SMP:LINEAR

Identifying the spoilage biome of plant-based meat alternatives

11-12-2024, Rick de Jongh (WFBR), Robert koel (Zwanenberg Food Group)

Setup SMP LINEAR project

- Aim: Measure levels, identify and isolate the spoilage (bacterial and fungal) organisms that typically limit shelf life of plant-based meat alternatives ("spoilage biome")

- Consortium of four food producers and one ingredient supplier

| Test	Timepoints for static temperature regime [days]***					Timepoints for dynamic temperature regime [days]****				
	T0	T1	T2	T3	T4	T0	T1	T2	T3	T4
Most Probable Number (MPN)*	x	x	x	x	x		x	x	x	x
Plate counts*			x		x	x		x		x
pH	x	x	x	x	x	x	x	x	x	x
O2/CO2 measurement**	x	x	x	x	x	x	x	x	x	x
Bacterial microbiome (16S seq.)	x	x	x	x	x	x	x	x	x	x
Fungal microbiome (ITS seq.)	x	x	x	x	x	x	x	x	x	x
Cryovial with glycerol in -80°C freezer	x	x	x	x	x	x	x	x	x	x
Visual inspection	x	x	x	x	x	x	x	x	x	x

*Measured organisms are lactic acid bacteria, total viable counts, yeasts and mesophilic spore formers
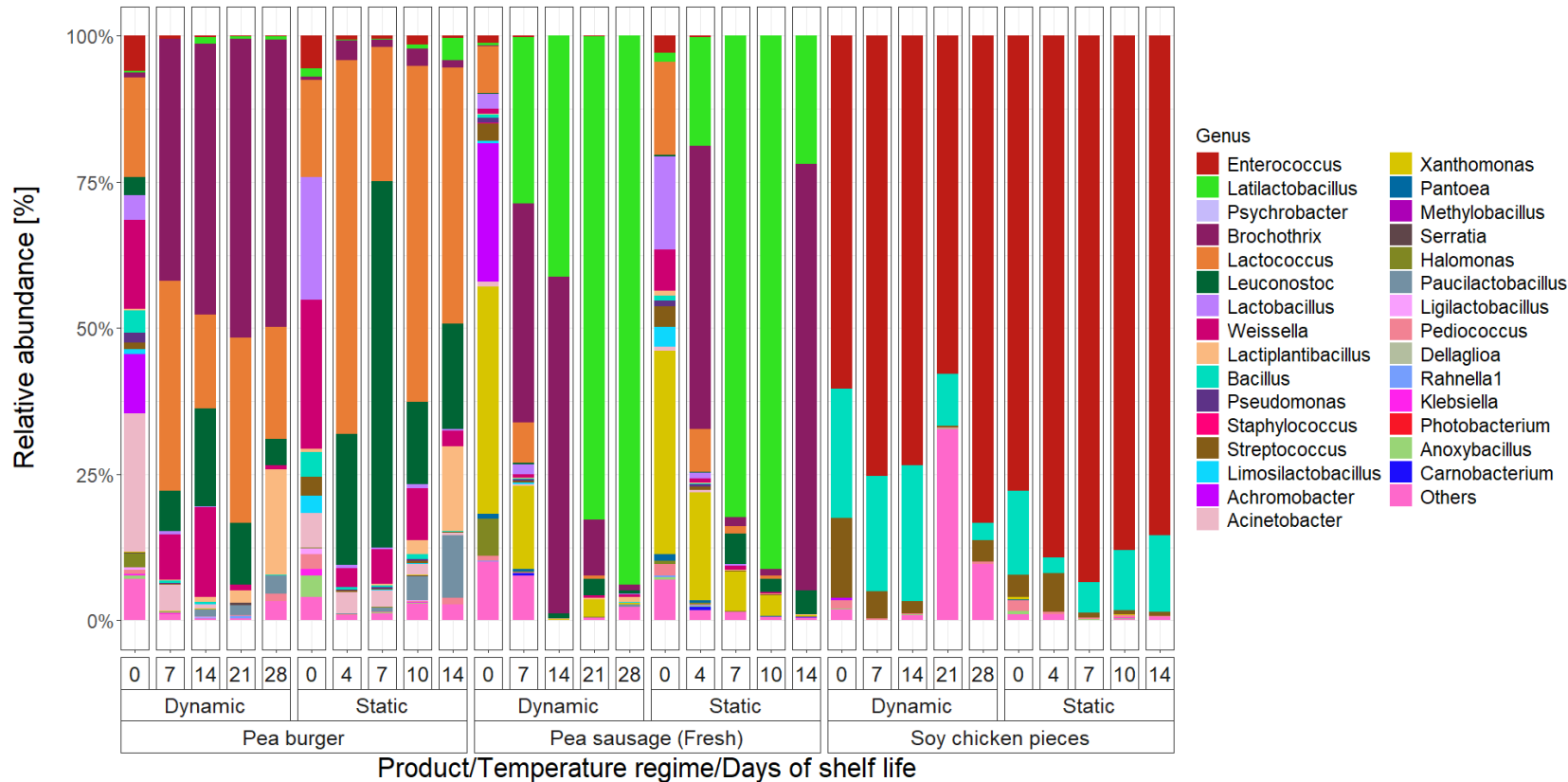**Applicable to products with a measurable gas atmosphere
*** static temperature regime 7°C till end of standard shelf life of the product
**** Dynamic temperature regime 4°C, 7°C, 9°C and 9°C during 4 weeks of experiments
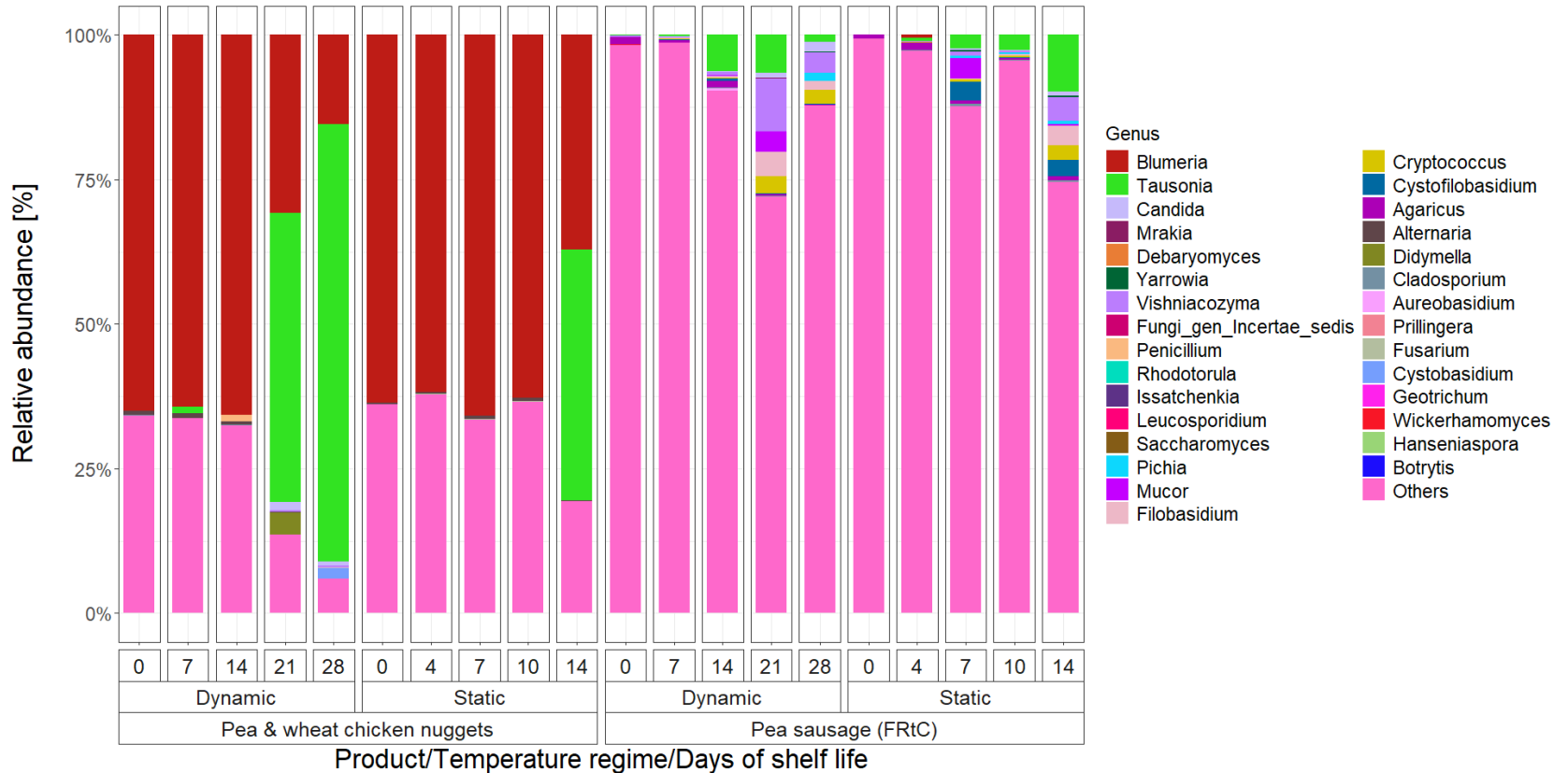
WAGENINGEN
UNIVERSITY & RESEARCH

Spoilage bacteria at the end of standard shelf life at 7°C
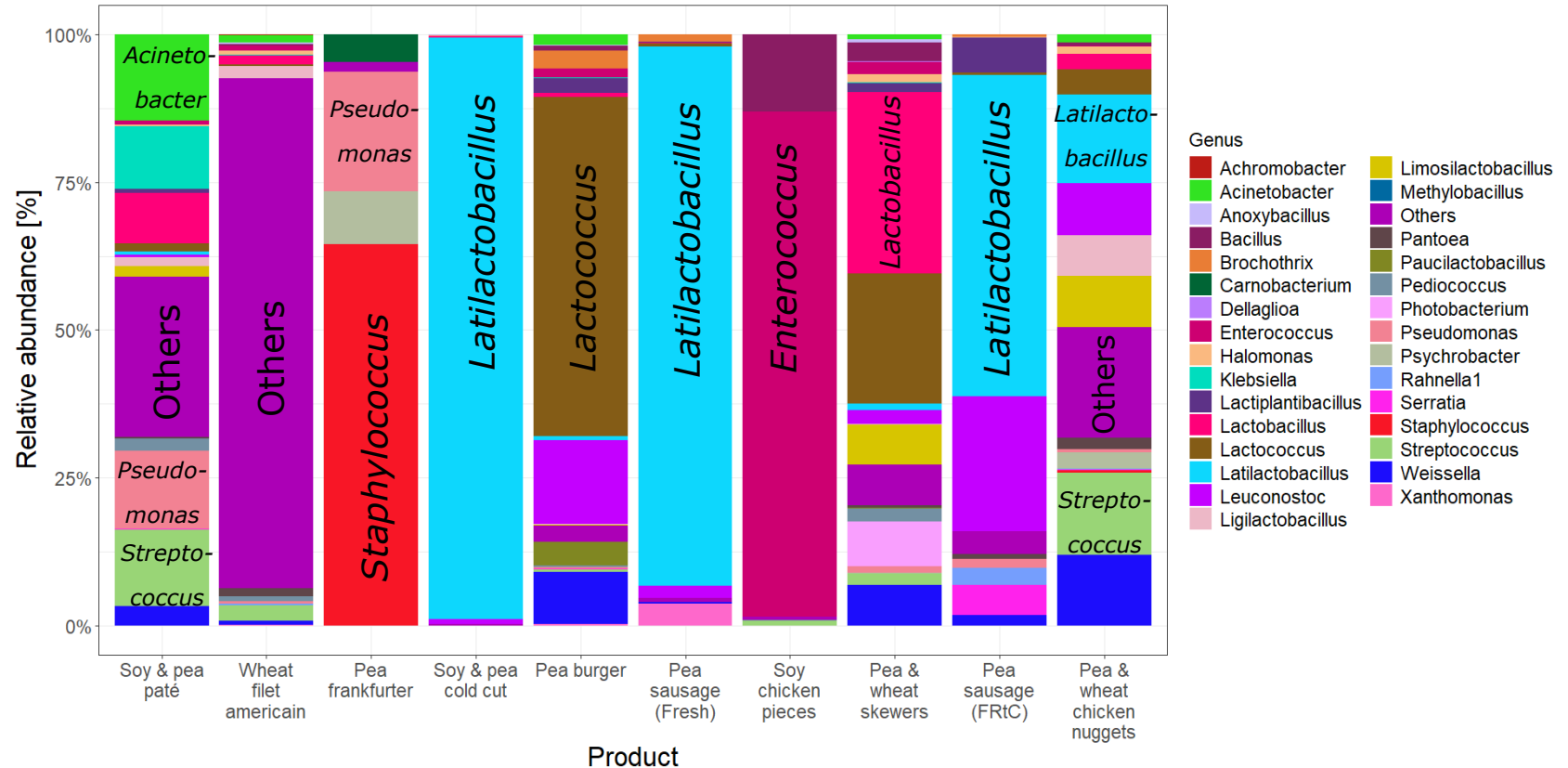
Spoilage bacteria during shelf life (static 7°C vs dynamic 4°C-9°C)

Spoilage fungi during shelf life (static 7°C vs dynamic 4°C-9°C)

Conclusions

- High diversity in microbial spoilage organisms

- Dominating spoilage microbes vary with storage temperature, time and type of protein

- *Latilactobacillus* associated with pea protein and rapeseed oil

- pH drop observed and CO_2 production for products with *Latilactobacillus* as dominating spoilage bacteria

- Temperature-specific spoilage: e.g. *Tausonia* in the pea burger and pea & wheat chicken nuggets when 7°C->9°C

- Product-specific approaches needed to control spoilage taking into account the protein source

WAGENINGEN
UNIVERSITY & RESEARCH

Follow up

- The information from SMP LINEAR on dominant spoilage microorganisms and isolated strains will be used as a starting point for PPP SHIELT which has been granted. Next step is setting up the consortium agreement.

- Results of SMP LINEAR

  - Identification of the spoilage biome from 10 plant-based meat alternative products

  - Relevant strains will be isolated in PPP SHIELT

  - Data will be used in anonymized form in PPP SHIELT

WAGENINGEN
UNIVERSITY & RESEARCH

How has the SMP supported the applicant?

- Looking at different microorganisms then the usual suspects

- Currently using same hurdles and processes for different vegan applications. SMP Linear makes clear that a more specific approach for different applications and ingredients gives safer products.

- Working together with different partners gives insight in their struggles and helps with determining the best approach for safer products

- The SMP Linear approach makes clearly visible that there is a lot more to know about spoilage bacteria then we currently know.

- Looking forward to the project and the outcomes in terms of hurdles and processes for bringing safer products to the market.

WAGENINGEN
UNIVERSITY & RESEARCH

Any questions?

Rick de Jongh

E: rick.dejongh@wur.nl

T: +31 (0) 317 48 01 72