

Assessing the physicochemical and microbiological properties of Bakery Meal used as feed ingredient in pig production

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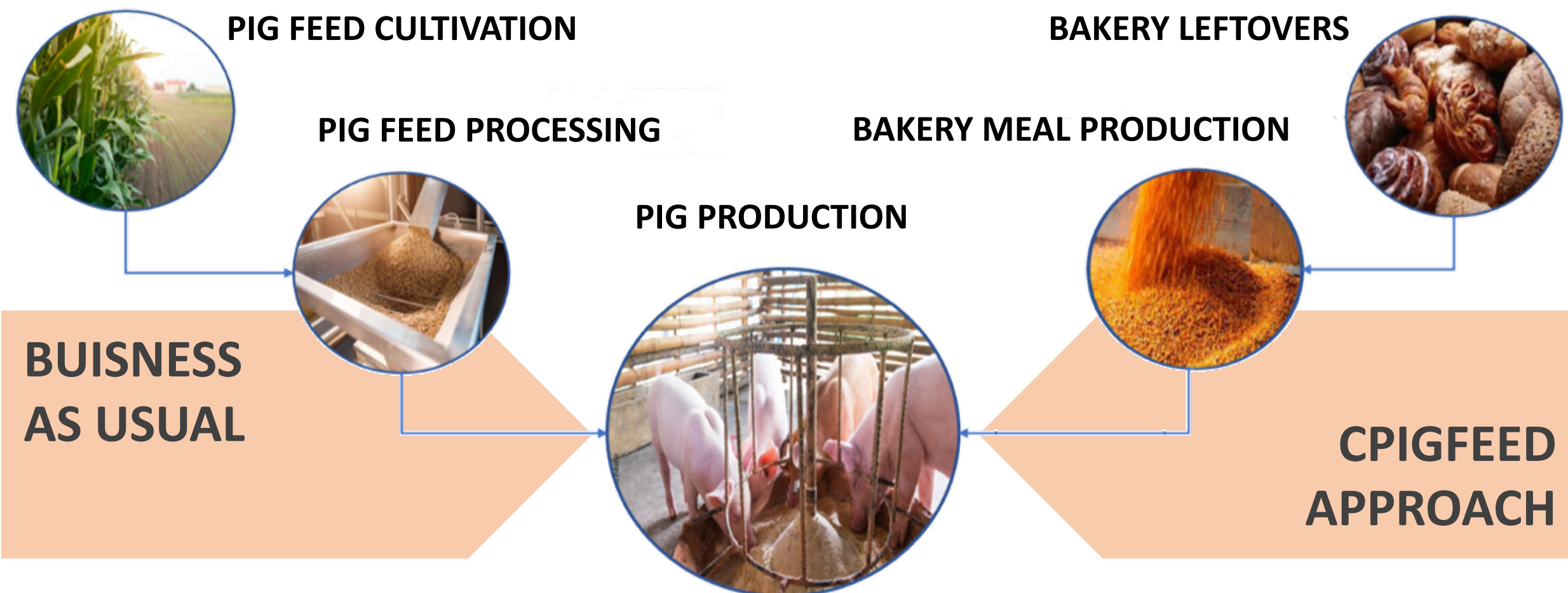


INTRODUCTION



- ❖ According to the United Nations Food and Agriculture Organization (FAO), **about one third** of all food produced around the globe **is lost or wasted**
- ❖ Food waste alone generates about **8 - 10% of global GHG emissions**
- ❖ In the EU, this amounts to around **87.6 million tons** of food every year; EU also produces approx. **3 - 3.5 million tons** of **bakery by-products/leftovers**

- ❖ **Bakery Meal (BM)** is a mixture of breads, cookies, cakes, crackers, chips, pasta, snacks, nuts, cereals, flour, baked goods and related food by-products that are **no longer suitable for human consumption**
- ❖ BM can be an **excellent choice** for animal rations formulations due to their **energy content**, high palatability, low levels of anti-nutritional agents and **constant availability**
- ❖ However, BM properties are usually characterized by **high variability**



The aim of this study is to assess the physicochemical and microbiological properties of different production batches of BM for its use as feed ingredient in pig production

RESULTS & DISCUSSION



Bakery Meal Production

- ❖ Collection of different bakery leftovers
- ❖ Unpackaging and grinding
- ❖ Thermal treatment: 20min @ 133°C and 3 bar
- ❖ Packing into 20kg bags
- ❖ Stored at ambient conditions
- ❖ Two samples from 5 different production batches

Bakery Meal Analysis

- ❖ Nutrient analysis (EC No 152/2009)
- ❖ Lipid and Amino acid profile (EC No 152/2009)
- ❖ Aflatoxins and Mycotoxins (LS-MS/MS)
- ❖ Enterobacteriaceae (ISO 21528-2:2017)
- ❖ *Salmonella* spp. (ISO 6579-1:2017)
- ❖ *Campylobacter* spp. (ISO 10272-2:2017)
- ❖ African swine fever virus (PCR in-house)



Table 1. Nutrients analysis, amino acids composition profile, aflatoxins and mycotoxins concentration, and microbiological characterization of the BM production batches. Data are presented as mean values \pm SD; the data comprise five production batches and ten samples in total.

Parameter	Value	Parameter	Value
Nutritional analysis		Amino acids composition (g/kg)	
Moisture & Volatiles (g/100g)	9.25 \pm 3.36	Alanine	10.86 \pm 7.36
Ash (g/100g)	6.39 \pm 2.91	Arginine	8.36 \pm 5.33
Fat (g/100g)	19.28 \pm 5.47	Aspartic acid	17.93 \pm 6.45
Proteins (g/100g)	23.45 \pm 6.23	Glutamic acid	31.49 \pm 16.36
Crude fibers % (g/100g)	1.07 \pm 1.19	Glycine	22.73 \pm 11.65
Carbohydrates (g/100g)	40.46 \pm 13.81	Histidine	7.59 \pm 6.45
Sugars (g/100g)	5.81 \pm 5.43	Isoleucine	9.20 \pm 3.59
Starch (g/100g)	23.83 \pm 8.94	Leucine	13.11 \pm 7.30
Energy (kcal/100g)	429.2 \pm 32.6	Lysine	12.37 \pm 8.86
Fatty Acid (FA) composition		Methionine	8.43 \pm 9.36
Monounsaturated FA - MUFA (%w/w)	36.2 \pm 10.1	Phenylalanine	11.79 \pm 3.74
Polyunsaturated FA - PUFA (% w/w)	14.4 \pm 4.3	Proline	21.44 \pm 21.30
Saturated FA - SFA (% w/w)	49.5 \pm 17.4	Serine	11.29 \pm 5.08
Iodine Value (meq O ₂ /kg)	< 0.5* - 9.5	Threonine	8.77 \pm 4.61
Aflatoxins and Mycotoxins (μg/kg)		Tryptophan	1.05 \pm 0.70
Aflatoxin B1	< 0.5* - 4.5	Tyrosine	7.00 \pm 3.97
Aflatoxin B2	< 0.5* - 1.0	Valine	11.18 \pm 4.67
Aflatoxin G1	< 0.5* - 1.5	Microbiological characterization	
Aflatoxin G2	< 0.5*	Enterobacteriaceae (cfu/g)	< 9.0* - 270
SUM of aflatoxins	< 2.0* - 7.0	<i>Campylobacter</i> spp.	ND
ZON	< 2.0* - 31	<i>Salmonella</i> spp.	ND
DON	< 40* - 244	ASFV	ND

* This value is the detection limit of the assay. ND: not detected

- ❖ 1 ton of BM is equivalent to approx. **511 kg of corn**, **530 kg of soybean meal** (44% protein content) and **200 kg of fat/oil**
- ❖ BM contains moderate to **high concentration** of **lysine** and **threonine** and low concentration of tryptophan
- ❖ **No aflatoxins or mycotoxins** present
- ❖ **Microbiologically safe**

CONCLUSIONS

- ❖ **Bakery Meal (BM)** is a valuable feed ingredient that can provide **energy, protein**, and other **nutrients** to various animal feeds, including **pig rations** mainly for corn and soya substitution
- ❖ **BM composition vary**, depending on the source and processing methods; however, when **properly produced** and handled it is a **microbiologically and hygiene safe** feed ingredient
- ❖ Non-edible foods may be **valorized** as animal feed ingredients in the context of **circular economy**
- ❖ Further research is needed to assess the effect of BM inclusion in pig feed on the **productivity** and **quality** of the **pig meat**

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