

Evaluation of the soybean replacement as protein source with Mediterranean legumes in the performance of growing pigs

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INTRODUCTION

- It is crucial to reduce livestock emissions by using feed materials with a low carbon footprint.
- Such feed materials include local products that could be included in pigs' feed to replace soybean.
- The use of local protein resources will contribute to the development and maintenance of the population in rural areas.



OBJECTIVE

To evaluate different local legumes (pea, lentil and chickpea) to replace soya (50% or 100%) as protein source in pig diets. The effect was evaluated in terms of pig health and performance.



MATERIAL AND METHODS

- ✓ Commercial farm in Segovia (Spain)
- ✓ 252 pigs (Pietrain boar x DNA sow)
- ✓ Initial age: 56 days of life
- ✓ Final age: 84 days of life
- ✓ Initial body weight: 20.3 ± 1.34 kg



Animals and facilities



MATERIAL AND METHODS

Experimental treatments



Supplier
↓
Feed mill



Supplier
↓
Legume distribution company
↓
Discards from human consumption

MATERIAL AND METHODS

Experimental treatments



T1
Soya 100%



T2
Pea 100%



T3
Pea 50%
Soya 50%



T4
Lentil 100%



T5
Lentil 50%
Soya 50%



T6
Chickpea
100%



T7
Chickpea 50%
Soya 50%

MATERIAL AND METHODS

Diets

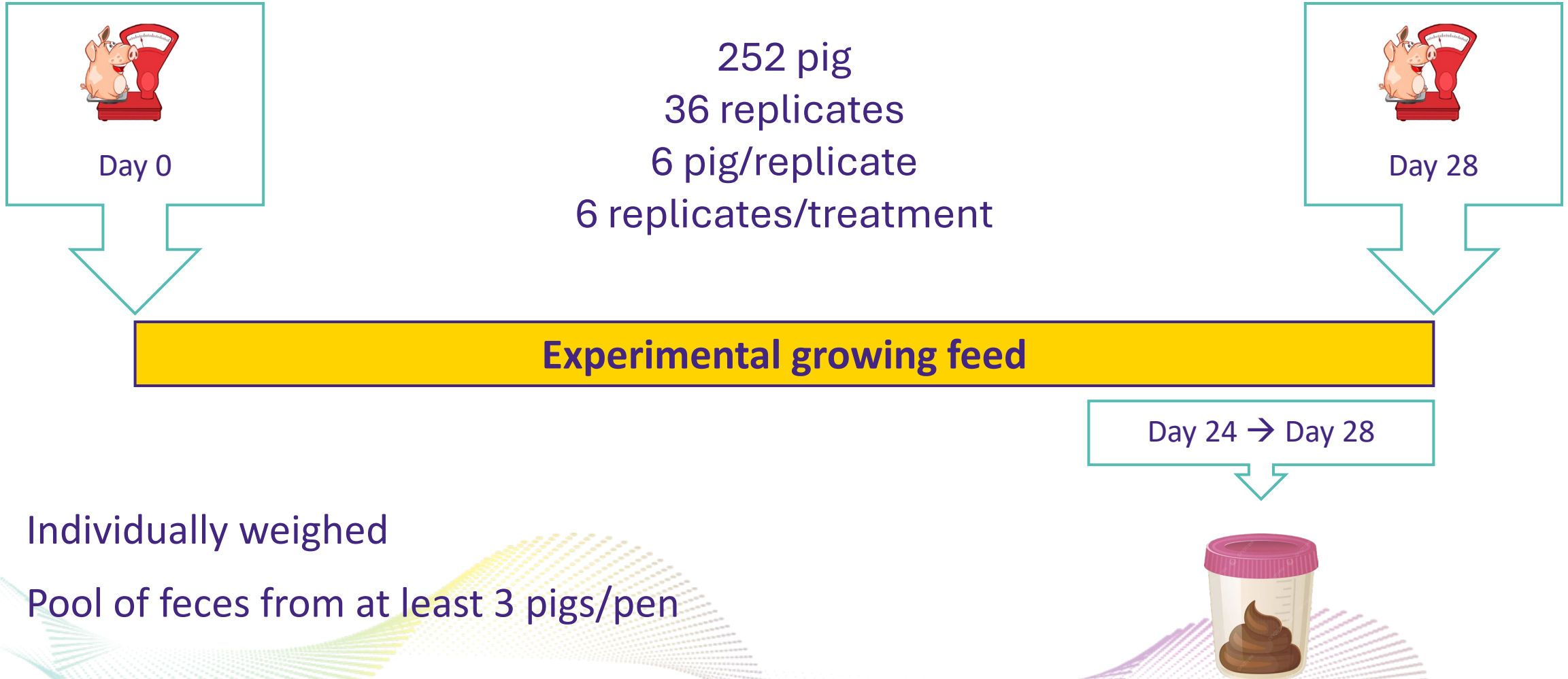
Ingredients	Negative Control	Pea100	Pea50	Lentil100	Lentil50	Chickpea100	Chickpea50
Ingredients, g/kg							
Barley	349	256	412	466	400	474	414
Corn	145	45	96	220	208	55	138
Soybean 47	155	0	94	0	89	0	93
Wheat	327	180	174	9	150	0	140
Pea	-	495	200	-	-	-	-
Lentil	-	-	-	280	129	-	-
Chickpea	-	-	-	-	-	444	190
Calculated nutrient composition, g/kg							
Total CP	160	160	160	160	161	161	160
CP from soya	74	0	42	0	42	0	43
CP from legume	0	102	42	94	42	104	43
ME, MJ/kg	13.0	12.9	12.9	13.2	13.1	13.3	13.2
Lipids	18.4	16.1	17.6	19.7	19.4	34.7	27.0
Lys SID	7.7	7.8	7.9	7.8	7.9	7.8	7.9
P dig	2.5	2.8	2.6	2.3	2.4	1.9	2.2

Diets were formulated to be isonutritive (**13.1 MJ/kg ME and 160 g/kg CP**)

Diets were complemented with essential amino acids to maintain the same essential (ideal) amino acid profile

MATERIAL AND METHODS

Experimental design



MATERIAL AND METHODS

Parameters recorded



Performance:

- Average daily gain (ADG)
- Average daily feed intake (ADFI)
- Gain feed ratio (GFR)



Apparent fecal digestibility (by acid-insoluble ash feed content):

- Dry matter
- Organic matter
- Crude protein

Statistical analysis

Statistical analysis was conducted by ANOVA.

Contrast analyses were conducted:

- ☐ Negative control vs Pea (50% & 100%)
- ☐ Negative control vs Lentil (50% & 100%)
- ☐ Negative control vs Chickpea (50% & 100%)

RESULTS

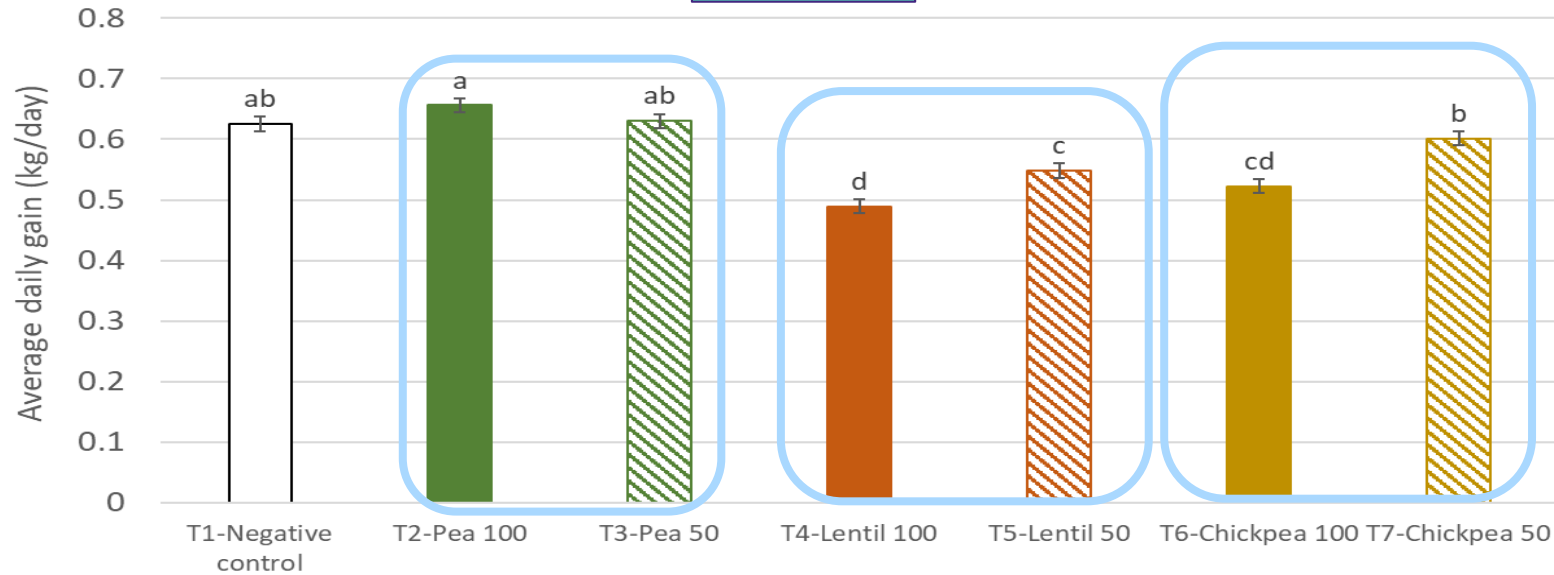
Diets

	Negative Control	Pea100	Pea50	Lentil100	Lentil50	Chickpea100	Chickpea50
Dry matter, %	89.2	89.0	89.1	89.4	88.9	88.8	89.3
Crude protein, %	16.7	17.0	16.7	16.5	16.6	15.7	14.1
Ether extract, %	2.24	1.92	2.39	2.68	3.39	2.63	2.59
Ash, %	5.44	5.15	4.72	5.49	5.25	5.06	4.81
Gross energy, cal/g	3786	3804	3830	3799	3824	3884	3796

Despite being formulated to be isoprotein, the chickpea diets had less protein.

RESULTS

ADG

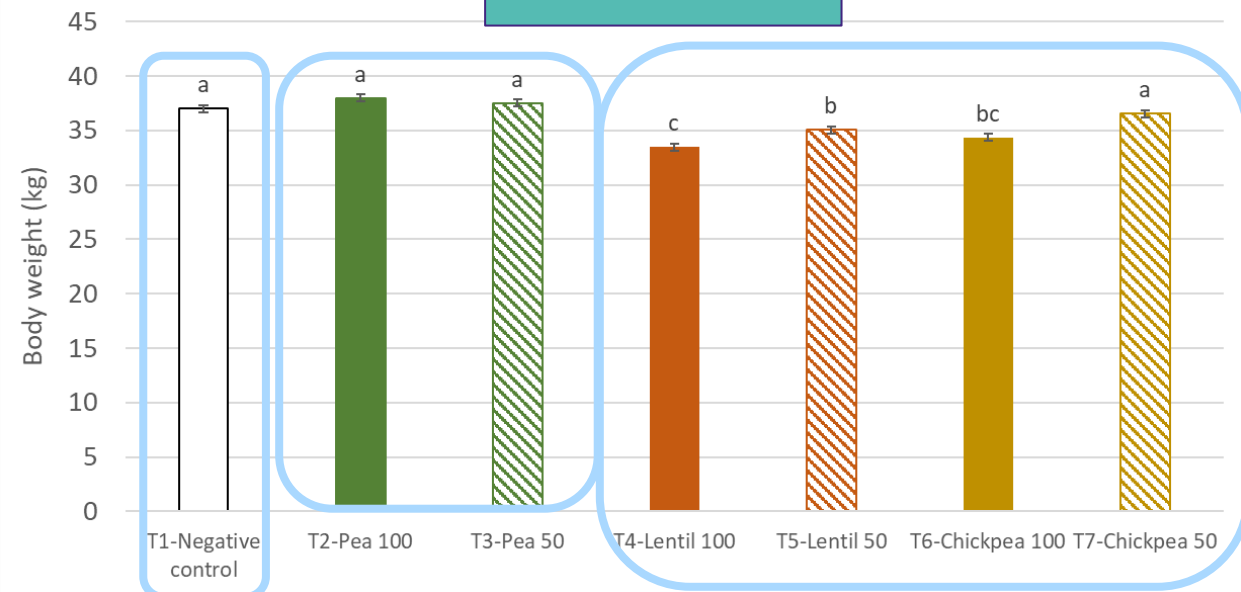


Pigs fed pea had the highest ADG

Pigs fed chickpea were intermediate

Pigs fed the lentil diets had the lowest ADG

Final BW



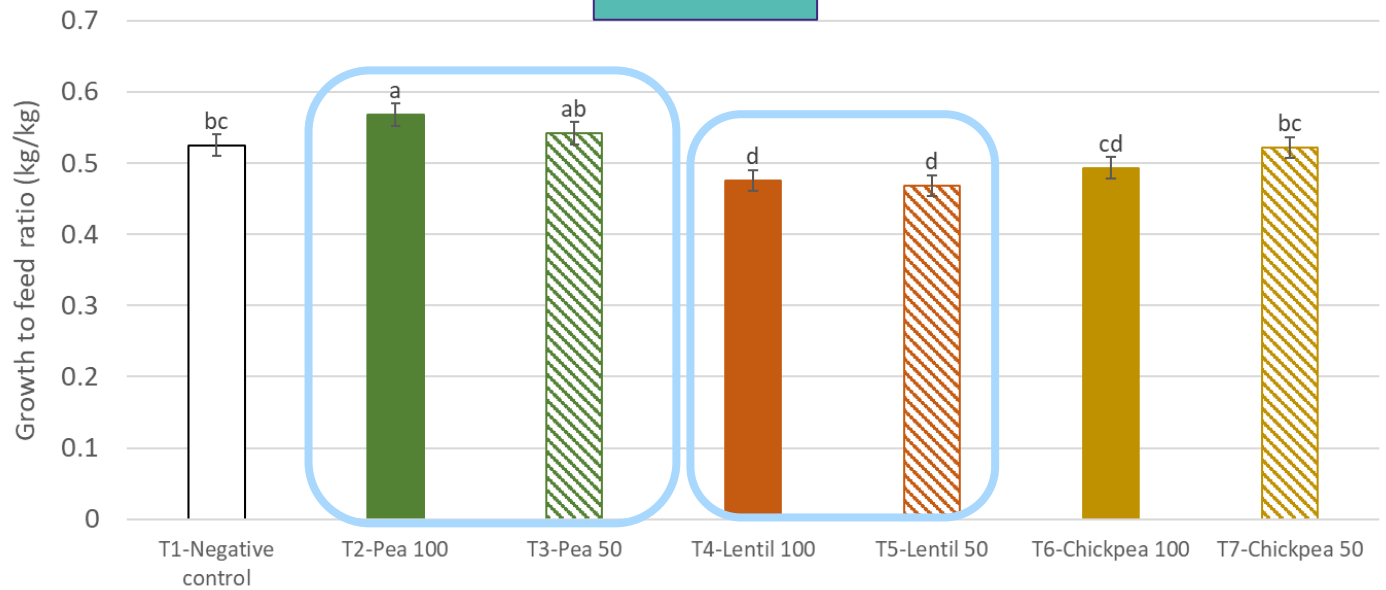
Pigs fed pea diets showed higher final BW than the rest of pigs, even tended to be higher than those fed with soya

The final BW of pigs fed with lentil and chickpea was lower than those fed with soya

Different letters indicate statistical differences ($P < 0.05$)

RESULTS

GFR

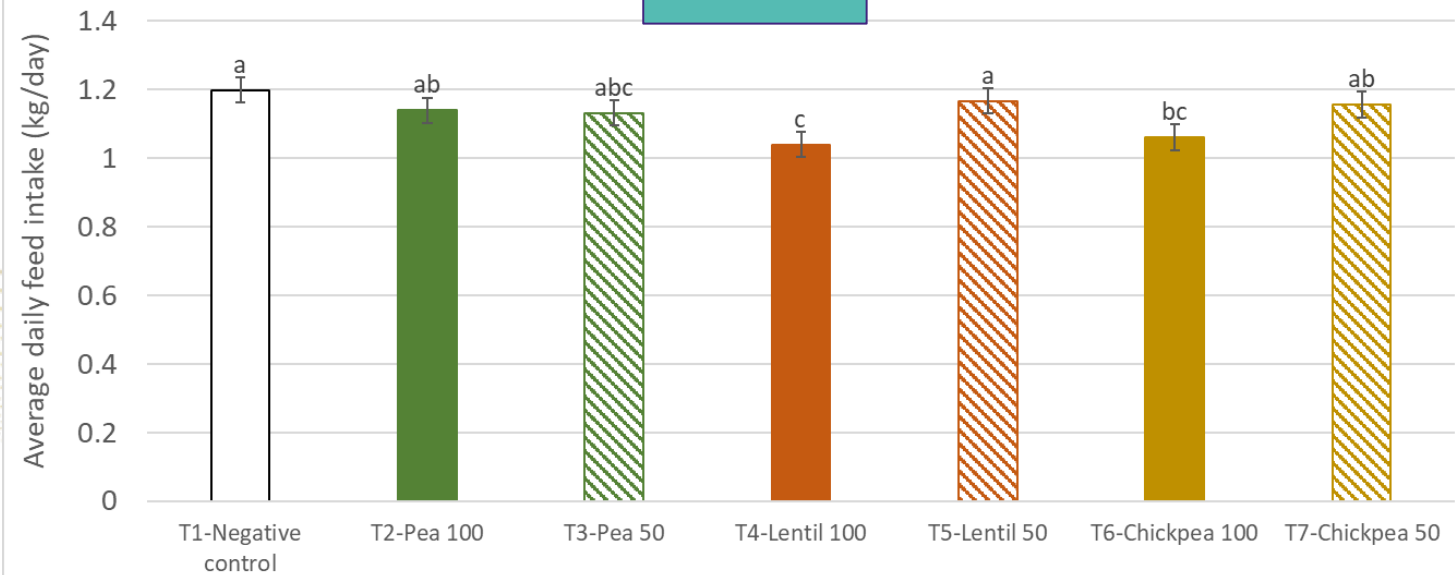


Performance

Pigs fed pea diets showed the highest feed efficiency

Pigs fed the lentil diets had the lowest GFR

ADFI

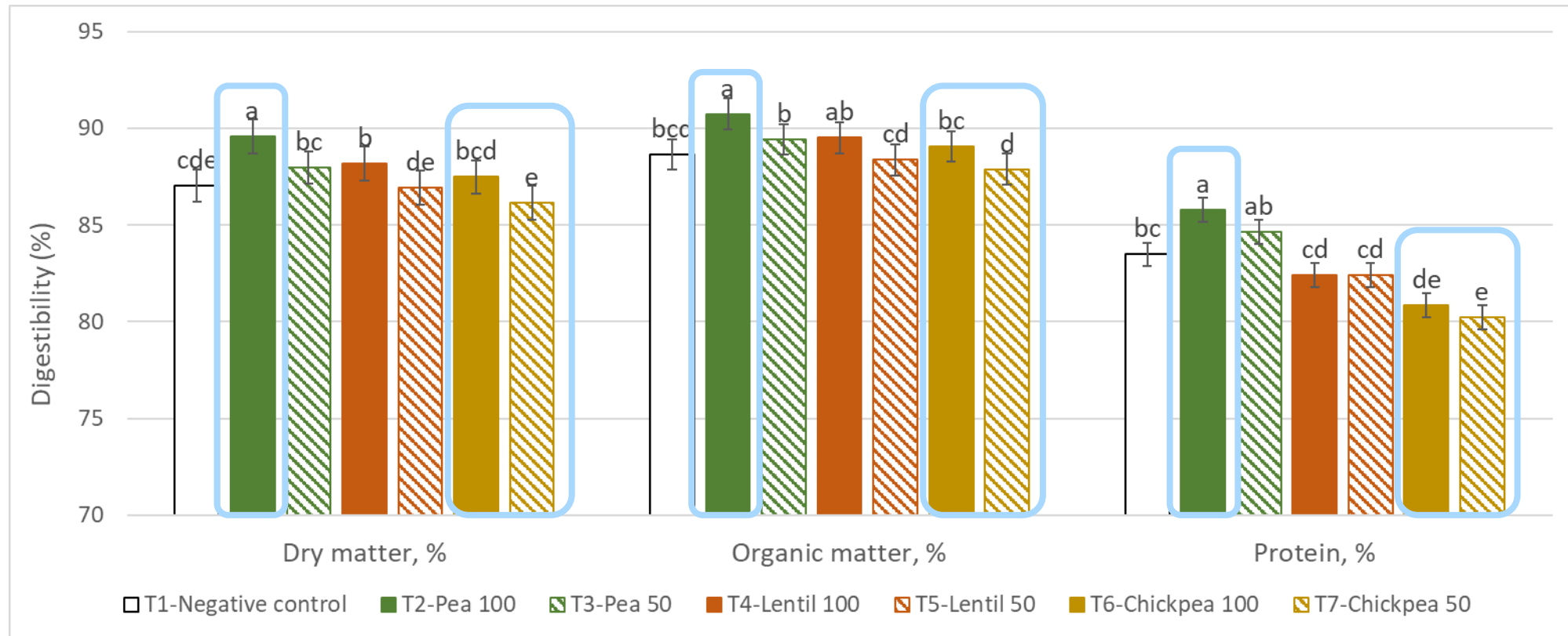


Variable results in feed intake

Different letters indicate statistical differences ($P < 0.05$)

RESULTS

Digestibility



Pigs fed the pea100 diet showed the highest nutrient digestibility values, while pigs fed the chickpea diets showed the lowest ones.

DISCUSSION

- Legumes could replace totally or partially soybean as main protein source in pig diets.
 - **Pea**, commonly used in animal feeding, showed the best **performance** results.
 - **Chickpea** showed an **intermediate performance** may be related to disparities in the evaluation of the ingredient for the **variability** in **discarded ingredients for humans**.
 - **Lentil** showed the lowest performance, and causes should be further investigated.
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- A decorative graphic at the bottom of the slide consisting of several overlapping, wavy lines. The lines are composed of many small, closely spaced dots or segments, creating a sense of motion and depth. The colors transition from light green on the left, through yellow and orange in the middle, to light purple and pink on the right.

TAKE HOME MESSAGE

Peas resulted the best alternative to replace soybean as protein source in terms of performance and nutrient digestibility.



Acknowledgment

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