



Effects of a blend of phytogenic feed additives on performance in fattening pigs fed liquid feed

A. Samson, E. Janvier, W. de Gaiffier, S. Constantin

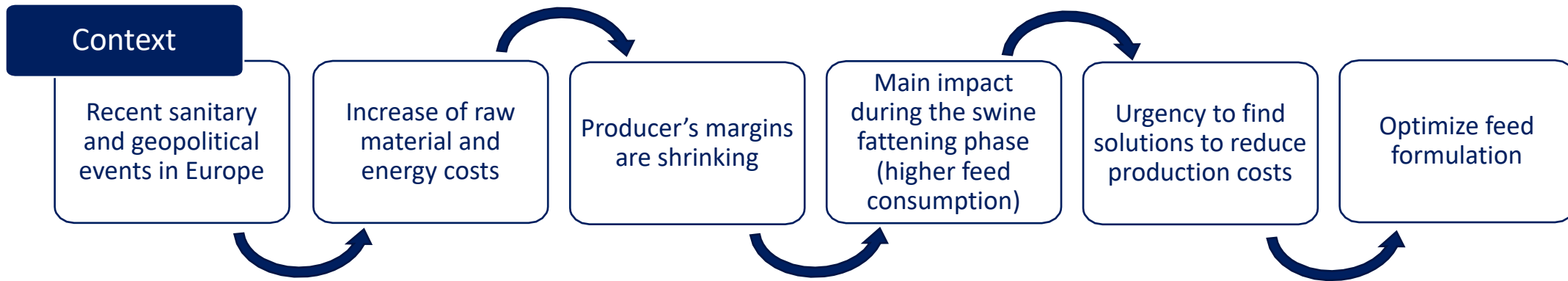


Introduction



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Introduction



➔ One way to achieve better Feed Efficiency can be to supplement animals with feed additives. Among them, phytochemicals are a promising natural solution.

Some active compounds such as **capsicum** from chili pepper, **cinnamaldehyde** from cinnamon or **carvacrol** from oregano have been described as able to alter expression of genes involved in digestive functions by triggering receptors located in the gut¹.

Several studies illustrated the effect of these compounds on energy sparing through a modulation of the activity of digestive enzymes (lipase, amylase, trypsin and chymotrypsin)² and lipid digestibility³.



Raise the interest of testing these molecules on performance in swine



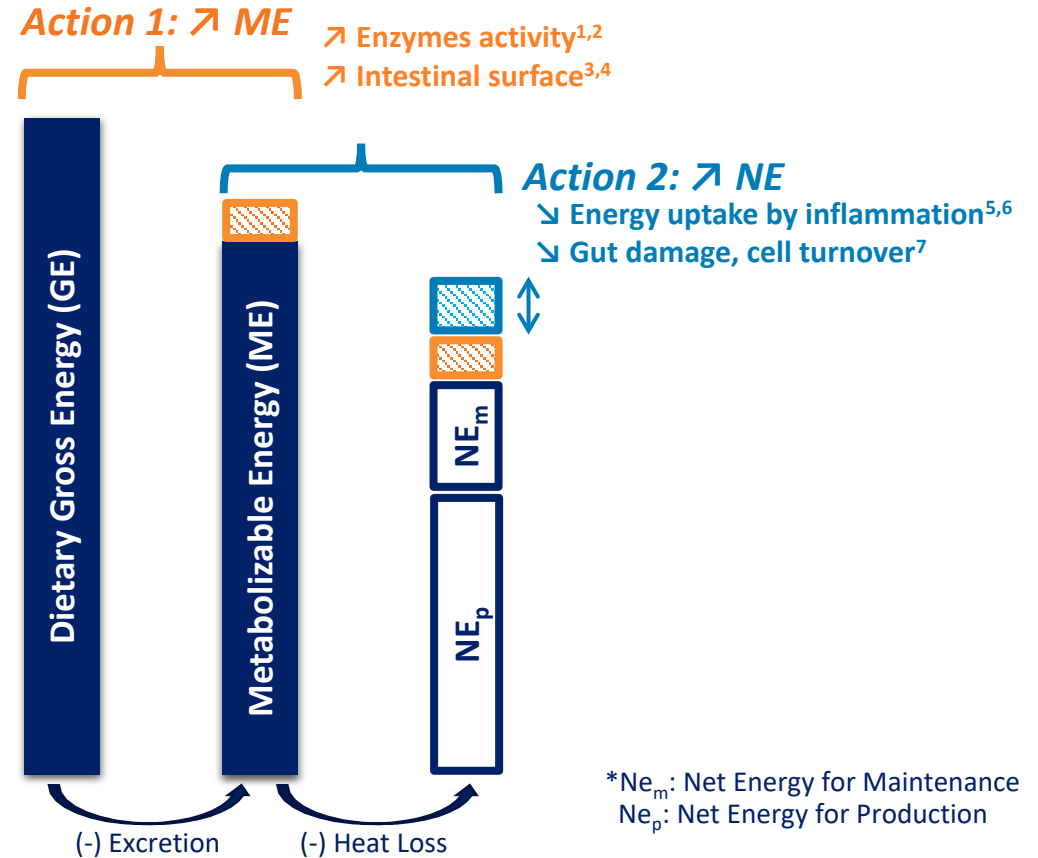
¹Bravo et al. 2013.; Kim et al 2010; ² Ganesh & Bhat et al., 1984; Platel and Srinivasan, 1996; Platel and Srinivasan, 2000; ³ Bravo, Pirgozliev et al., 2014

Introduction

Research history

- In previous studies, a blend of cinnamaldehyde (3%), capsicum oleoresin (2%) and carvacrol (5%) has been tested on swine.
 - A multiple trial analysis (14 trials organized in 7 studies)^a was performed to assess the efficacy of these compounds in fattening pigs fed ad libitum dry feed.
 - A first estimate of the energy equivalence was 80 g/t of the plant extract blend = 30 kcal (0.125MJ) NE/kg for growing and finishing pigs.
 - It could thus be interesting to validate this energy equivalence in a European context, that means with pigs fed restricted with liquid diets.
- + Feedback from the field suggests a greater effect on energy sparing (more than 30kcal NE/kg).

Hypothesis on mode of action



Objective of the trial: Assess the effect of supplementing a standardized blend of cinnamaldehyde, capsicum oleoresin and carvacrol on growth performance and carcass grading in fattening pigs fed low nutritional value liquid diets (-0.2 MJ (-50kcal) NE/kg and -0.02% SID Lys).

Material & Methods



Material and methods

Location: CRZA Research Farm, France

Animals & housing:

270, 68-days-old pigs (ADENIA x Piétrain) initially weighing 32.1 kg

45 pens (L: 3.85 m, l: 1.55 m = 5.97 m²) of 6 pigs each (mix of barrows and females)



Feeding strategy:

Liquid feed (dilution: 2.8 L/kg of feed)

Feed restriction applied all through the experimental period:

40g of feed/kg of BW at d0, then a progression of 27g/d with a maximum of 2.65kg/d.

Bi-phase strategy:



Experimental design: 3 experimental treatments compared over the whole fattening period:

Negative control (NC)



Low but no deficient levels of energy and digestible amino acids.

Negative control + Plant extract (PE)



NC diet + 80g/T of phytogenic feed additives (2% Capsicum oleoresin, 3% Cinnamaldehyde, 5% Carvacrol).

Positive control (PC)



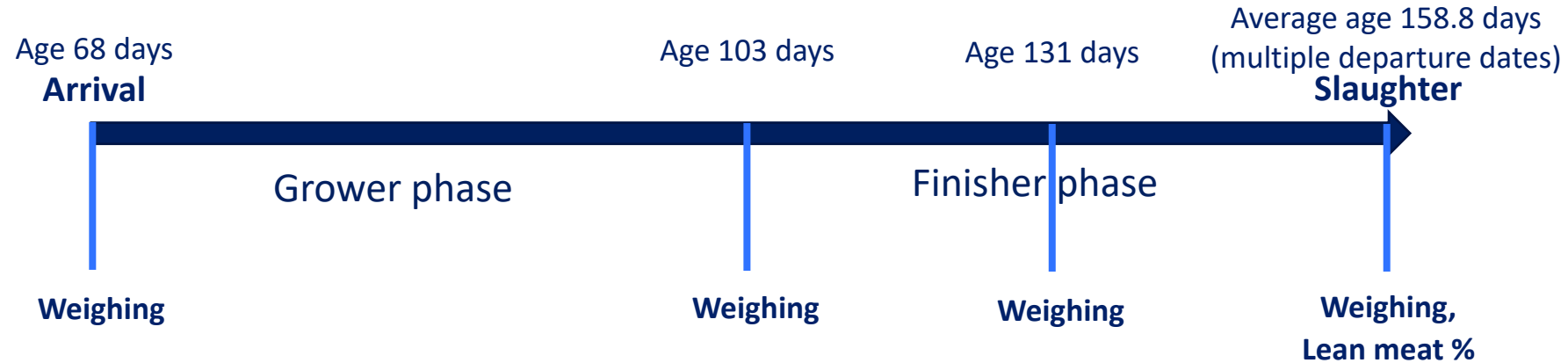
Higher NE value (+50 kcal= +0.2 MJ vs. NC feeds) - same SID lysine/NE ratios.

	Growing (d68-d103)			Finishing (d103-Slaughter)		
Description	NC	NC + PE	PC	NC	NC + PE	PC
PE	0	80 g/T	0	0	80 g/T	0
EN, MJ/kg	9.6	9.6	9.8	9.7	9.7	9.9
EN, kcal/kg	2293	2293	2341	2317	2317	2365
Prot, %	15.0	15.0	15.2	14.1	14.1	14.2
Lys SID	0.84	0.84	0.86	0.78	0.78	0.80
Lys SID/EN	0.088	0.088	0.088	0.080	0.080	0.081

Material and methods

Parameters measured:

Feed intake: daily recording per pen.



Calculations:

Average Daily Feed Intake (ADFI), Average Daily Gain (ADG) and Feed Conversion Ratio (FCR) were calculated based on data recorded during the trial. Dressing percentage was calculated as the slaughter weight divided by the carcass weight.

Statistical analysis:

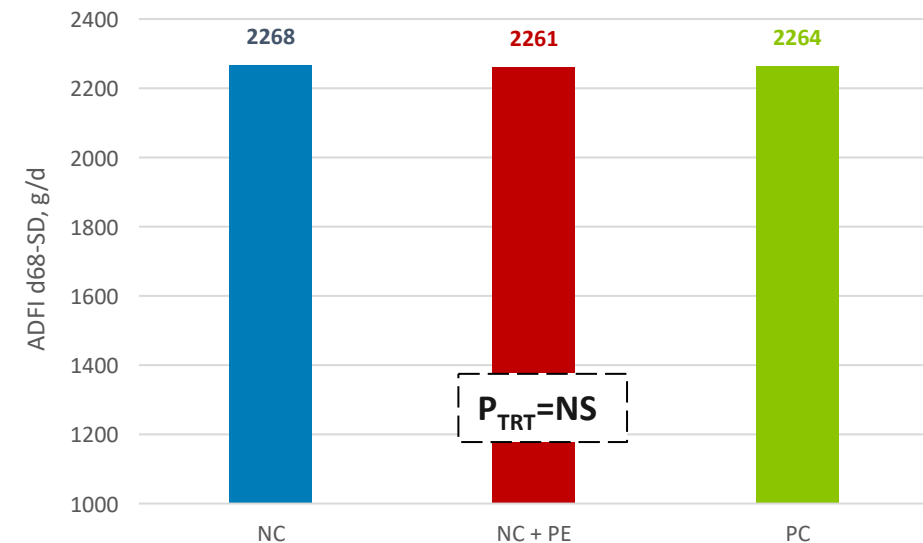
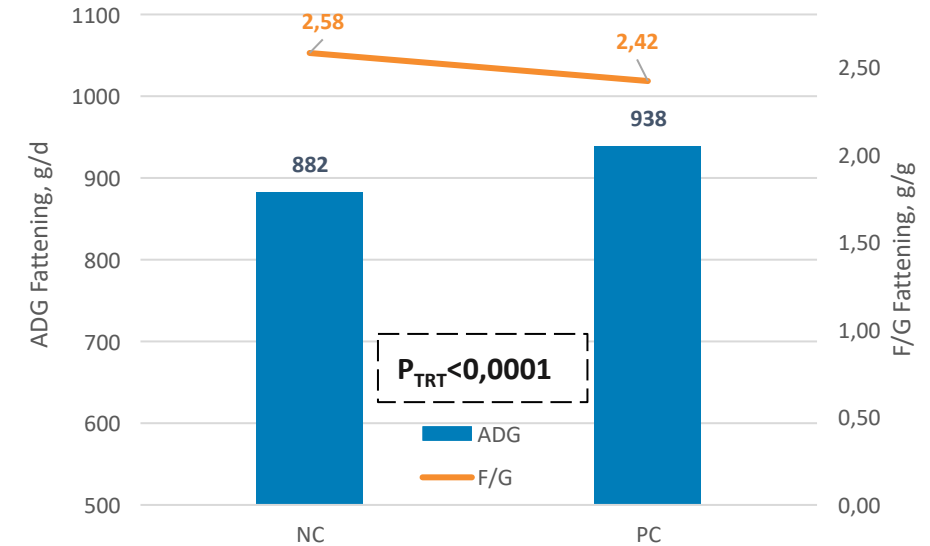
- The experimental unit was the pen for all the variables.
- Anova: $Y = \mu + TRT + Room + BWd68 + Error$
 - Interactions removed as non-significant
- Variables expressed as % transformed by applying arcsine function

Results



Validation of the experimental design

- No outlier identified: 15 pens/treatment
- Validation of the design: difference between the 2 CONTROL groups?
 - Over the whole fattening period, the PC pigs performed significantly better than the NC animals
 - Significant differences observed for all parameters (BW, ADG, FCR and some traits related to carcass grading)
 - Differences observed for most of the periods (growing, finishing and entire fattening period)
- As expected, (feed restriction applied), no difference of ADFI among the 3 groups
 - **Experimental design validated**



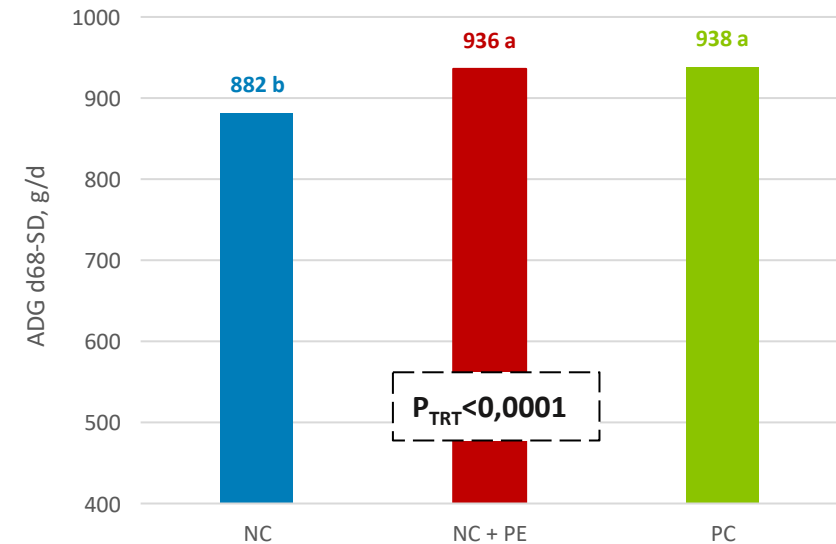
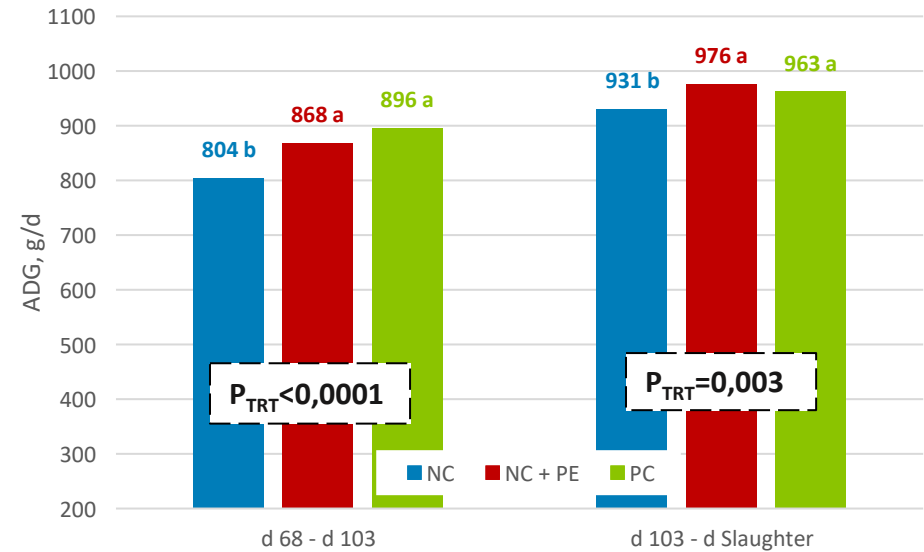
Results: Growth

During both growing and finishing periods, pigs fed PE realized:

- Significantly higher ADG compared to the NC group
- Comparable ADG compared to the PC group

Over the entire fattening period, pigs fed PE realized:

- Significantly higher ADG compared to the NC group: +6,1%
- Comparable ADG compared to the PC group



Results: Feed Efficiency

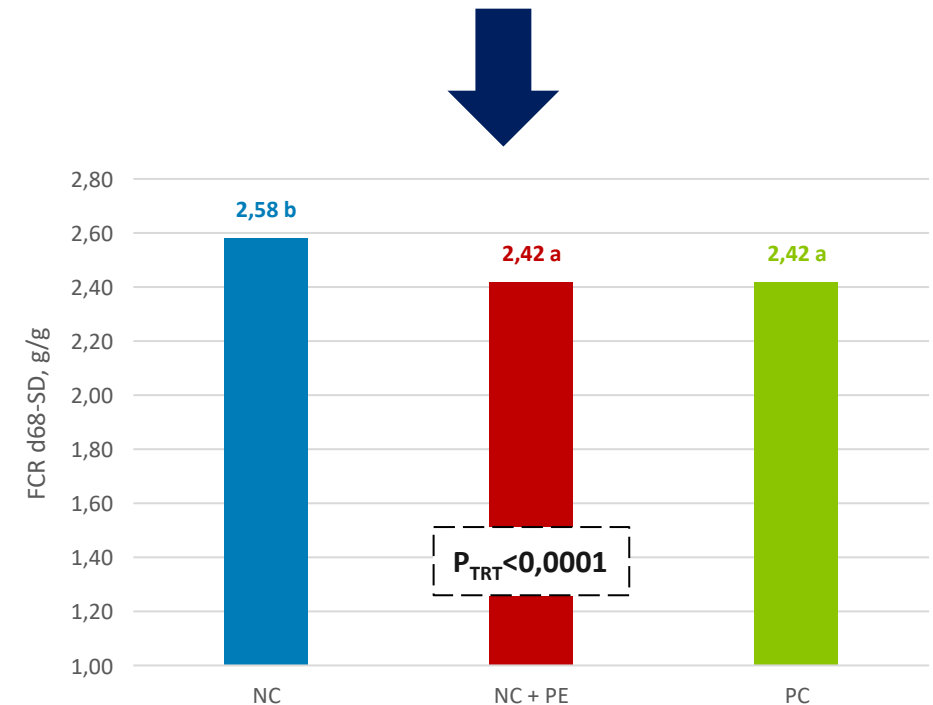
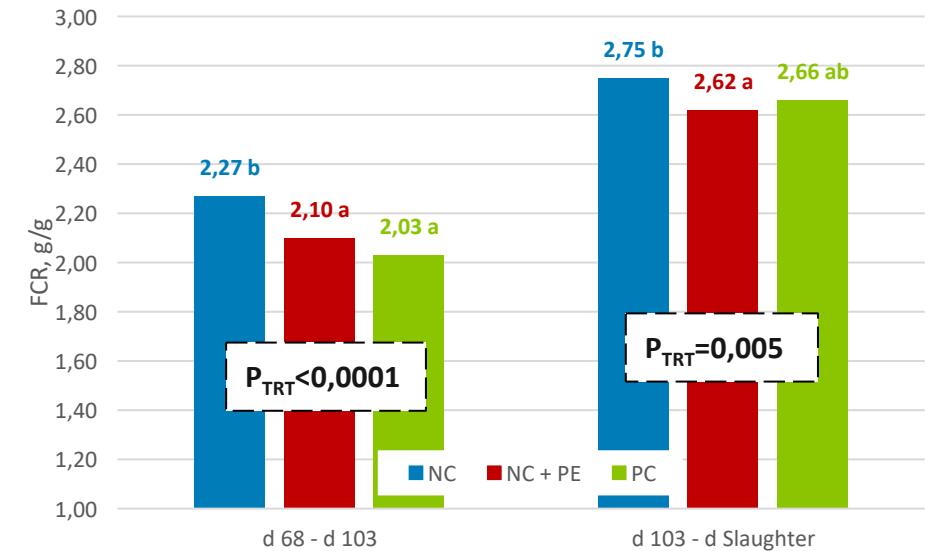
During both growing and finishing periods, pigs fed PE had:

- Significantly lower FCR compared to the NC group
- Comparable FCR compared to the PC group

➔ Same hierarchy and magnitude of differences as ADG due to feed restriction

Over the entire fattening period, pigs fed PE had:

- Significantly lower FCR compared to the NC group: -6,2%
- Same FCR compared to the PC group



Results: carcass grading

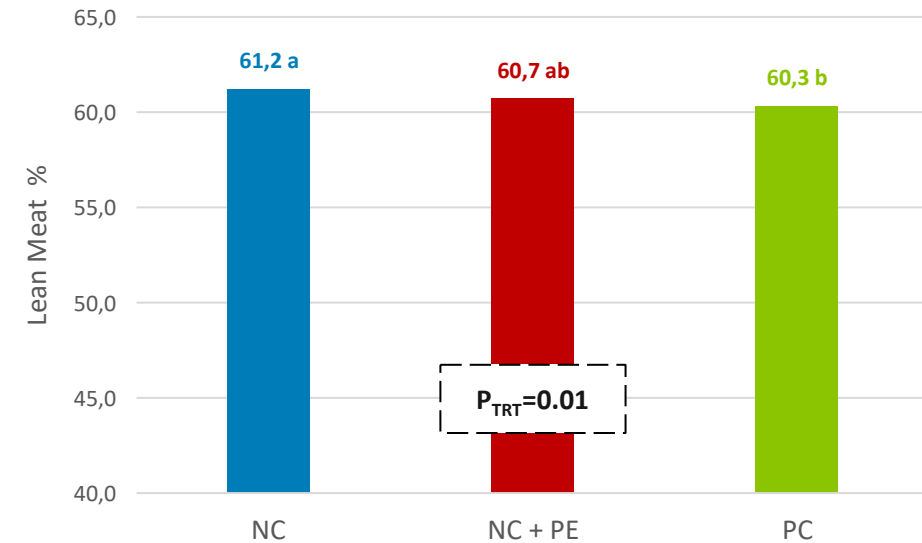
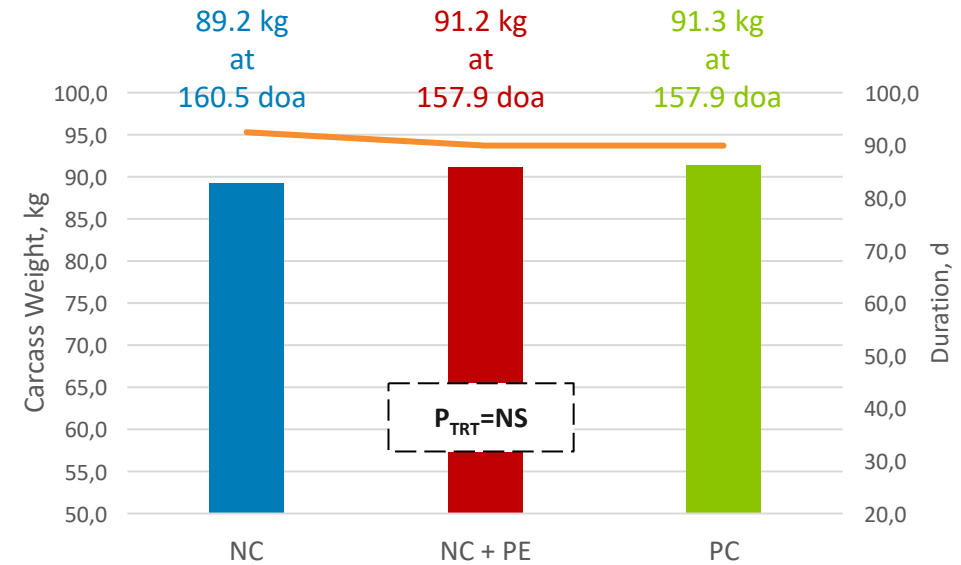
Carcass weight and age at slaughter

- Pigs fed NC were slaughtered numerically later when compared with other groups (+ 2.5d, P=NS)
- No significant different in terms of carcass weight – but NC carcasses were numerically lighter (- 2kg, P=NS)

Lean Meat percentage

- All 3 groups are within French carcass valorization standards (TMP).
- LM content from PC pigs was lower than the one from NC pigs. LM content was intermediate for the pigs fed PE
- Need to consider that PC and NC+PE pigs were heavier at slaughter day → a potential bias!

BW at slaughter day added as covariable in the model but same observation



Conclusion



Discussion & Conclusion

Results

- Validated experimental design → higher performance for the pigs fed PC vs NC
- The pigs fed PE performed better than NC pigs and realized the same performance level as the PC group.
 - Validation of the **upper value calculation** hypothesized → Net Energy equivalence = 50kcal (0.2MJ) /kg of feed, for 80ppm inclusion of the Plant Extract additive.

ROI*: PC = **2.1 : 1** vs. NC

PE = **22.1 : 1** vs. NC

* French market quotation MPB (June 2023), taking lean meat ratio (TMP) into account

Perspectives

- Beneficial on challenged animals ?
- Complementary with carbohydrase, already tested in poultry (internal data)
- Sustainability? Excretion?

Thank You

