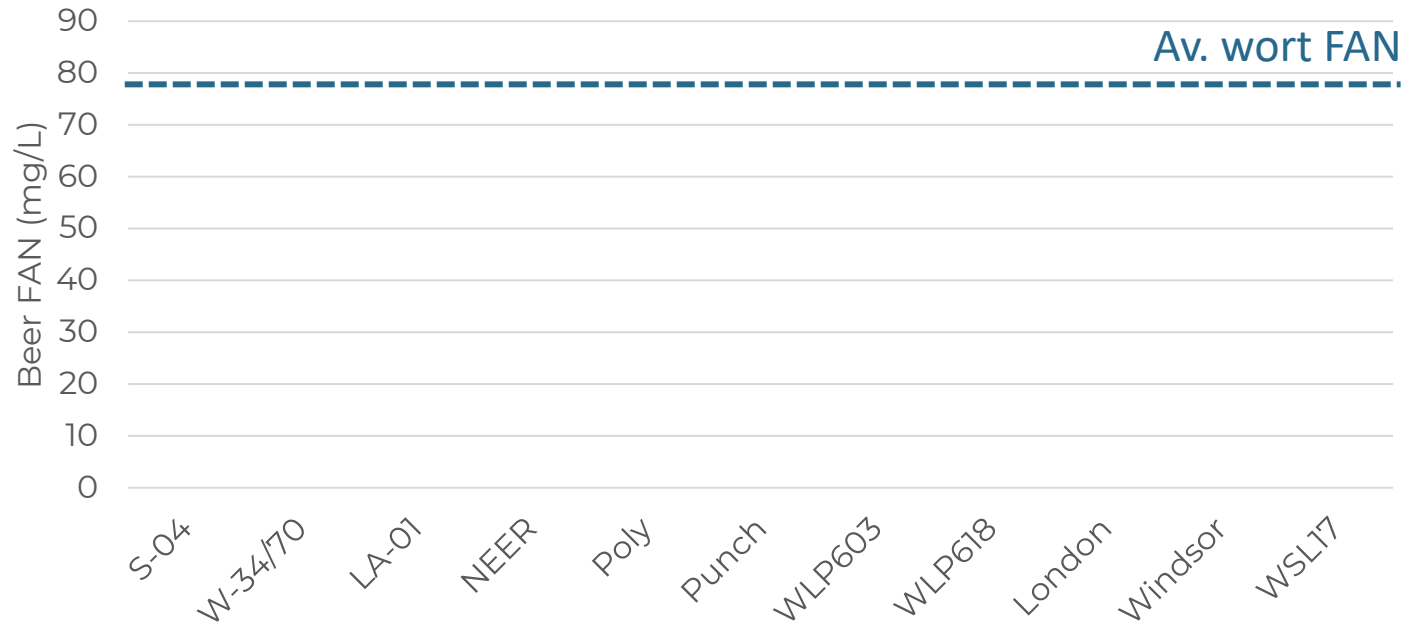
**microbiological stability:
aim for pH < 4.3**

pH drop during fermentation

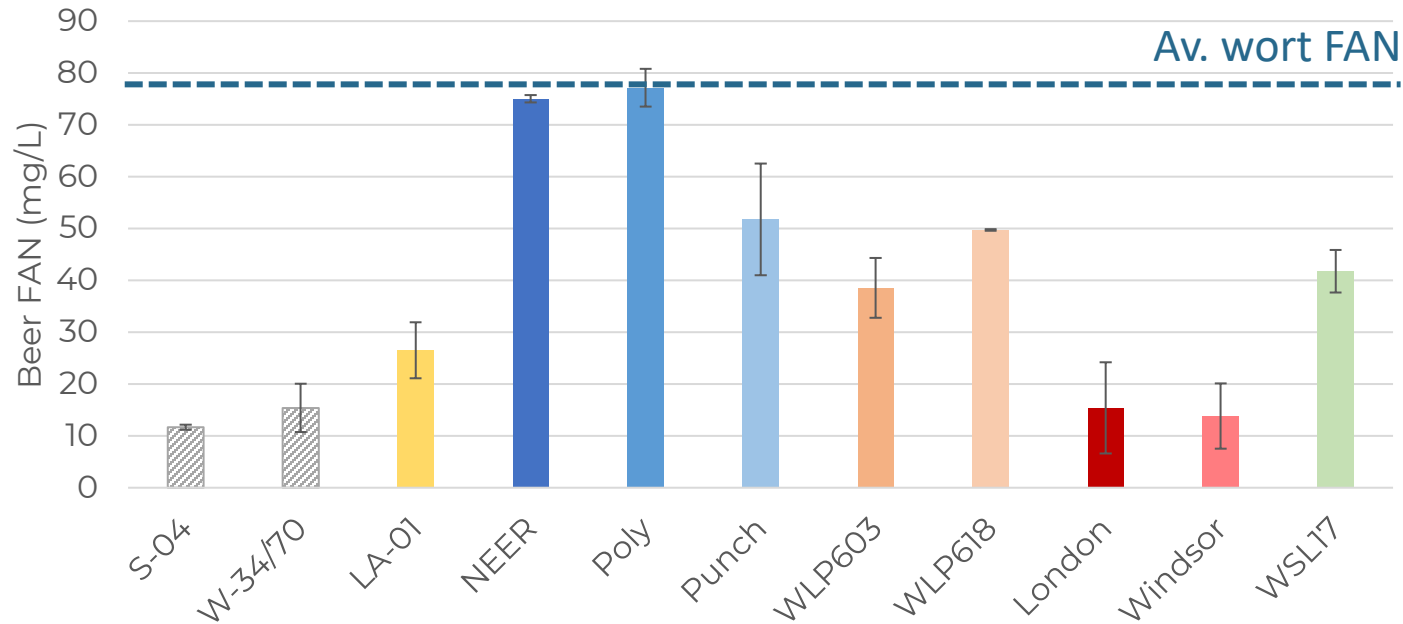
LA-01	0.7	} NABLAB pH: 4.5-4.8
WLP603	0.9	
WLP618	0.7	
London	1.0	
Windsor	0.9	
NEER*	0.1	
WSL17*	0.1	
S-04	1.2	} Reference pH: 4.1-4.2
W-34/70	1.3	

*pH adjusted to 4.5-4.6 prior to fermentation

Less consumption of FAN by maltose-negative yeasts.



Less consumption of FAN by maltose-negative yeasts.





3. Sensory.

**Characterisation and comparison of commercial
NABLAB yeasts.**

Sensory.

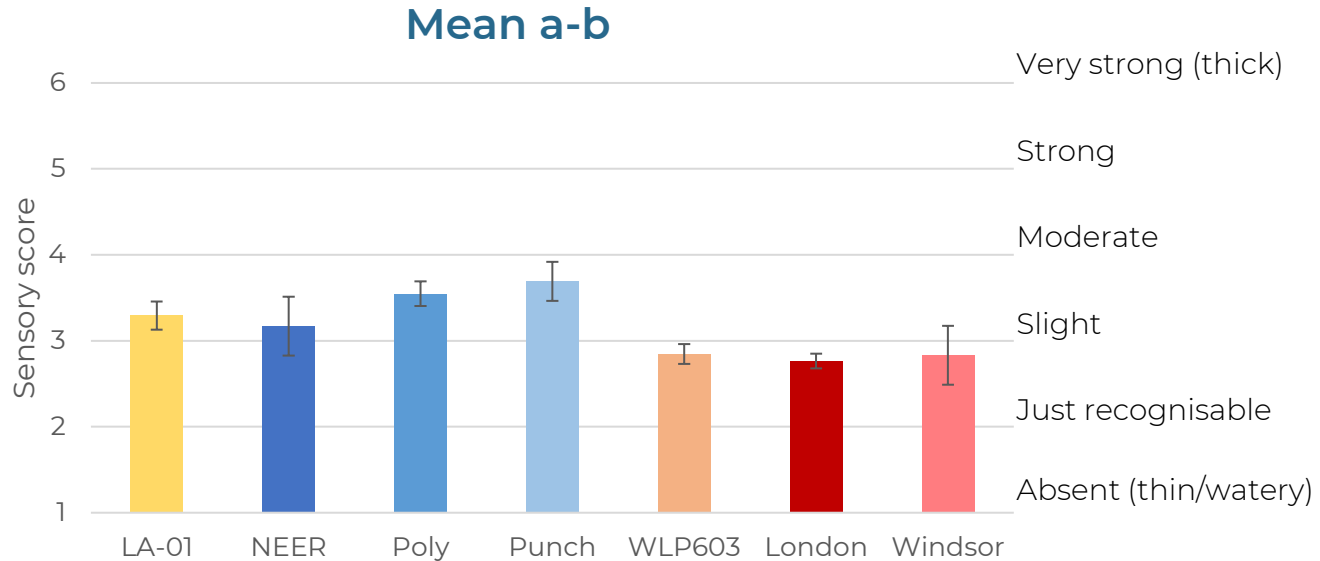
Batch a
27 tasters

Batch b
17 tasters

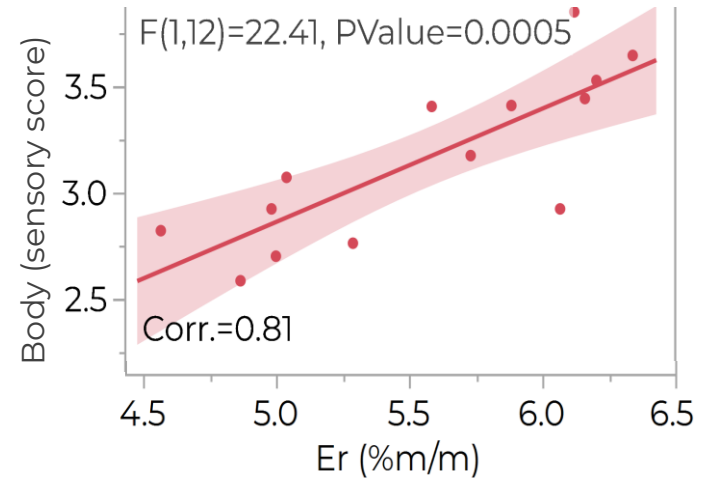
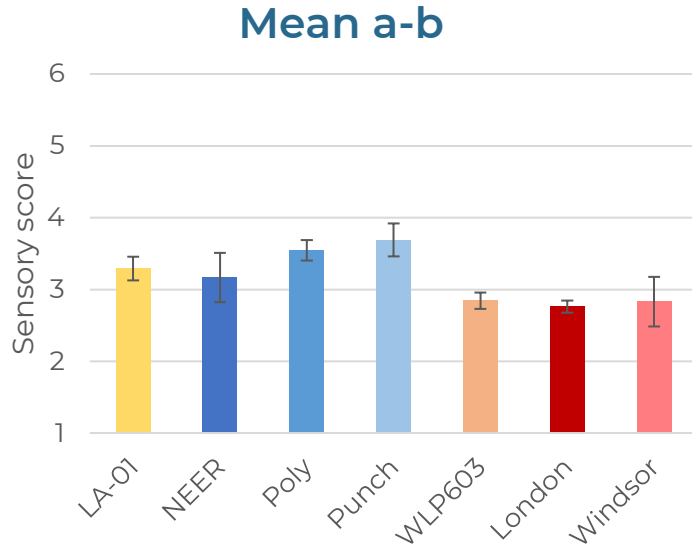
Data representation
Mean a-b



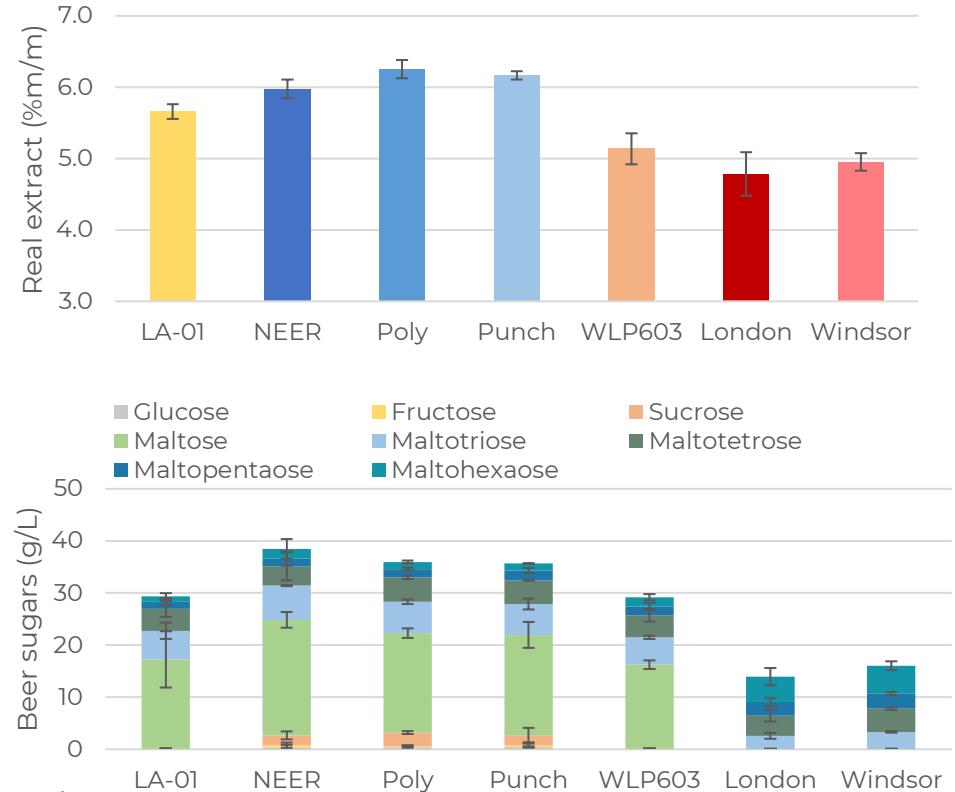
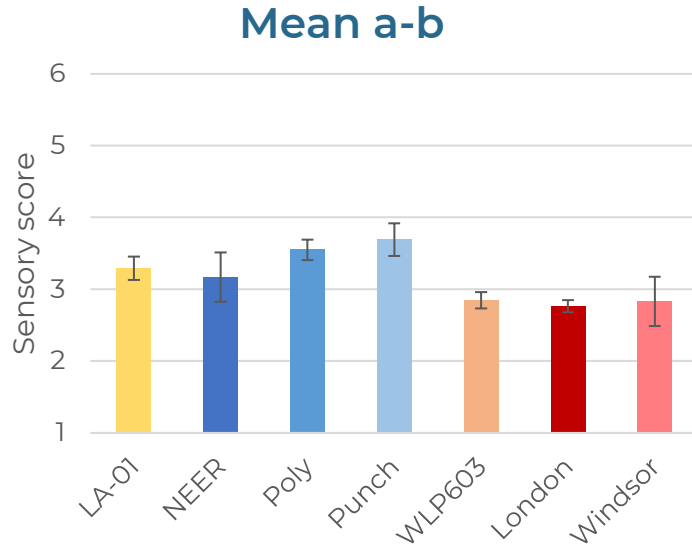
Fullness/Body.



Fullness/Body ~ dissolved solids.



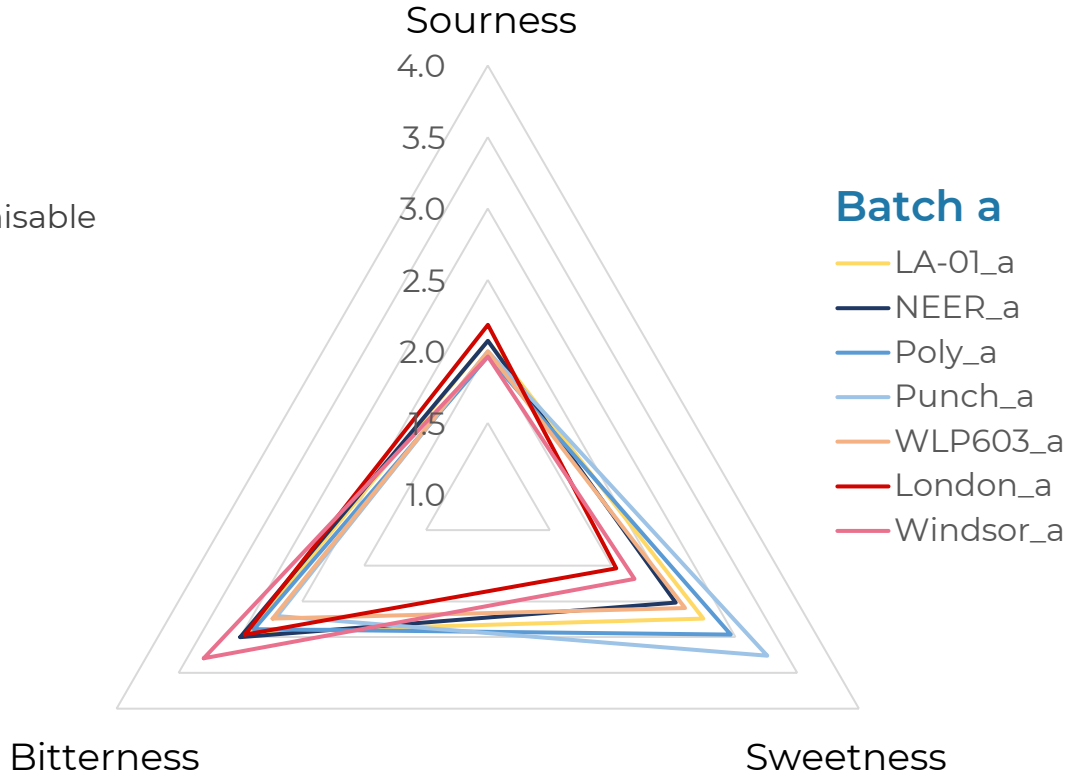
Fullness/Body ~ remaining sugars.



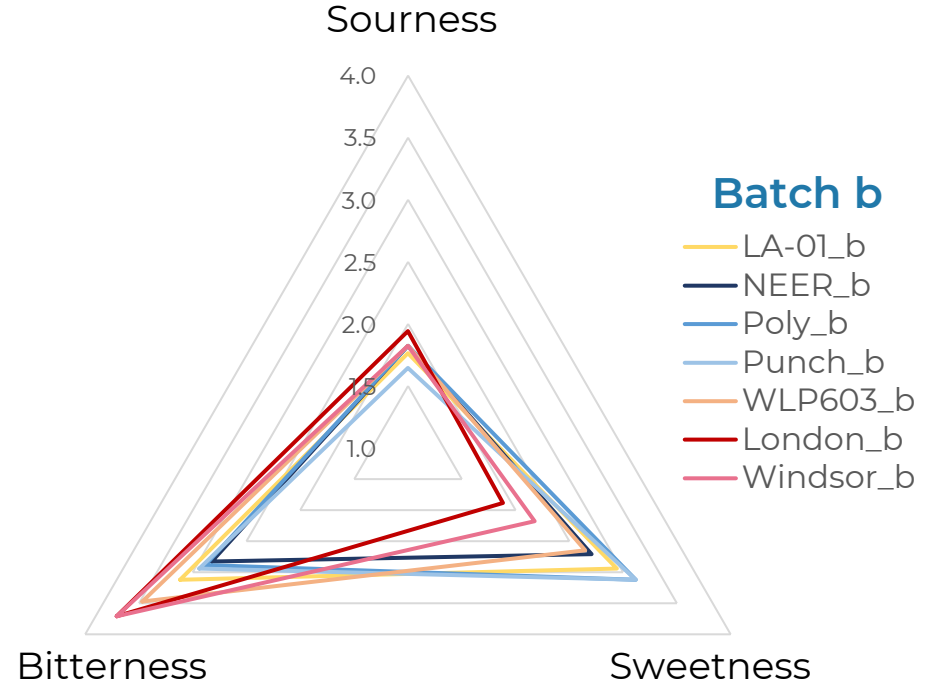
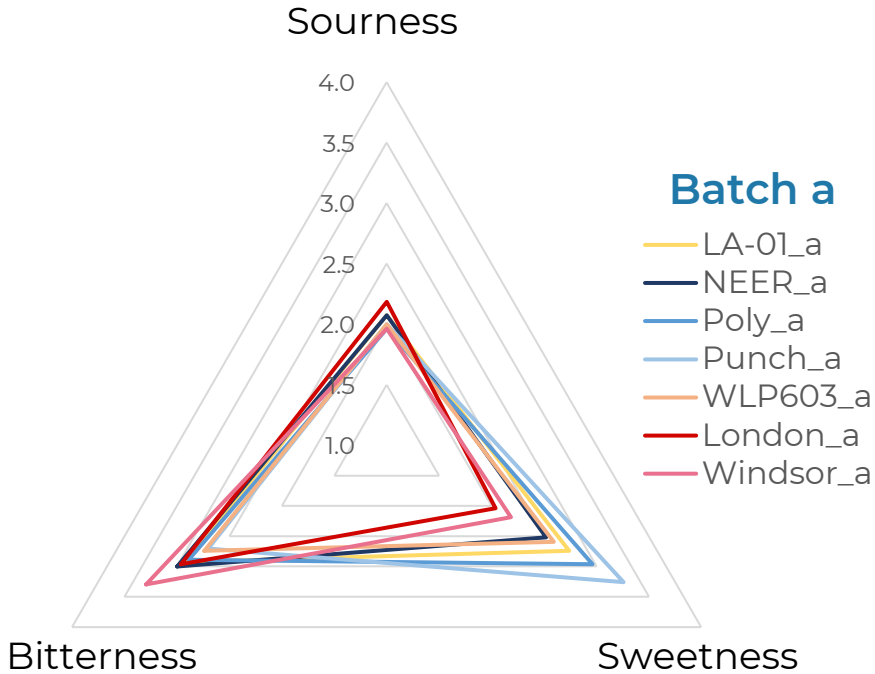
Taste: controlled by beer sugars.



- 6. Very strong
- 5. Strong
- 4. Moderate
- 3. Slight
- 2. Just recognisable
- 1. Absent

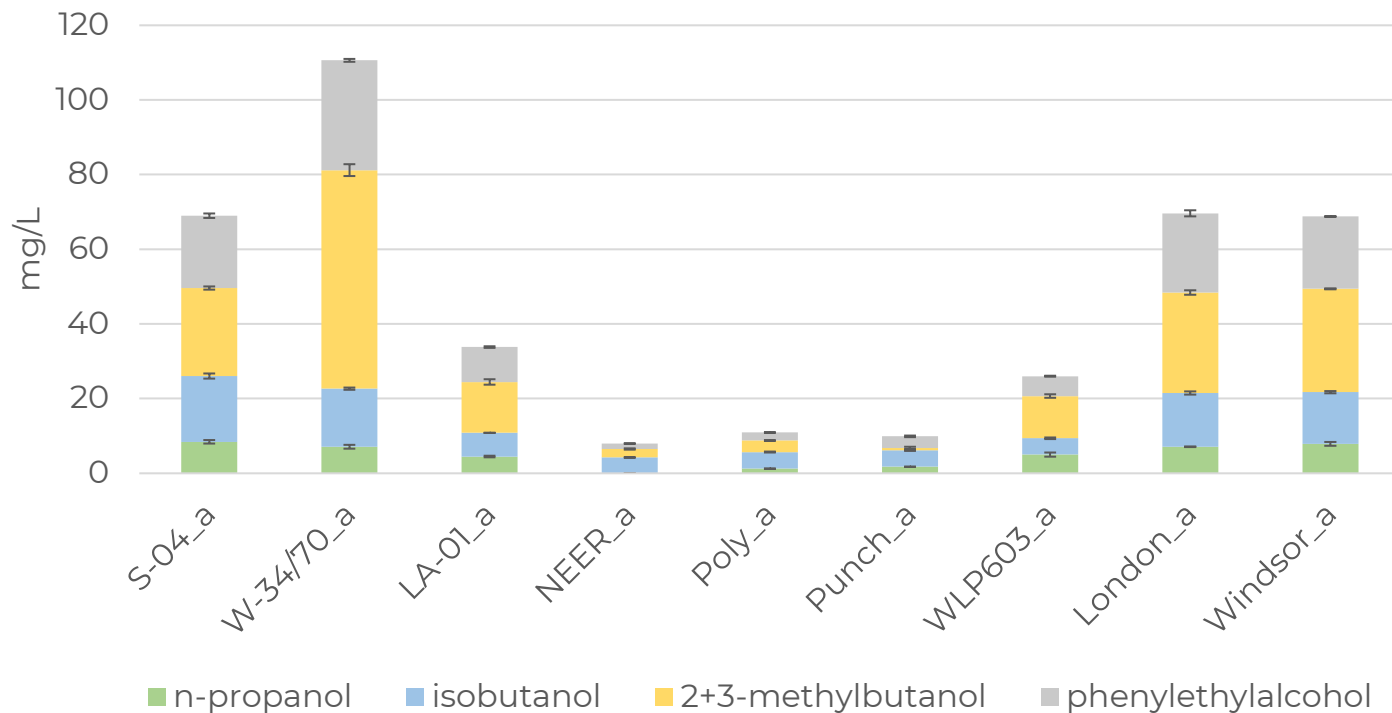


Taste: controlled by beer sugars.



Higher Alcohols.

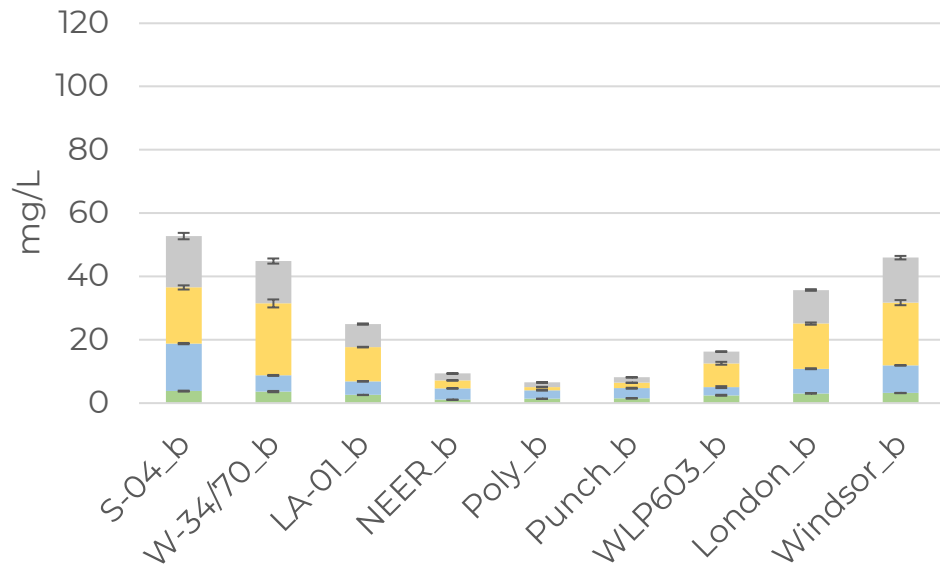
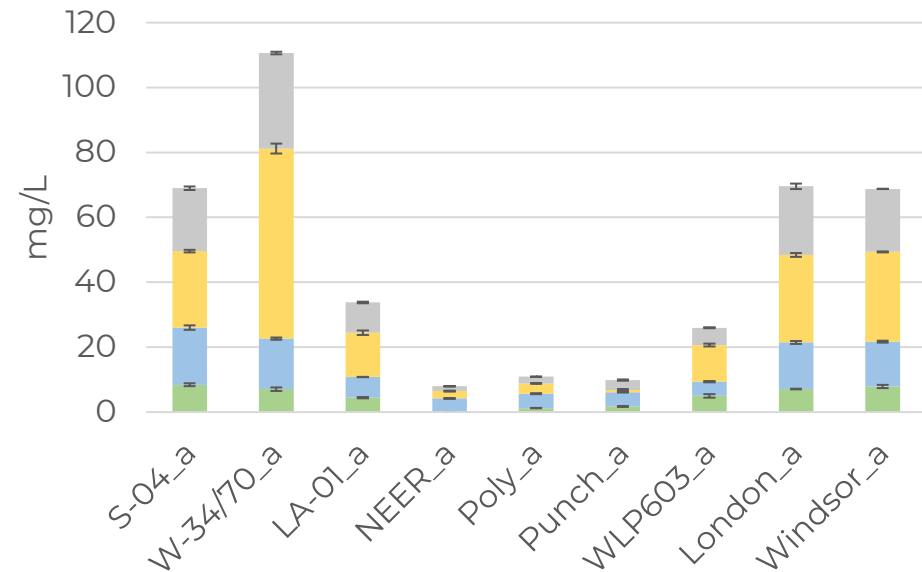
Batch a



Higher Alcohols.

Batch a

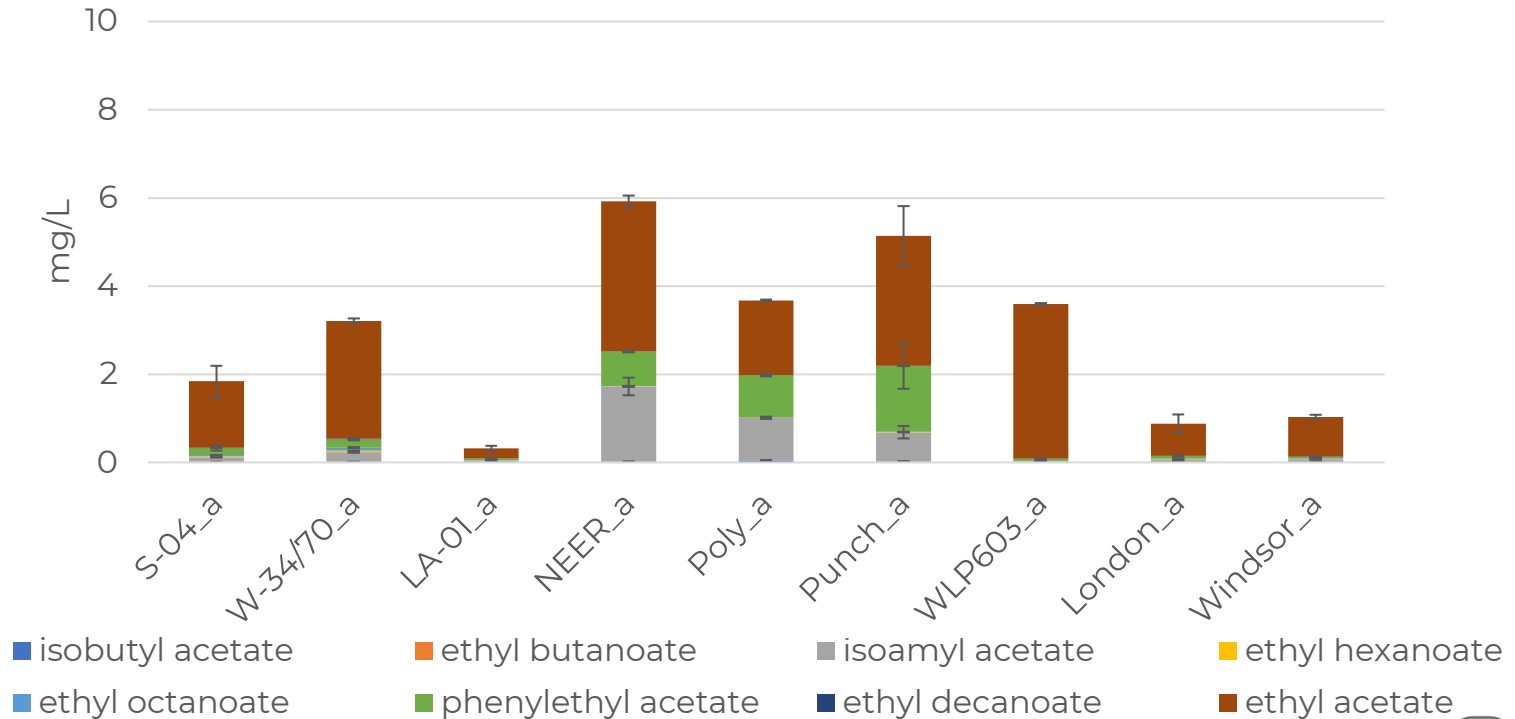
Batch b



■ n-propanol ■ isobutanol ■ 2+3-methylbutanol ■ phenylethylalcohol

Esters.

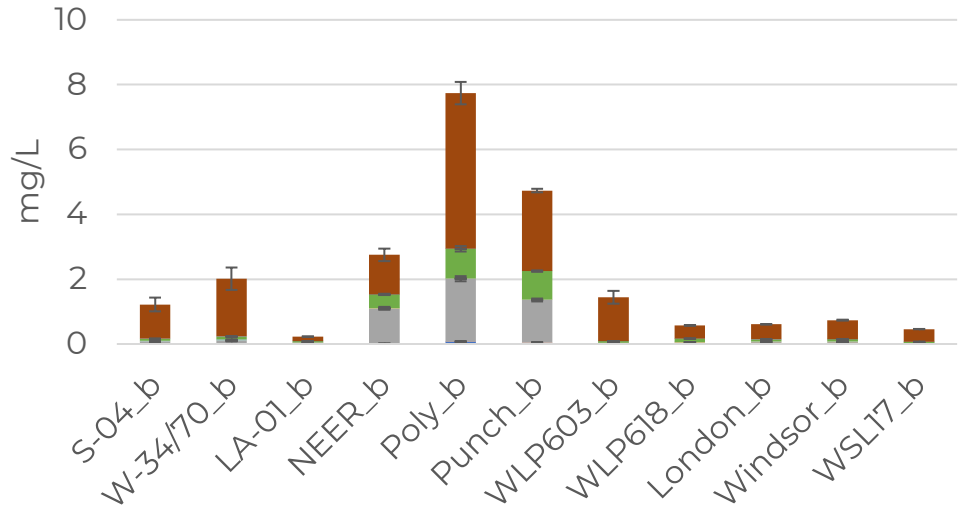
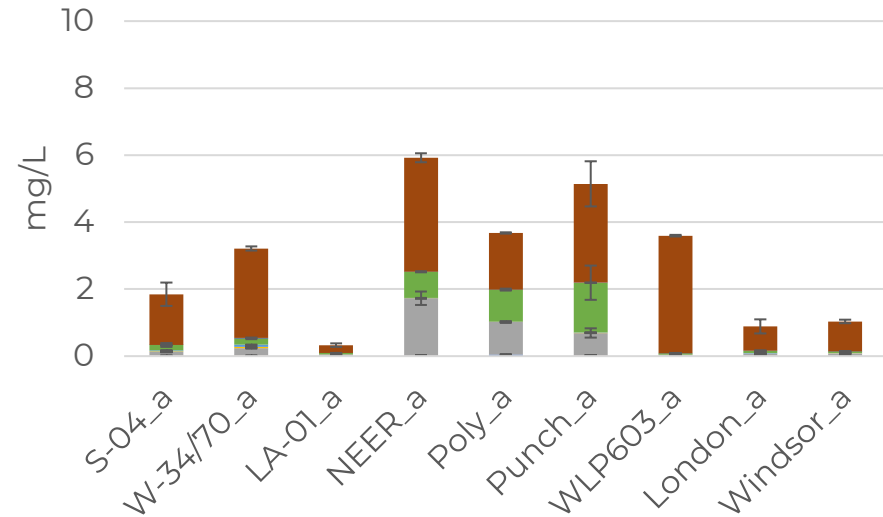
Batch a



Esters.

Batch a

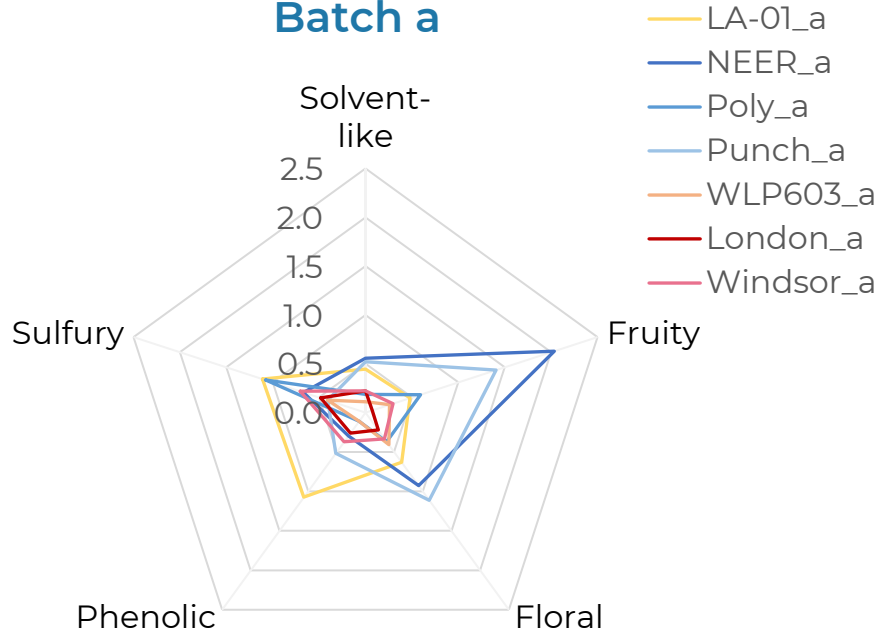
Batch b



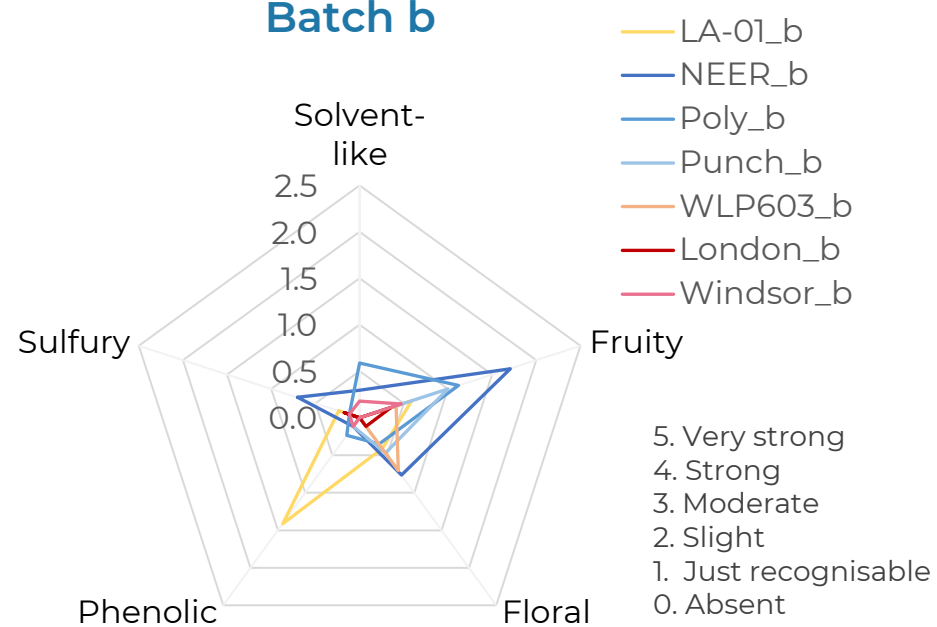
- isobutyl acetate
- ethyl butanoate
- isoamyl acetate
- ethyl hexanoate
- ethyl octanoate
- phenylethyl acetate
- ethyl decanoate
- ethyl acetate

Odour & Aroma.

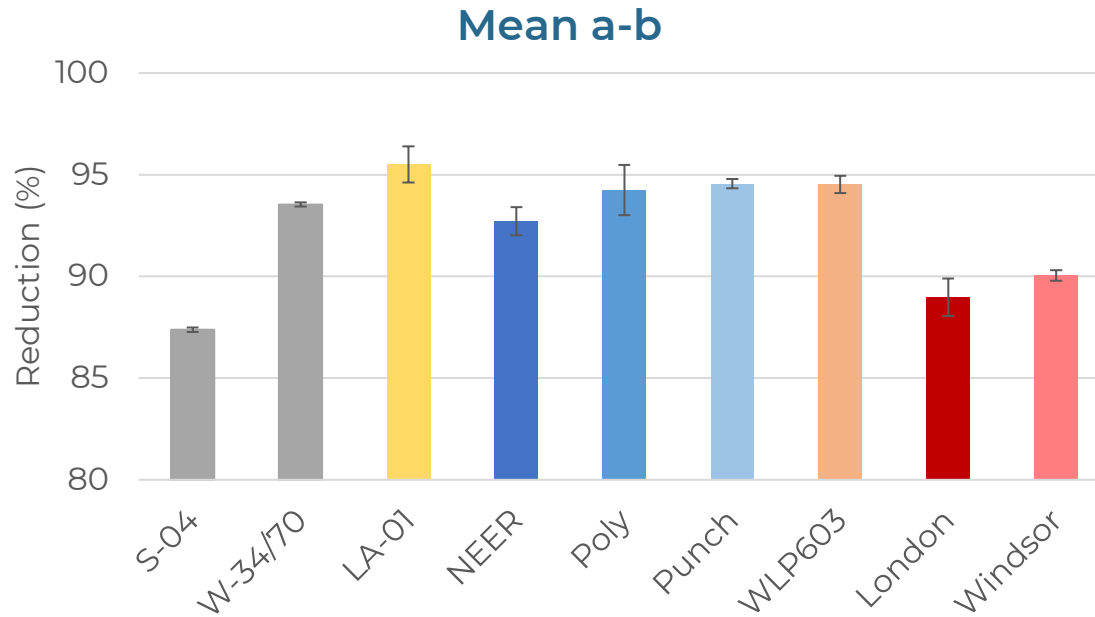
Batch a



Batch b

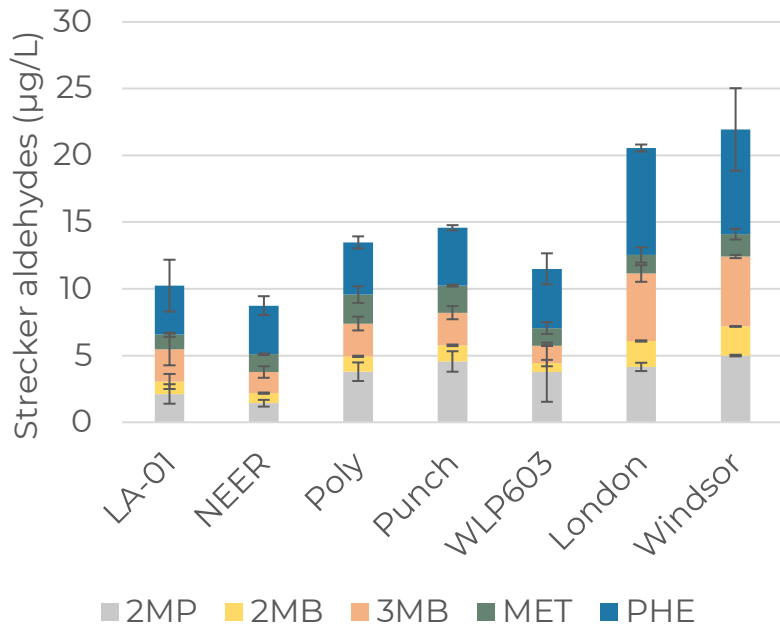


Efficient aldehyde reduction.



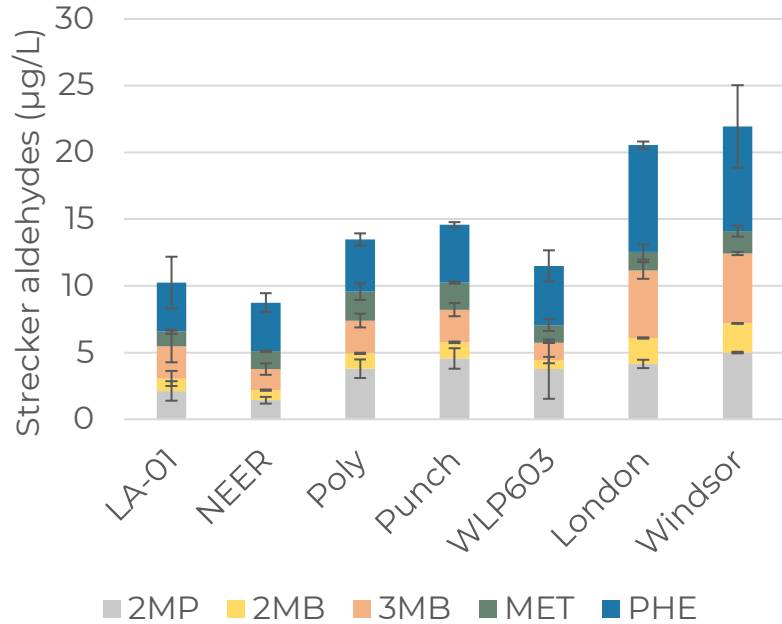
Low levels of aldehydes in final beers.

Mean a-b

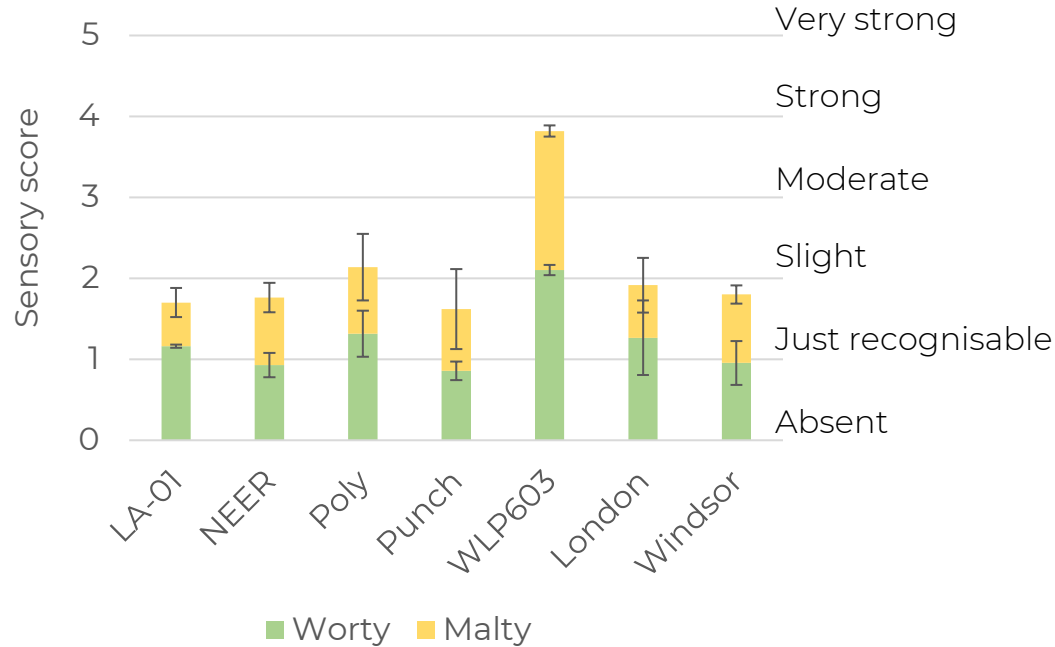


Still wort flavour: other actors at play?!

Mean a-b



Mean a-b



SafAle™ LA-01

NAB

No maltose & maltotriose

Beer-like

4VG - phenolic - spicy – clove

Grainy

Less fruity - flowery – sweet



WLP603

NAB

No maltose & maltotriose

Malty – bready – worty – honey

Slightly floral

Neutral – little complexity

Beer-like to sweet aromatic

Clean



NEER™, Poly & Punch

NAB

Only glucose and fructose

Strongly fruity, tropical, floral

Sweet aromatic

Complex

Less watery



Punch

Less sulfury

Good aftertaste

LalBrew® London & Windsor

LAB

No maltotriose

Beer-like

Neutral

More bitterness (less sweet)



Lack of technical know-how

Flavour challenges

Watery

Worty

Sweet



What to expect from different NABLAB yeasts?

How to produce NABLAB?

Contact us.



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IBF

INNOVATION CENTRE FOR BREWING & FERMENTATION



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