The impact of resistant potato starch and *Lactiplantibacillus plantarum* on growth and health of post-weaned pigs

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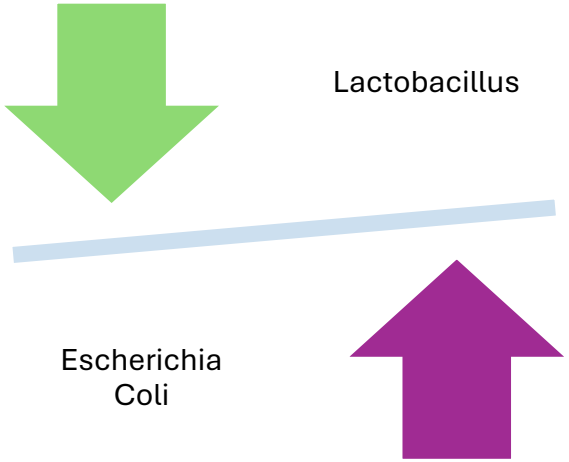
The weaning process

- In the wild, weaning is a gradual process that occurs when piglets are 3-4 months of age
- Commercial weaning is abrupt and occurs when piglets are 3-4 weeks of age
- During weaning:
  - ❖ Separated from sow, littermates, and familiar surroundings
  - ❖ Moved into strange accommodation with a new pathogen load and must establish hierarchy
  - ❖ Transition from milk-based diet to dry cereal-based diet

- Reduction in feed intake
- Intestinal inflammation
- Microbial dysbiosis
- Post-weaning diarrhoea
- Reduced growth rates

The impact of weaning on the intestinal microbiome

- Dietary change
- Inflammation
- Environmental change



Lactobacillus

- Carbohydrate fermenting bacteria (Cui et al, 2021)
- Antimicrobial substances (Liévin-Le Moal and Servin, 2006)
- Competitive exclusion (Valeriano et al, 2017)

Lactiplantibacillus Plantarum

- Improve growth performance (Yu et al, 2024)
- Reduce diarrhoea in post-weaned pigs (Dell' Anno et al, 2021)

Can we increase the abundance of intestinal Lactobacillus post-weaning via the supplementation of a probiotic/prebiotic?

Lactiplantibacillus Plantarum

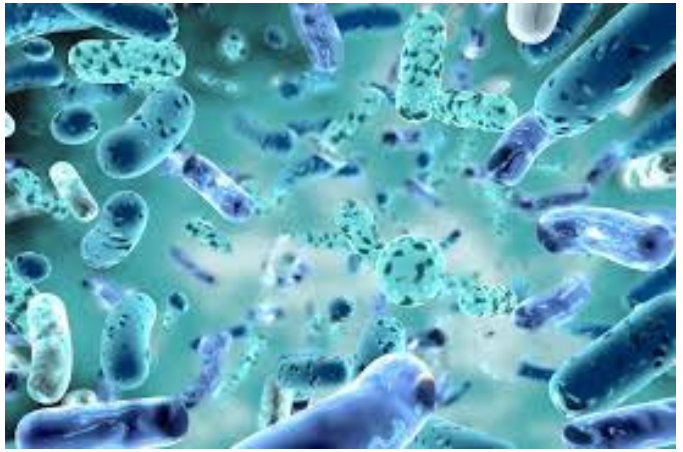
- Tolerant of both low stomach pH and high pH of duodenum - detectable in caecum (O'Shea et al, 2012)
- Secretes antimicrobial substances (Cebeci et al ,2003)
- Competitive exclusion (Cebeci et al ,2003)
- Anti-inflammatory and anti-oxidant properties (Tang et al., 2021)
- Increases butyrate producing bacteria (Pieper et al, 2010)

Prebiotics

- Oligosaccharides which are not digested but metabolised by intestinal microflora, stimulating the proliferation of beneficial bacteria and as a result benefiting the pig (Gibson and Roberfroid, 1995)
- Easily fermented by bacteria including *Lactobacilli* and *Bifidobacteria* (Flickinger et al, 2003)
- Supplementation of prebiotics increased SCFA production (Kiernan et al, 2023)

Various prebiotics:

- ❖ Inulin
- ❖ Lactulose
- ❖ Wheat bran
- ❖ Resistant starch



Resistant potato starch

- Resistant starch is the proportion of starch resistant to digestion and is fermented in the colon (Buttriss et al, 2008)
- Increases the proliferation of beneficial bacteria (Riviere et al ,2016)
- Increases SCFA production and absorption (Trachsel et al, 2019)
- Increase gut mucin production and modulates inflammatory response (Tan et al, 2021)

Objective

To compare the performance and intestinal health of post-weaned pigs offered diets containing either a prebiotic **(Resistant potato starch)**, or a probiotic ***(Lactiplantibacillus plantarum)*** or a combination of both

Hypothesis

The combination diet consisting of the resistant potato starch and *Lactiplantibacillus Plantarum* will have the greatest effect on piglet health and performance post-weaning

Experimental design

96 newly weaned piglets (28 days)with an average weight of 7kg were assigned to 1 of 4 dietary treatments in a 2 x 2 factorial design for 35 days

- SID lysine 12.0 g/kg
- Net energy 10.6 MJ/kg

Basal Diet

Basal Diet + **1%** Potato Starch

Basal Diet + **2 x 10^8** CFU/g of *Lactiplantibacillus plantarum*

Basal Diet + **1%** Potato Starch and **2 x 10^8** CFU/g of *Lactiplantibacillus plantarum*

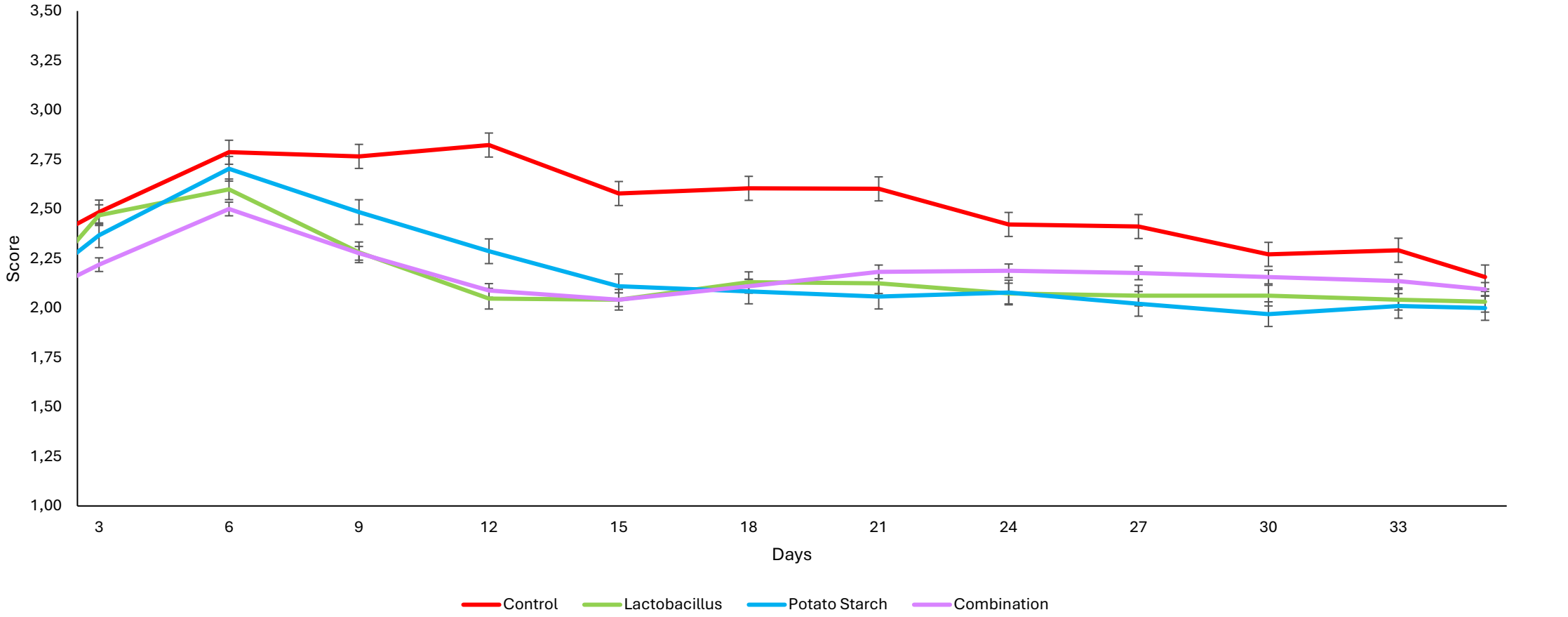
- 2 × 10^8 CFUs/gram reduced diarrhea incidence and faecal scores in weaner pigs (Dell'Anno et al, 2021)
- Supplementing piglets with 1% resistant potato starch improved faecal scores compared to 0.5% potato starch (Heo et al, 2014)

Data collection

- Pig housed in groups of 3
- Piglets weighed weekly
- Average daily gain (ADG), average daily feed intake (ADFI), feed conversion ratio (FCR) calculated weekly
- Faecal scoring on a scale of 1-5 carried out twice a day in the am and pm
- Fresh faecal samples from each pen (n=8) collected on day 8 post-weaning for VFA and microbiome analysis by 16s rRNA sequencing

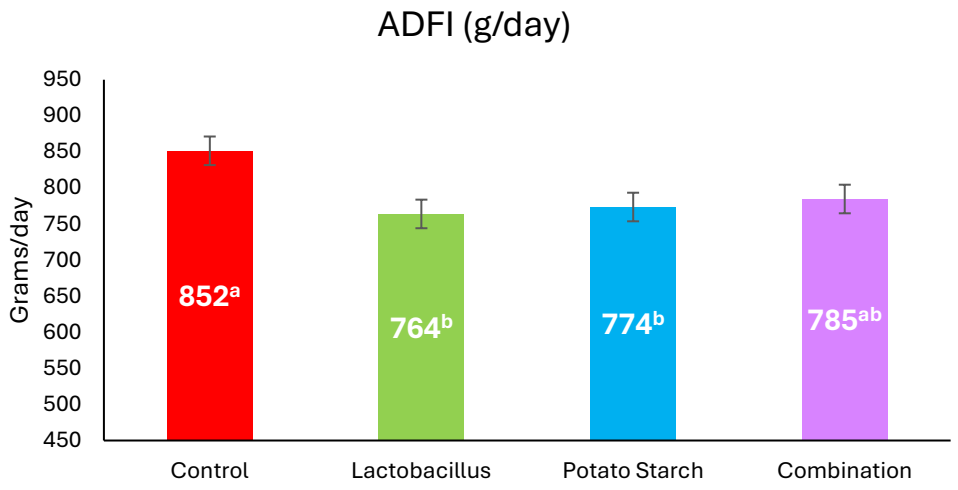
Faecal scores for 35 days post-weaning

Lactobacillus x starch *p* value <0.05

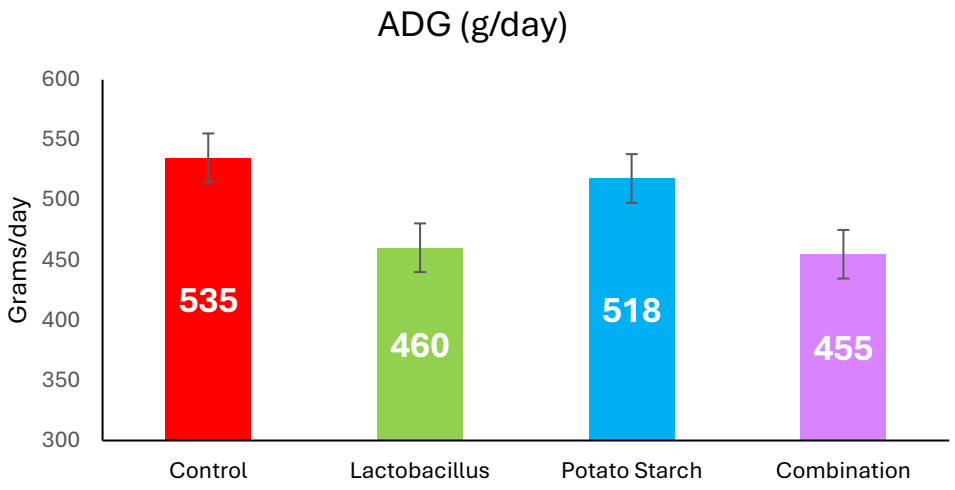


Growth performance results

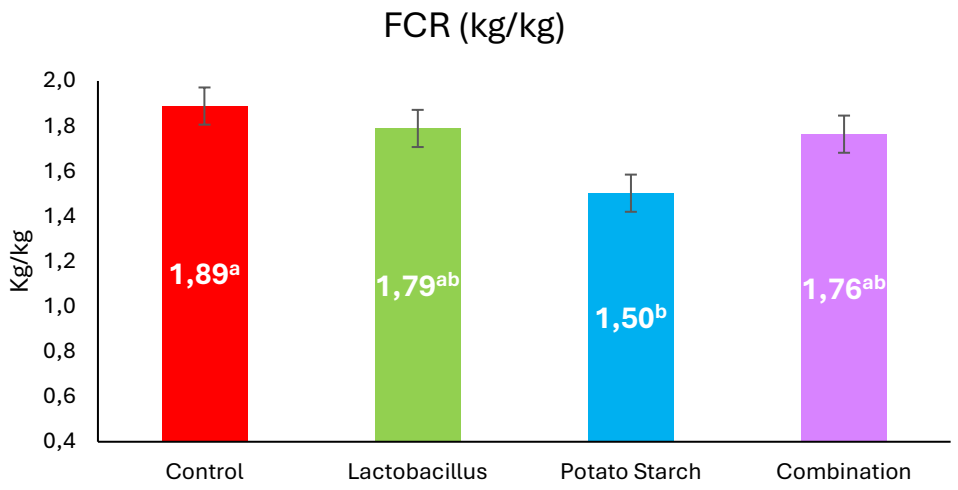
Lacto x starch *p* value <0.05



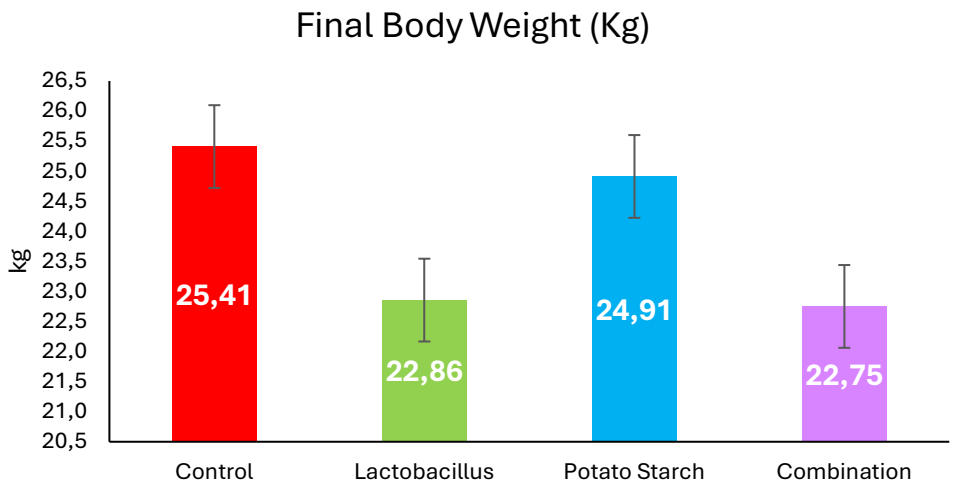
Lacto *p* value <0.05



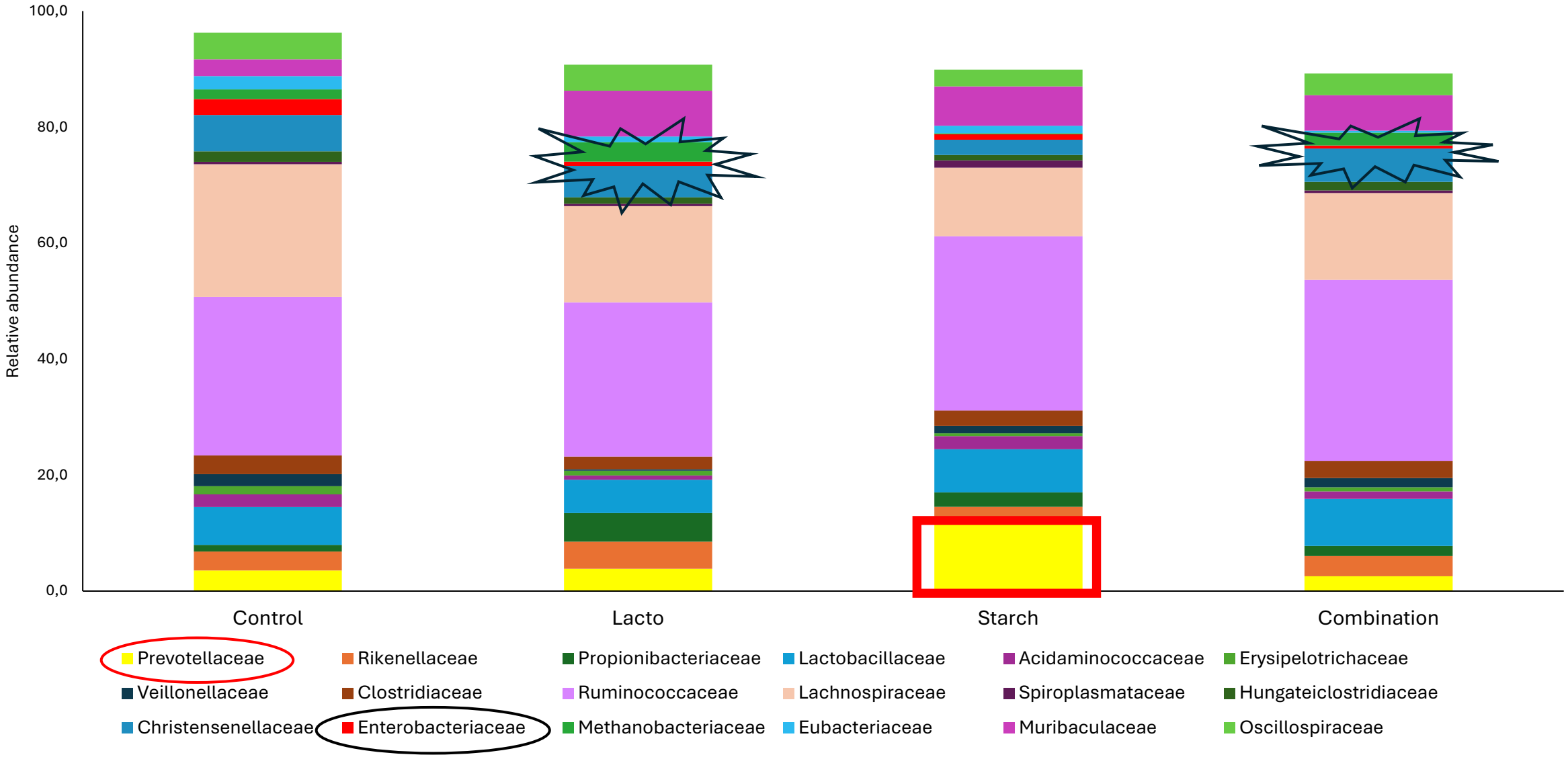
Lacto x starch *p* <0.05



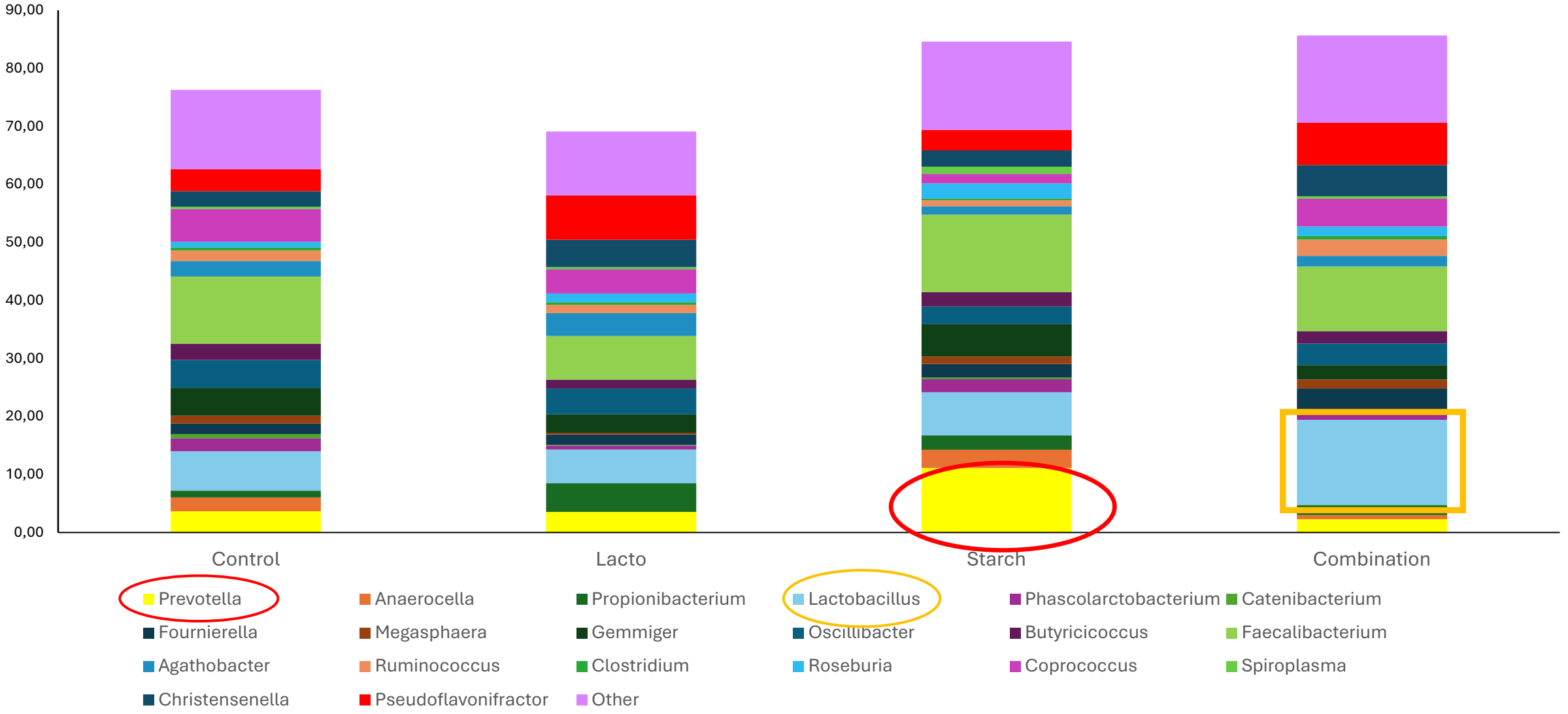
Lacto *p* value <0.05



Microbiome results-family



Microbiome results-genus



Conclusions

- Resistant potato starch and *Lactiplantibacillus plantarum* improved faecal scores of post-weaned pigs
- However, *Lactiplantibacillus plantarum* reduced ADFI and growth performance of post-weaned pigs
- Further dietary manipulation of diets supplemented with *Lactiplantibacillus plantarum* is required to maintain faecal scores without reducing performance

Thank you!

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