1st International SOURDOUGH SUMMIT by Richemont Lucerne Switzerland, 09 May 2019

Pattern of Gas Formation from diverse Sourdoughs

H. Trautmann, A. Dossenbach, U. Röthlin, R. Fries

Introduction

Depending on the specific application, sourdough preparations exhibit different characteristics concerning their gas formation activity. Italian sourdoughs, e.g., typically used for Panettone are intended to result in high gas formation rates, whereas French sourdoughs for extra-long proving are intended to release gas over corresponding prolonged time-periods at rather moderate rates.

In this study, 5 different sourdoughs were examined for their gas formation properties, applying a Gas Volume Monitor from abiotec AG. This measurement device, originally designed for Nestlé Research Center in Lausanne for the purpose of sensitive measurements of gas formation from chilled yeast doughs, allows detailed insights concerning gas formation kinetics.

For this experiment, chilled sourdough stock samples were refreshed (subcultivated) according to their specific prescriptions. Samples, 100 g each, were filled into the measurement units (see picture beside), tightly closed and thermostated to 27 °C in a waterbath, before monitoring of generated gas volumes was started.

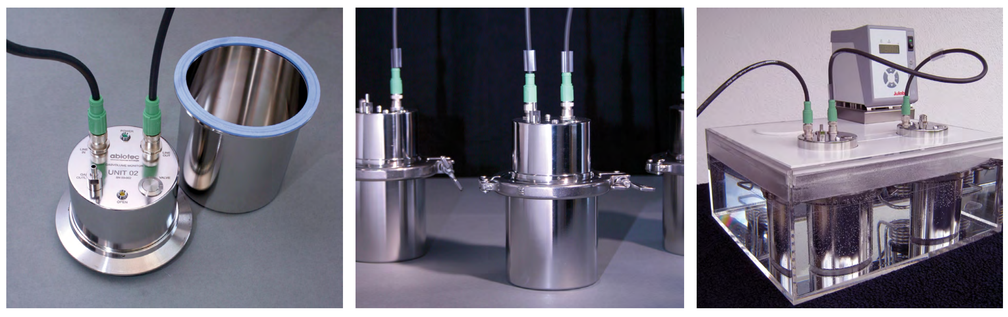

Fig. 1: Determination of gas formation activity by means of the Gas Volume Monitor from abiotec AG.

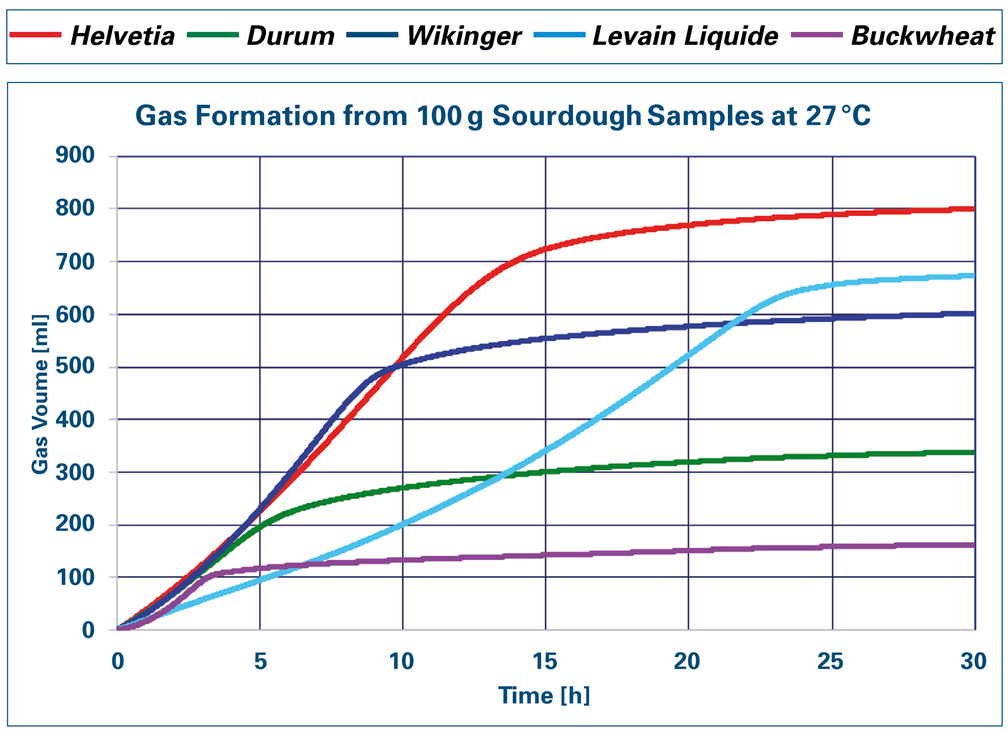

Fig. 2: Gas formation from 100 g sourdough samples at 27 °C

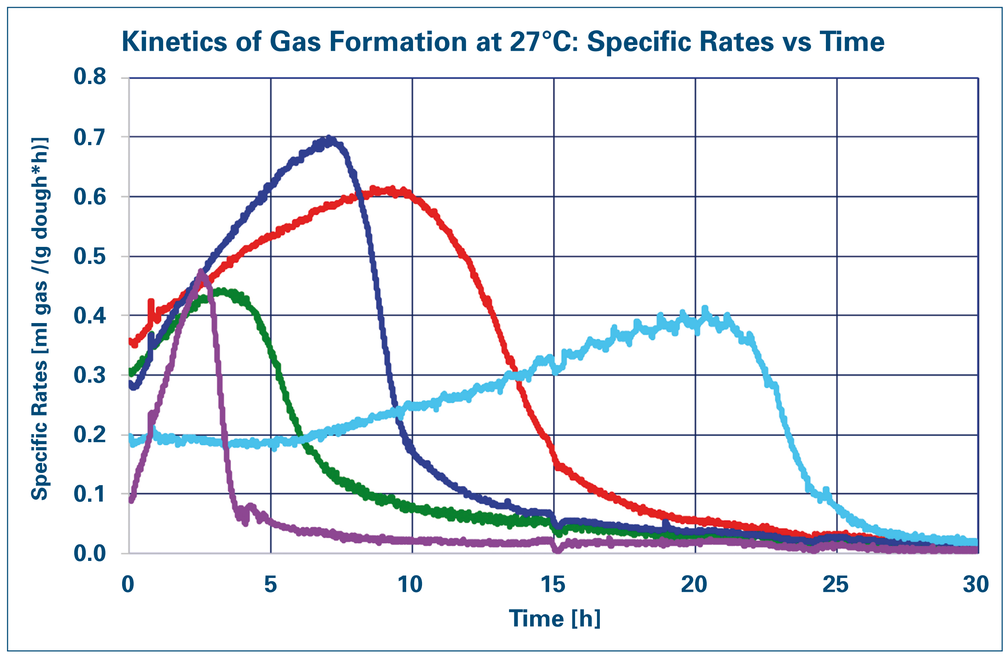

Fig. 3: Display of data as specific rates of gas formation over time

Results

Primary results of gas formation over 30 hours (Fig. 2) show significant differences in the amount and the periods of gas formation for each of the 5 sourdough samples:

Sourdoughs ***Helvetia*** and ***Wikinger*** exhibit the largest and fastest gas formation during the first 15 hours.

Durum and ***Buckwheat*** sourdough show significantly reduced time periods of gas formation, thus leading to less final gas volumes.

Levain Liquide shows a sustained gas production, however, over a prolonged period of about 25 hours, thus leading to a rather high final gas volume.

For a more detailed kinetic analysis, display of data as specific rates of gas formation over time was used (Fig. 3):

Buckwheat sourdough develops a short, almost peak-like activity during the first hours with a maximum at about 2.6 h.

Durum has a similar high maximum at 3.3 h, however starts at a higher rate and exhibits a broader curve width.

Activity of ***Levain Liquide*** is low and stable during the first 5 hours and doubles during the following 15 h in a linear mode. Shortly after the maximum, the rate drops rather sharp.

In contrast, ***Wikinger*** and ***Helvetia*** develop from the very beginning higher gas formation activities: ***Wikinger*** exhibits the highest activity, however, dropping rather fast after reaching its maximum; whereas ***Helvetia*** produces gas at relative high rates over a more prolonged time period, finally resulting in the highest total amount of gas.

(For details, see table 1)

Type of Sourdough (Substrate for refresh)	max. Gas Formation Activity (GFA_{max})		Time period of Gas Formation Activity		Total Gas Formation
	Peak Time [h]	GFA_{max} [ml/(g*h)]	≥ 50% GFA_{max} [h]	≥ 10% GFA_{max} [h]	after 30 h [ml]
Helvetia (wheat flour 400)	9.1	0.61	13.7	19.2	800
Durum (durum wheat flour)	3.3	0.44	5.8	15.0	338
Wikinger (50% wheat flour 1100, 50% dark rye flour)	7.0	0.70	8.2	14.0	602
Levain Liquide (wheat flour 720)	20.0	0.40	23.4	26.4	673
Buckwheat (buckwheat flour)	2.6	0.47	2.4	5.3	162

Table 1: Detailed view on various characteristic numbers of gas formation.

Conclusions

The measurement technique with the presented display of kinetic data offers an interesting potential for the **detailed characterisation of sourdoughs** with respect to their **gas formation activities.** Thus it may be successfully applied for the

- **development of new sourdough strains**
- **precise determination of limiting nutrient factors and the effective development of recipes**
- **elaboration / optimisation of effective processes for dough proving by developing suitable feeding strategies**

Richemont Kompetenzzentrum
Seeburgstrasse 51
CH– 6006 Luzern
www.richemont.online

abiotec
advanced bioprocess technologies
abiotec AG
Buchenweg 21
CH– 4310 Rheinfelden
www.abiotec.ch