Yeast derived ingredients addition to meat model systems: a study.

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Contents

1. Introduction s1

The role of yeasts in the reformulation context

Consumer demand → Health oriented products

Some meat products are known to have high amount of salt and saturated fat (*Colmenero et al. 2001*)

Technologists turn to new ingredients to reformulate their products

Yeasts derivatives → taste enhancer, dietary fiber.

1. Introduction s2

Yeast extracts → taste enhancer (already used in meat industry).

Yeast derivatives → dietary fiber → *β*-glucan (NEW** to meat industry)

Yeast *β*-glucan → (1,3 – 1,6) *β – glucan;*

Technological uses:

- Textural property modifier
- Improving emulsion storage stability
- Fat mimic

(based on it's property to increase the viscosity of aqueous solutions)

2. Materials and methods s1

Materials

Yeast derivate ingredient A, yeast extract (YIA);

Yeast derivate ingredient B, *β*-glucan concentrate (YIB);

Pork meat, pork back fat;

Other technological additives and ingredients (salt, polyphosphate, sodium nitrate and nitrites, soy protein isolate)

Brookfield DV-E digital viscometer;

Instron Texture Profile Analyzer;

Megazyme yeast and mushroom *β*-glucan assay kit;

Pilot plant equipment;

Usual laboratory equipment (centrifuge, water bath, mixer).

2. Materials and methods s2

Methods

Chemical analysis (total nitrogen, total fat, ash, moisture, carbohydrate - *AOAC)*

Water holding capacity

Test 1 (centrifuge test)

Ingredient A ⎤ thoroughly wetted

Ingredient B ⎦ paste like consistency

centrifuge 4000 rpm/10`

(record the water retained)

2. Materials and methods s3

Water holding capacity

Test 2 (meat model system)

75 g pork meat
15 g pork back fat
15 g chilled distilled water

Yeast ingr. A (0,5; 1; 1,5) % w/w
Yeast ingr. B (0,5; 1; 1,5) % w/w

mixed (no more than 3 min not exceeding 15ºC) → vacuum bags (vacuumed) → rest (1 h, 4ºC) →

boiling (water bath, 95ºC, 1 h) → cooling open bags → record drip loss (% drip volume x control) →

2. Materials and methods s4

Emulsifying capacity

Model system (modified *Swift and Locket 1961)*

600 ml Griffin beaker
25 g Yeast ingredient
X Water (WHC test)

sunflower oil
(incremental addition, mixing 2 min, 15ºC)

Viscosity and torque recording
(sudden drop – indicator of emulsion breakdown)

2. Materials and methods s5

Emulsion stability

Model system (modified *Yogesh et al. 2013*)

75 g pork meat
15 g pork back fat
15 g chilled distilled water
Salt mix A (salt 1,5%, polyp. 0,3%)
Salt mix B (salt 1%, polyp. 0,2%)

YIA (0,5; 1; 1,5) w/w
YIB (0,5; 1; 1,5) w/w
Yeast ingr. mixture (50% YIA + 50% YIB)
Control

centrifuge tubes
weighing
centrifugation (2.5 G, 3ºC, 15 min)
→ hermetically closed
boiling (70ºC, 30 min)
→ Open
upside down onto Petri
(1 h, 10ºC)
→

Total Fluid Released, 16h 105ºC oven → FR, WR difference between TFR and FR.

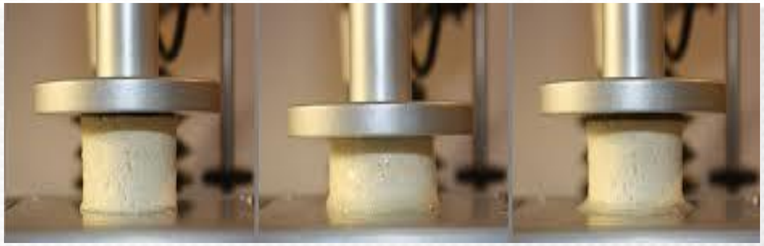
2. Materials and methods s6

Texture profile analysis

Mixture YIA and YIB → cooked & smoked technology (polonezi)
1, 2, 3, 4, 5, 6 (% w/w raw batter) → no spices, no added sugars.

	C	P1	P2	P3	P4	P5	P6
PORK LEG	60	60	60	60	60	60	60
PORK BACK FAT	14	14	14	14	14	14	14
ICED WATER	23.3	23.3	23.3	23.3	23.3	23.3	23.3
SALT	1.5	1.5	1.5	1.5	1.5	1.5	1.5
POLYPHOSPHATES	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SOY PROTEIN	1	1	1	1	1	1	1
YEAST MIX*	-	1	2	3	4	5	6
B-GLUCAN CONTENT (MG/100G)	-	0.274	0.549	0.823	1.098	1.372	1.647

2. Materials and methods s7



Texture profile analysis

(modified Bourne method 1978)

13 meat cube samples (1 cm^3 ± 1 mm) → two cycle compression test

To 25% x original height, 4 mm/s, 50 N loading cell.

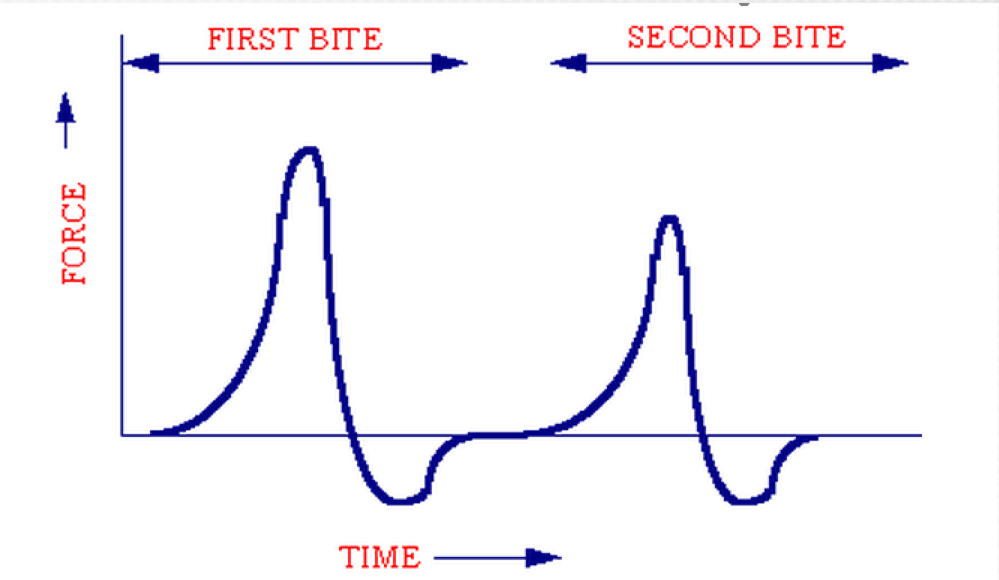
Fracturability (N)

Hardness (N)

Adhesiveness (N x s)

Cohesiveness (dimensionless)

Springiness (m)



2. Materials and methods s8

Yeast β-glucan assay from meat product (NEW*)

*(Cleary, Andersson & Brennan, **<u>2007</u>**)*

*Because food processing conditions may alter β-glucan MW, structure, function and **<u>quantity</u>** quantification of β-glucan that underwent processing inside the food matrix is crucial.*

Megazyme Yeast and Mushroom Assay kit

Strong acid hydrolyses + high temp. → exo-1,3-β-glucanase and β-glucosidase →D-glucose monomers →GOPOD →spectrophotometric.

2. Data analysis

All measurements were conducted in triplicate (unless otherwise mentioned)

SPSS software, ANOVA one - way, ANOVA Friedman, $p > 0.05$.

3. Results s1

Water holding capacity

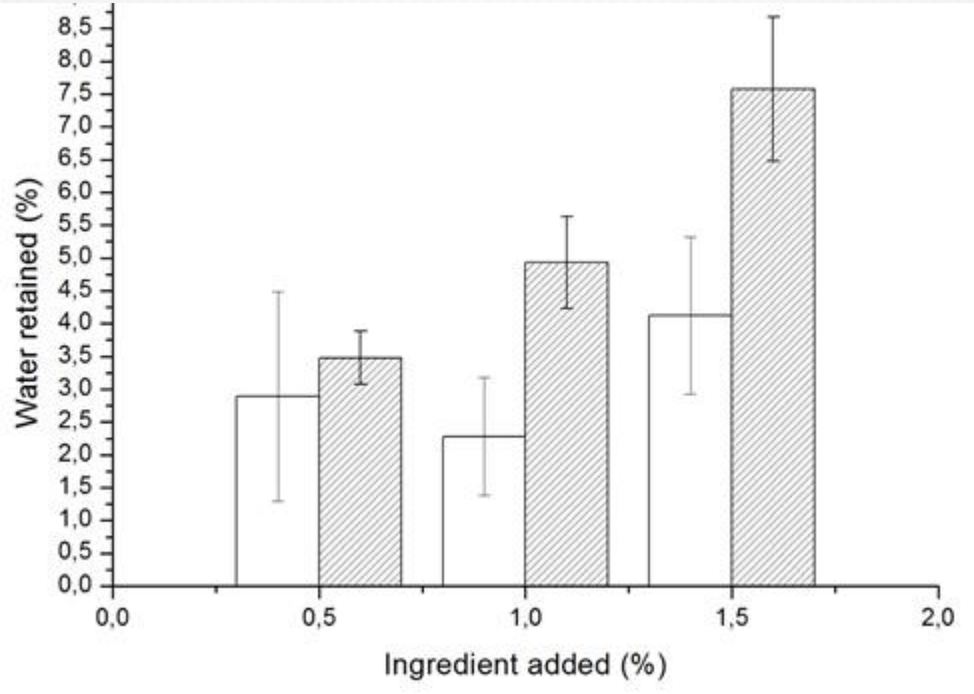


Fig 1. Water retained at given concentrations of yeast ingredients added to model meat emulsions, recorded as percentage decrease in drip volume compared to control.

3. Results s2

Emulsifying capacity

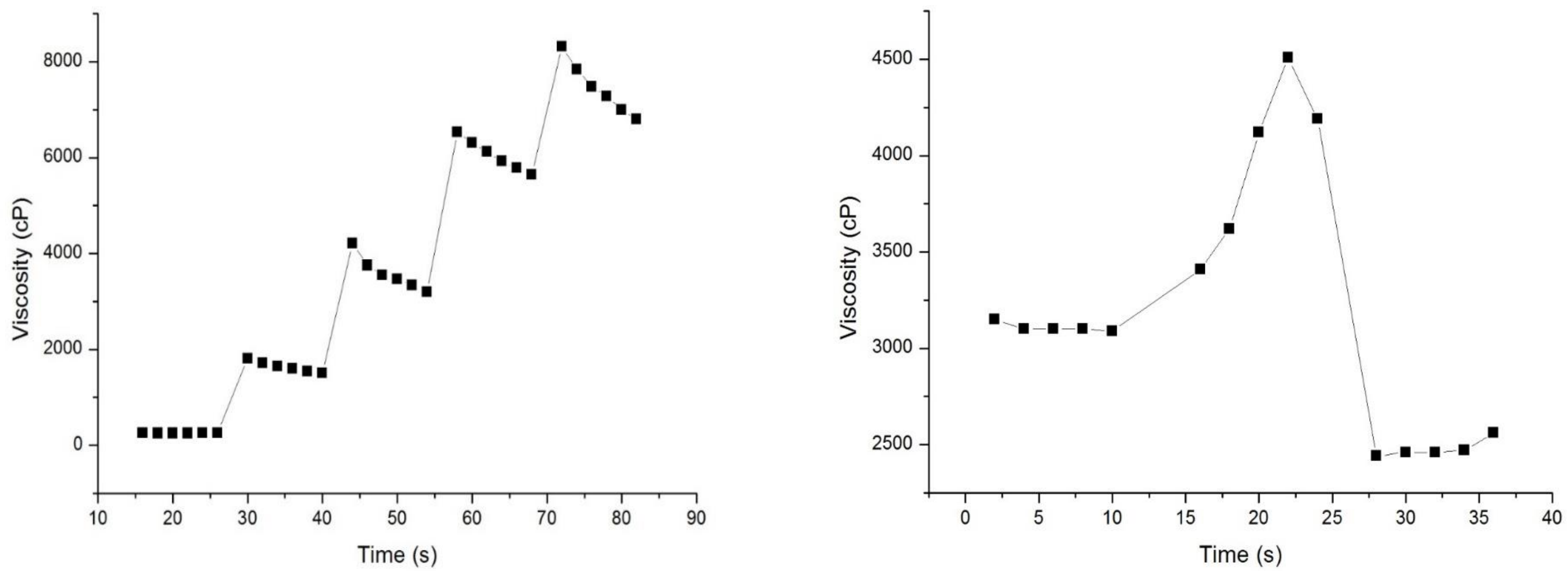


Fig 2. Viscosity behaviour of the yeast derived ingredients, extract (left), glucan concentrate (right).

3. Results s3

Emulsifying stability

Yeast extract 1.5%→ under 15% TFR

Yeast β-glucan concentrate 1%→ above 15% TFR

3. Results s4

Texture Profile Analysis

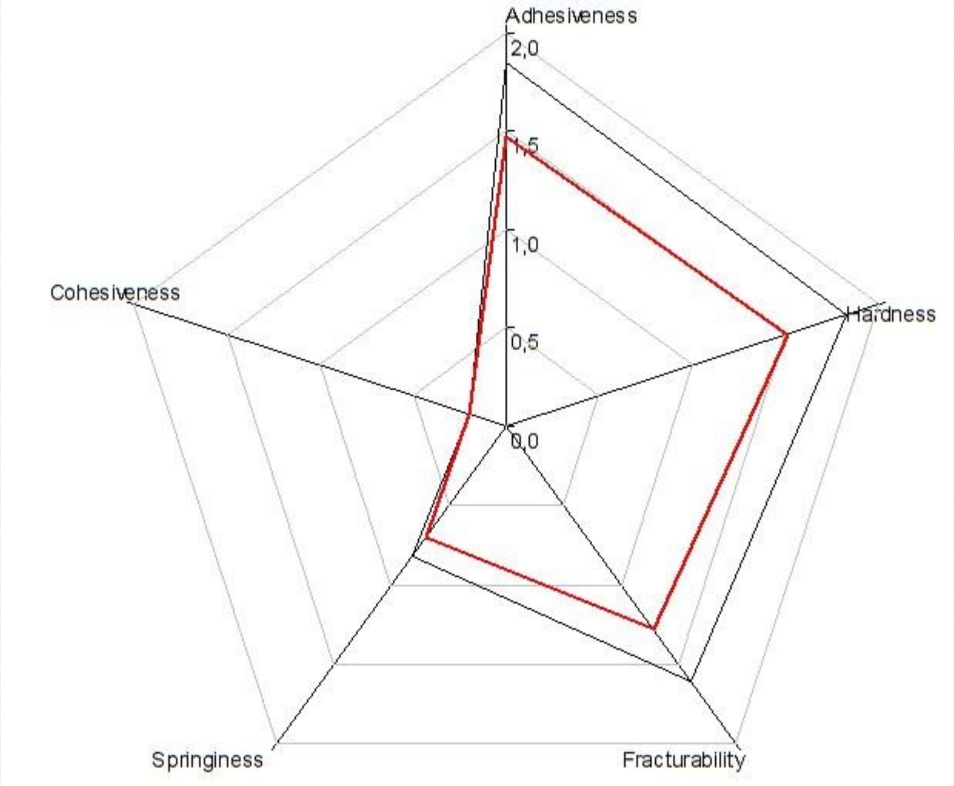


Fig 3. Texture profile analysis of the meat samples formulated with yeast beta-glucan. Average values are plotted with no significant differences for samples P4; P5; P6 (red profile) and no significant differences for samples M; P1; P2; P3 (black profile)***.***

3. Results s5

Yeast β-glucan assay from meat product

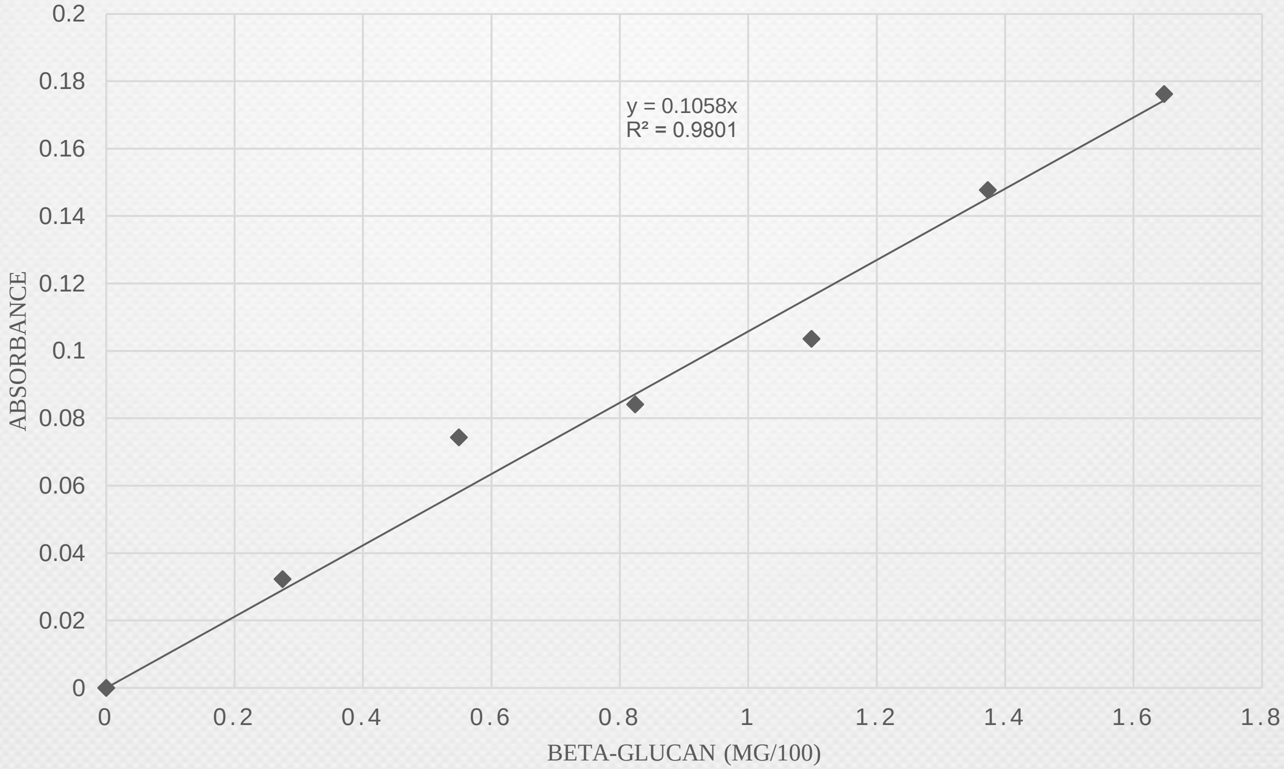


Fig 4. Linearity of yeast β-glucan from meat samples.

4. Conclusions s1

WHC ***– Yeast β-glucan concentrate had significantly ($p < 0.05$) better results – high fiber content.***

Emulsion capacity ***– Yeast extract had significantly ($p < 0.05$) better results – high protein content.***

Emulsion stability ***– 1.5 %YIA → under 15% TFR.***

– 1% YIB → above 15% TFR.

4. Conclusions s2

<u>TPA</u> – high concentrations of yeast derived ingredients do influence textural parameters.

~ 0.800 mg / 100 g yeast β-glucan.

Adding yeast β-glucan to meat batters help:

- ***Maintain the structural cohesiveness***
- ***Slightly decreasing hardness***

4. Conclusions s3

Yeast β-glucan assay from meat product

A satisfactory correlation factor of (R^2 = 0.9885) has been calculated when plotting total glucan absorbance values and measured beta-glucan concentrations from meat samples (Fig 4).

The methodology applied has demonstrated good linearity on the studied concentration interval.

Questions.

Thank you for your patience!