IOCFE 2025 Conference
The 1st International Online Conference on Fermentation
12–13 November 2025 | Online
MDPI

Technological quality and volatile profile of breads with sourdoughs prepared from sprouted and unsprouted whole-wheat flour

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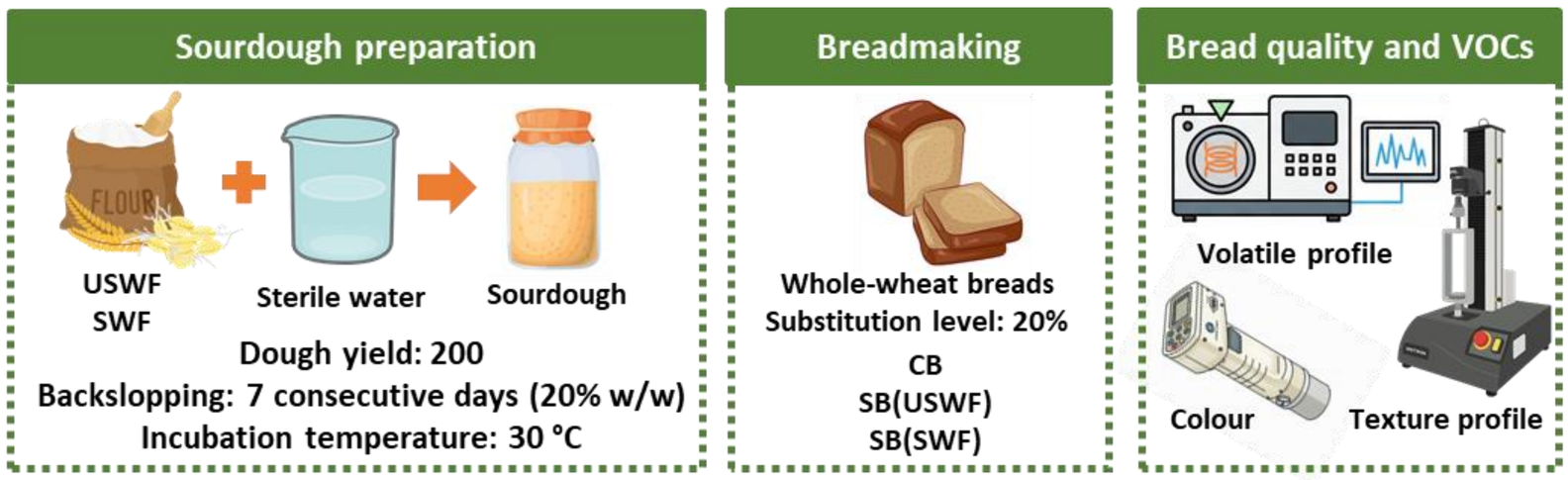
INTRODUCTION & AIM

There is a growing interest in applying natural and sustainable methods to improve functional, nutritional, and technological properties of foods. Sprouting and sourdough are promising technological solutions in the bakery industry. This study evaluated the effect of incorporating sourdough (SD) made from unsprouted (USWF) and sprouted whole-wheat flour (SWF) on the technological quality and volatile profile of bread.

Keywords: *sprouting; sourdough; whole-wheat bread; technological quality; volatile organic compounds.*

METHODS

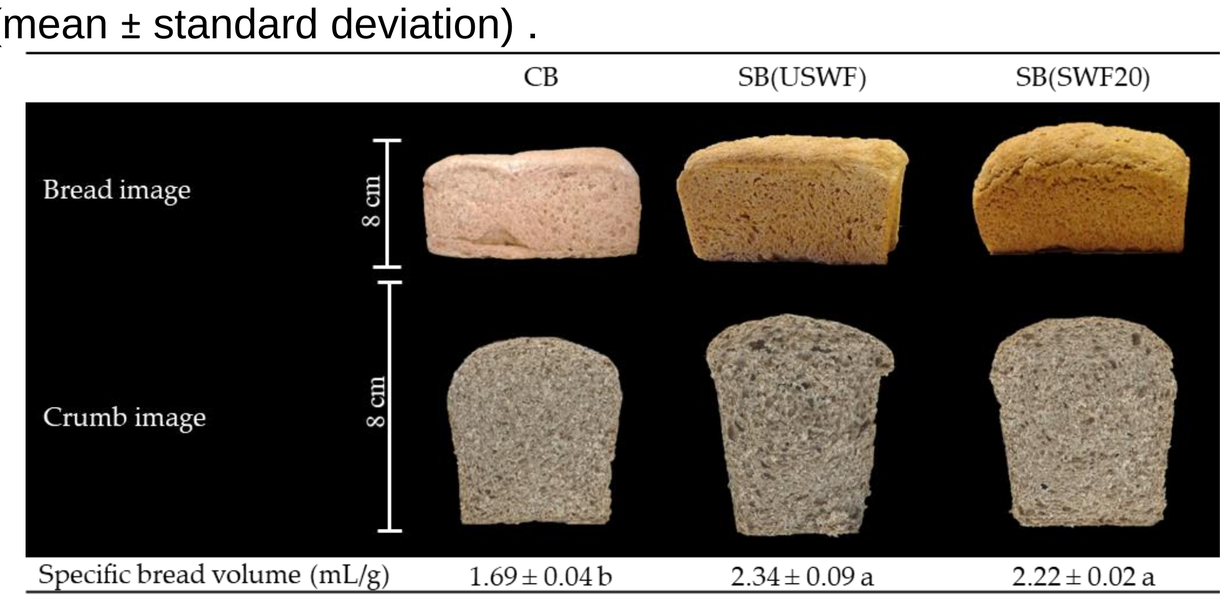
Sourdoughs were prepared from USWF or SWF, obtained under controlled conditions (20 °C for 24 h), and propagated at 30 °C for 7 days. Breads were formulated by substituting 20% of USWF with ripe sourdoughs—SB(USWF) and SB(SWF), respectively—and compared with a control bread (CB) made exclusively with USWF. Bread quality and volatile organic compounds (VOCs) were assessed.



RESULTS & DISCUSSION

Sourdough-substituted breads exhibited improved specific volume (30–40%) and softer crumb texture (20–60% less firmness), both post-baking and following storage (Fig. 1). SB(SWF) led to higher crust browning (Fig. 1). The major chemical classes detected in whole-wheat breads were alcohols (predominant), followed by aldehydes and esters (Fig. 2).

Figure 1 – Images and quality parameters of whole-wheat breads (mean ± standard deviation) .

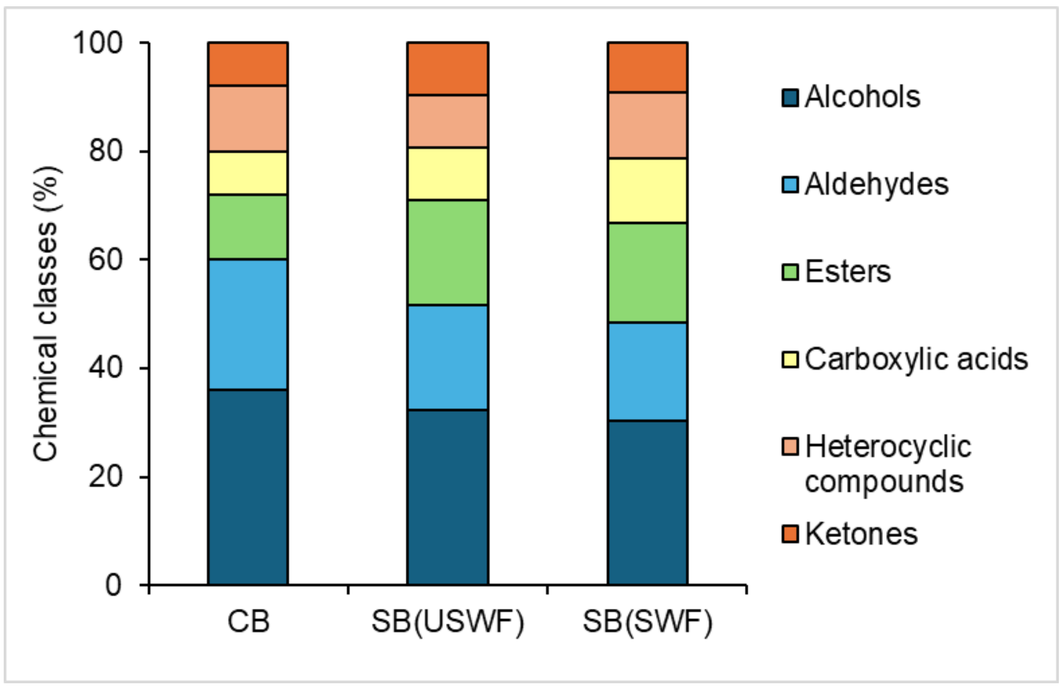


	CB	SB(USWF)	SB(SWF20)
Specific bread volume (mL/g)	1.69 ± 0.04 b	2.34 ± 0.09 a	2.22 ± 0.02 a
Crust			
Browning (100- L*)	38.56 ± 0.34 b	41.09 ± 0.81 b	43.25 ± 1.48 a
a*	10.84 ± 1.05 a	12.77 ± 0.89 a	11.72 ± 0.83 a
b*	24.91 ± 0.72 a	22.64 ± 2.17 a	25.53 ± 2.18 a
Crumb			
Browning (100- L*)	43.57 ± 0.05 a	45.01 ± 1.73 a	42.96 ± 2.31 a
a*	7.40 ± 0.10 a	7.05 ± 0.22 a	6.79 ± 0.42 a
b*	21.94 ± 0.21 a	22.17 ± 0.78 a	21.86 ± 0.49 a
Initial firmness (N)	32.00 ± 1.13 a	13.23 ± 0.47 c	22.09 ± 0.84 b
Final firmness (N)	54.10 ± 0.99 a	31.41 ± 2.17 c	40.62 ± 1.30 b

Different letters indicate significant difference (LSD test, $p \leq 0.05$) among samples.

SB(SWF) led to distinct VOCs, such as ethyl-heptanoate, heptanol, and geranyl-acetone, which were absent in SB(USWF) and CB**.** The compounds are associated with pleasant aromas, which may represent a potential advantage of using SD made from SWF.

Figure 2 – Relative abundance of volatile compound chemical classes of whole-wheat breads.



CONCLUSION

Overall, combining sprouting with sourdough improves whole-wheat bread's texture and aroma, providing a promising strategy to improve sensory attributes and consumer acceptability.