

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

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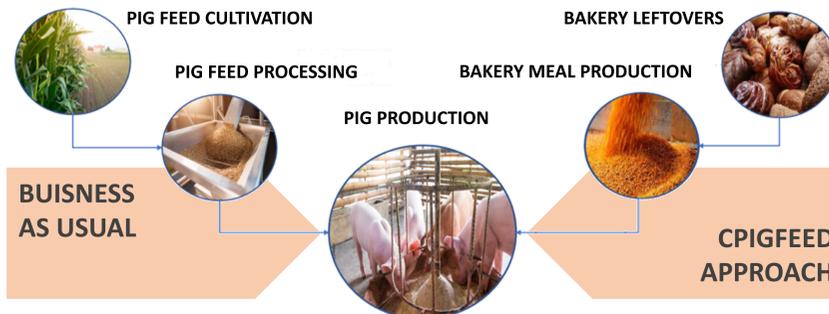
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INTRODUCTION

- ❖ 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**



- ❖ 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**

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 LEFTOVERS COLLECTION



DEPACKAGING & THERMAL TREATMENT



FEEDING SCREW CONVEYOR

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)



BAKERY MEAL PRODUCTION



BAKERY MEAL FINAL PRODUCT

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 ± SD; the data comprise five production batches and ten samples in total.

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