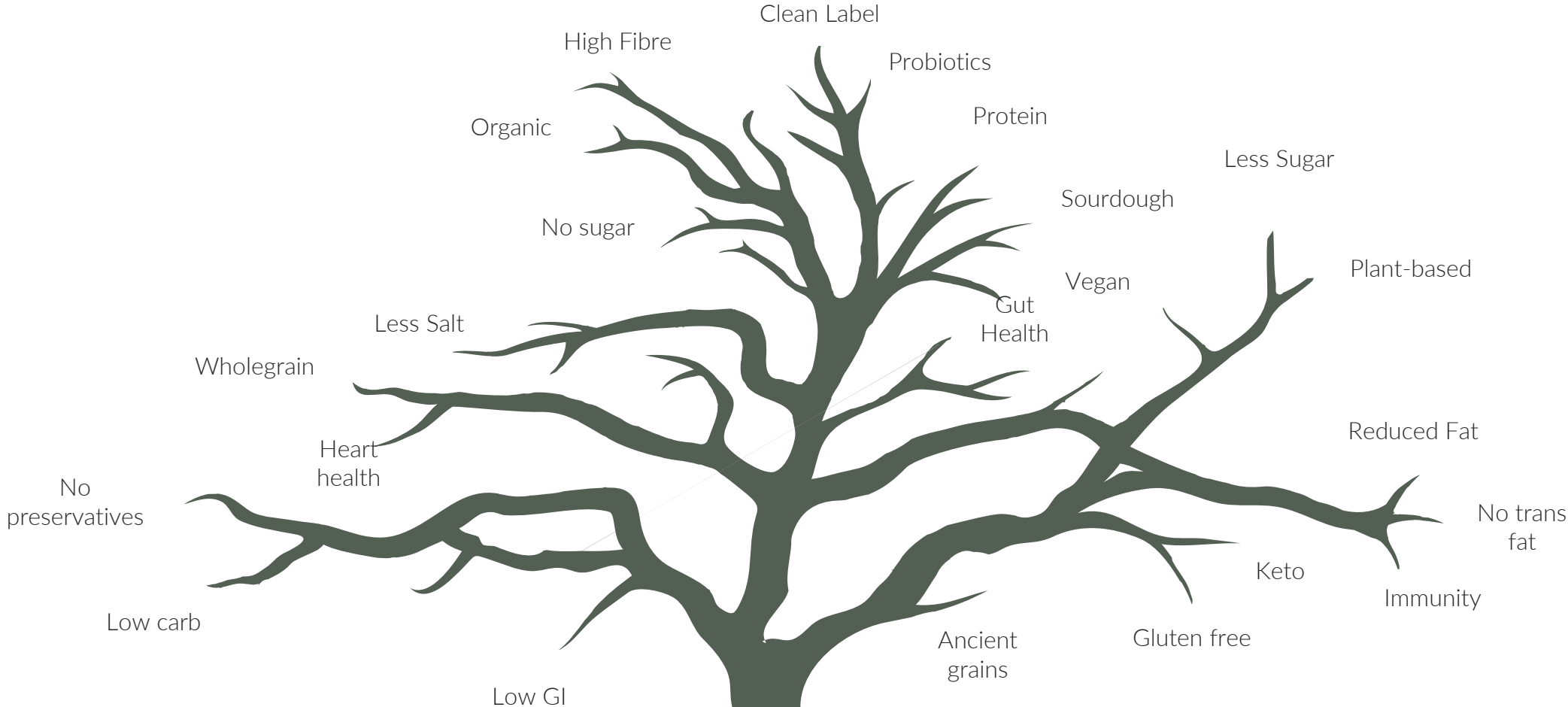




Designing healthier foods through enzymatic technology

AARD Meeting
Dr. dipl.-ing. Alina-Ioana GOSTIN
19/06/2022

Healthy baked goods are growing across a broad range of claim categories, indicating ample opportunities for innovation



Non-exhaustive

Enzymes are

- biological catalysts in the form of proteins
- found in nature in every living organism
- all enzymes are proteins, but not all proteins are enzymes
- fully biodegradable
- not living organisms



Benefits

Good for baking

- Produce more and better products
- Less impact on the environment
- Clean label declaration

Cleaner and greener

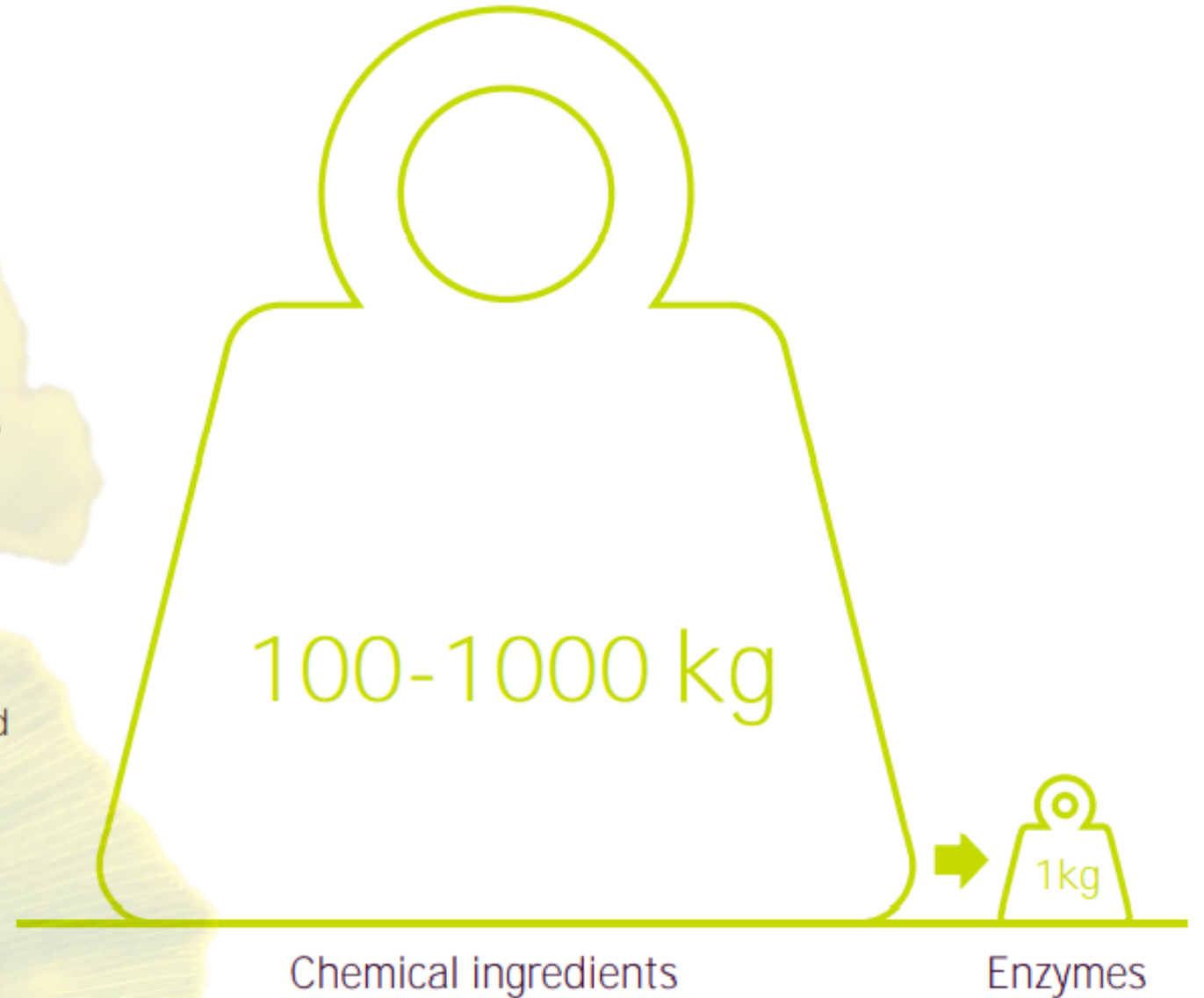
- Biodegradable; alternative to chemical agents
- Water and electricity savings in production
- Small carbon dioxide foot print
- Savings, too, in storage, transportation and handling costs

Easy to implement

- No need for specially designed equipment and control systems

Safer

- Less harsh and/or hazardous process conditions
- No unwanted by-products



A person wearing a white long-sleeved shirt is holding a woven basket filled with several loaves of golden-brown bread. The bread is resting on a white cloth. The background is dark. A semi-transparent white box with a yellow triangle on the left side is overlaid on the image, containing text.

VALENA[®] PULSE G

Baking healthier and more sustainable bread with enzymes

Novozymes

Healthy Baking Innovation Team
AR Baking department

IMAGINE IF

WE CAN HELP YOU BAKE A BREAD THAT IS...

Healthier, clean-label, delicious, sustainable

1 HEALTHY



Claims for **high protein** and **source of fiber**

2 SUSTAINABLE



Regional ingredients

3 NATURAL



Clean-label

4 DELICIOUS



Great **texture and appearance**

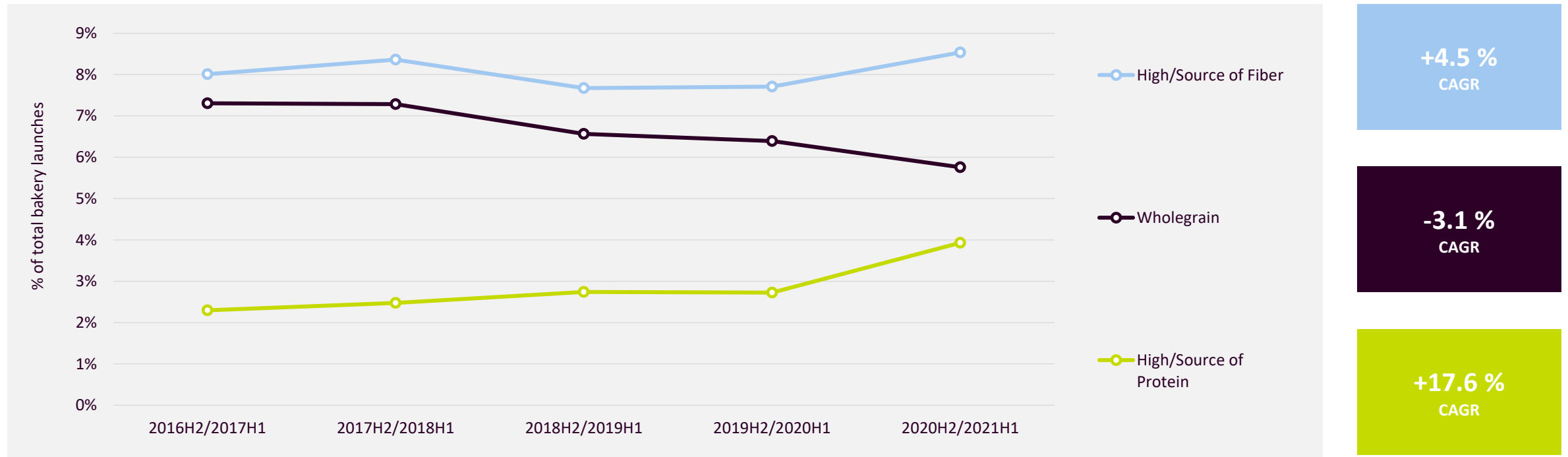


... BETTER FOR YOU

Protein claims show double digit growth in global bakery launches, and fiber claims also demonstrating solid growth

Figure

% Share of total bakery launches carrying high/source of fiber vs high/source of protein vs wholegrain claims (Global, CAGR 2016H2/2017H1 vs 2020H2/2021H1)



Notes: Innova Market Insights, Healthy Baking study for Novozymes 2021.

Pulses present a great opportunity to create healthier and sustainable bread

PULSES

- High in protein and dietary fibers
- Ideal amino acids to complement gluten
- Regionally and sustainably sourced



BREAD

- Staple food product across cultures
- Major component of a healthy and balanced diet
- Delivers nutrients like fiber, vitamins and minerals

...but manufacturers are currently challenged to meet consumer demands

Key Challenges Of Pulse Fortification



Impaired dough parameters



Reduced volume

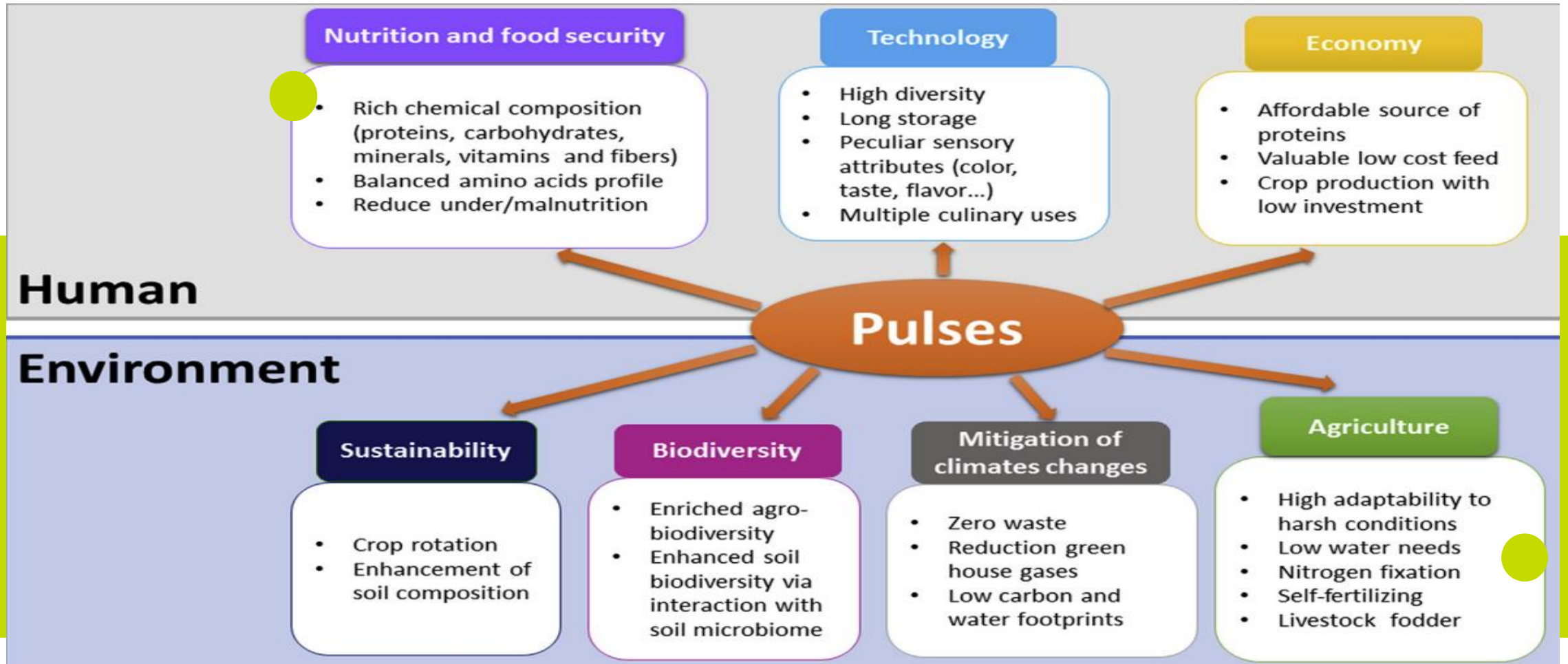


Fast staling



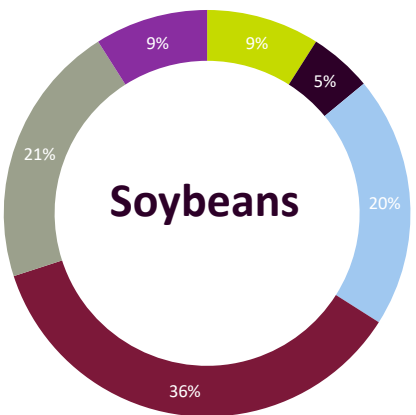
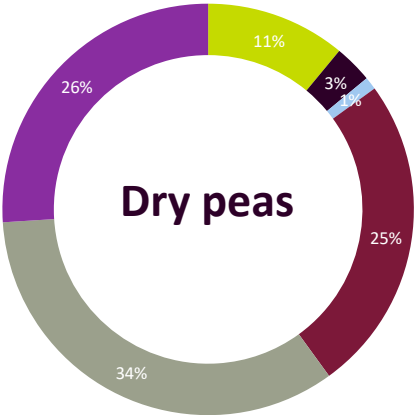
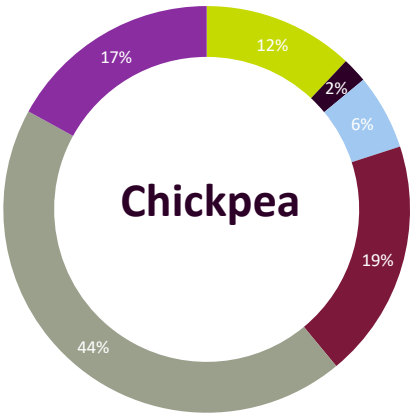
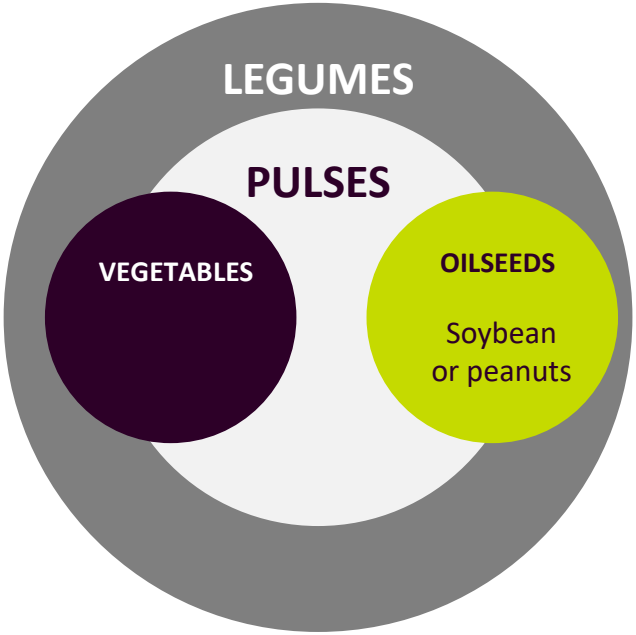
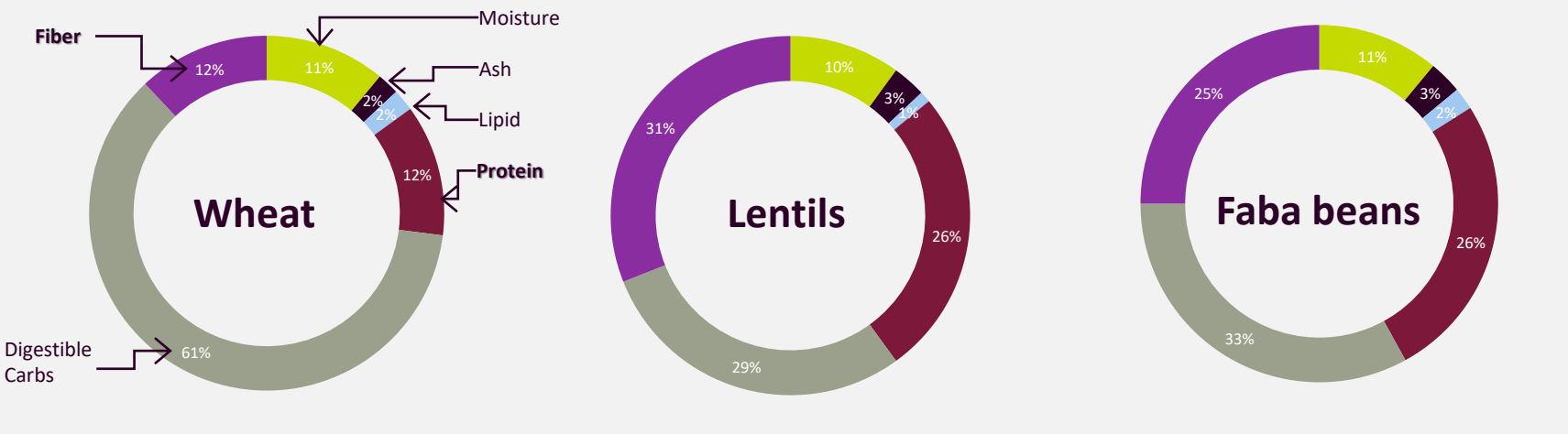
Off-flavours

Pulses contribute to a balanced and sustainable Humans-Environment relation



Source: Boukid et al., Trends in Food Science & Technology, 2019

Pulses display nutritional benefits and are recommended in sustainable diets



Cereal grains are low in total protein compared to legumes and oilseeds.

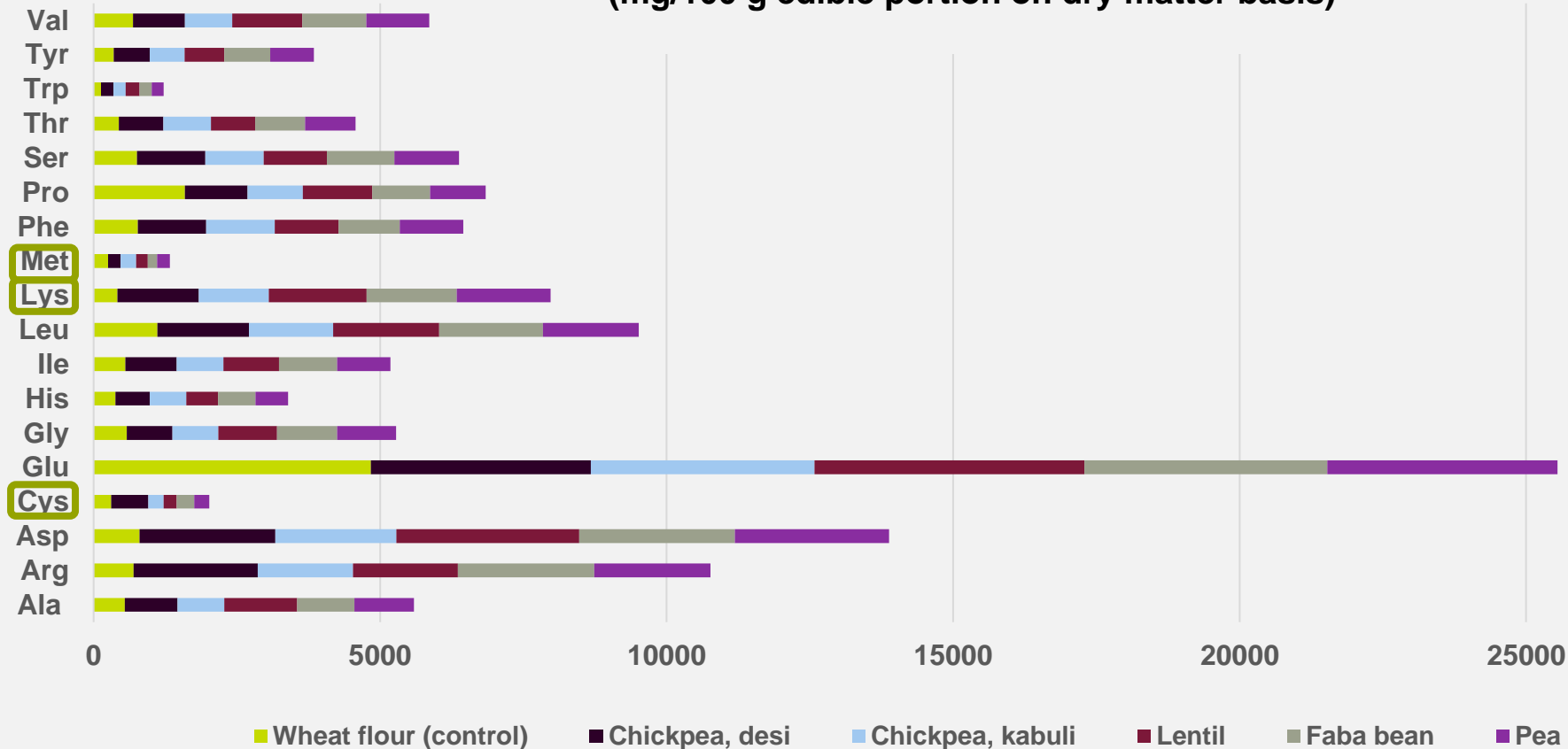
- Moisture
- Protein
- Ash
- Dietary Fiber
- Lipid
- Digestible Carbs

Source: Nutrient data retrieved from the National Nutrient Database for Standard Reference (USDA, 2019). All data are for mature raw seeds.



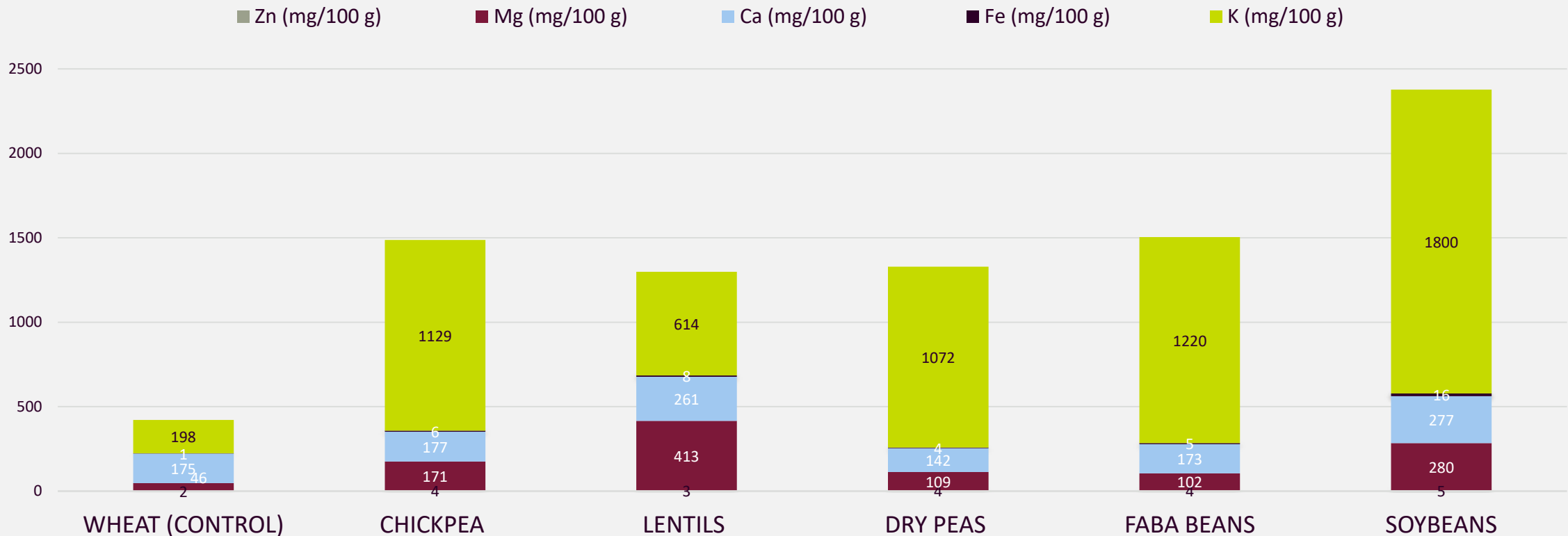
Pulses are an ideal protein to combine with cereal grain for creating a more balanced protein

Amino acid profile of some pulses
(mg/100 g edible portion on dry matter basis)






- Cereal grains are low in Lysine.
- Pulses are rich in Lysine, but low in Methionine and Cysteine.

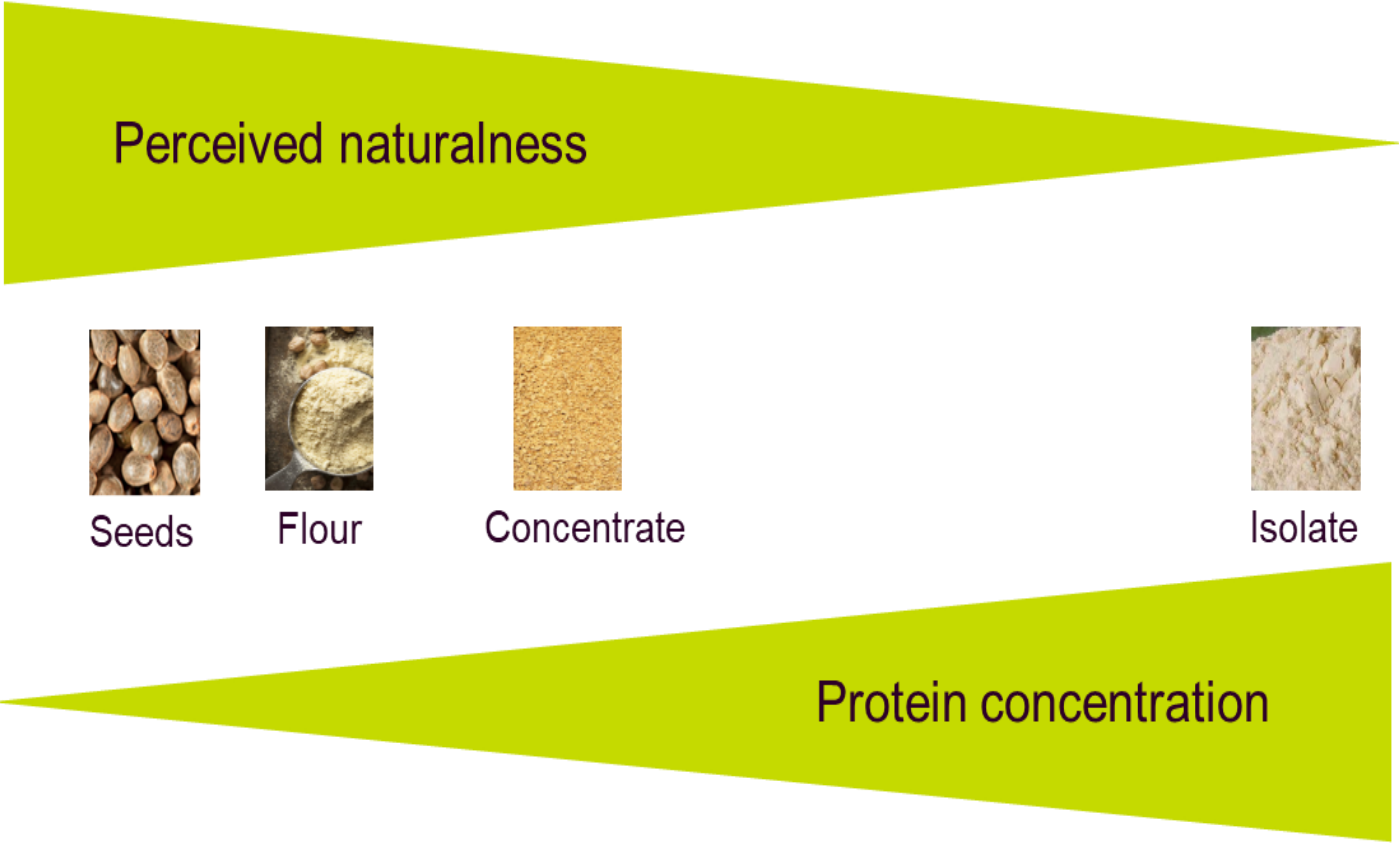
Pulses have higher mineral content, especially of Zn, Mg, Fe and K compared to wheat



Sources: Hall et al, 2017; Millar et al., 2019; FoodData Central (usda.gov).

Pulses: flour, concentrate and isolate

	Flour	<ul style="list-style-type: none">• 15-20% protein• 6% fiber• 45-60% starch
	Concentrate	<ul style="list-style-type: none">• 50-60% protein• 15-20% fiber• 1-2% starch
	Isolate	<ul style="list-style-type: none">• 80-90% protein• 1% fiber• 1% starch

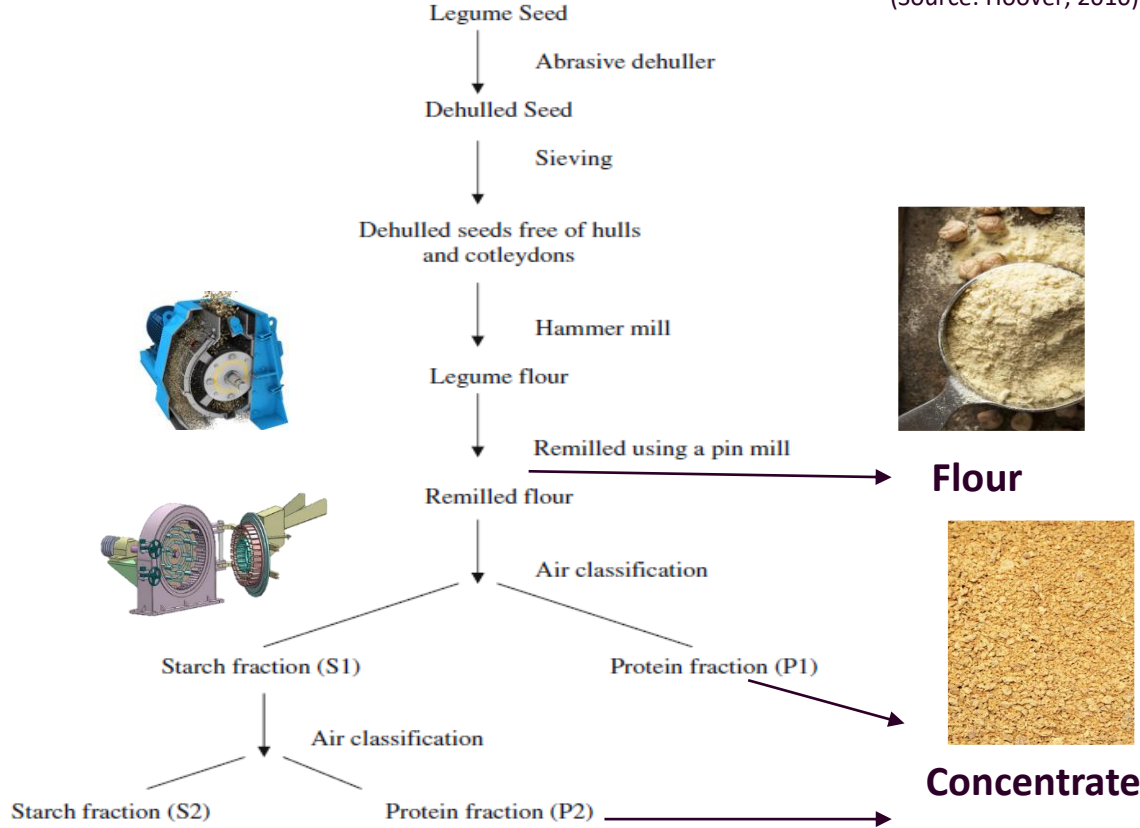


Pulses are dry harvested legumes like pea, chickpea, lentils and faba beans.

Dry or wet processing: processing is different for pulse **protein flours, concentrates and isolates**

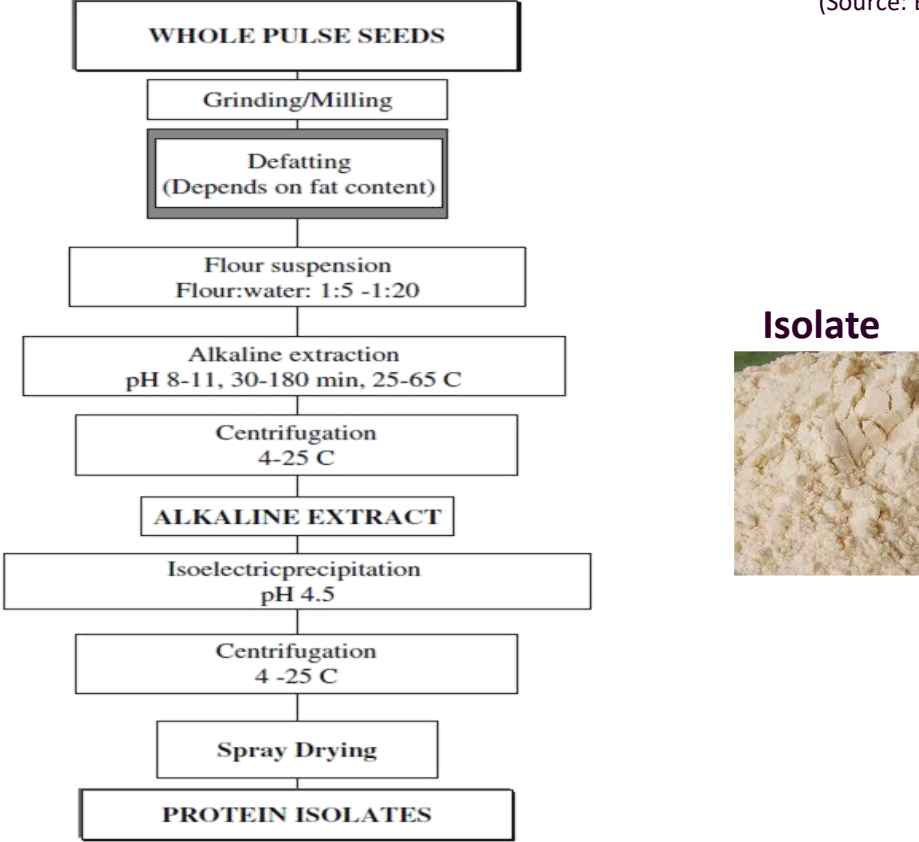
DRY Process

(Source: Hoover, 2010)



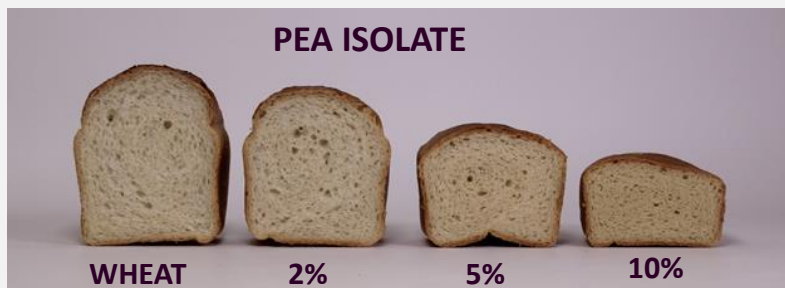
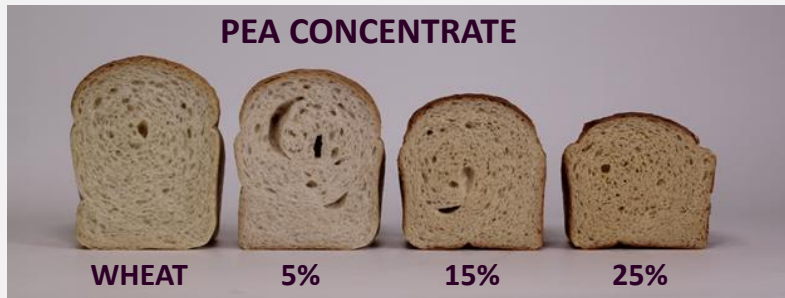
WET Process

(Source: Boye, 2010)



Three challenges using pulses in baking

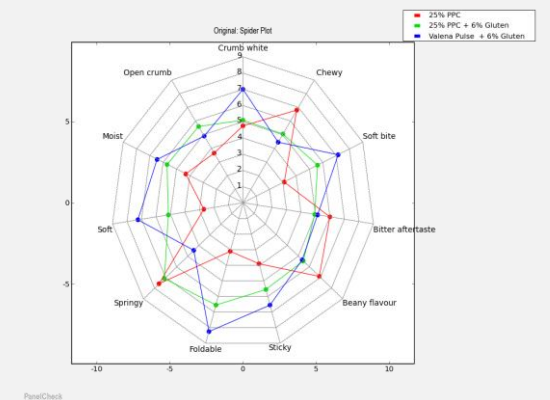
VOLUME



DOUGH RHEOLOGY



SENSORY



Consumer communication and front-of-label statements

EU legislation



Protein Claim

Source of protein: $\geq 12\%$ of energy/serving

High source of protein: $\geq 20\%$ of energy/serving



Fiber Claim

Source of fiber: ≥ 3 g/ 100 g

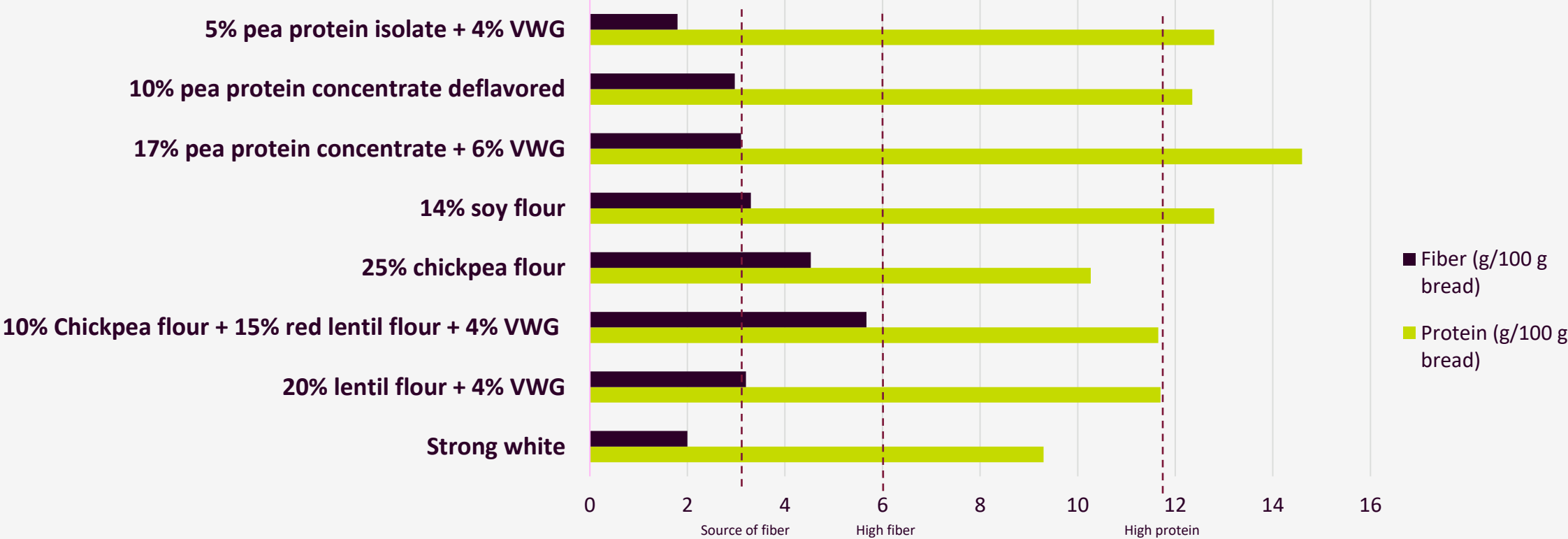
High in fiber: ≥ 6 g/100 g



Enabling nutritional claims with Pulses

Flour, concentrate and isolate

Calculated content of protein and fiber pulse bread based on strong white flour



Introducing...

VALENA PULSE G

a novel solution to unlock the value of healthier ingredients and provide healthier, high quality bread



Increased nutrition through high protein content and a source of fiber



More sustainable solution compared to standard bread



Cleaner label compared to use of emulsifiers and stabilizers



Meet consumer expectations for **appeal and eating experience**

CASE STORY 1 :
THE CHICKPEA FLOUR

CASE STORY 2 :
THE SOYBEAN FLOUR

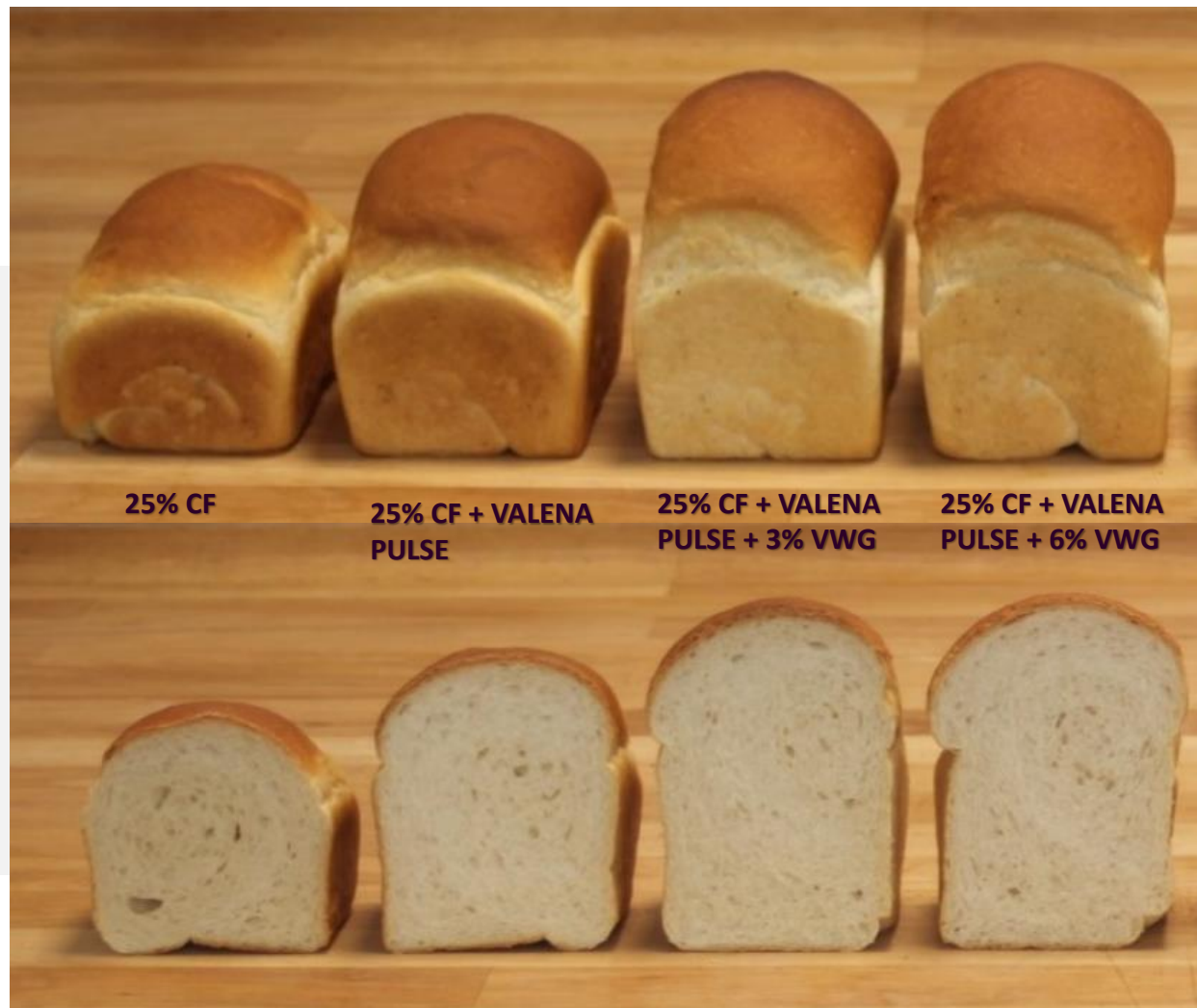
CASE STORY 3:
THE FABA BEAN CONCENTRATE

CASE STORY 4:
THE LENTIL FLOUR

CASE STORY 5:
MIXED PULSE FLOURS

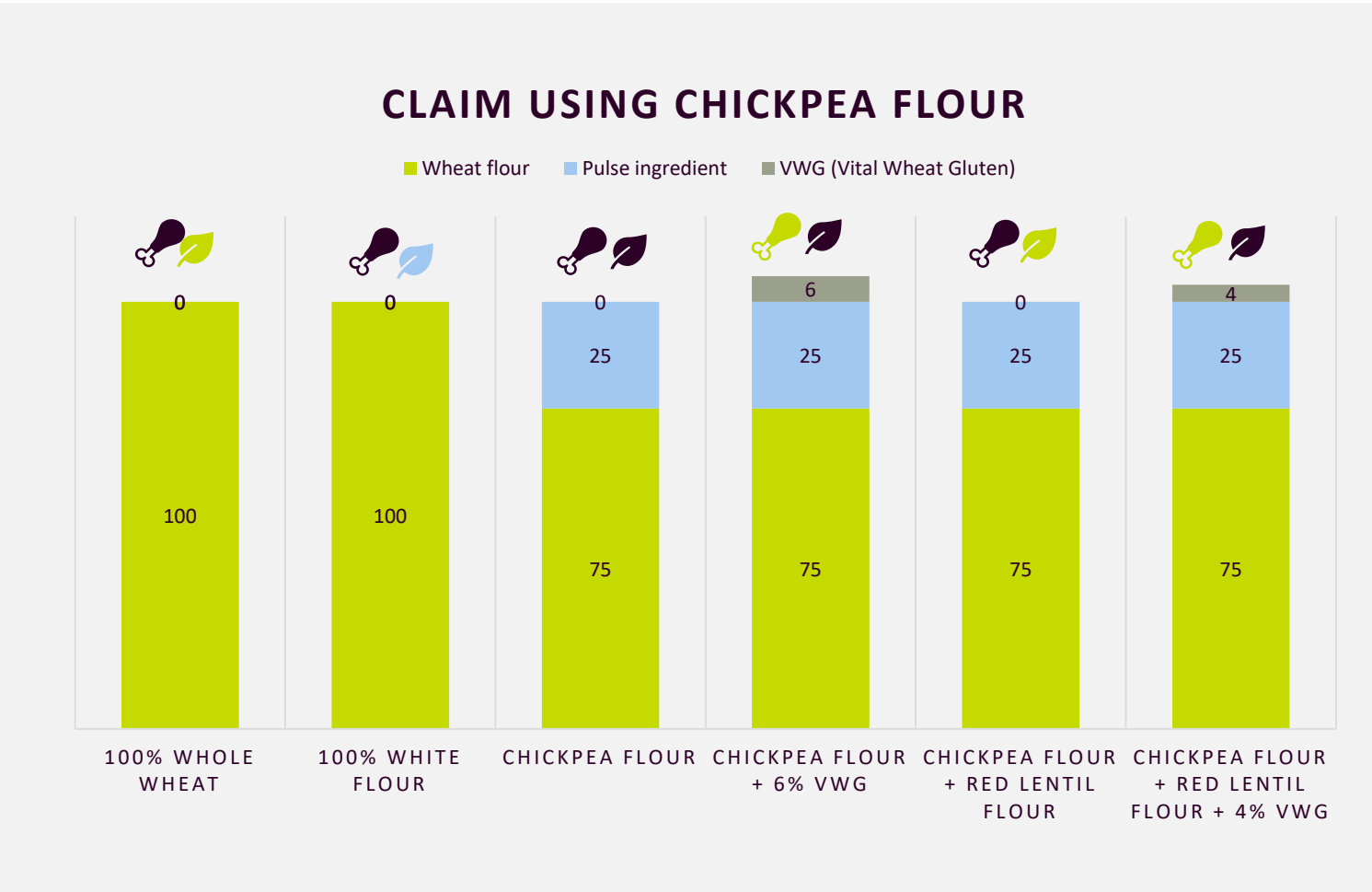
CASE STORY 6:
THE PEA

Case story:
*25% Chickpea flour
in all breads*



CASE STORY: THE CHICKPEA FLOUR

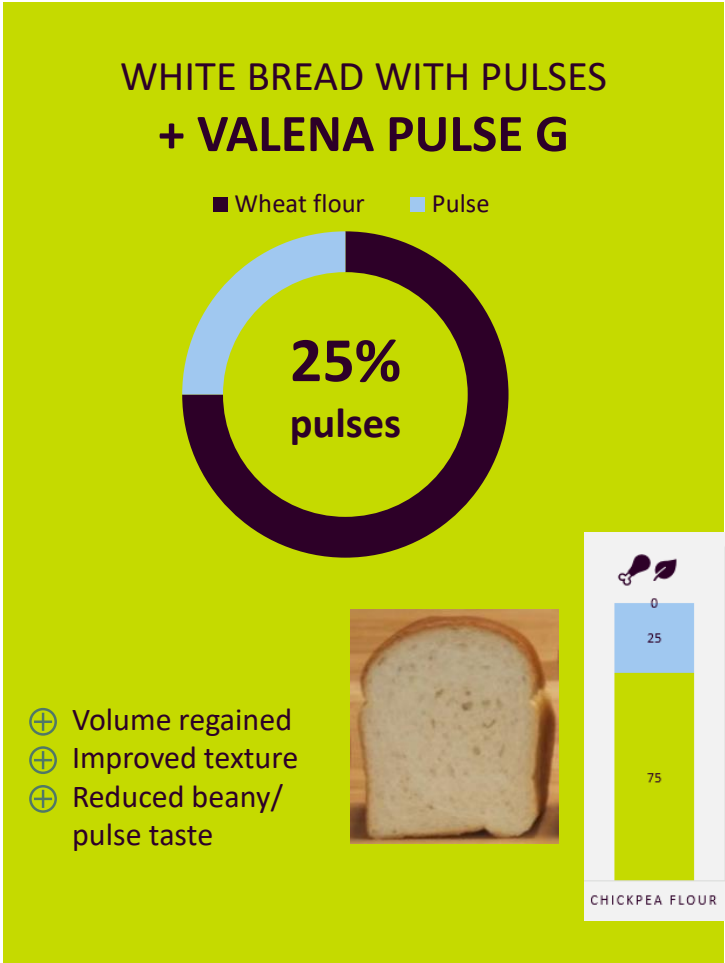
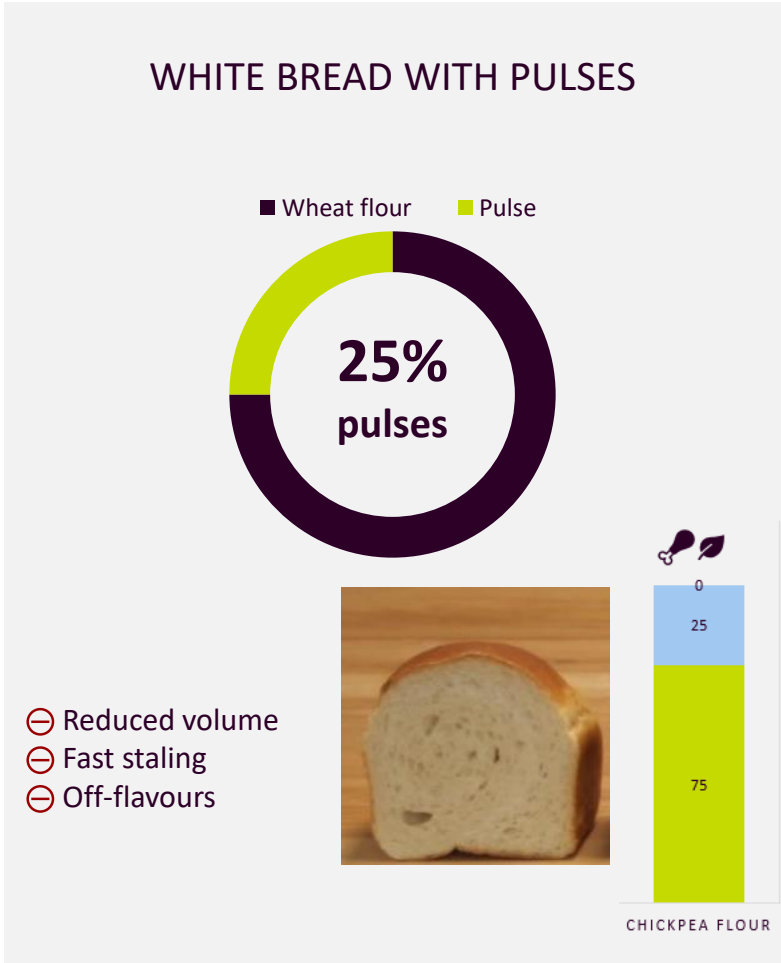
Pulses can help delivering healthier breads and enabling protein and fiber claims



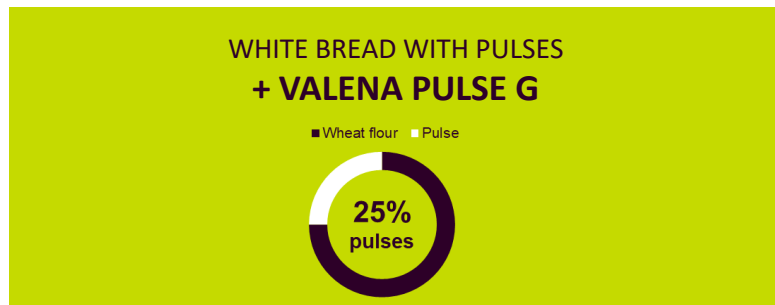
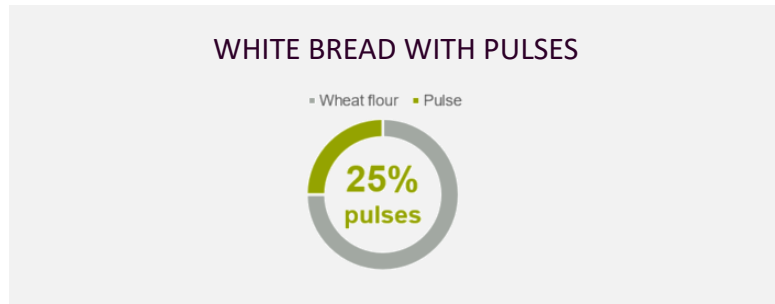
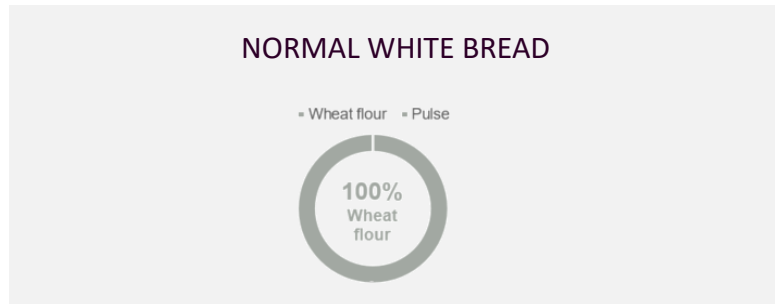
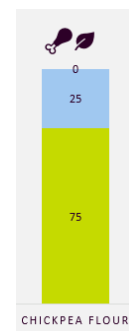
High protein	
Source of protein	
No protein claim	
High fiber	
Source of fiber	
No fiber claim	

EU definition of protein and fiber claim used

Our enzyme technology can help you overcome challenges with appearance, texture and taste caused by protein pulses

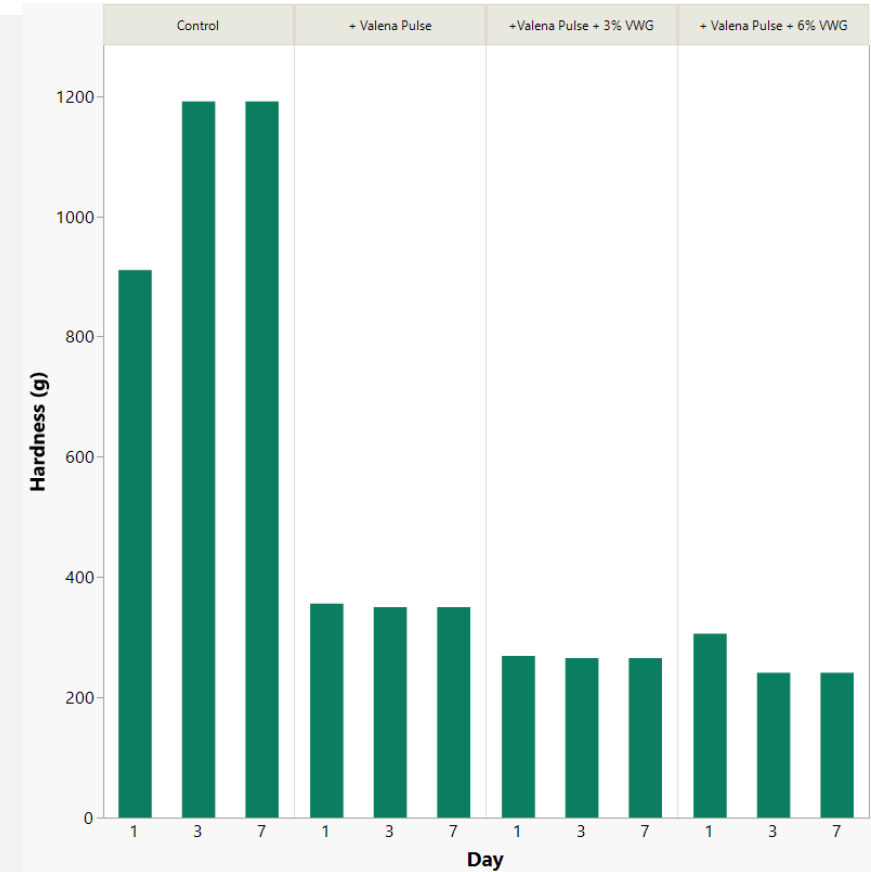


Our enzyme technology can significantly reduce staling of protein bread already from day 1 of your bread production

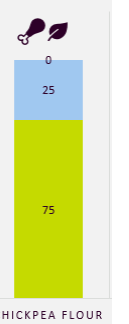


EXAMPLE

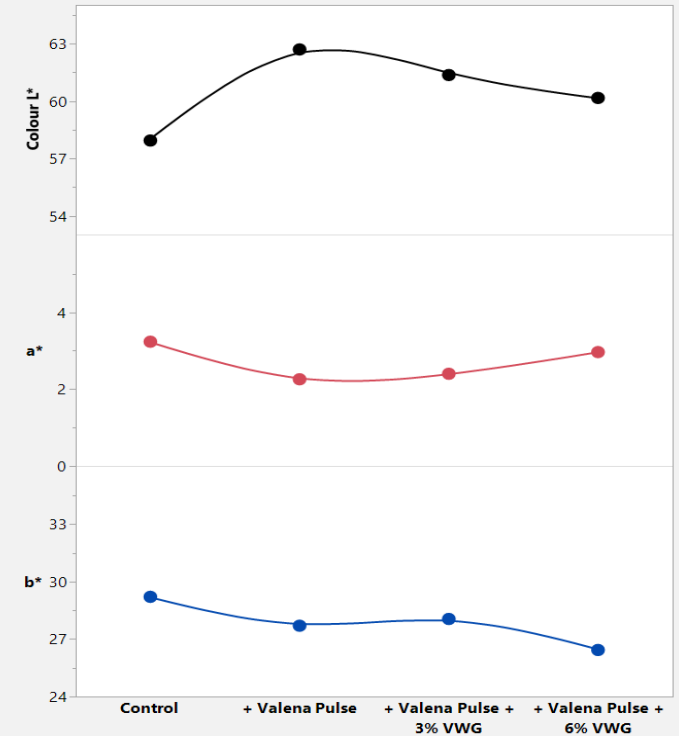
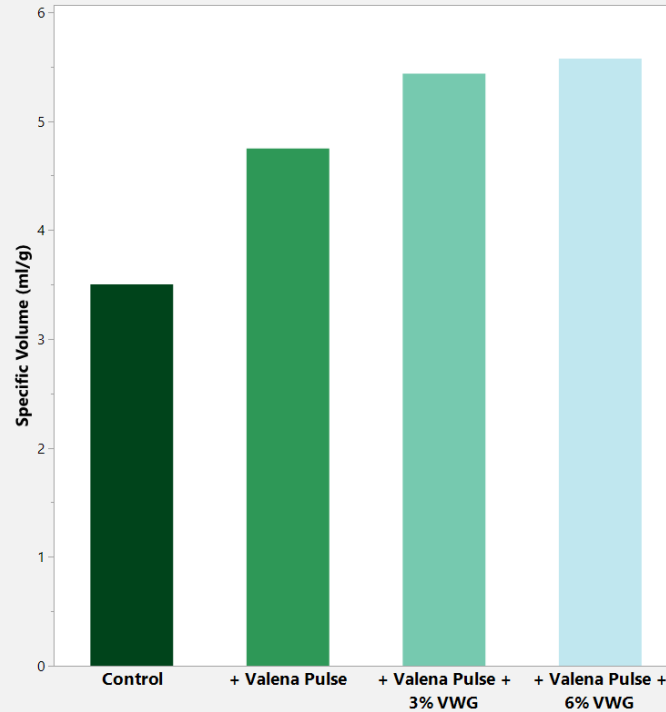
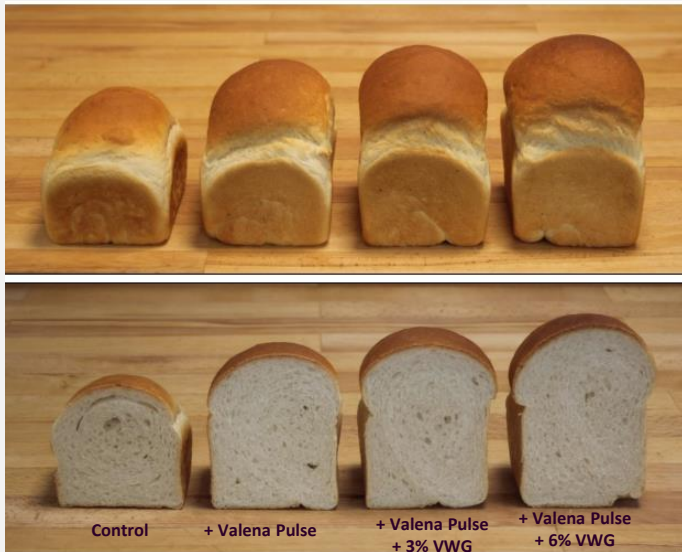
VALENA PULSE G reduces staling of protein bread already from day 1 of your bread production



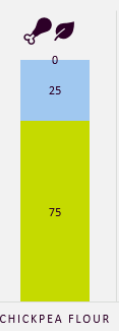
VALENA PULSE G increases bread volume and crumb whiteness



25% chickpea flour in all breads

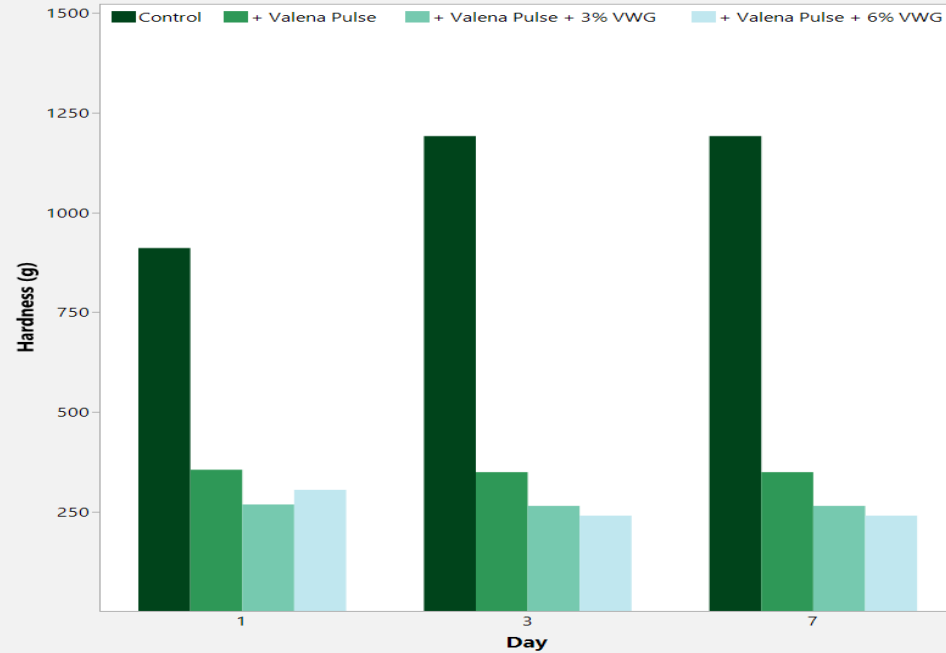


VALENA PULSE G secures crumb softness and reduces staling

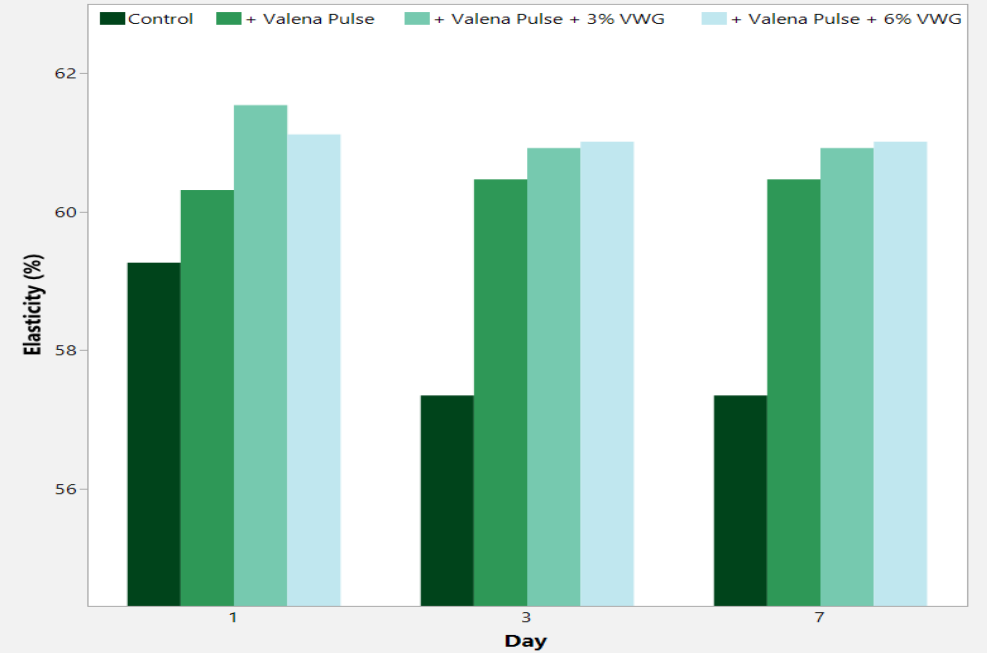


25% chickpea flour in all breads

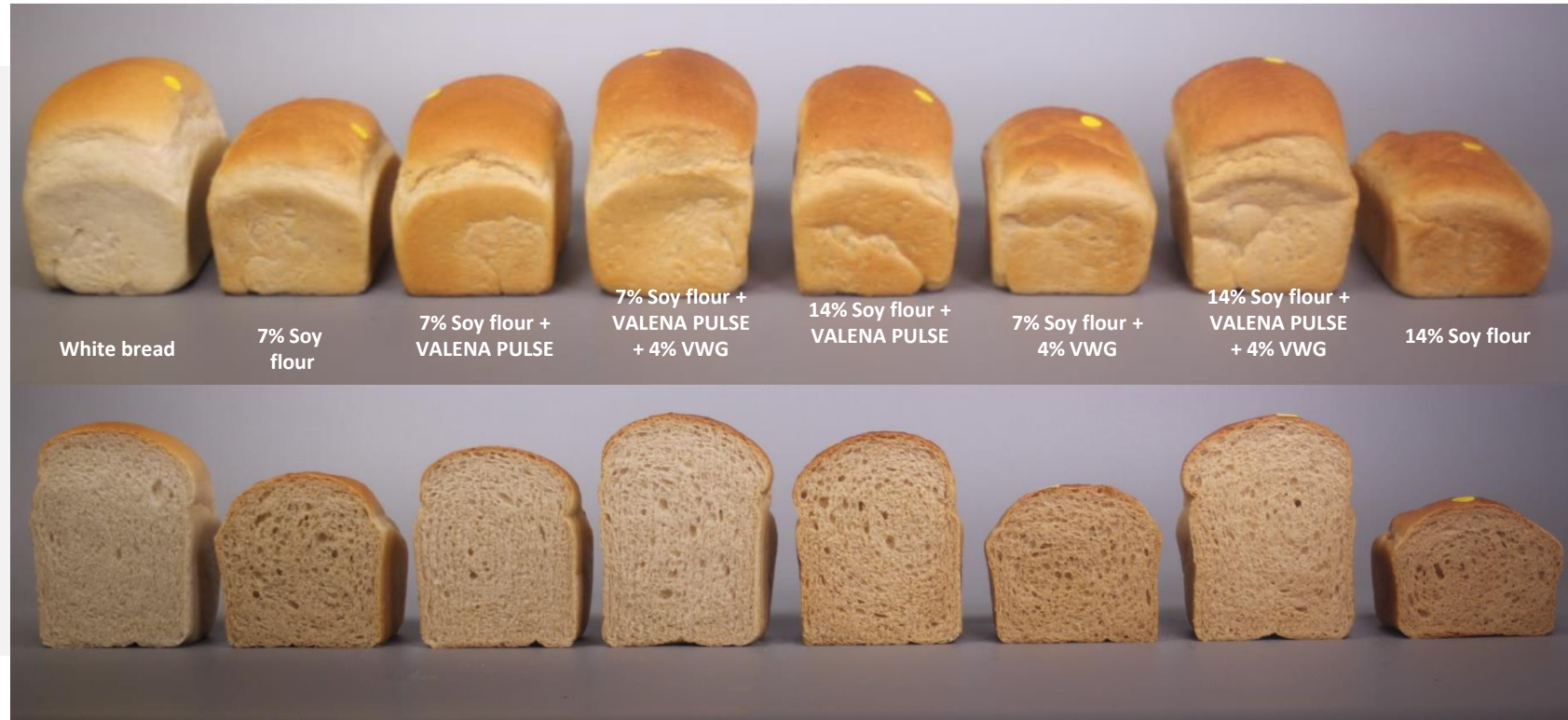
Hardness



Elasticity



Case story:
*7 and 14% soybean
meal flour + white
flour*

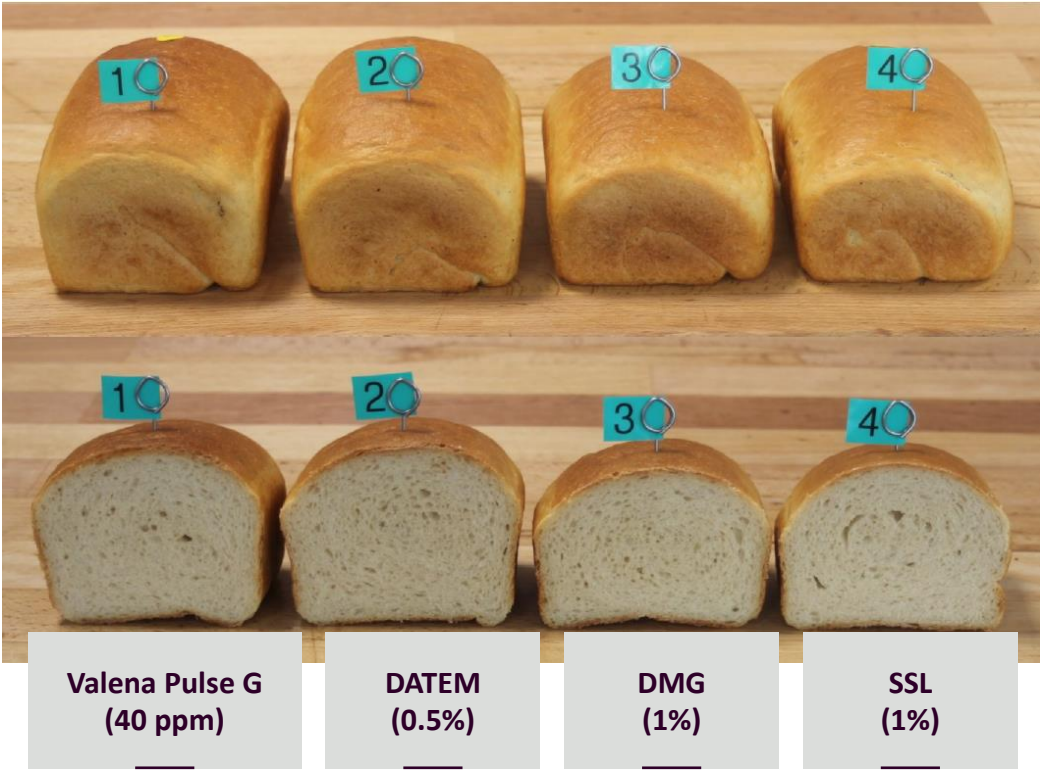


Case story:
*25% pea protein
concentrate*



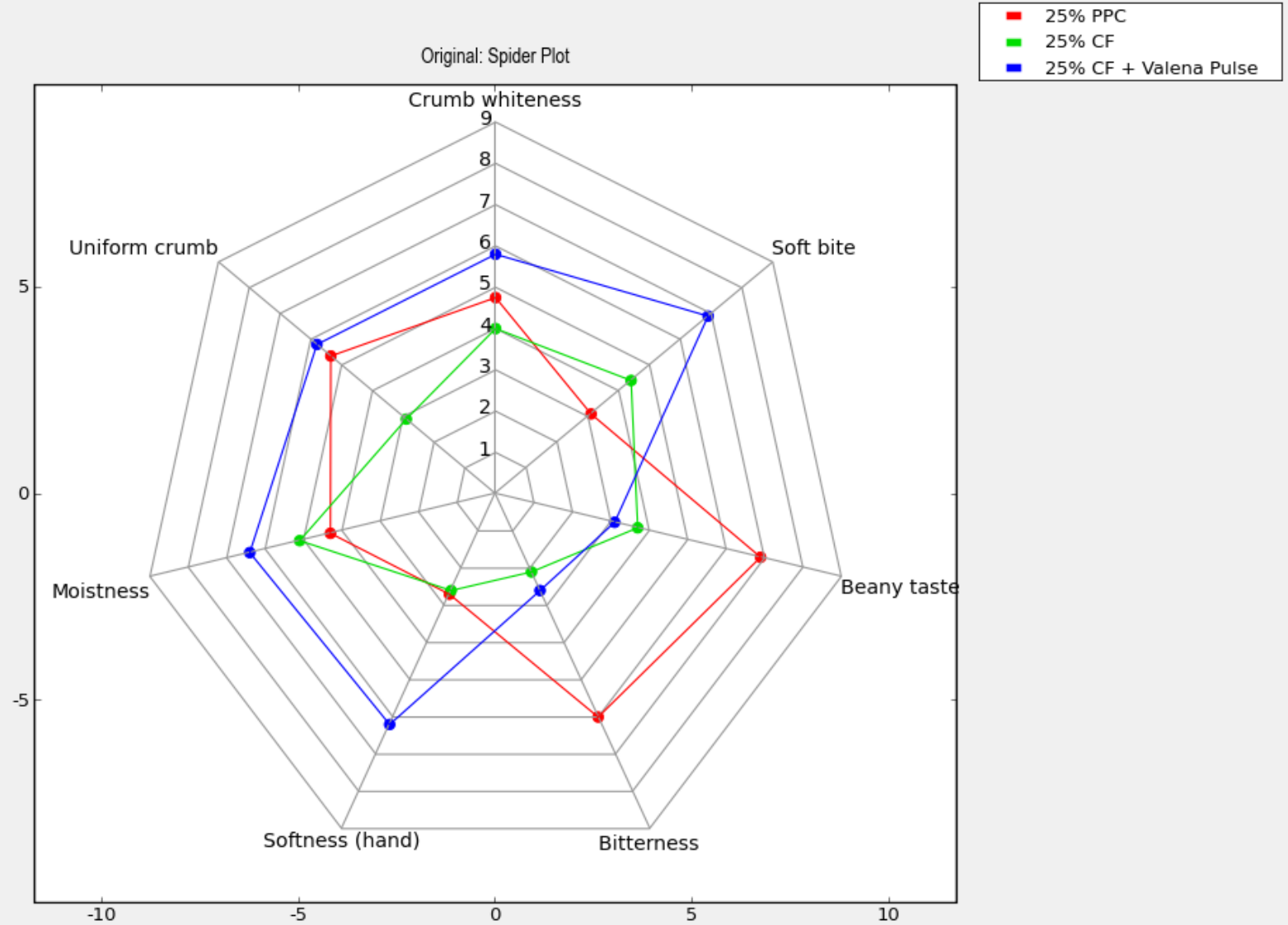
Chemical emulsifiers do not improve volume beyond that attainable with Valena Pulse G

Full scale baking with 10% pea protein isolate (PI)



SENSORY DATA

Formulating for taste



Pulses improve Nutri-score of white breads

White Pan Bread	
	gram
Wheat flour	2000.000
Water	1040.000
Wheat gluten	60.000
Fresh yeast	80.000
Sugar	30.000
Salt	30.000
Ascorbic acid	0.200
Pentopan® Mono	0.060
Fungamyl®G	0.032
TOTAL	3240.292



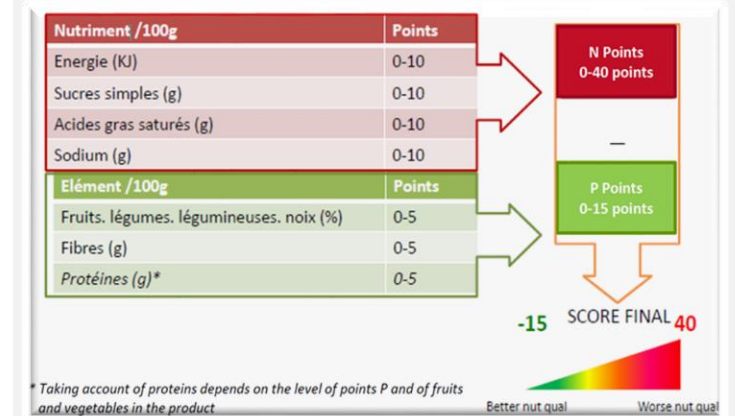
25% chickpea flour + Valena Pulse®G	
	gram
Wheat flour	1500.000
Water	1140.000
Chickpea Flour	500.000
Wheat gluten	60.000
Fresh yeast	80.000
Sugar	30.000
Salt	30.000
Ascorbic acid	0.200
Valena Pulse®G	0.080
Fungamyl®G	0.032
TOTAL	3340.312



5% pea concentrate + Valena Pulse®G	
	gram
Wheat flour	1900.000
Water	1400.000
Pea concentrate	100.000
Wheat gluten	60.000
Fresh yeast	80.000
Sugar	30.000
Salt	30.000
Ascorbic acid	0.200
Valena Pulse®G	0.080
Fungamyl®G	0.032
TOTAL	3600.312



2,5% pea isolate + Valena Pulse®G	
	gram
Wheat flour	1950.000
Water	1400.000
Wheat gluten	60.000
Pea isolate	50.000
Fresh yeast	80.000
Sugar	30.000
Salt	30.000
Ascorbic acid	0.200
Valena Pulse®G	0.080
Fungamyl®G	0.032
TOTAL	3600.312



So what does it take to win and make this an attractive segment to consumers looking for healthier breads?

Our answer is...

Valena® Pulse G



The right type of pulse



In the right format

A versatile solution to ensure an appealing bread for consumers

Optimized for taste, claims, price, sustainability or consumer acceptance

Enabling the right claims and dough handling

Thank you