Effects of spontaneously fermented ancient wheat sourdoughs on quality of refined wheat flour bread

SOURDOMICS

Tamara Dapčević-Hadnađev[1], Jelena Tomić[1], Dubravka Škrobot[1], Nikola Popović[2], Miroslav Hadnađev[1]

[1]University of Novi Sad, Institute of Food Technology, Novi Sad, Serbia

[2]University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Laboratory for Molecular Microbiology, Belgrade, Serbia

SOURDOMICS

AGENDA

- About ancient wheat
- Spontaneous fermentation of ancient wheat flour
- Sourdough characterization
- Bread evaluation

SOURDOMICS

Ancient grains are represented by populations of primitive grains, which were not subject to any modern breeding or selection, and which retained characters of wild ancestors, such as large individual variability, ear height, brittle rachis, and low harvest index.

Ancient wheat - refers to refers to emmer, einkorn, Khorasan wheat (Oriental wheat) and spelt

- ~95% of the cultivated wheat worldwide is *Triticum aestivum*
- most of the remaining 5% is *T. turgidum* susbp. *durum*

Boukid, Fatma, et al. Comprehensive reviews in food science and food safety 17.1 (2018): 123-136.

Can sourdough technology help?

ADVANTAGES

- **Preserved genetic diversity**
- **Suitable for organic farming**

- High adaptability to low agronomic inputs
- High resistance to some diseases and disadvantageous
- growing conditions

DISADVANTAGES

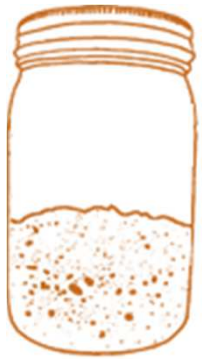
- **Low yield**

- Susceptible to lodging with consequent significant yield loss
- Low technological quality

Experimental setup

SOURDOMICS

Spontaneous fermentation of wholegrain emmer, khorasan, spelt and wheat flours was carried out for 5 days with back-slopping every 24 h (dough yield of 200) at 25 °C.



0 h

pH, TTA, LAB and yeasts counts

Proteolytic activity, %H, electrophoresis, rheology, SEM, Temporal dominance of sensations

6 h

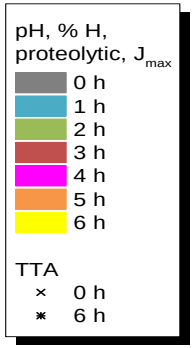
Specific volume, texture

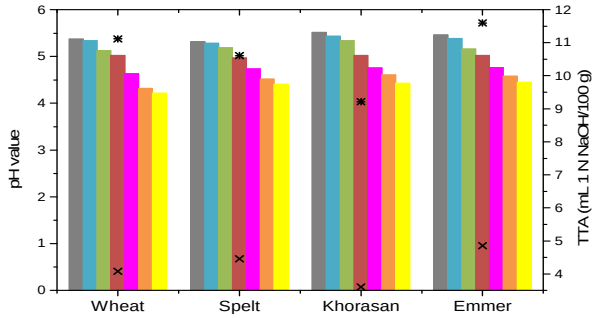
Crumb/crust colour
Sensory analysis

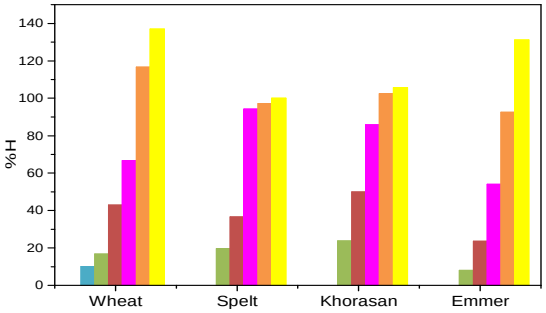
50% sourdough

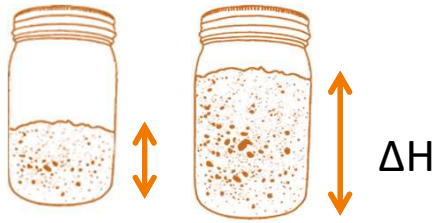
SOURDOMICS

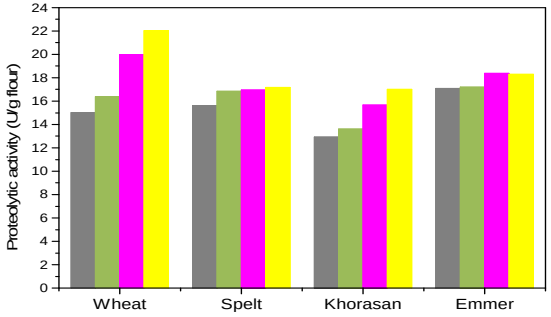
Changes during sourdough evolution

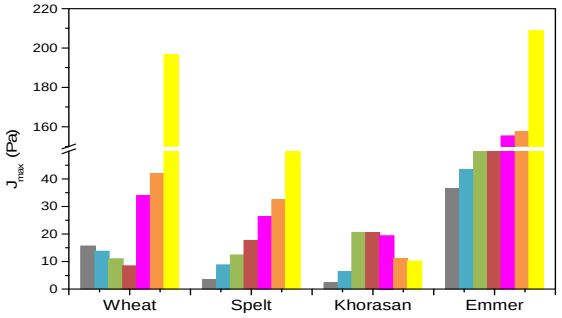


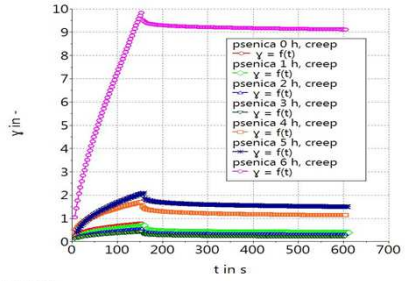






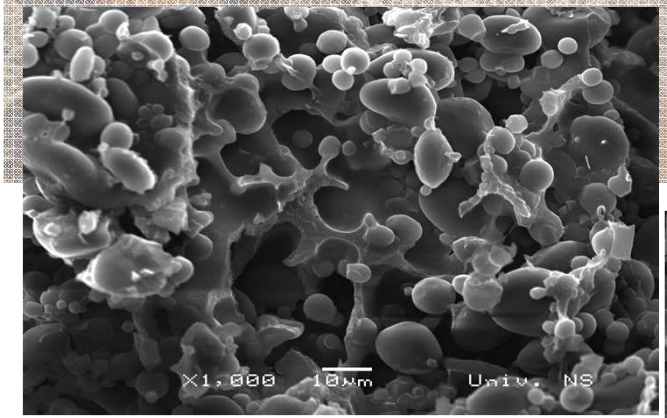




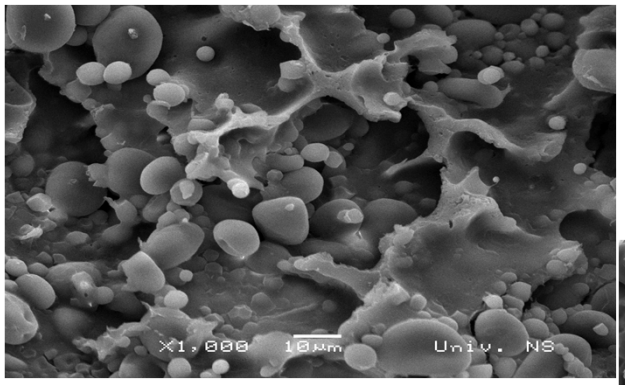


SOURDOMICS

Emmer dough under SEM – gluten changes

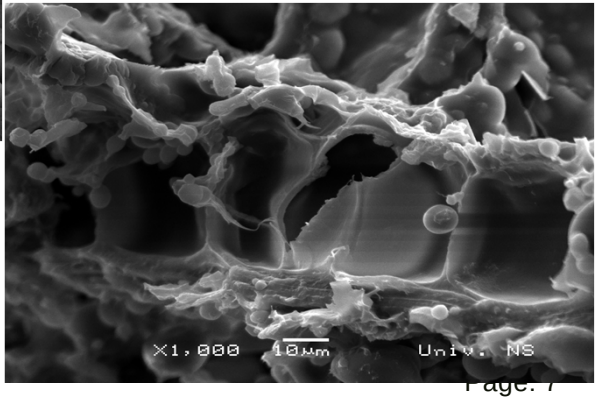


0 h



4 h

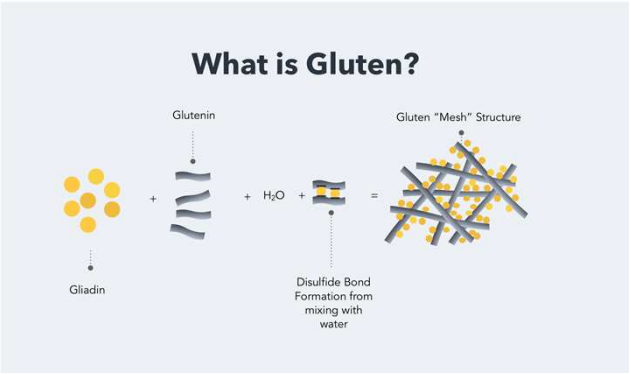
6 h



SOURDOMICS

The reason for different dough behaviour during spontaneous fermentation

Flour	Wet gluten	Gluten index
Emmer	31.0	10
Khorasan	19.2	61
Spelt	32.2	42
Wheat	24.7	80

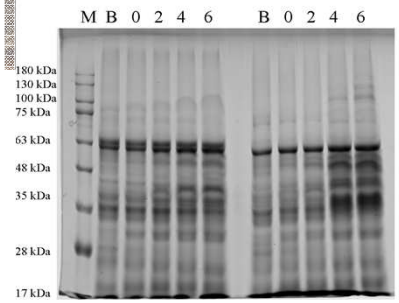


Changes during sourdough evolution

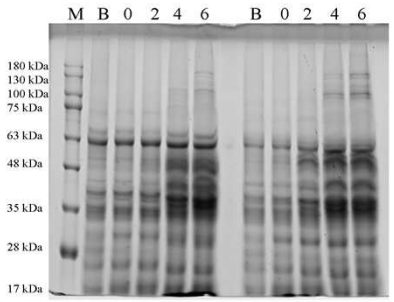
SOURDOMICS

Albumins

Emmer Khorasan

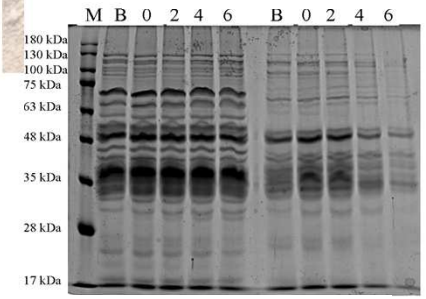


Spelt Wheat

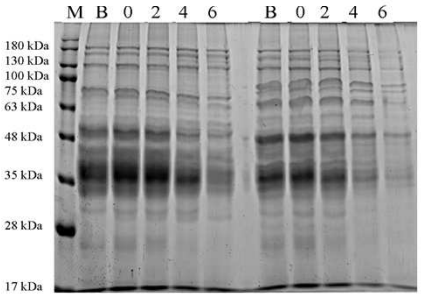


Gliadins

Emmer Khorasan

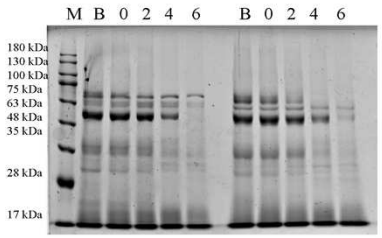


Spelt Wheat

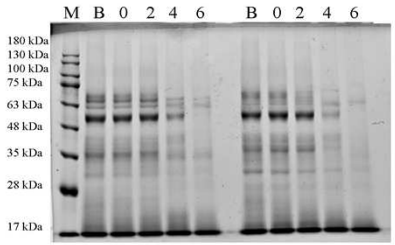


Globulins

Emmer Khorasan

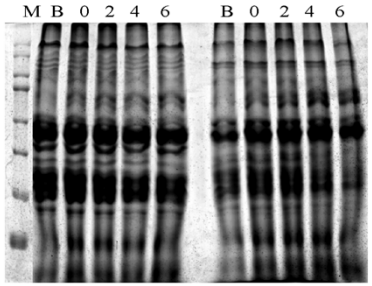


Spelt Wheat

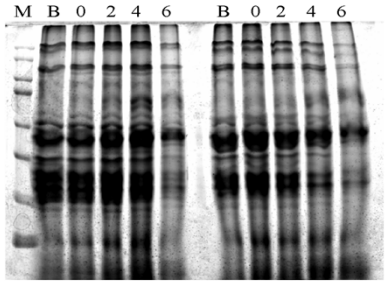


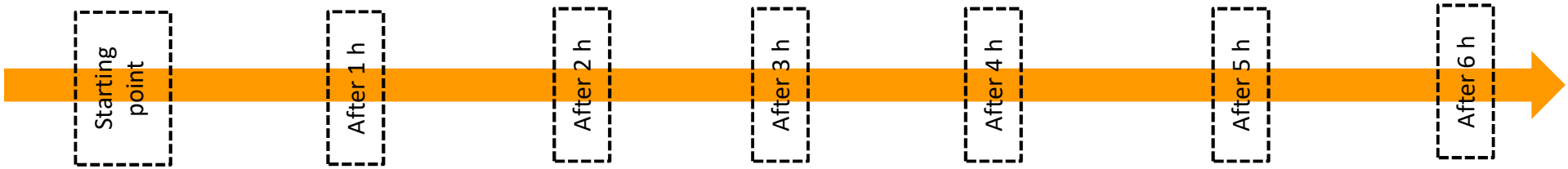
Glutenins

Emmer Khorasan

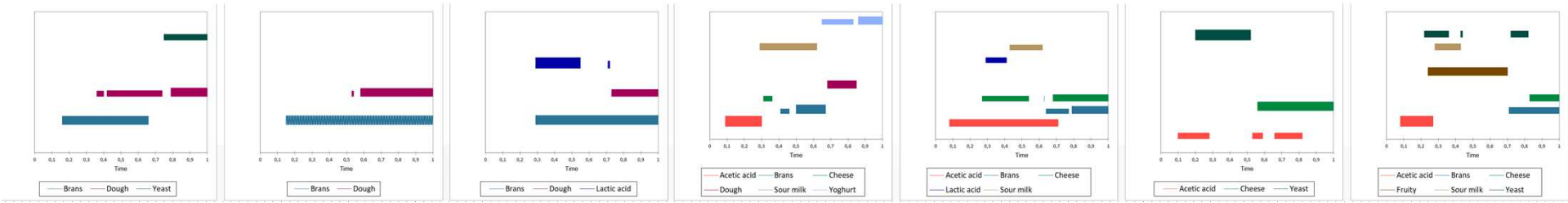


Spelt Wheat

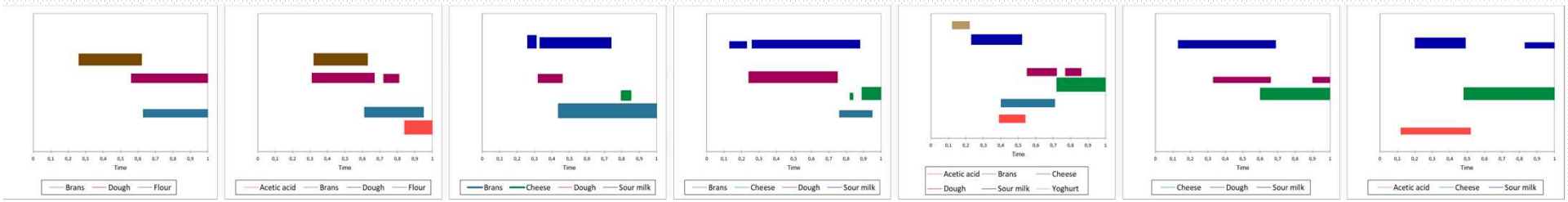




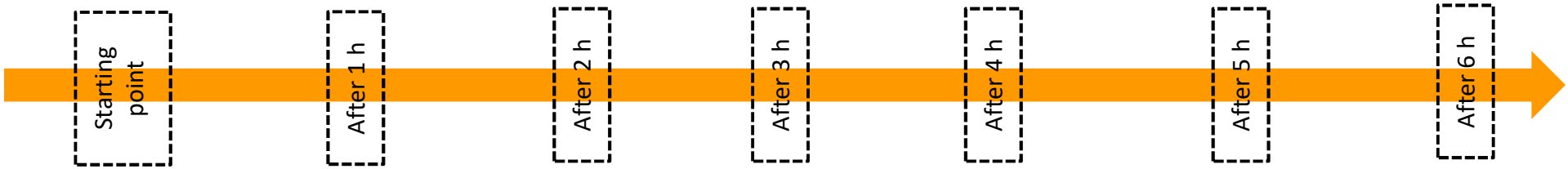
Spelt sourdough - At the beginning flour-like, brans-like and dough-like attributes dominant odours; during the time they became masked with more sharp odour notes reminiscent of sour milk, cheese, yoghurt and acetic acid



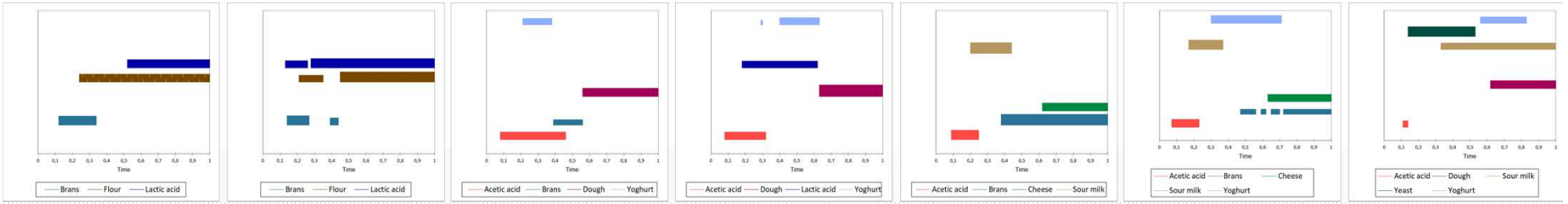
Wheat sourdough – no yeast odour, long and intensive sour milk odour



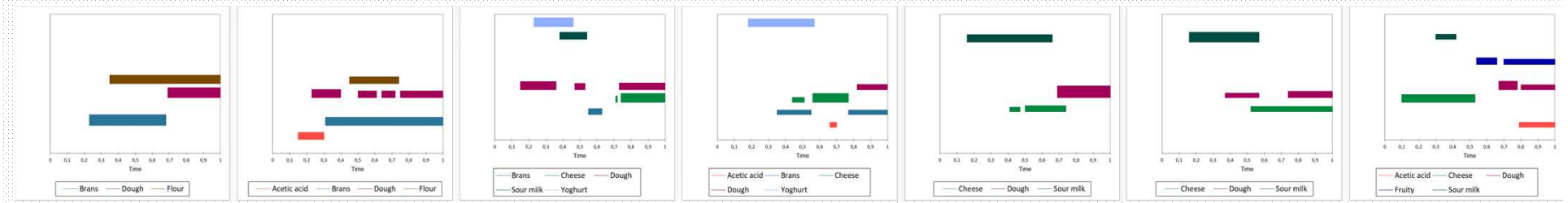
TEMPORAL DOMINANCE OF SENSATIONS



Emmer sourdough – intensive lactic acid odour from beginning, which turns to sour milk and cheese



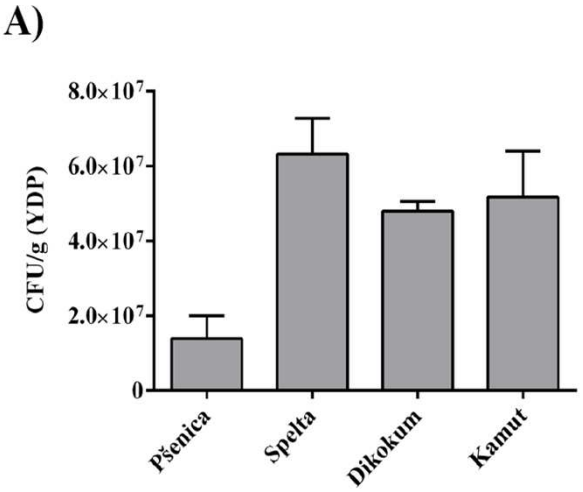
Khorasan sourdough – fruity odour at the end

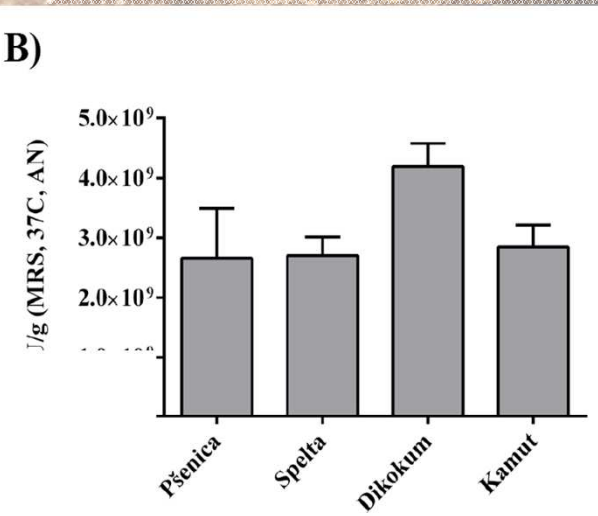


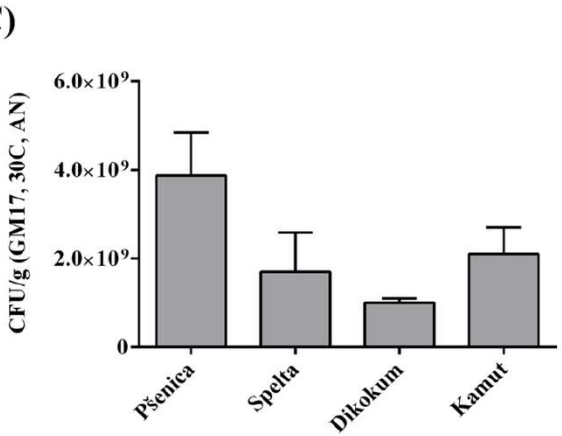
TEMPORAL DOMINANCE OF SENSATIONS

SOURDOMICS

A) Total yeasts
B) Lactobacillus
C) Lactococcus and enterococcus

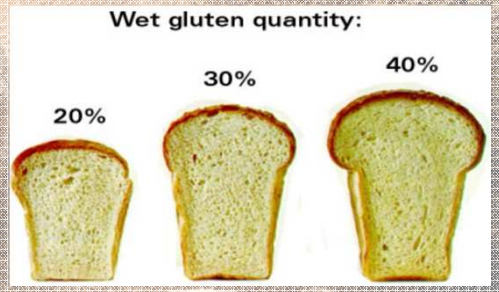


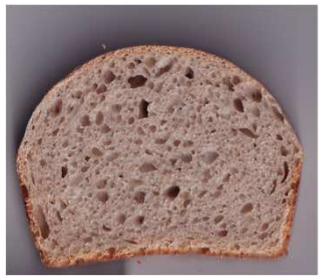




SOURDOMICS

BREAD VOLUME





Wheat

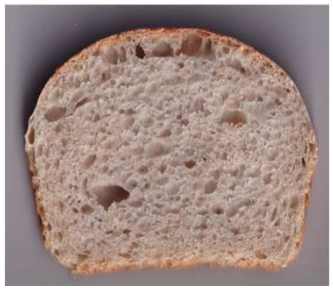
Vsp = 2.26±0.04

Spelt

Vsp = 2.80±0.01

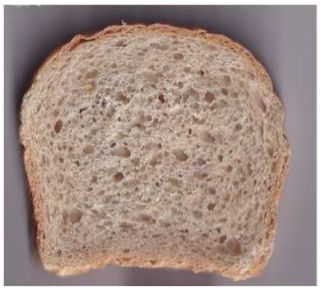
Emmer

Vsp = 2.84±0.02



Khorasan

Vsp = 2.67±0.09

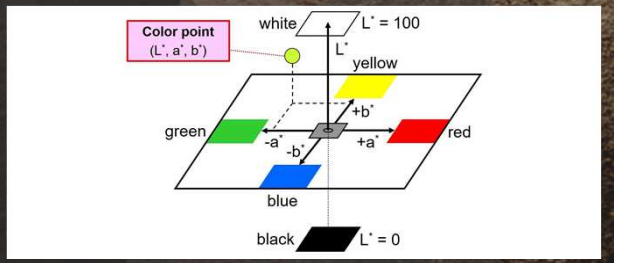


Control

Vsp = 2.77±0.05

Bread	Hardness (g)	Springiness	Cohesiveness	Chewiness	Resilience
Emmer	5589±238	0.941±0.008	0.631±0.005	3353±140	0.269±0.006
Khorasan	7742±879	0.957±0.007	0.650±0.004	4777±486	0.323±0.006
Spelt	7427±356	0.949±0.008	0.629±0.010	4425±222	0.293±0.016
Wheat	14238±1318	0.928±0.011	0.601±0.003	7941±782	0.294±0.006

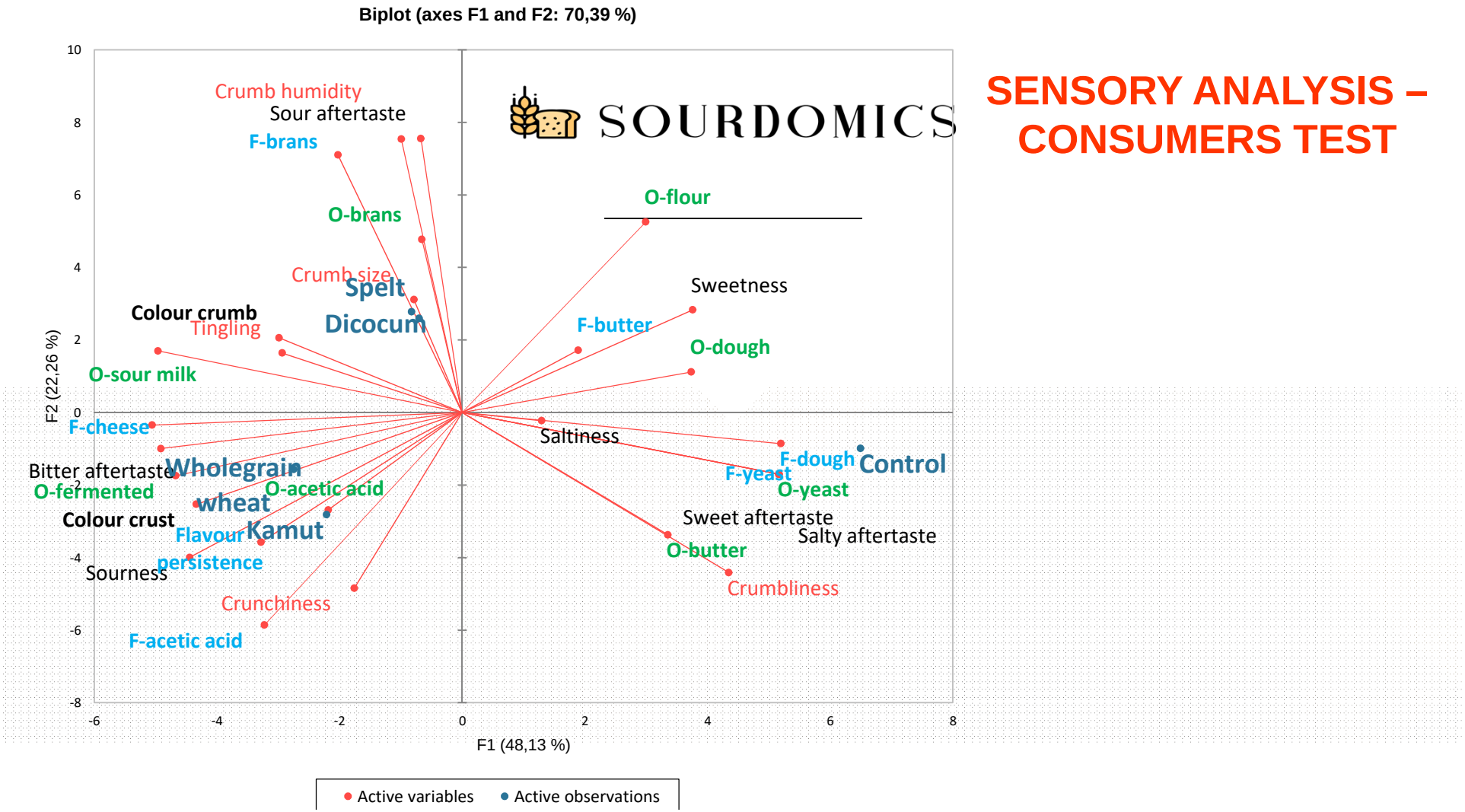
SOURDOMICS



CRUMB AND CRUST COLOUR

Bread	Crumb			Crust		
	*L**	*a**	*b**	*L**	*a**	*b**
Emmer	73.1±0.99	2.15±0.17	17.49±0.32	46.71±3.19	15.53±1.35	28.51±1.98
Khorasan	75.5±2.17	1.19±0.35	17.29±0.74	49.39±2.50	15.71±1.12	31.02±1.72
Spelt	72.4±0.87	2.48±0.28	16.75±0.69	50.09±1.57	14.51±0.85	29.83±1.37
Wheat	66.3±1.67	3.33±0.31	17.93±0.83	49.66±3.55	13.84±1.59	28.67±1.76

SENSORY ANALYSIS – CONSUMERS TEST



CONTACT US

Thank you for your attention!

SOURDOMICS member

Tamara Dapčević-Hadnađev, PhD
e-mail: thadnadjev@sourdomics.com
tamara.dapcevic@fins.uns.ac.rs

SOURDOMICS Webpage

www.sourdomics.com