rehydrera eller inte rehydrera, det är frågan

14/09/2018, Upplands-Väsby, Sweden

THE OBVIOUS CHOICE FOR BEVERAGE FERMENTATION

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3. Easy 2 Use study: rehydration or direct pitch?
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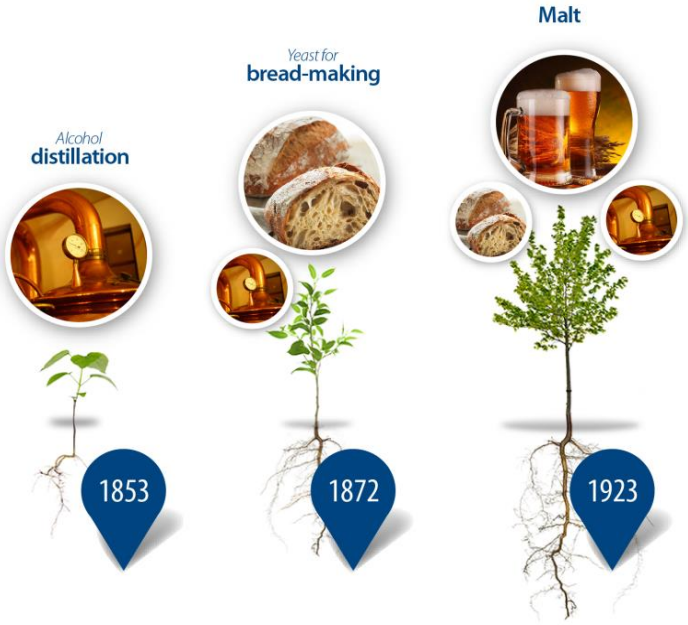
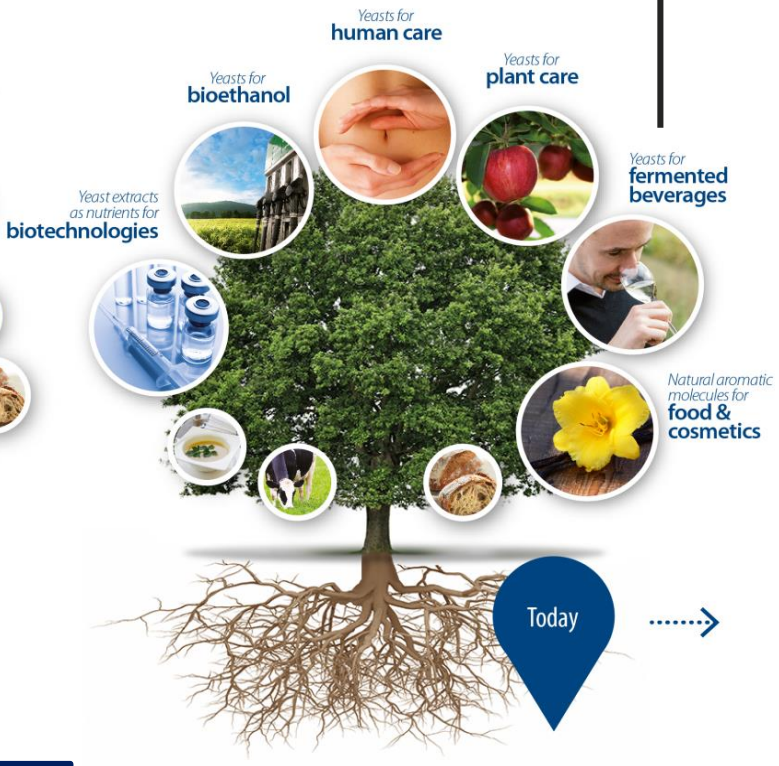
LESAFFRE, MORE THAN 160 YEARS OF HISTORY

Louis Bonduelle

Louis Lesaffre





1939-45 Alcohol production suspended. Development of the first active dry yeast production process.

LESAFFRE, A GLOBAL PRESENCE

550
R&D experts

160
years of expertise
and know-how

60
partners universities
and research centers
around the world

1 BREAD OUT OF 3 IN
THE WORLD MADE
WITH LESAFFRE YEAST

Radiate internationally

63 production sites operating in 45 countries

180 countries where products and services are marketed

70 nationalities represented

Commit for the environment

15%
of all industrial
and technical investments
are devoted to the environment

http://www.lesaffre.com/group/key-figures/

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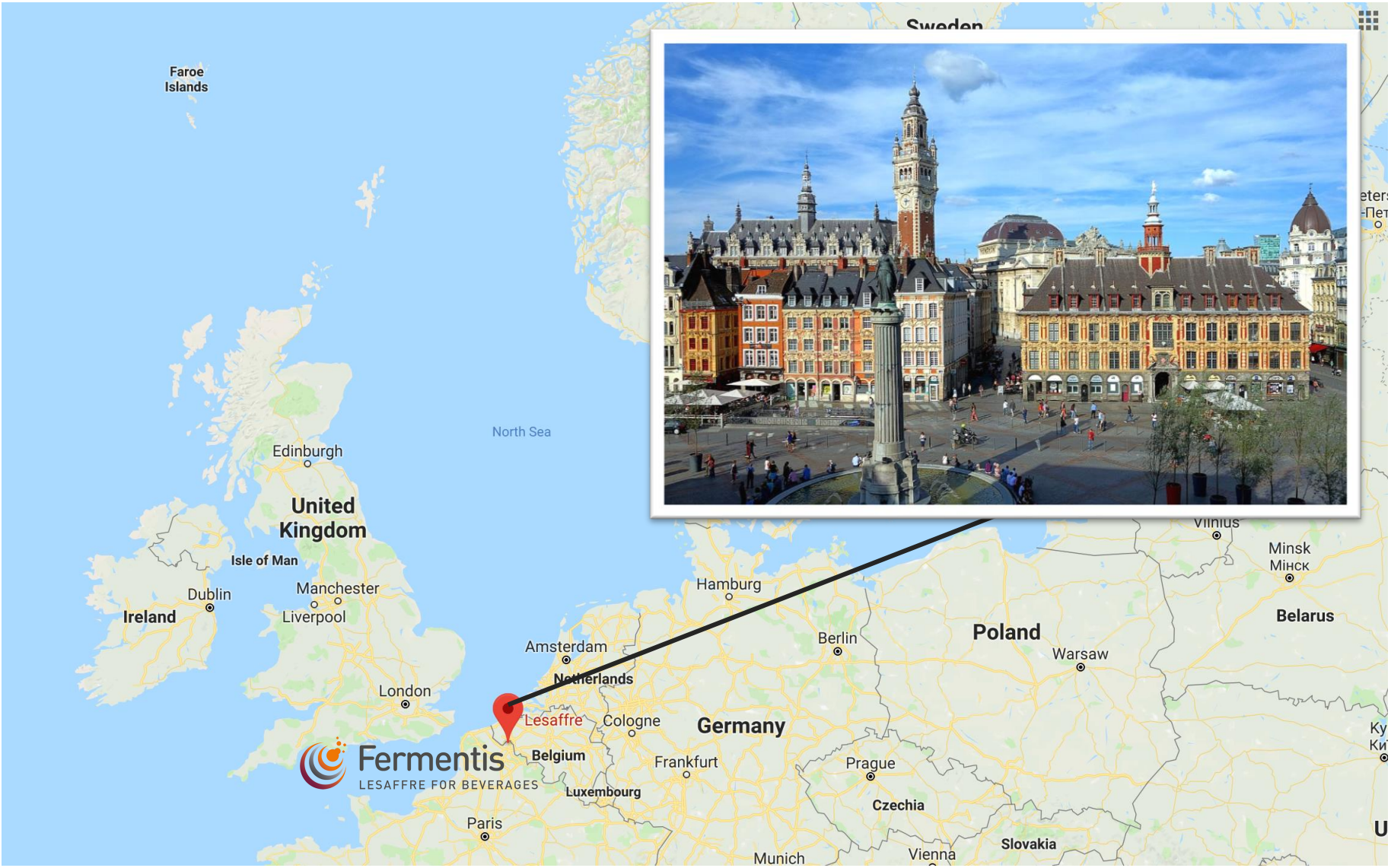
LESAFFRE / FERMENTIS HEADQUARTERS (LILLE, NORTH OF FRANCE)



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Fermentis is the business unit of Lesaffre that focuses on the development and sales of innovative products and technical services for **beer**, **wine**, **cider**, **spirits** and **potable ethanol**.

YEAST & YEAST DERIVATIVES

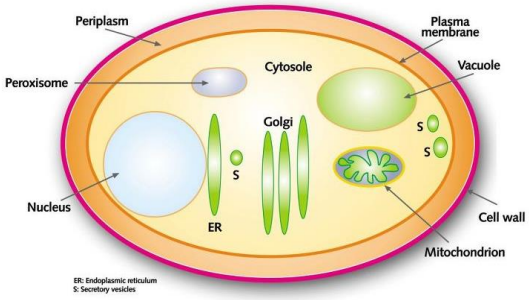
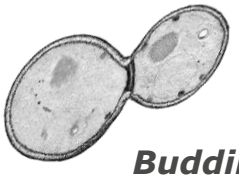


Diagram of yeast cell



Budding yeast

Yeast is a (sexual) organism **of 4-8 µm** (fungus)

± 200.000 species, most well-known species: ***Saccharomyces cerevisiae***

Yeast can be used for a variety of purposes:

- fermented drinks (beer, wine, cider, spirits, others)
- bread dough (rising & nutritional quality)
- healthcare products for people, animals and plants
- bioethanol and new green chemistry products

+O_2

In the **presence of oxygen** and nutrients yeast multiplies (**propagation**)

-O_2

In the **absence of oxygen**, yeast produces alcohol(s), CO_2 and aromas (**fermentation**)

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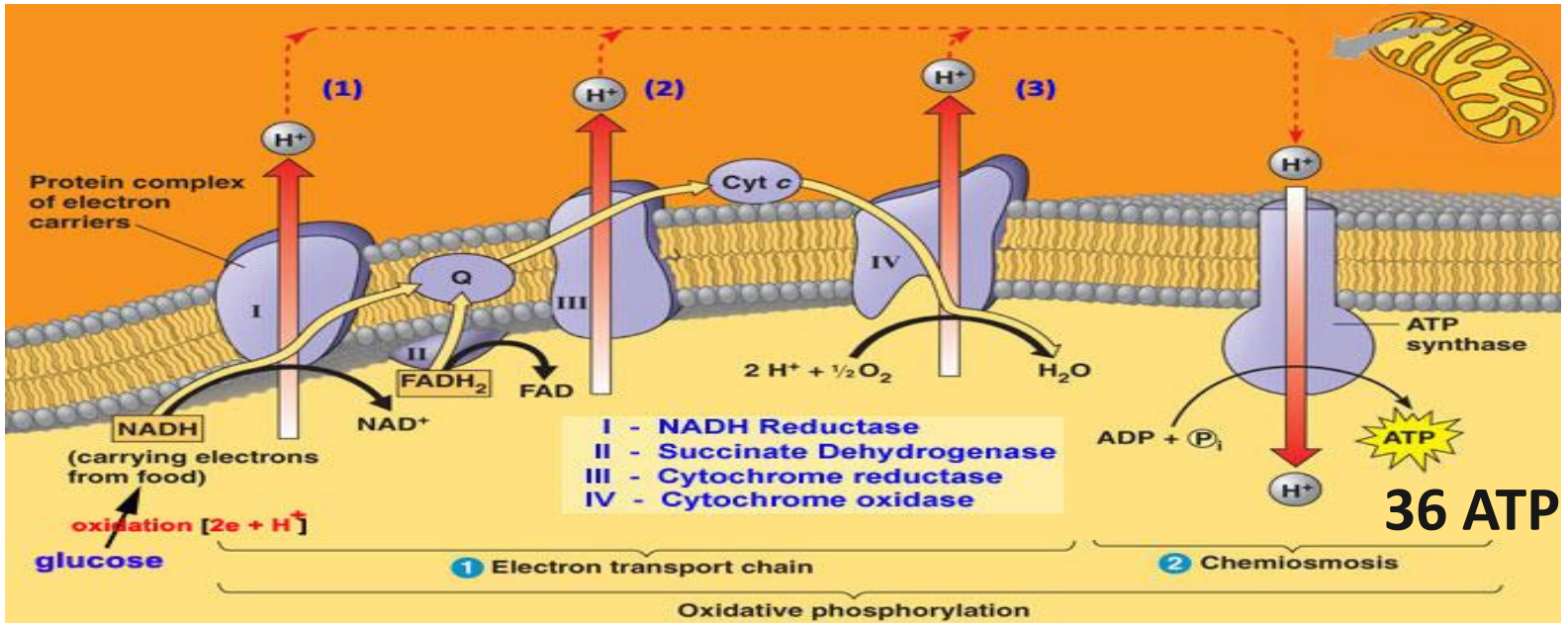
RESPIRATION: IT'S ALL ABOUT ELECTRONS

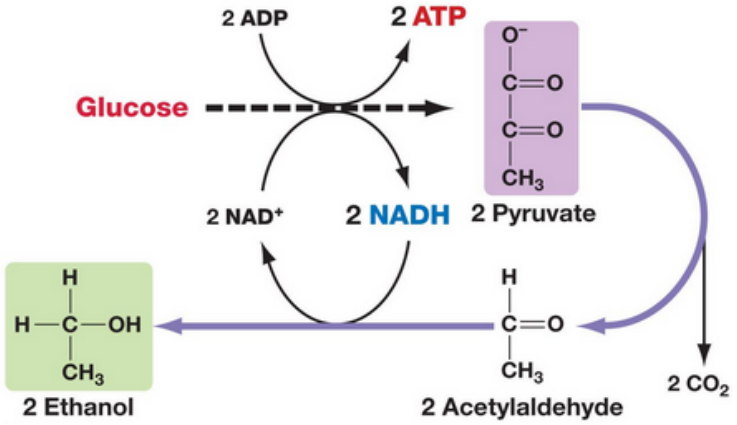
+O_2



-O_2

Ethanol pathway

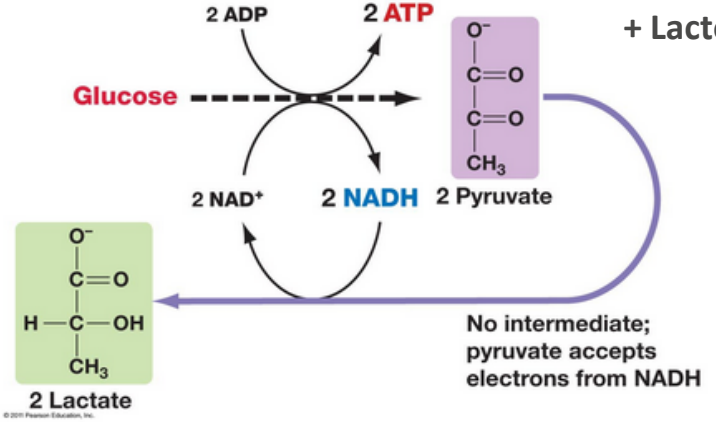
Alcohol fermentation occurs in yeast.



Lactate pathway

Lactic acid fermentation occurs in humans.

+ Lacto's



YEAST: 2 MAIN SPECIES FOR BEER BREWING

Saccharomyces cerevisiae
(ale yeast)

Saccharomyces pastorianus
(lager yeast)

Saccharomyces cerevisiae x Saccharomyces eubayanus

Peppermint
watermint x spearmint

Liger
Lion x Tiger

Wolphin
False Killer Whale x Dolphin

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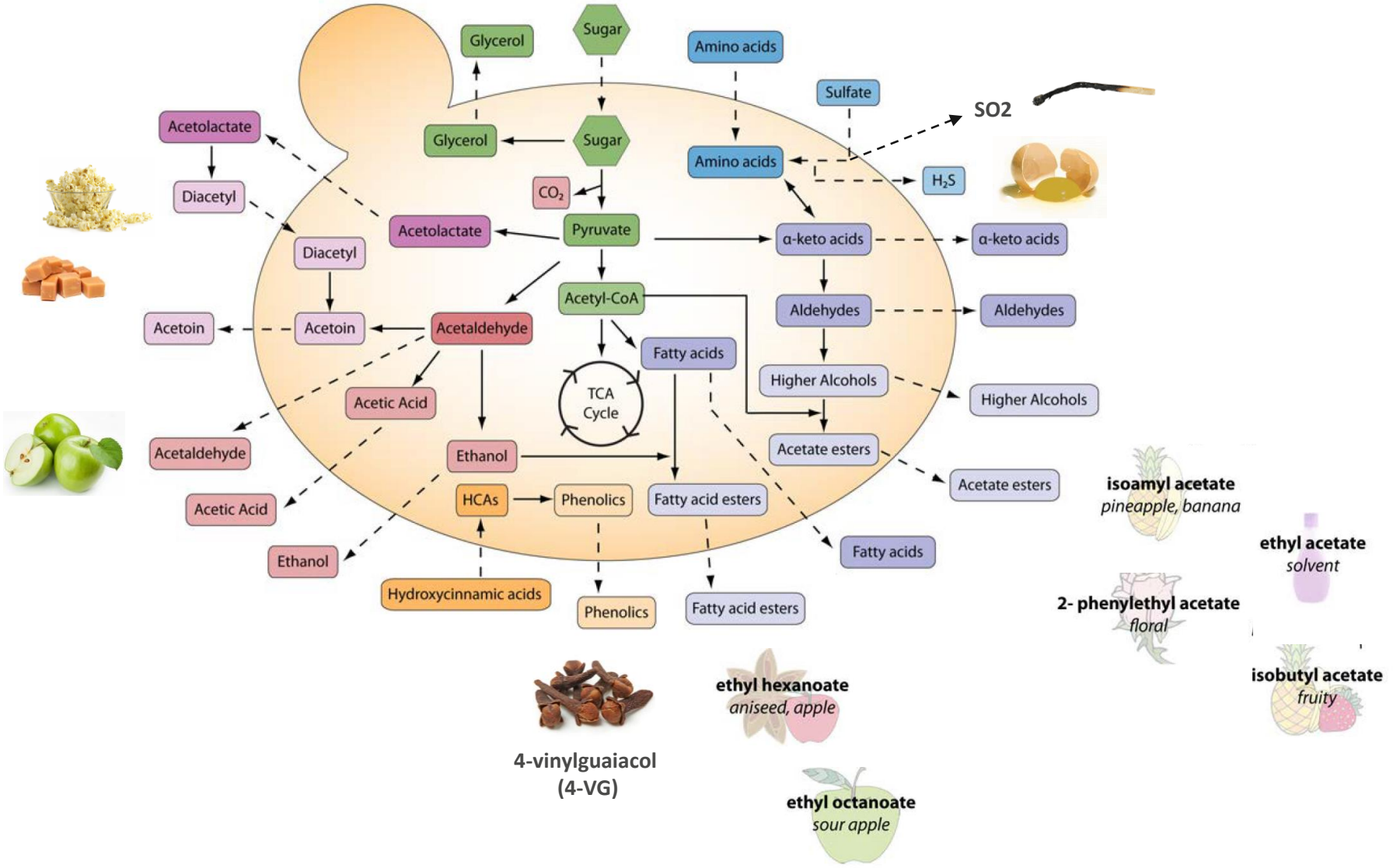
YEAST METABOLISM (FERMENTATION)



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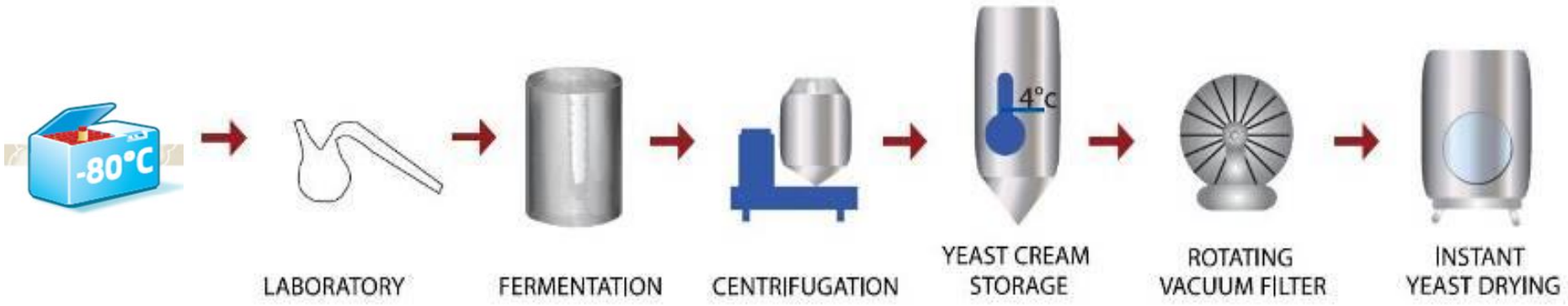
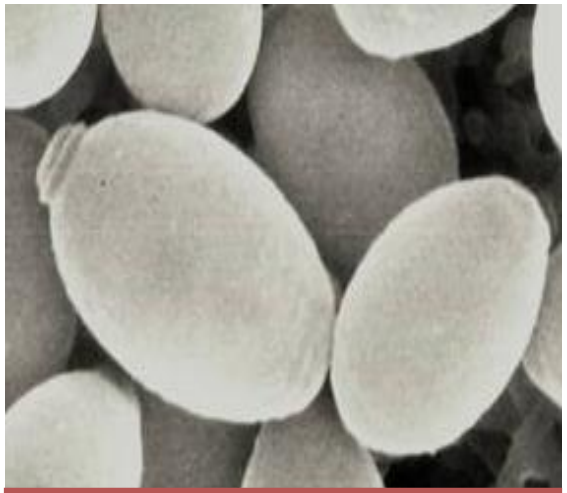
ACTIVE DRY YEAST PRODUCTION: A CONTROLLED PROCESS



- pure cultured yeast
- propagated in **dedicated state-of-the art facilities**
- **aerobic fed-batch** process on a balanced medium (molasses)
- Propagation process is stopped at the optimal moment to shape the yeast to its best physiological state for both drying and fermentation.

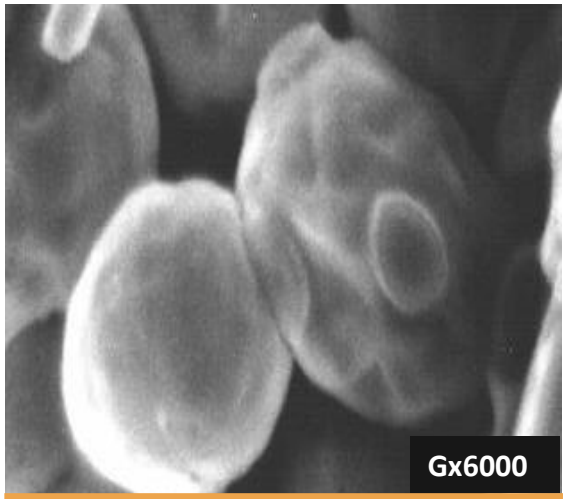
Each yeast has its own dedicated fermentation & drying process

PROCESS UNDER THE MICROSCOPE



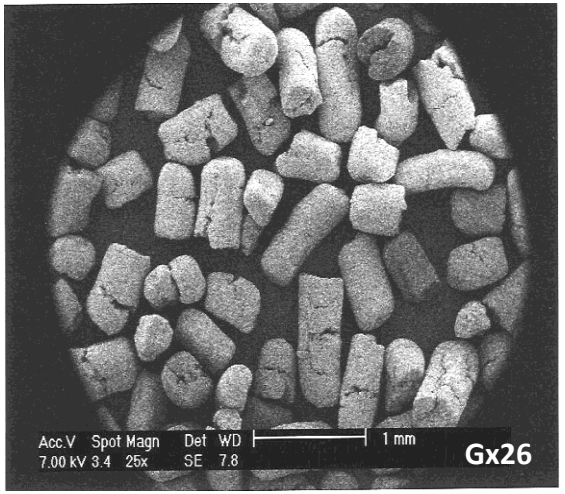
Before drying

- 25-30% dry matter
- Smooth surface



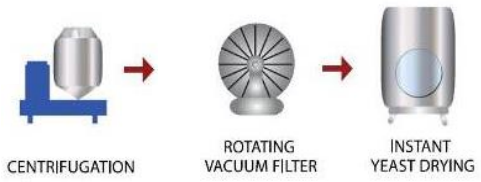
After drying

- 94-96,5% dry matter
- Uneven surface (membrane intact)



Active dry yeast microgranulates (~1mm)

- vacuum-packed: preserve from oxygen and moisture
- shelf life: 3 years



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FERMENTIS ACTIVE DRY YEAST PRODUCTION PLANT (GHENT, BELGIUM)

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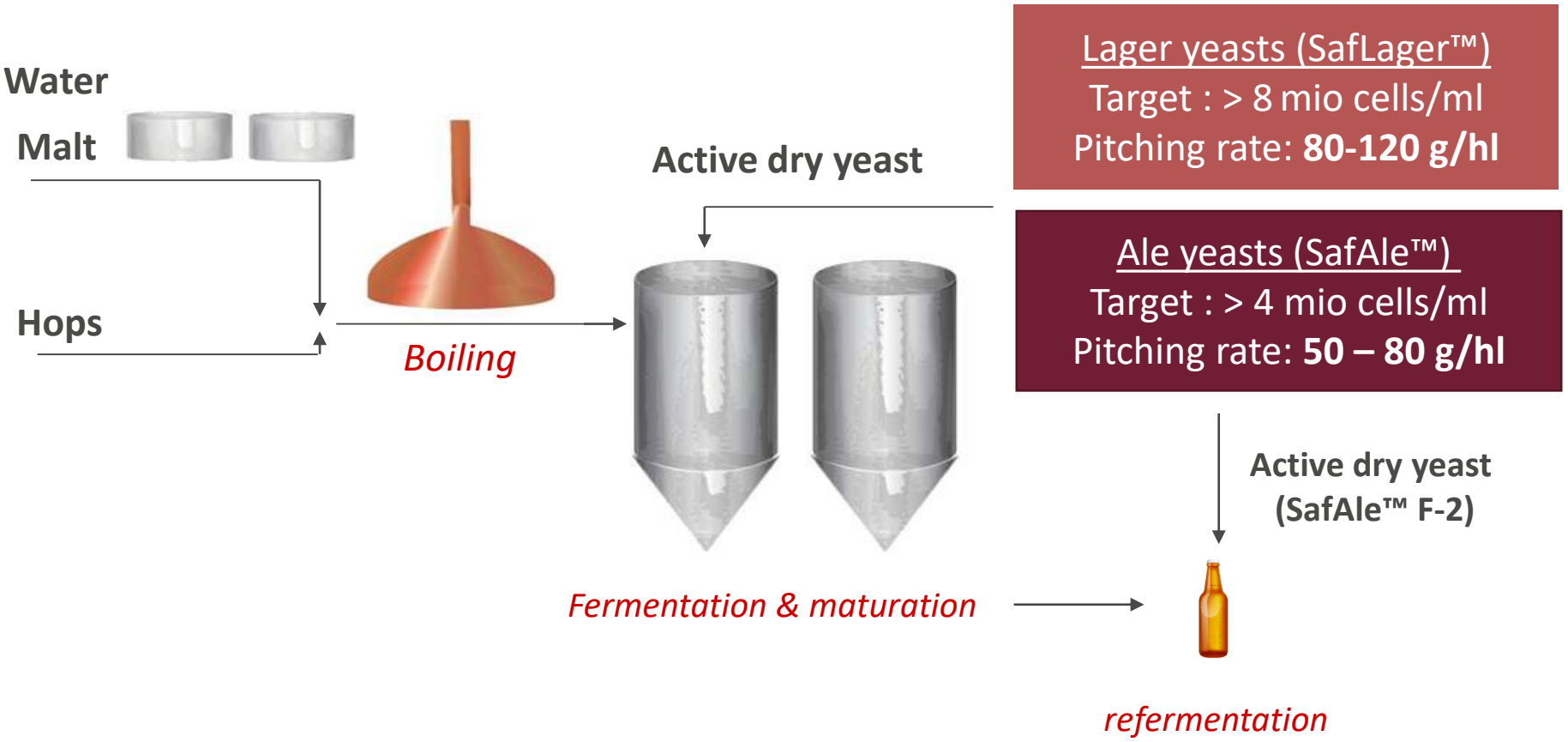
ACTIVE DRY YEAST IN THE BREWERY



Lager yeasts (SafLager™)
Target : > 8 mio cells/ml
Pitching rate: **80-120 g/hl**

Ale yeasts (SafAle™)
Target : > 4 mio cells/ml
Pitching rate: **50 – 80 g/hl**

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REHYDRATION OR DIRECT PITCHING OF YEAST?

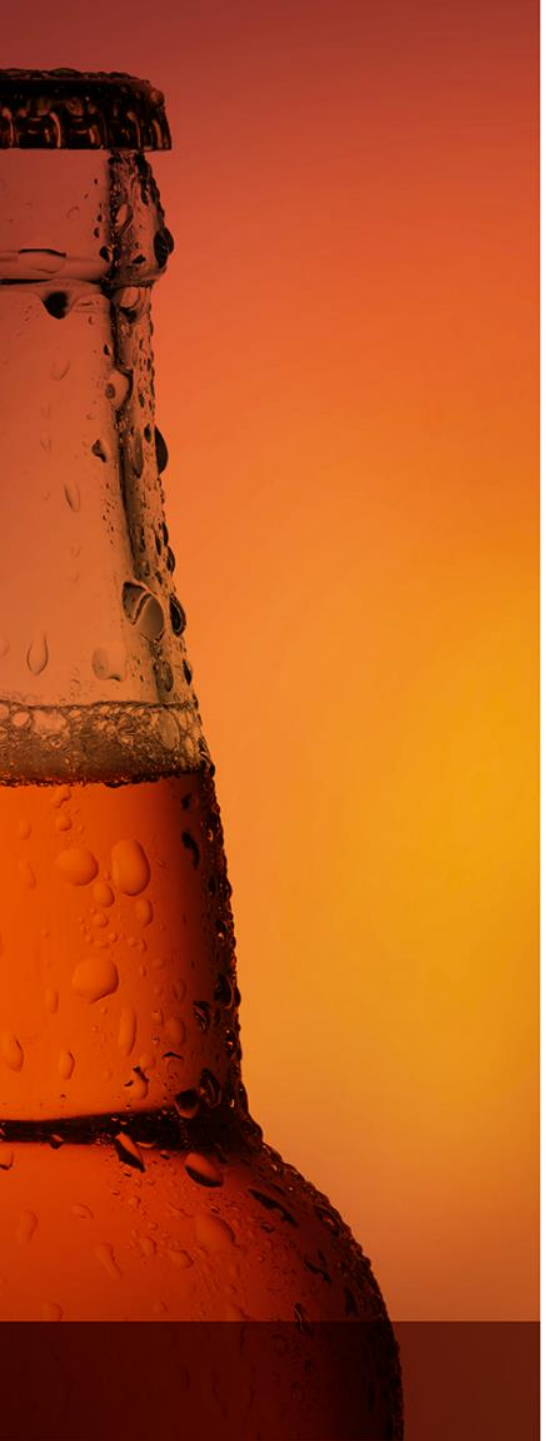
Lager (SafLager™)
21 – 25 °C

Ale (SafAle™)
25 – 29 °C

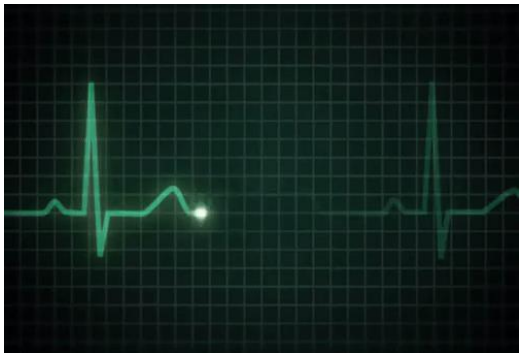
Temp. after rehydration and before pitching (°C)	Maximum time before pitching (h)
4	18
20	6
25	4

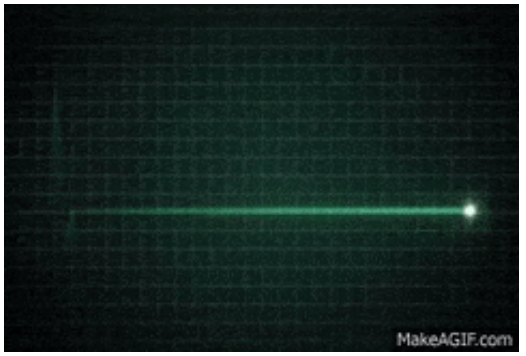
REHYDRATION

DIRECT PITCHING



What is the impact of rehydration on the yeast cell viability?





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PROTOCOL

VIABILITY - CONDITIONS

	SafAle™ strains	SafLager™ strains
Strains	S-33, US-05, T-58	S-23, S-189, W34/70
Rehydration	15, 25, 35 & 45 min. rehydration in 10 times the volume	
Agitation conditions	1. **Without agitation** (**WA**) the yeast is placed on liquid surface and rehydration is realized without agitation. 2. **Moderate agitation** (**MA**) : the yeast is placed on liquid surface, rehydration is realized without agitation during 15 min. and after the agitation is maintained at 100 rpm. 3. **Vigorous agitation** (**VA**) : the yeast is placed in a sterile flask, the medium is poured on the yeast and vigorous shaking is done every 2 min.	
Temperatures	8, 12, 16, 20, 32, 40 °C	
Media	Distilled water, Mineral water, Tap water, 7% ethanol, Wort at 7°P, Wort at 15°P & Wort at 25°P	

Viability measured by Trypan blue exclusion test of cell viability

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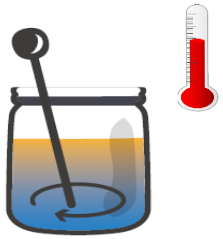
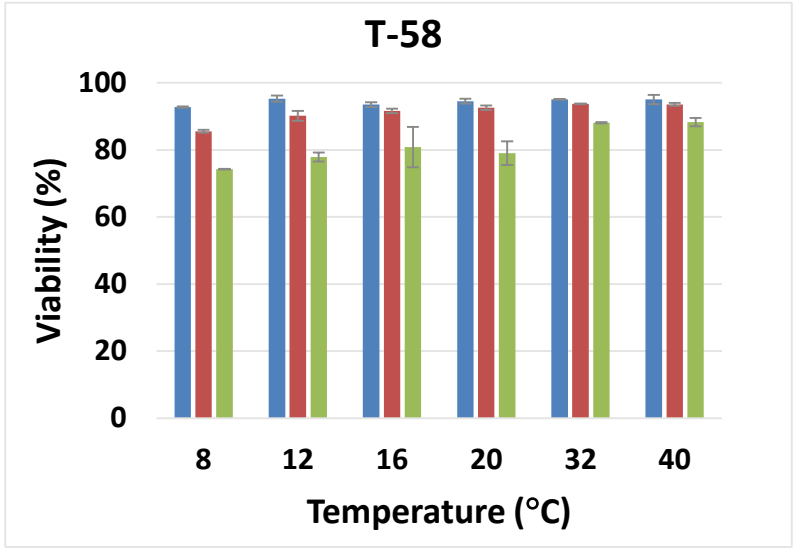
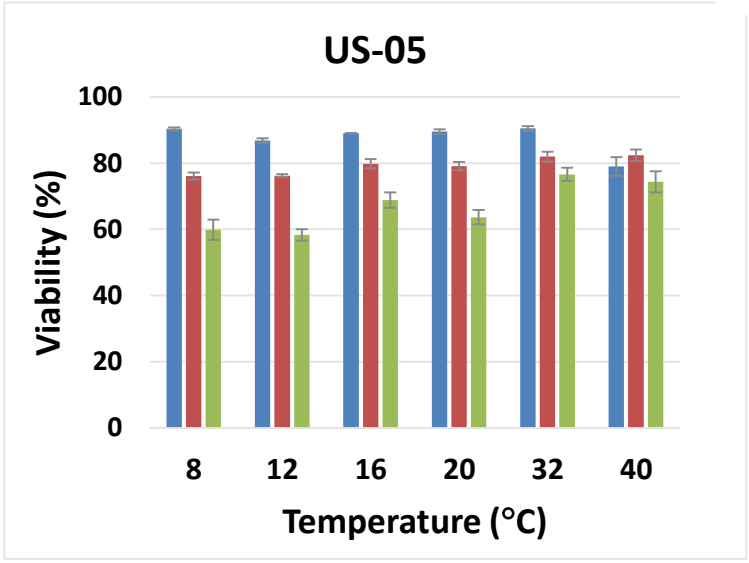
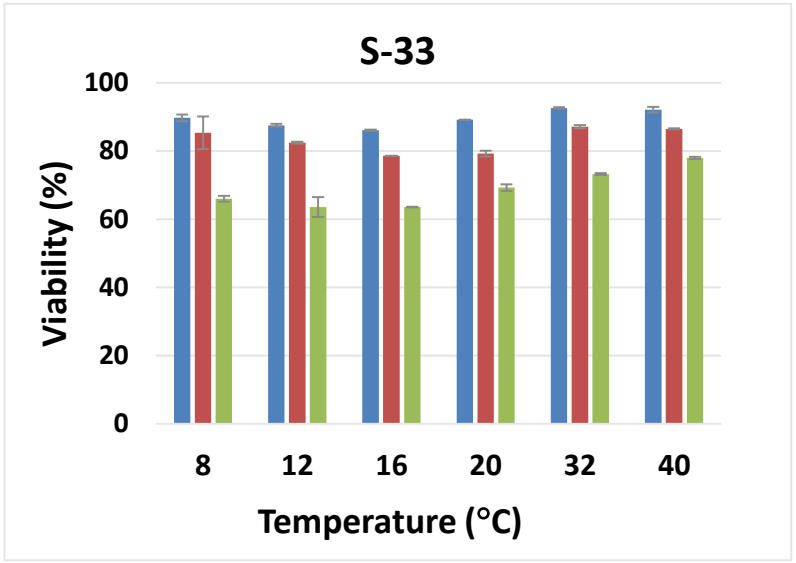
VIABILITY(%) - ALES









Best conditions: WA, higher T

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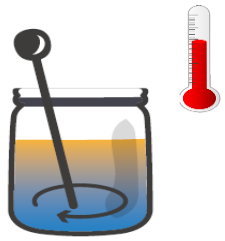
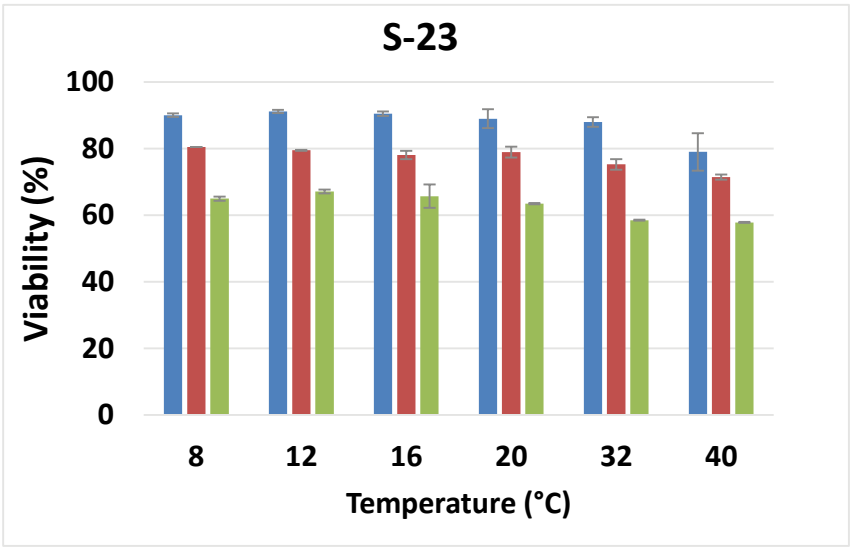
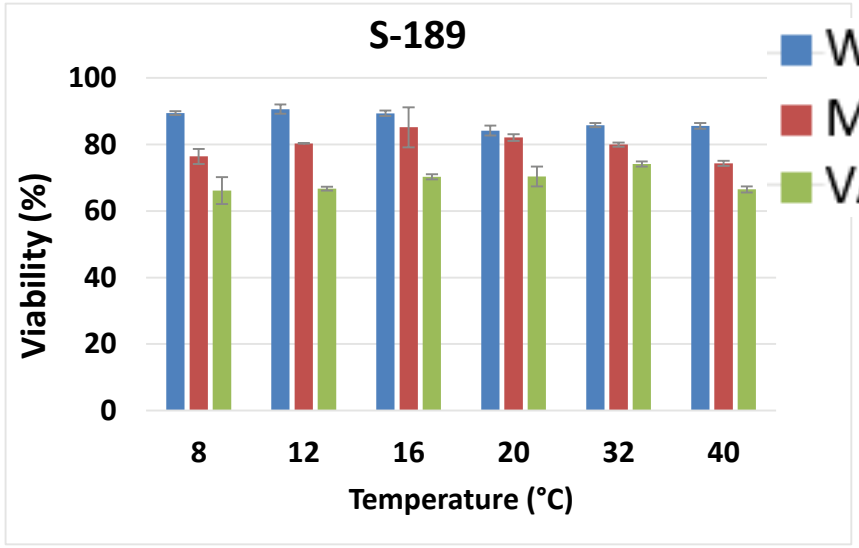
VIABILITY (%) - LAGERS







Best conditions :
WA/MA, lower T

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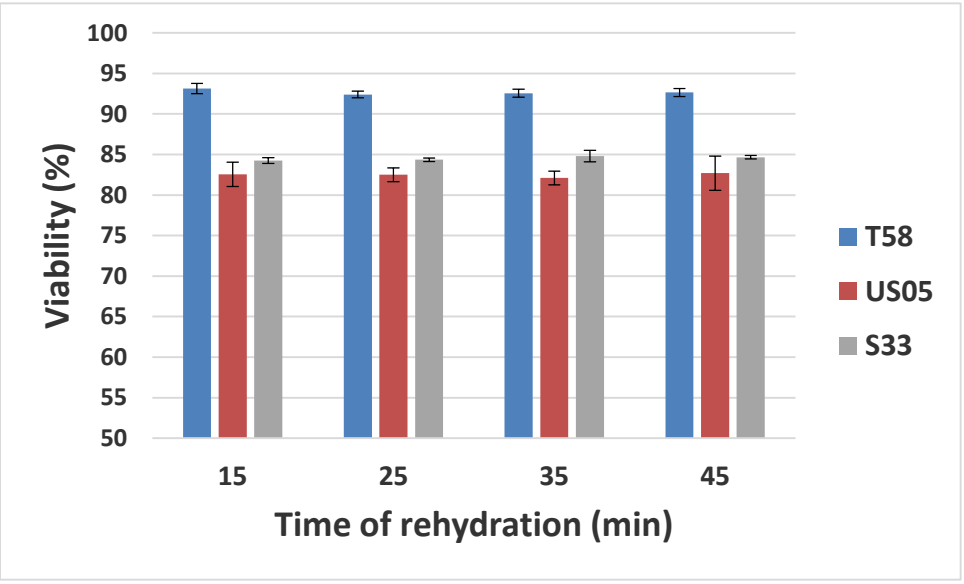
INFLUENCE OF REHYDRATION TIME ON VIABILITY

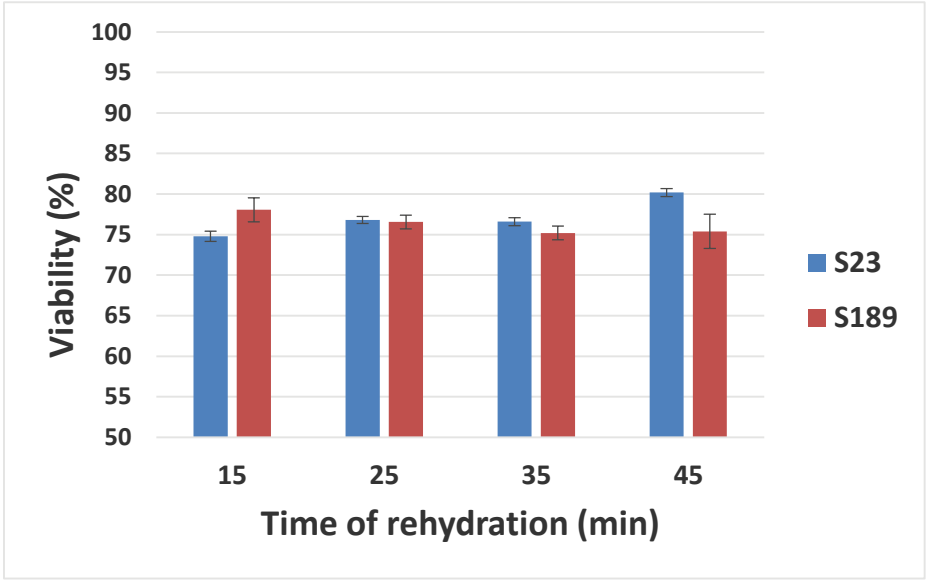
VIABILITY - ALES / LAGERS

At moderate agitation and 32°C

Ales



Lagers



Rehydration complete after 15 min with good viability

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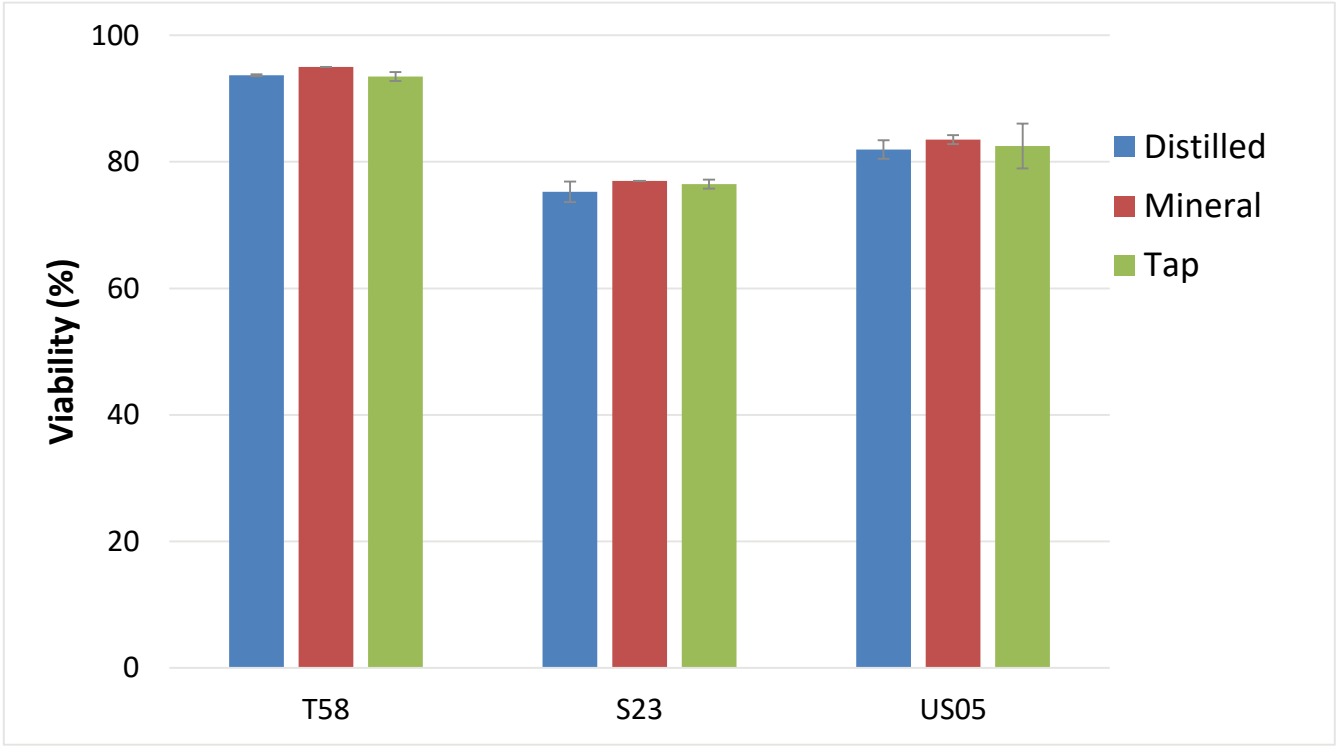
VIABILITY - ALES

At moderate agitation and 32°C



Water quality does not significantly influence viability during rehydration

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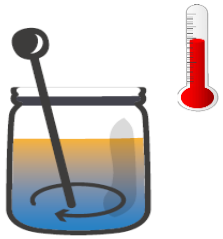
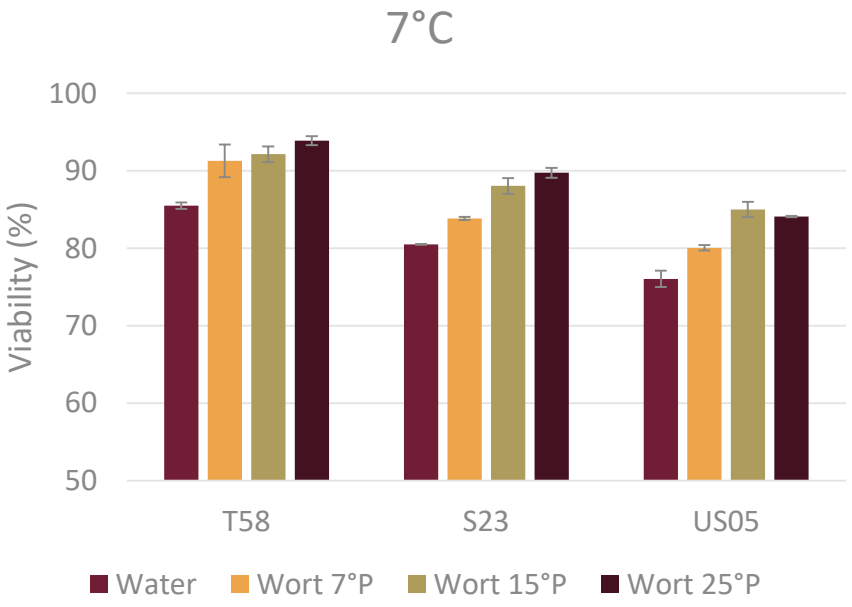
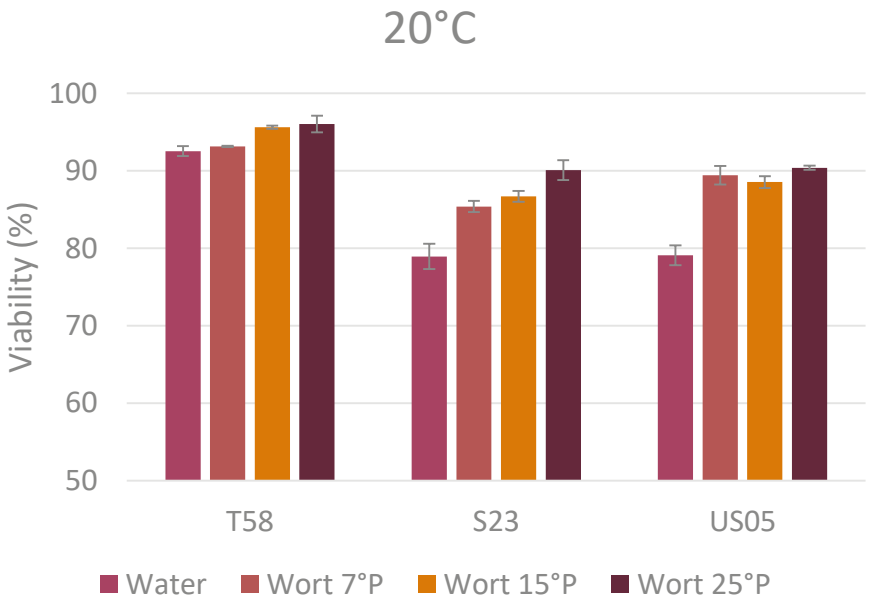
VIABILITY - ALES / LAGERS



At moderate agitation





- Sugar concentration does not impact viability greatly during rehydration
- Surprisingly at HG wort, the viability is not affected compared to lower gravities

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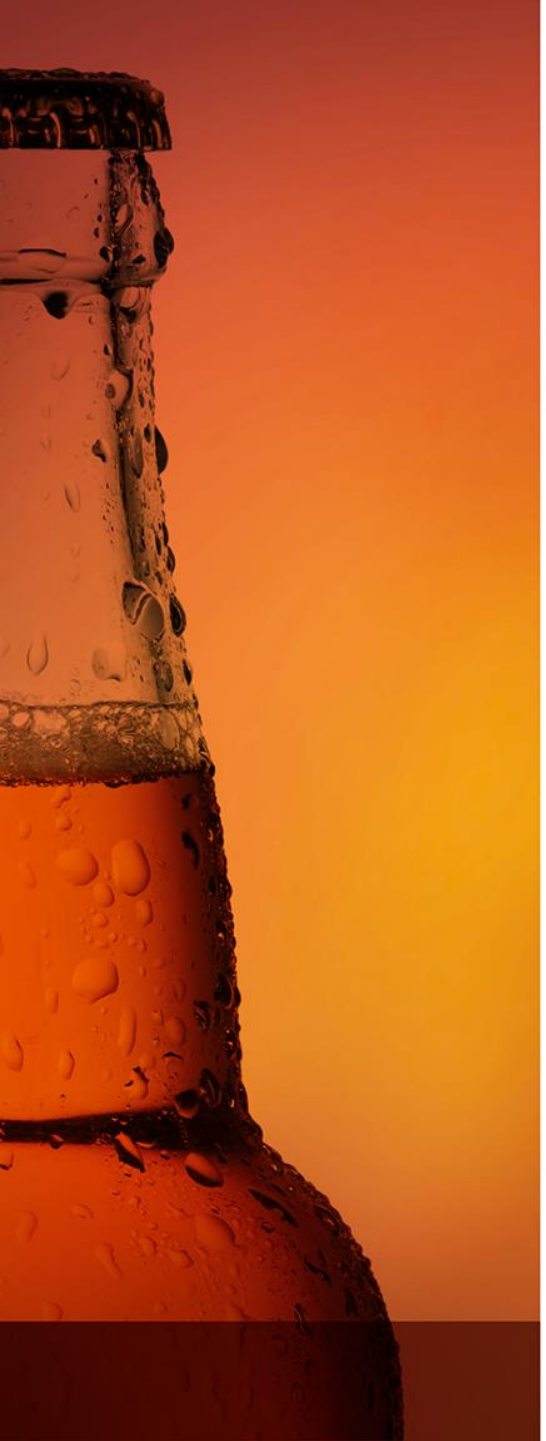

CONCLUSIONS YEAST CELL VIABILITY

Agitation method has the highest impact in rehydration process **> No or moderate agitation** works best

Temperature does not significantly impact without or with moderate agitation.

Type of media does not significantly influence the viability.

No difference was observed with different rehydration times. (Rehydration was complete after 15 min.)

Conclusions are similar for **Ales** and **Lagers**.

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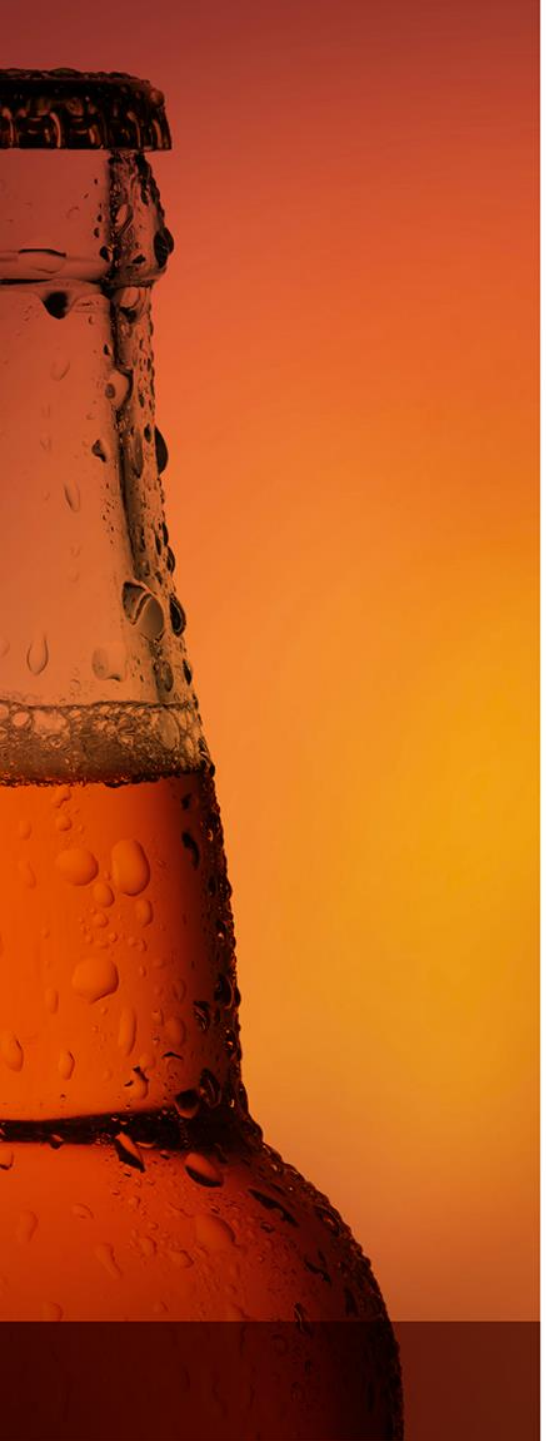

What is the impact of direct pitch on the yeast cell vitality?

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PROTOCOL

VITALITY - CONDITIONS TESTED

	SafAle™ strains	SafLager™ strains
Strains	S-04, US-05, T-58	S-23, S-189, W34/70
Rehydration conditions	1. No rehydration → Direct Pitch in wort (**DP**) 2. Rehydration in water at 30 °C with moderate agitation (**W**) 3. Rehydration in wort at 20 °C with moderate agitation (**15°P**)	
Pitching rate Standard wort Temperature	50 g/hL 15°P 20°C	100 g/hL 15°P 14°C

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VITALITY - FORCED AGEING TEST

Fresh ADY

Forced ageing test*

Aged ADY

Trials:
Fresh and Aged* Samples of SafAle™ US-05 and SafLager™ S-23

*Forced ageing test - equivalency to 3 years of natural ageing

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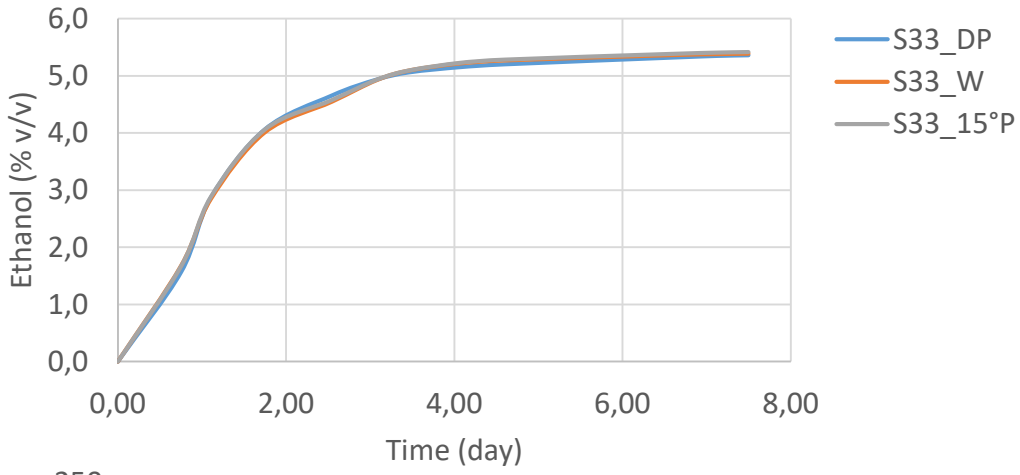
VITALITY – FOLLOW UP & ANALYSES

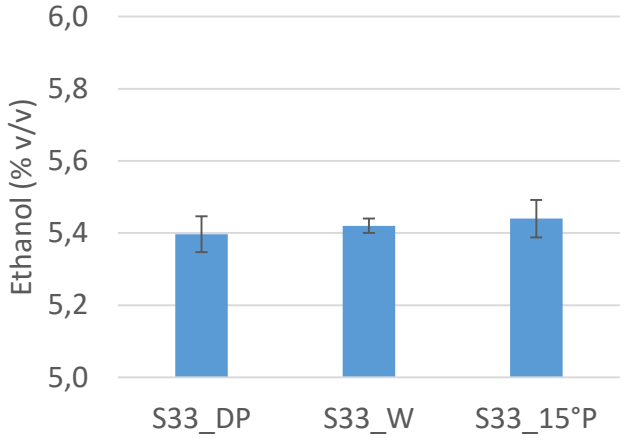
Test fermentation performance in triplicate:
Evaluate kinetics by measuring the decrease of weight of the medium which is correlated with the sugar conversion into CO_2 and ethanol.

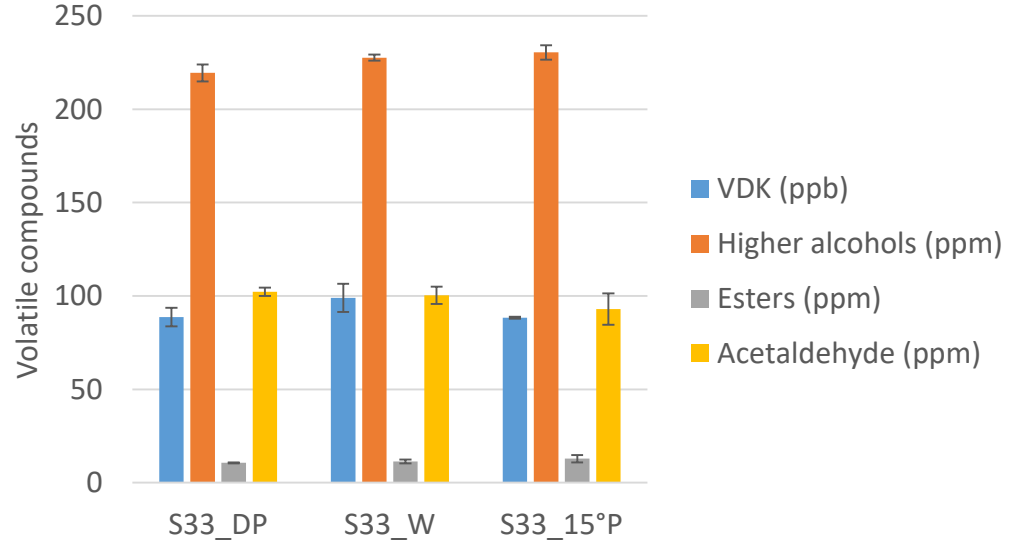
Analyses at the end of fermentation:

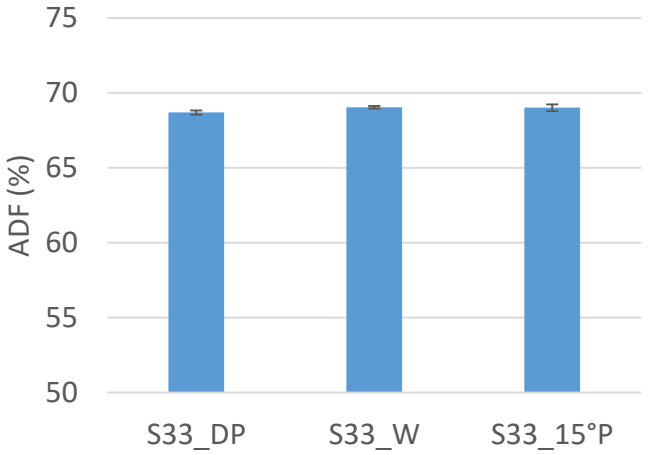
- Ethanol production
- volatile compounds
  - acetaldehyde
  - esters
  - higher alcohols
  - vicinal diketones (diacetyl, 2,3-pentadione)

VITALITY – ALES: SAFALE S-33









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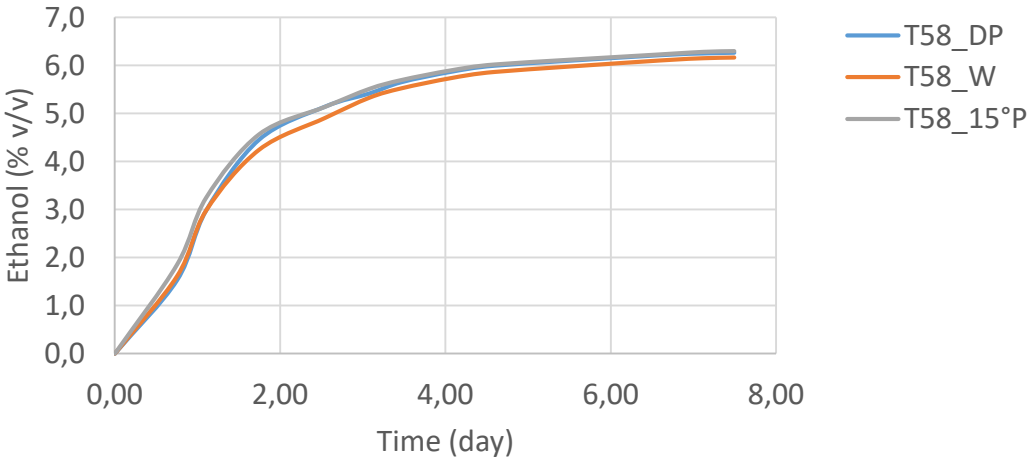
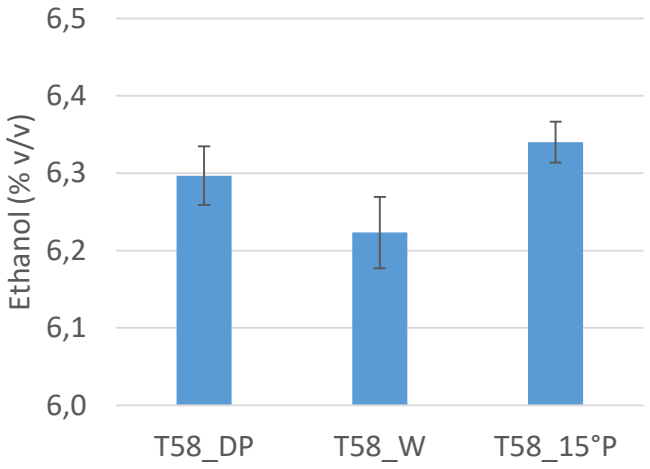
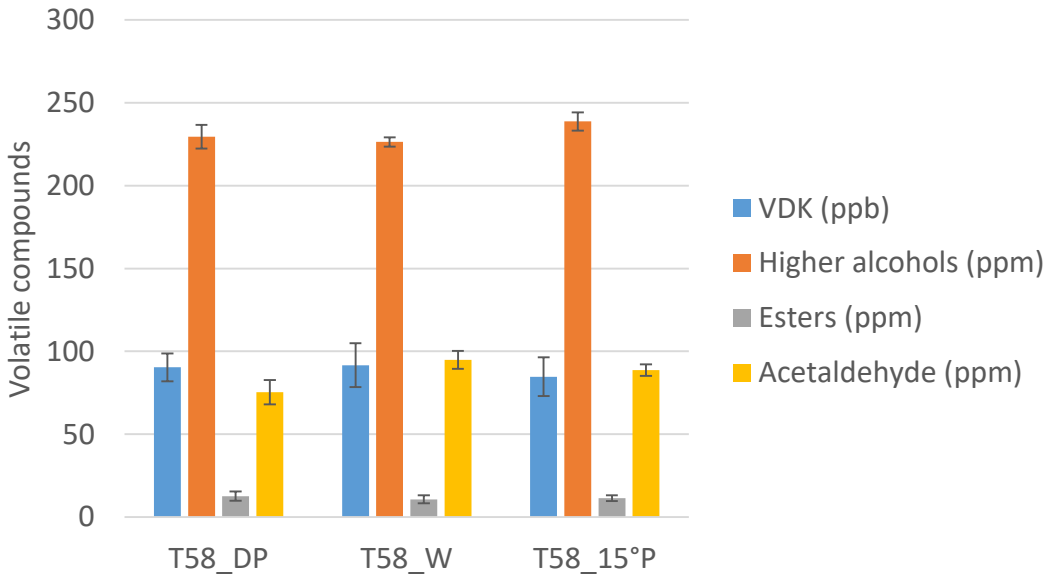
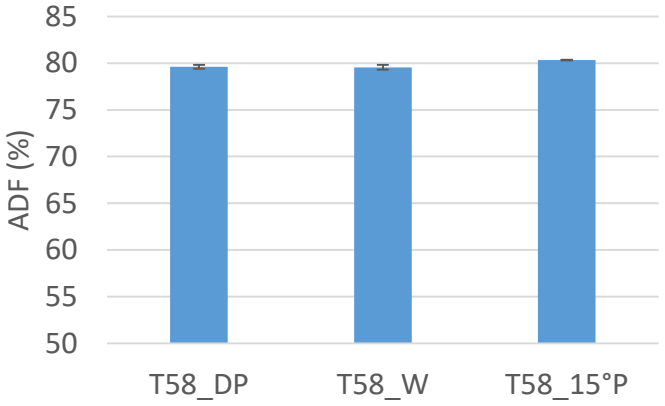
VITALITY – ALES: SAFALE T-58









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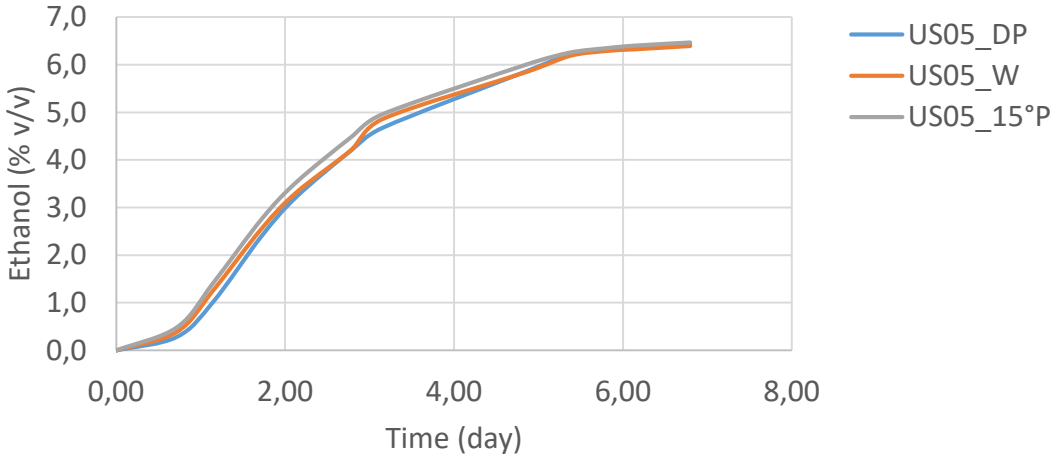
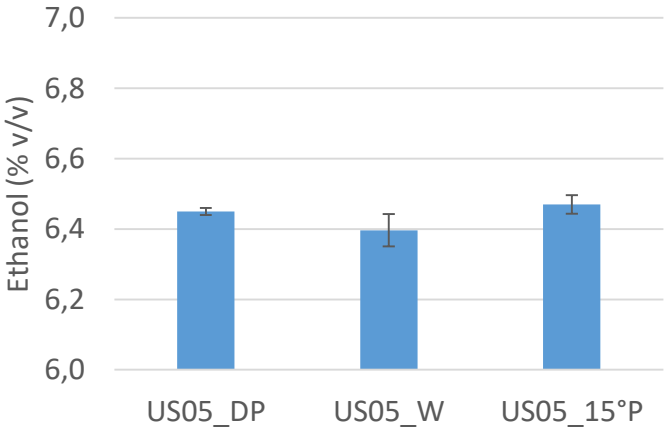
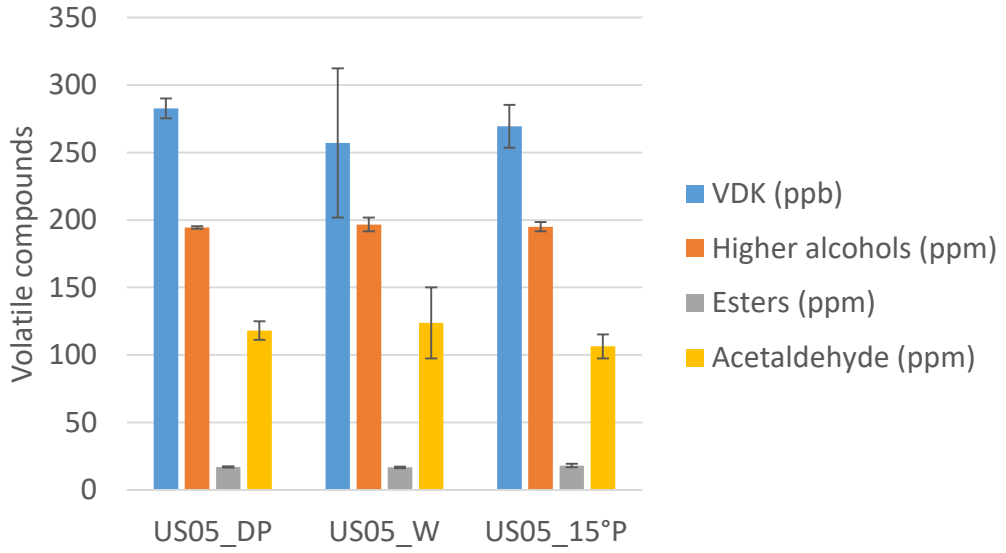
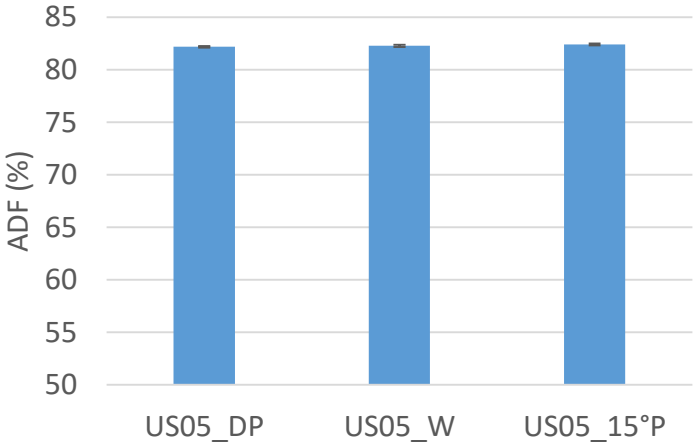
VITALITY – ALES: SAFALE US-05









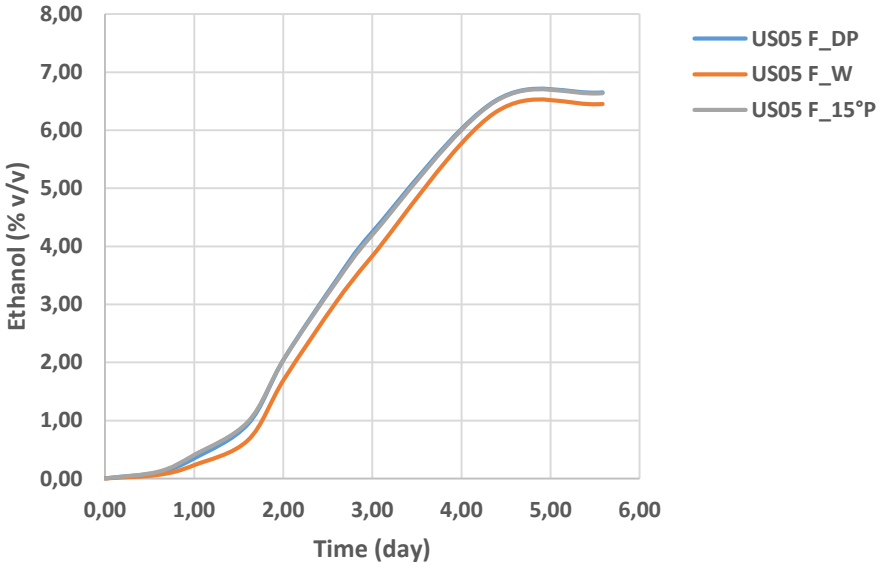
Fermentis
LESAFFRE FOR BEVERAGES

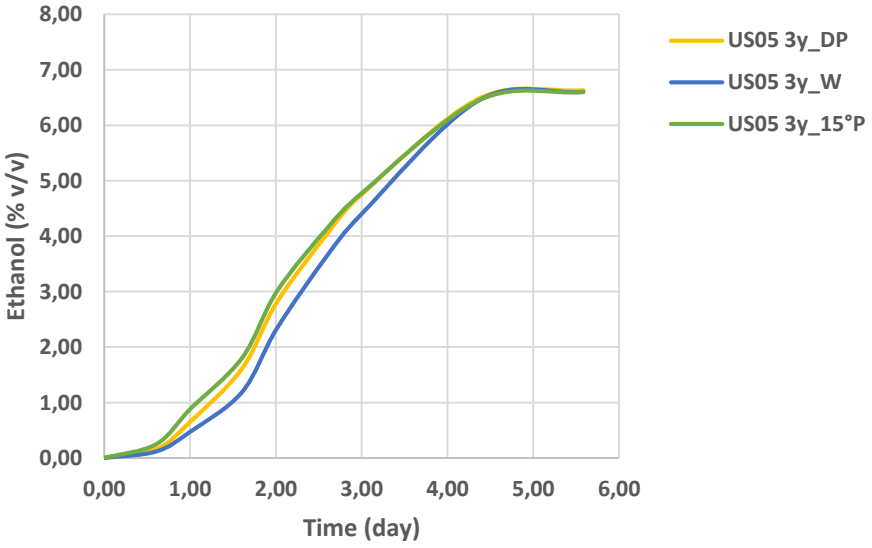
VITALITY – ALES: SAFALE US-05

Fresh ADY

Forced ageing test

Aged ADY





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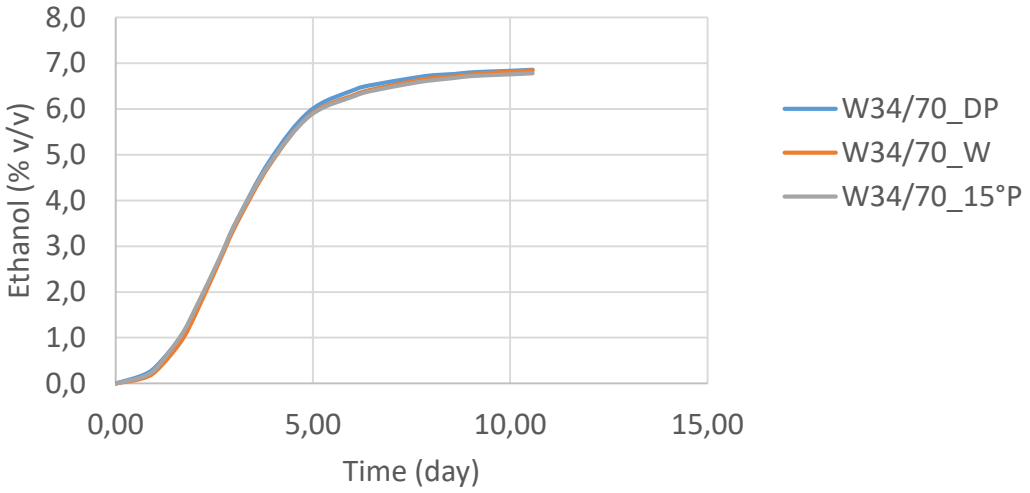
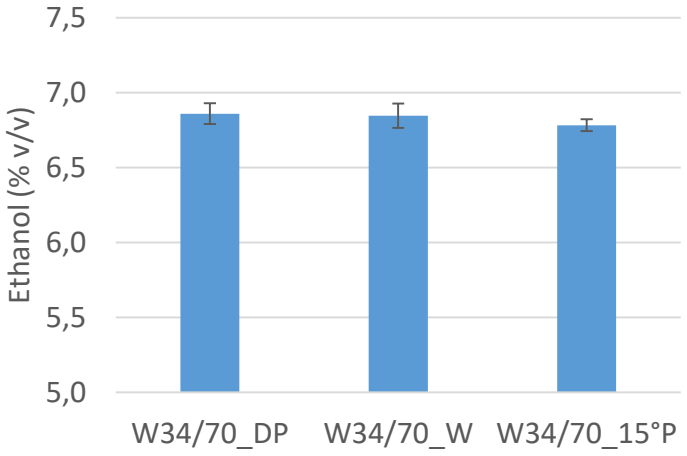
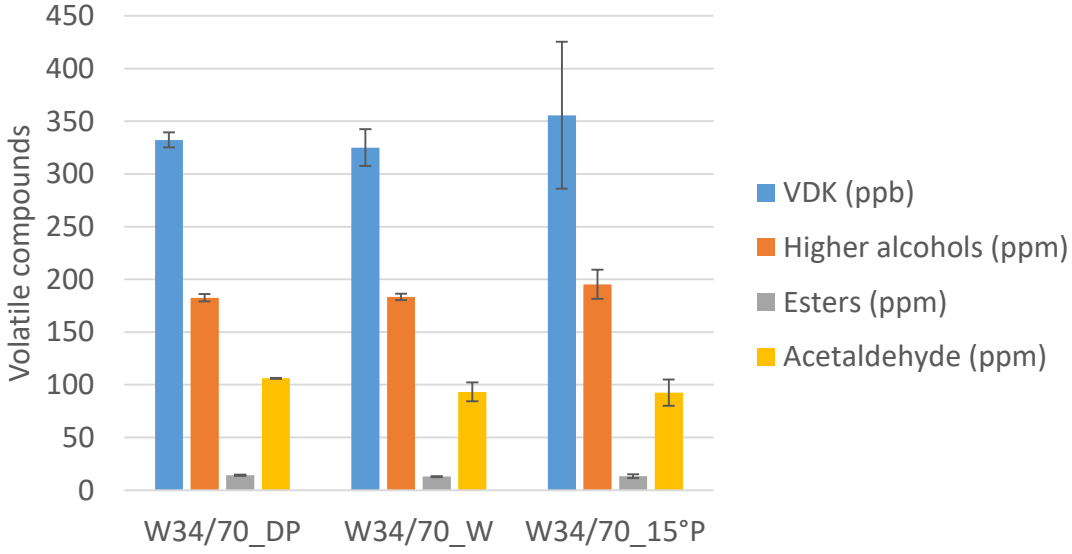
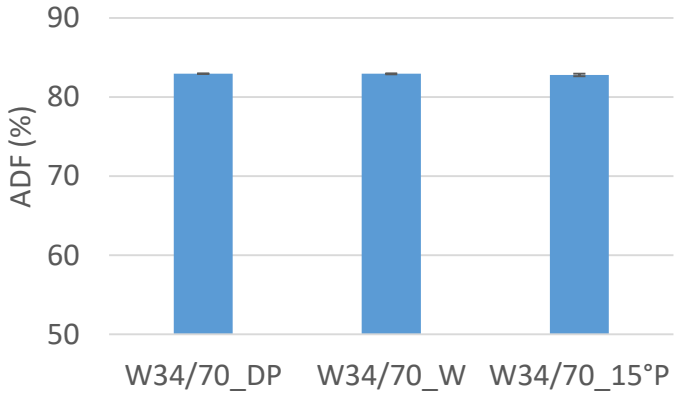
VITALITY – LAGERS: SAFLAGER W34/70









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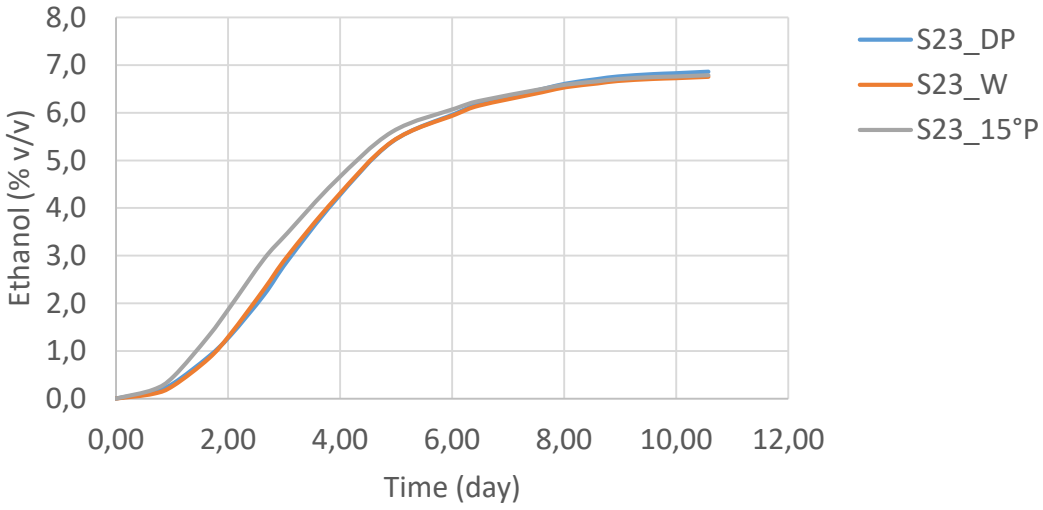
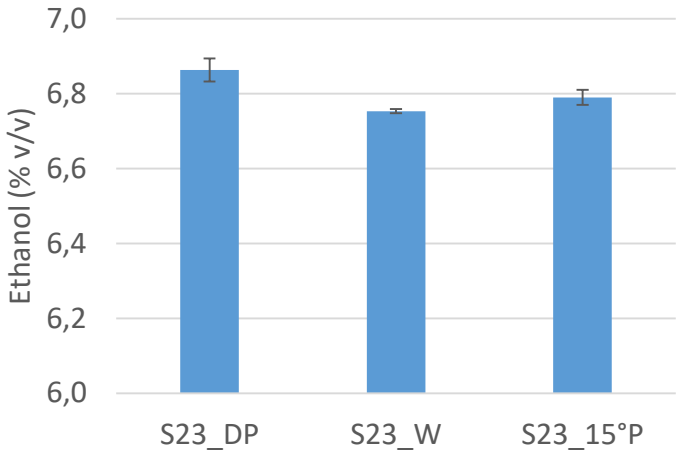
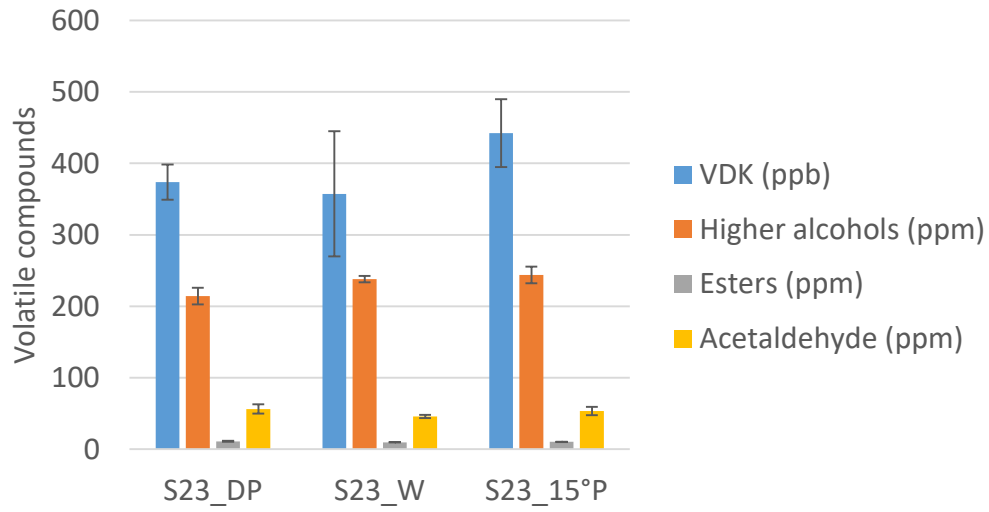
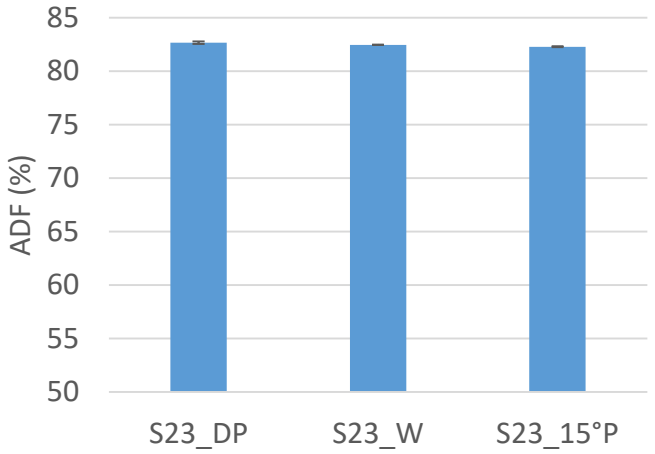
VITALITY – LAGERS: SAFLAGER S-23









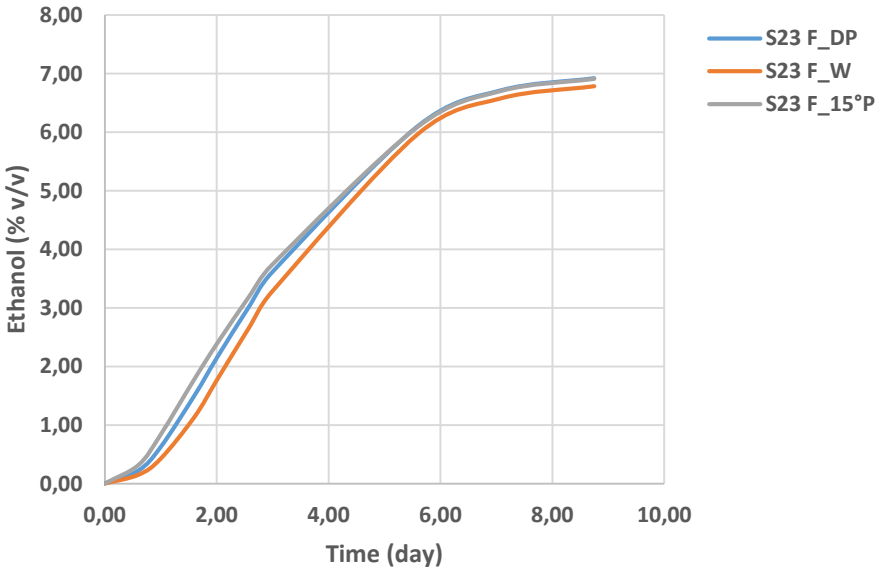
Fermentis
LESAFFRE FOR BEVERAGES

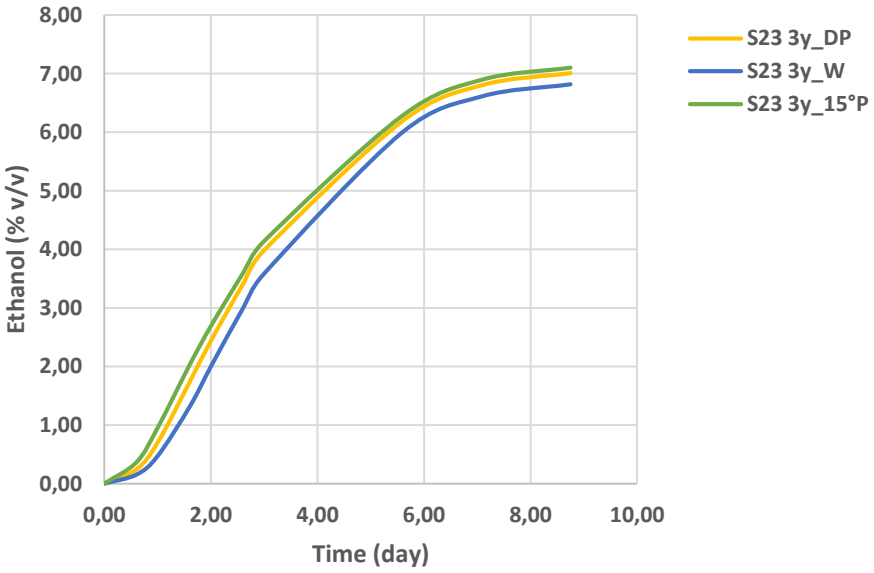
VITALITY – LAGERS: SAFLAGER S-23

Fresh ADY

Forced ageing test

Aged ADY





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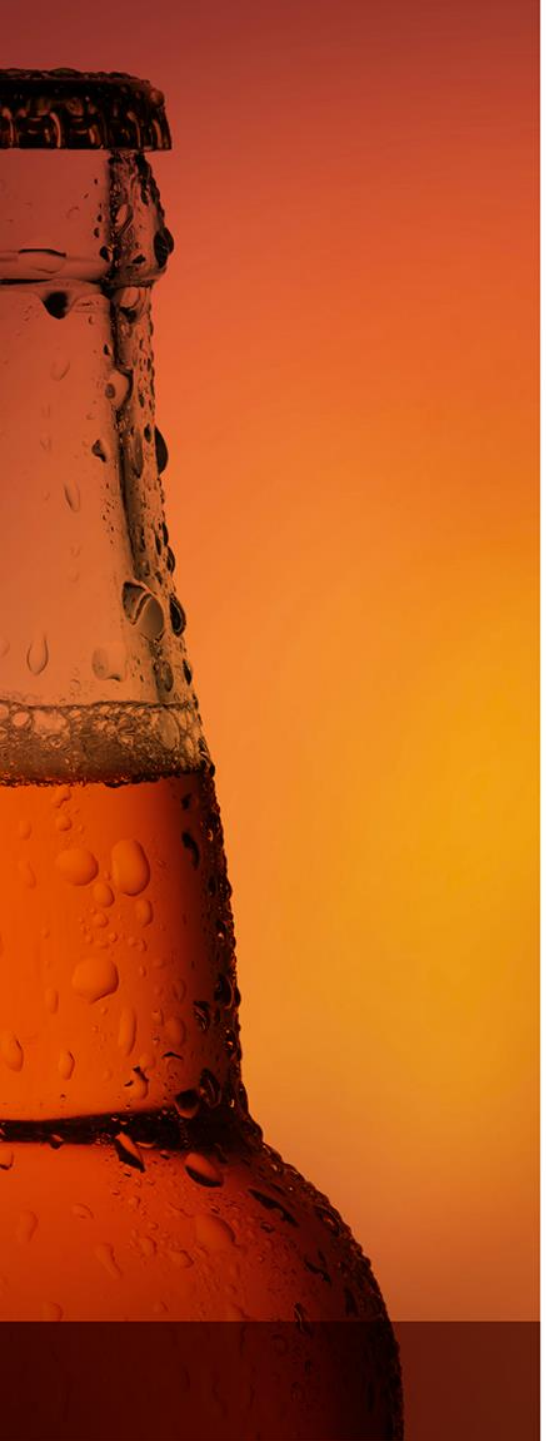

CONCLUSIONS YEAST CELL VITALITY

No significant differences between direct pitch (DP), rehydration in water (W) and rehydration in wort (15 °P):

fermentation kinetics

forced aged fermentation kinetics

production of volatiles and final ABV

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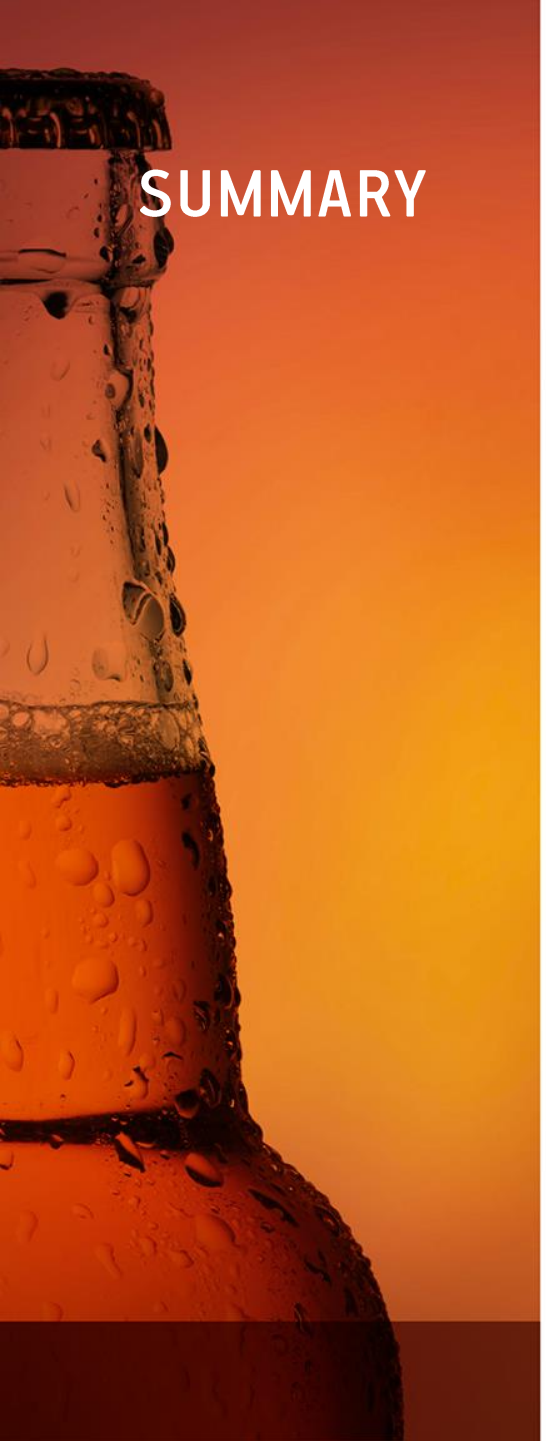


SUMMARY

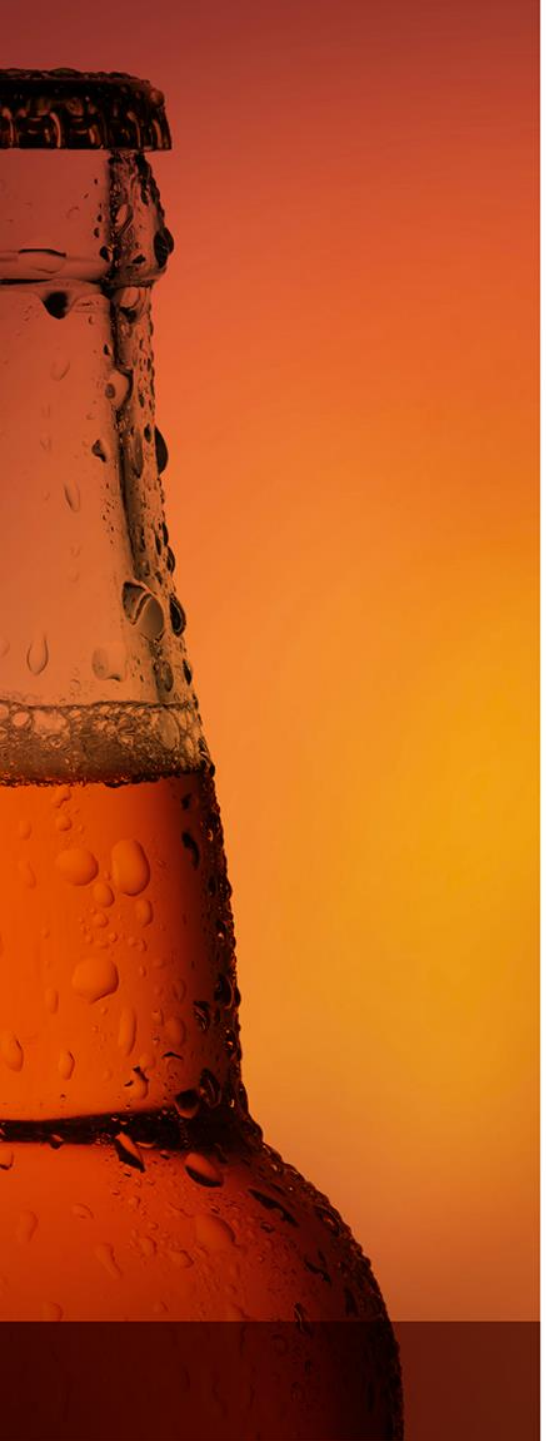
Direct pitching in wort or rehydration under a wide range of conditions can be used for all* Fermentis brewing strains

E2U EASY USE by Fermentis

Make it easy!

** Except SafAle™ F-2 (pitched in beer) & HA-18*

Fermentis LESAFFRE FOR BEVERAGES



FERMENTIS E2U EASY 2 USE by Fermentis ACTIVE DRY YEASTS

3 lager yeasts (SafLager™):

- S-23
- S-189
- W34/70

10 ale yeasts (SafAle™):

- US-05
- S-04
- K-97
- BE-256
- S-33
- T-58
- WB-06
- F-2*
- **BE-134 (New!)**
- **HA-18* (New!)**

** Rehydration required*

Sachets of 11,5 g

Bricks of 500 g

Boxes of 10 kg

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Thank you!

g.baart@fermentis.lesaffre.com

Fermentis.com

THE OBVIOUS CHOICE FOR BEVERAGE FERMENTATION

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