



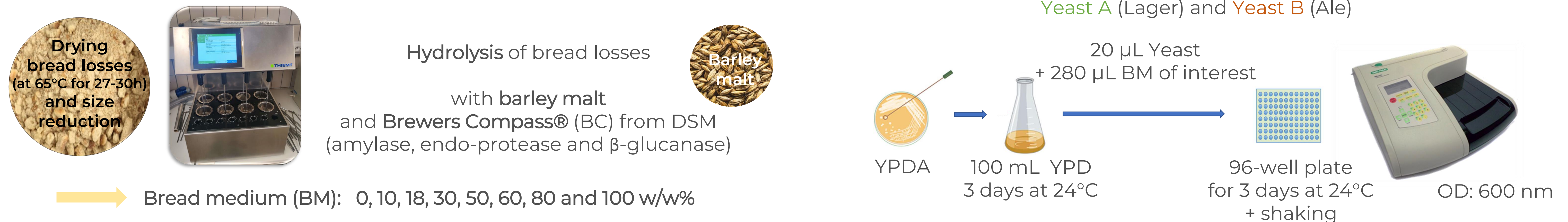
## 1. BACKGROUND

In Flanders, around a quarter of all bread and bakery products are lost or wasted every year. However, most of the bread that is lost during production is still suitable for human consumption. Nevertheless, today these losses mainly go to cattle feed or biogas production. Bread is a wheat-based processed food product that has not been enzymatically modified and can therefore be used as an adjunct in wort production.

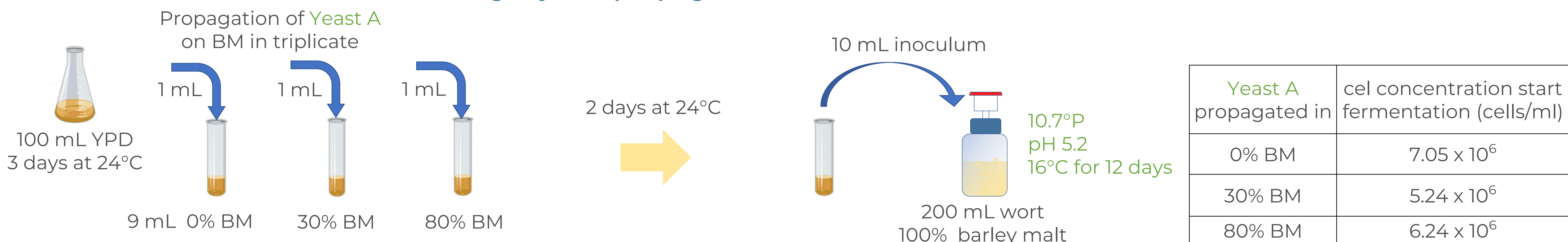
The aim of this study is to investigate the use of unavoidable bread losses, in this case sandwiches, as a nutrient in a growth medium for brewer's yeast. To this end, the wort composition of the bread extract is compared to that of a classical growth medium. Growth curves of ale and lager yeasts in the bread medium are monitored and compared to the growth curves in classical propagation medium. The subsequent fermentation capacity of the freshly propagated lager yeast is also verified.

## 2. EXPERIMENTAL

### Monitoring cell growth of industrial yeasts on bread medium



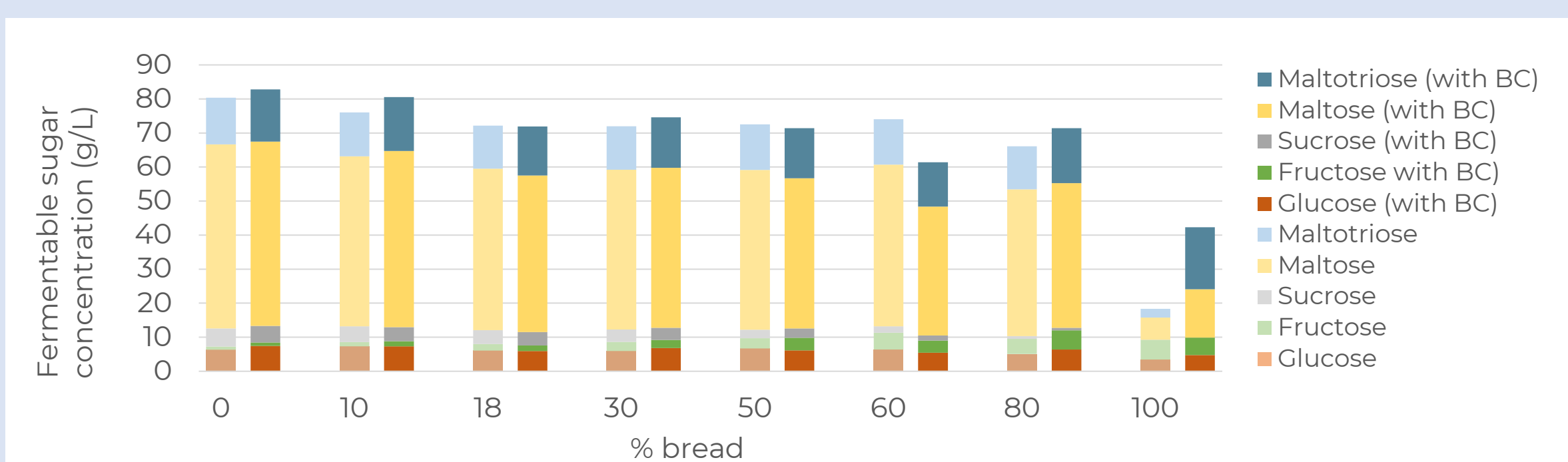
### Fermentation trial with an industrial lager yeast propagated in bread medium



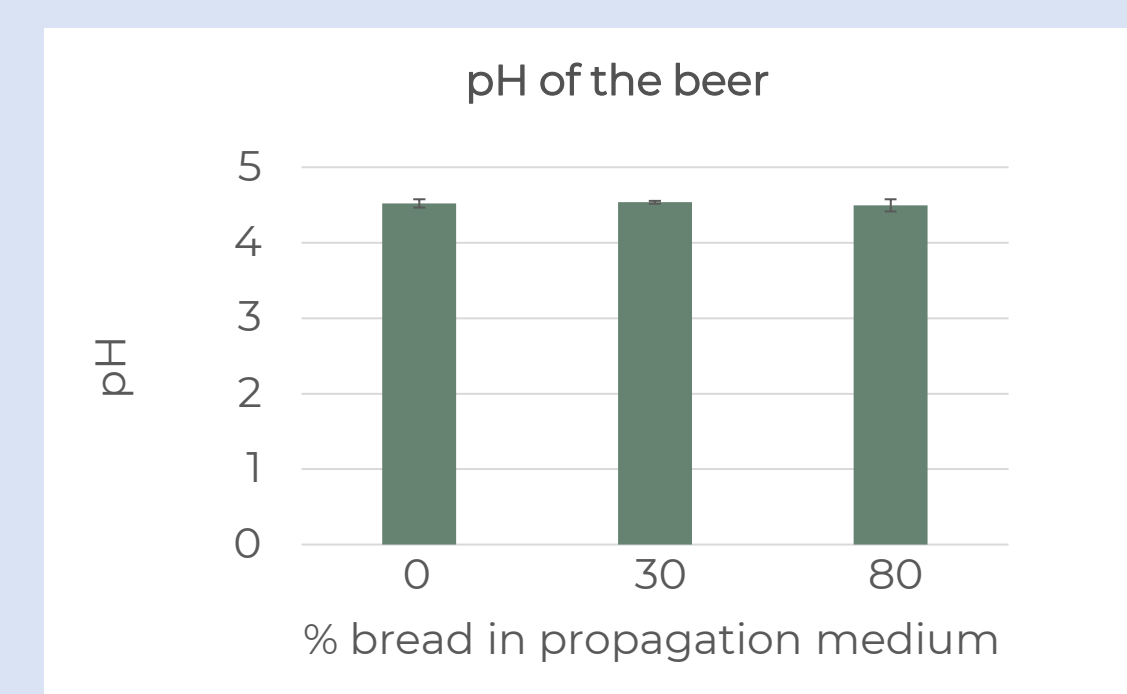
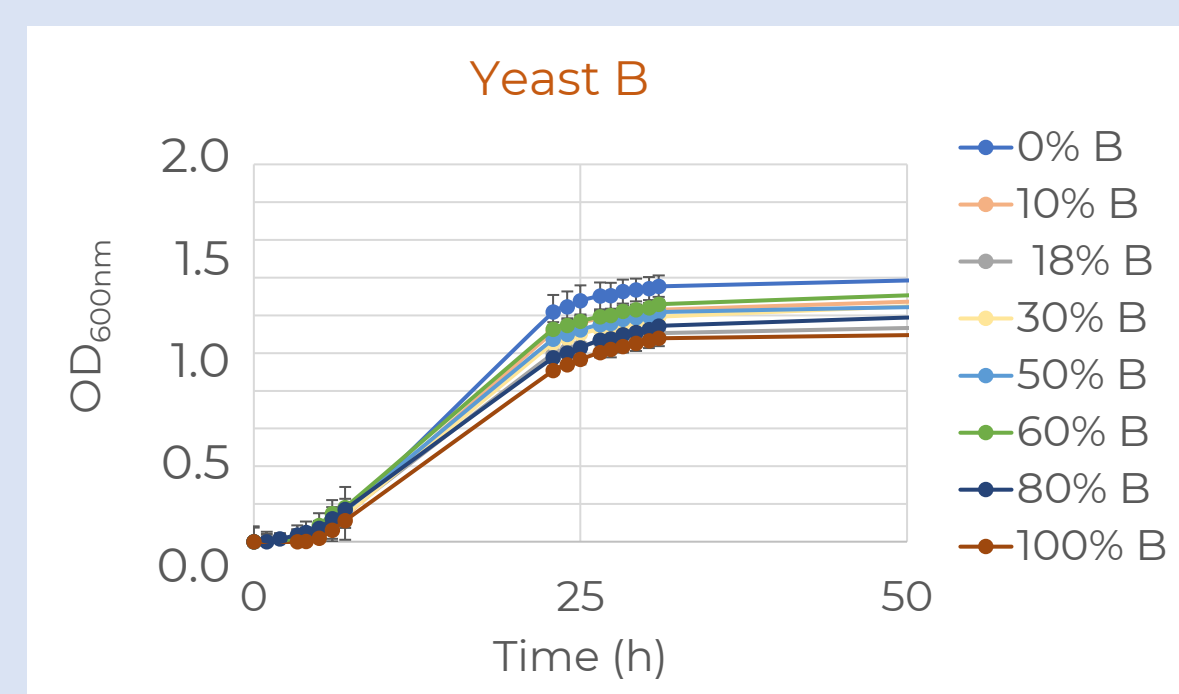
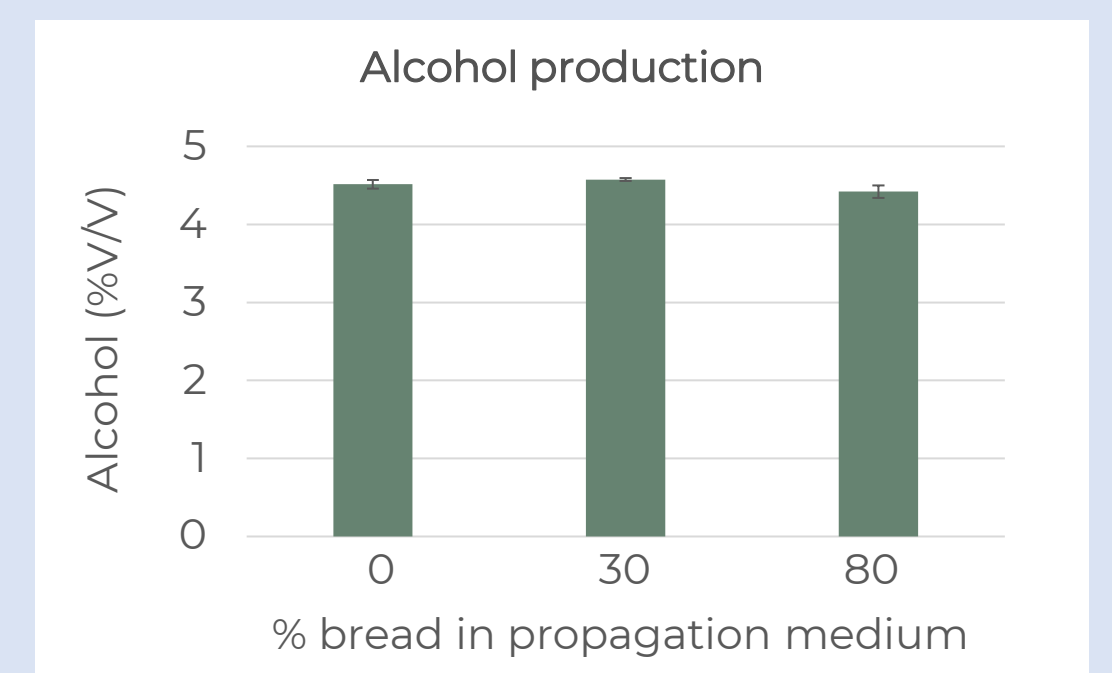
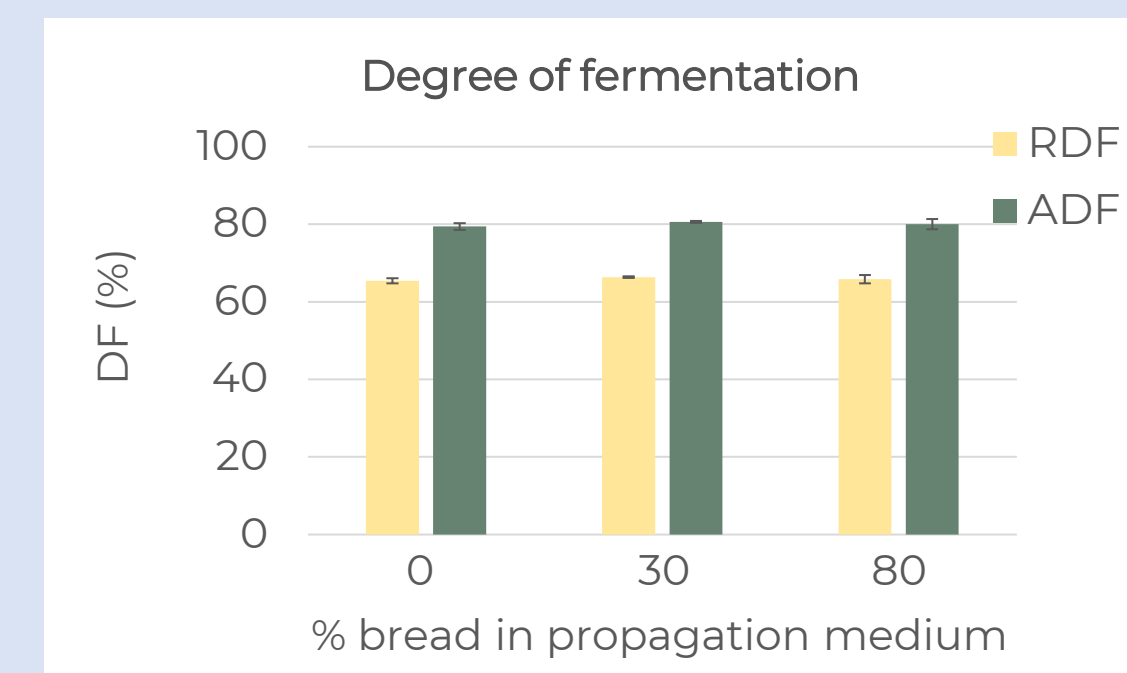
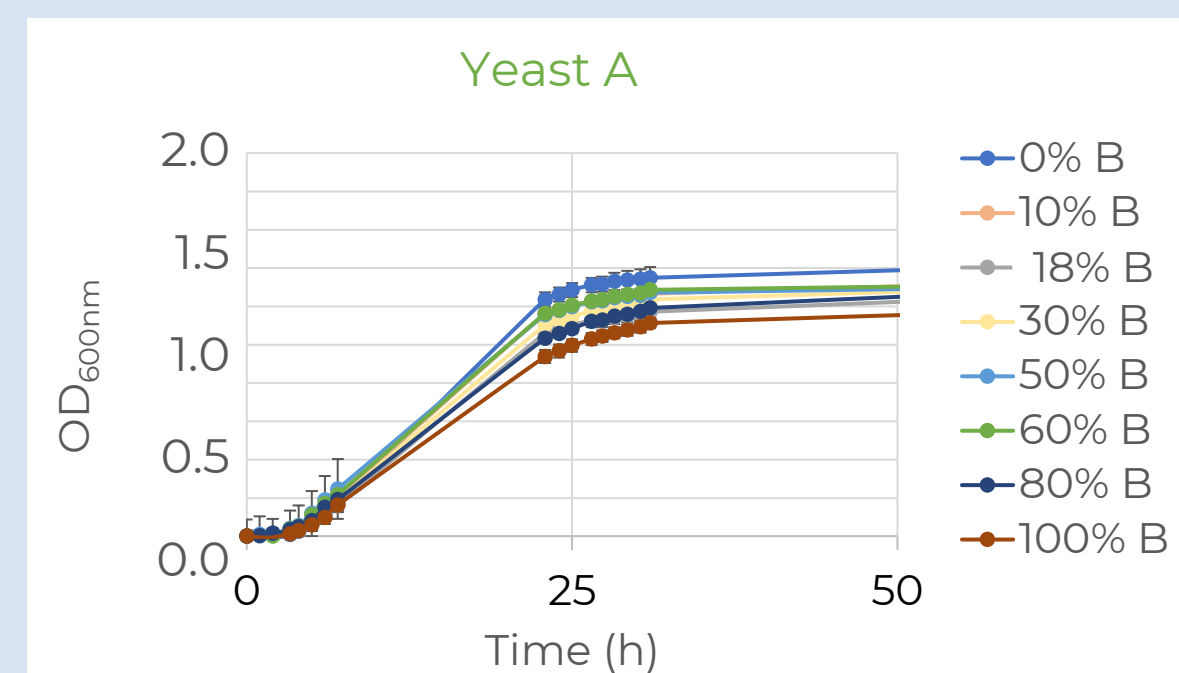
## 3. RESULTS & DISCUSSION

### Propagation medium properties

- The **sacharification** of bread with barley malt is possible up to 80% bread, higher dosage requires industrial enzymes (BC)
- Bread complicates the wort filtration
- Bread medium: 10.5°P
- FAN: decreases at higher bread use due to a lack of protein rest
- Fermentable sugars:** bread adds extra fructose, no sucrose



### Fermentation properties Yeast A



In each case, the yeast was able to convert the fermentable sugars with a residual concentration of fermentable sugars in the beers: 0% bread: 5.27 g/L, 30% bread: 4.09 g/L, 80% bread: 4.24 g/L

## 4. CONCLUSION & PERSPECTIVES

This study confirmed that yeast A (lager) and B (ale) grow well on wort medium in which a certain percentage of pilsner malt has been replaced by bread. When 80% bread is used in the propagation medium, additional enzymes have to be added to break down the starch into fermentable sugar. At this bread content, wort filtration is also difficult. Higher amounts of bread reduce the free amino nitrogen content. This can be optimised by adding yeast extract or by incorporating a protein rest into the mashing schedule. As a follow-up, it has also been proven that the use of a bread medium as propagation medium does not affect the sugar consumption and fermentation capacity of yeast A. However, it is important to conduct further research into the organoleptic characteristics of these lager beers. In addition, the fermentation properties of the ale yeast (B) must be further investigated.

## 5. ACKNOWLEDGEMENTS

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