Surplus bread as a resource: a unique opportunity for brewers within a circular economy

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Introduction

About a **quarter** of bakery products in Flanders are **lost or wasted**. The total loss and waste of bread during the supply chain is 3-9%, leading to 18% of the total climate impact of food loss.[1] So far, most of the bread surplus is used for animal feed and biogas production. Instead, a circular economy approach with higher economic and environmental valorisation can be applied: human consumption.[2] Our consumer research indicated of over thousand beer drinkers indicated 86% of Flemish costumers like to try bread-based beers.

Several bread-based beers are already produced and consumed worldwide. Yet no scientific research is available.

Aim of the study

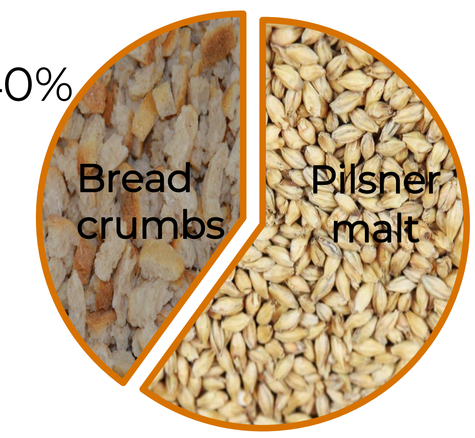
Investigation of the influence of the **addition of bread to pilsner malt** on **wort and fermentation** parameters.

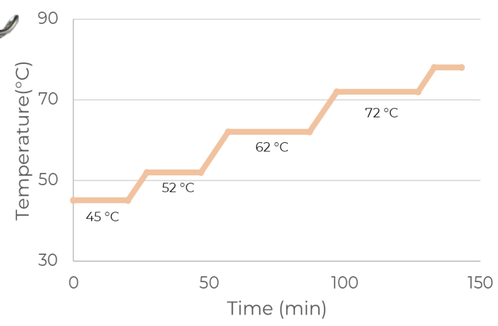
Bread crumbs as raw material

- Selected **low in fat** surplus bread stream: Par-baked (80% fully baked) French baguettes
- Ground and **dried bread crumbs:** diameter < 3 cm; moisture < 5.2 %; aw < 0.6) ; have a shelf life of months.
- **No enzymes** or husks in surplus bread.
- Bread addition: 0% - 15% - 20% - 25% - 30% - 40%

Materials and methods

Par-baked
French baguettes





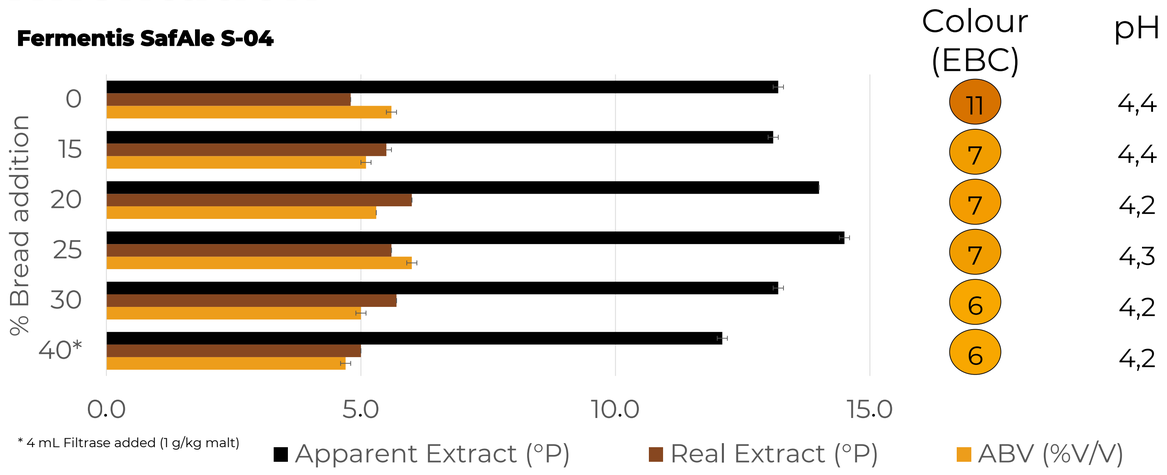
Fermentis SafAle S-04 and T-58
7 days at 24°C

Wort production

% Bread addition	Filtration time (min) for 20 L	Extract (°P)	pH	Brewhouse Efficiency (%)
0	30	13.5	5.8	55.1
15	30	12.8	5.8	52.2
20	45	14.5	5.8	59.2
25	60	14.0	5.9	57.1
30	60	13.6	5.6	55.5
40*	70	13.0	6.0	53.0

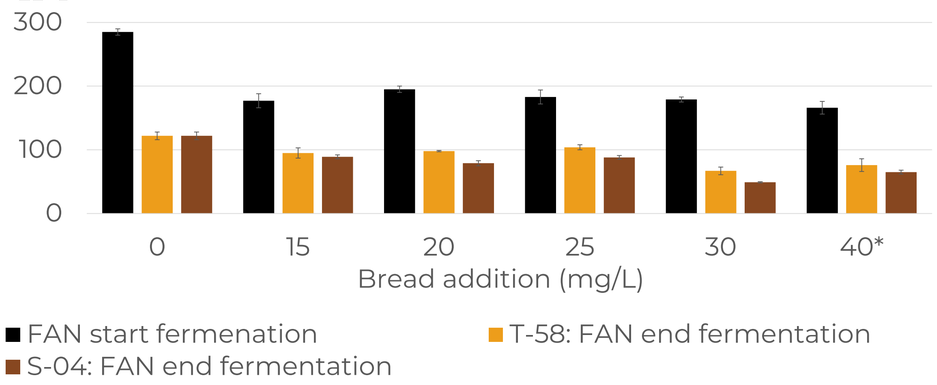
All additions resulted in perfect saccharification and delivered 17 L of wort

Fermentation



The fermentations with Fermentis SafAle T-58 gave similar results.

FAN



Acknowledegments.

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References

[1] OVAM, "Food loss and packaging," Mechelen, 2012.

[2] Brancoli, Pedro, Kim Bolton, and Mattias Eriksson. "Environmental impacts of waste management and valorisation pathways for surplus bread in Sweden."

Conclusion and Future perspectives

- **Par-baked French baguettes** can be used as a raw material for wort and beer production.
- Wheat bread **provides a lighter colour starting at 15%**, but presents **challenges** in terms of **wort filtration** on lab scale. These traits may also occur when using other unmalted wheat-based **adjuncts.**
- **A lower FAN** content may be beneficial to the flavour stability of the beer, but wort filtration must then be improved.

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Sustainable valorisation of bread losses in brewery and bakery

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