

EFFECT OF DIFFERENT INSECT MEALS ON PERFORMANCE AND GUT HEALTH OF MONOGASTRIC ANIMALS

- A BROILER STUDY

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INTRODUCTION

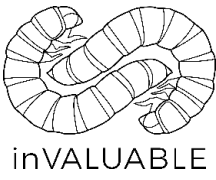
- 40 g → 2.5 kg in 35 days
= need for feed ingredients with high nutrient levels

The gastro-intestinal tract is thus very important!

- Efficient digestion and absorption.
- Healthy animal - gut environment: it's complex.

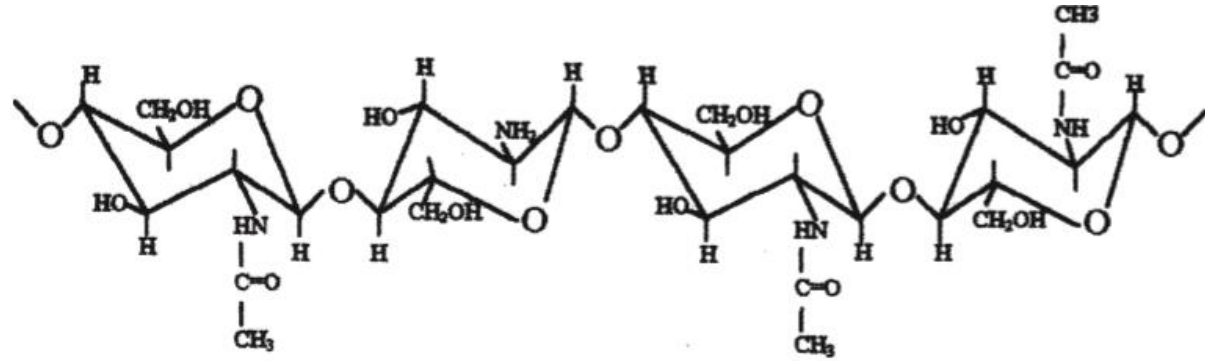


BIOACTIVE COMPOUNDS IN INSECTS



Bioactive compounds:

- Do not only have nutritional value.
- Do also have health promoting effects.



Chitin

Antimicrobial peptide

Pathogen reduction

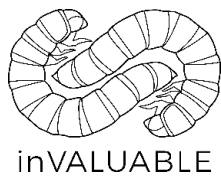
Microbial fermentation

INSECTS

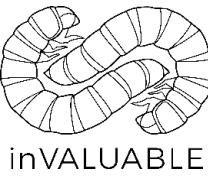
g/100g DM



	Hermetia illucens¹	Aphitobius diaperinus	Tenebrio molitor
Dry matter, g/100g	96.82	98.68	97.85
ADF	13.05	15.02	9.05
Ash	8.97	2.73	4.78
Crude Protein	71.16	63.56	75.44
Fat	6.82	18.69	10.74
Aspartic acid, % CP	7.90	4.28	5.96
Cysteine, % CP	0.79	0.49	0.60
Glutamine, % CP	10.93	5.95	8.25
Lysine, % CP	8.00	4.93	6.03
Methionine, % CP	5.23	3.13	3.94
Sodium	0.191	0.275	0.209
Phosphorus	1.327	0.588	1.031
Kalium	2.082	0.573	1.203
Calcium	1.07	0.093	0.067



AIM AND HYPOTHESES



AIM:

1. To test if 10% of different types of insect meal can be fed to broiler chicks without negatively affecting growth.
2. To test if the presence of bioactive compounds in insect meal can positively affect microbiota composition and SCFA levels in the gastro-intestinal tract.

HYPOTHESES:

1. Birds fed insect meal are suspected to reach similar weight as birds fed conventional feedstuffs.
2. Bioactive compounds, i.e. chitin and derivatives and antimicrobial peptides, might positively affect selected microbiota and SCFA composition.



DIETARY TREATMENTS

Black soldier fly = BSF

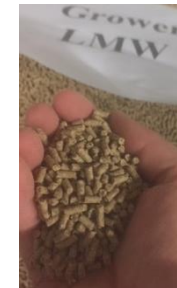
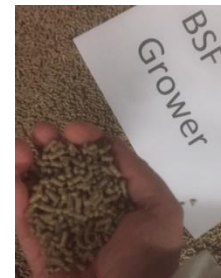
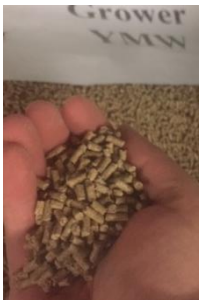
Lesser mealworm = LMW

Yellow mealworm = YMW

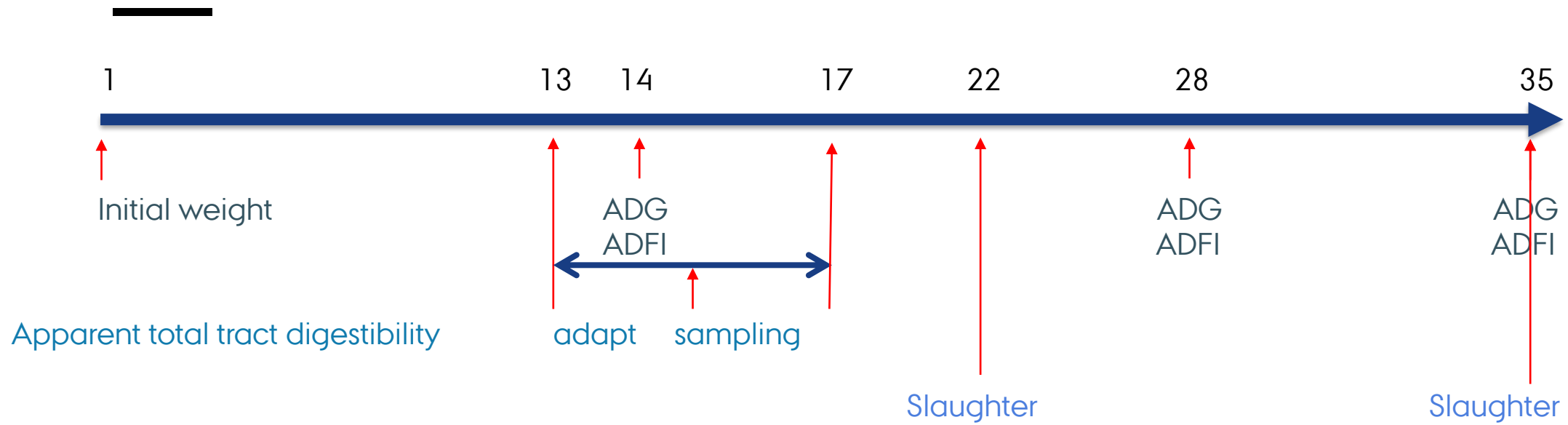
Control = CTRL

Starter (Day 1-11)		Grower (Day 11-35)	
Wheat		Wheat	
Fishmeal (~5%)/SBM	Insects (~10%)	Soybean (~30%)	Insects (~10%)

- Diets were iso-energetic
- Comparable in levels of the most limiting AA's (lysine, methionine, cystine, threonine).
- Requirements of all other nutrients were met.
- **Drawback:** Protein levels of diets containing insects were higher (~1.5% difference) to fulfill cysteine requirements.



EXPERIMENTAL DESIGN



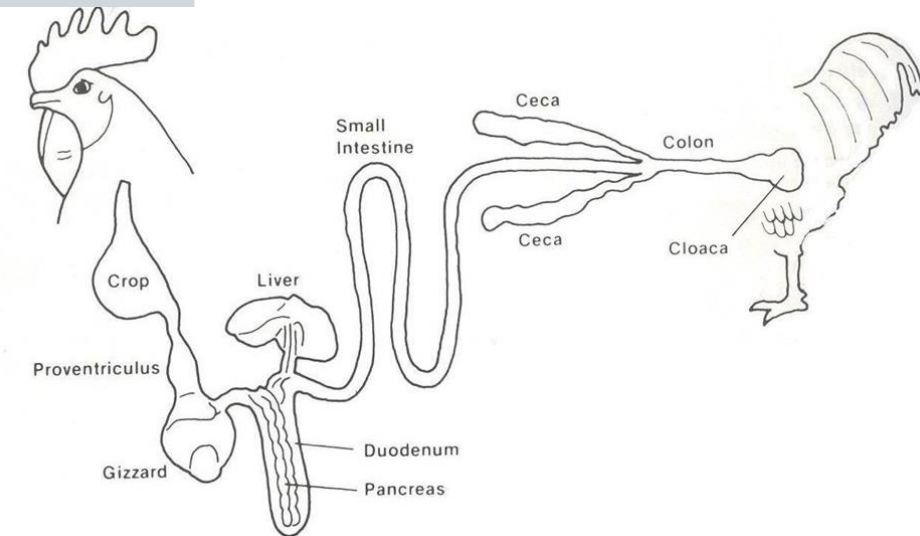
- 24 identical pens → 6 per treatment
- 25 birds (mixed gender) per pen



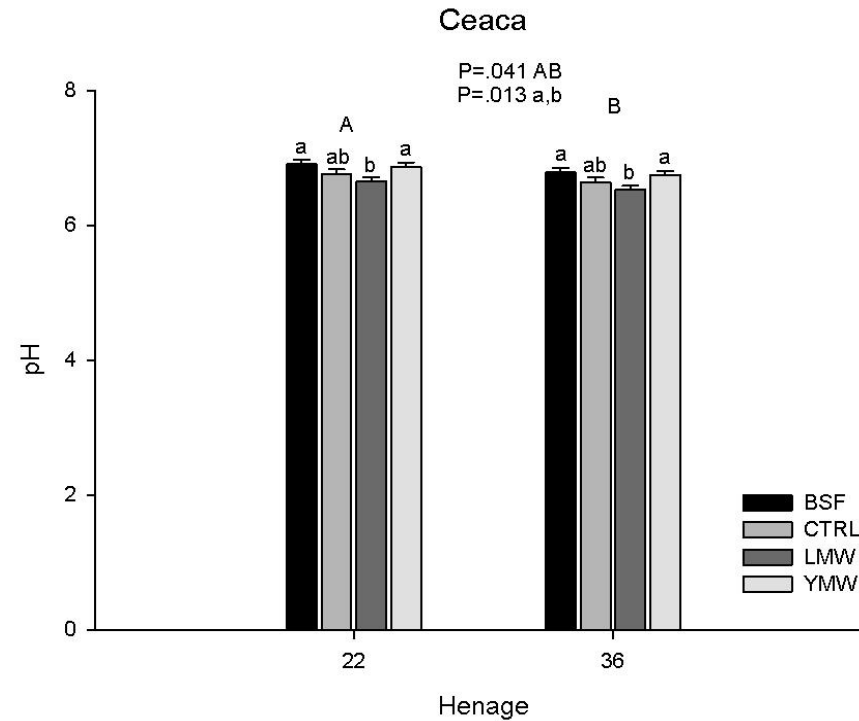
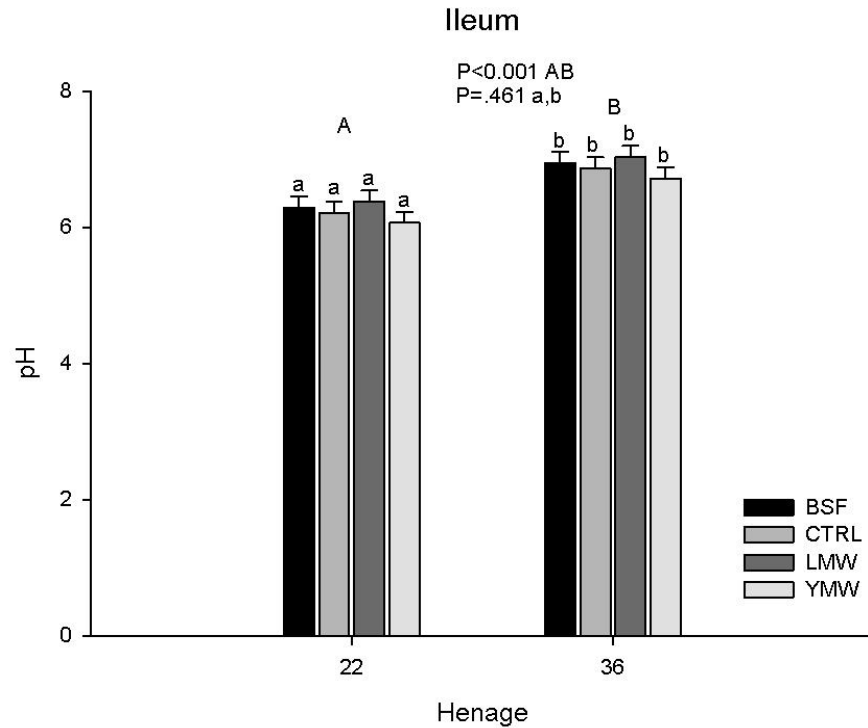
SLAUGHTER

Sample location	Sample type	Analyses
Crop	Digesta	pH
Ileum	Digesta	pH, weight, SCFA, enum. bacteria
Ceca	Digesta	pH, SCFA, enum. bacteria
Spleen	Organ	Weight
Bursa of fabricius	Organ	Weight

3 female hens per pen → pooled sample

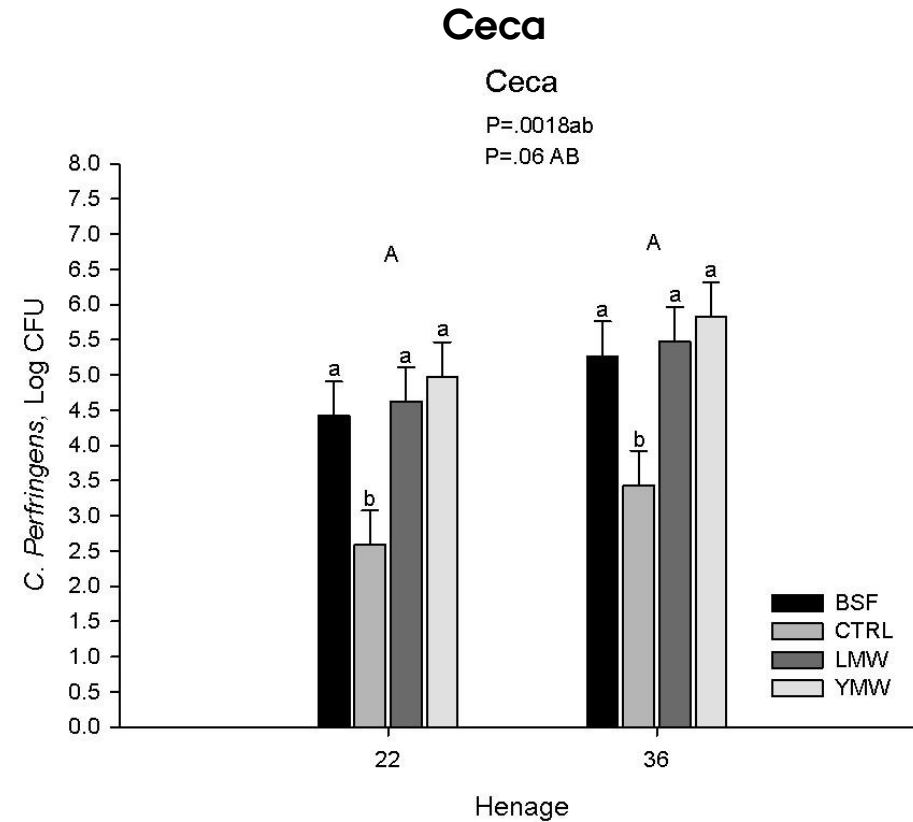
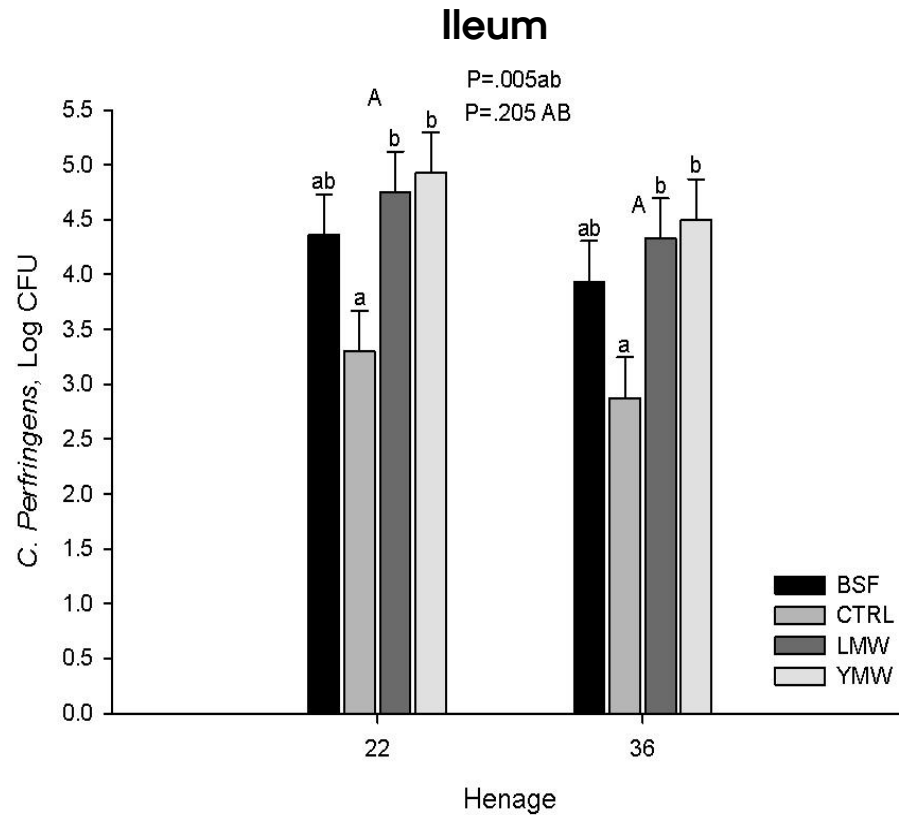


RESULTS: PH



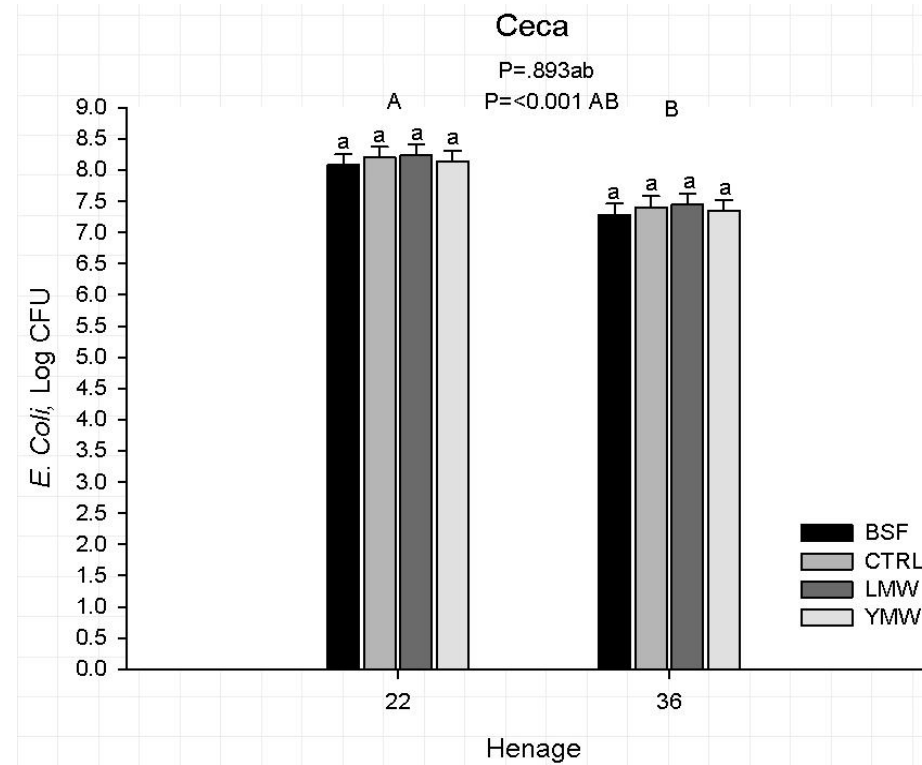
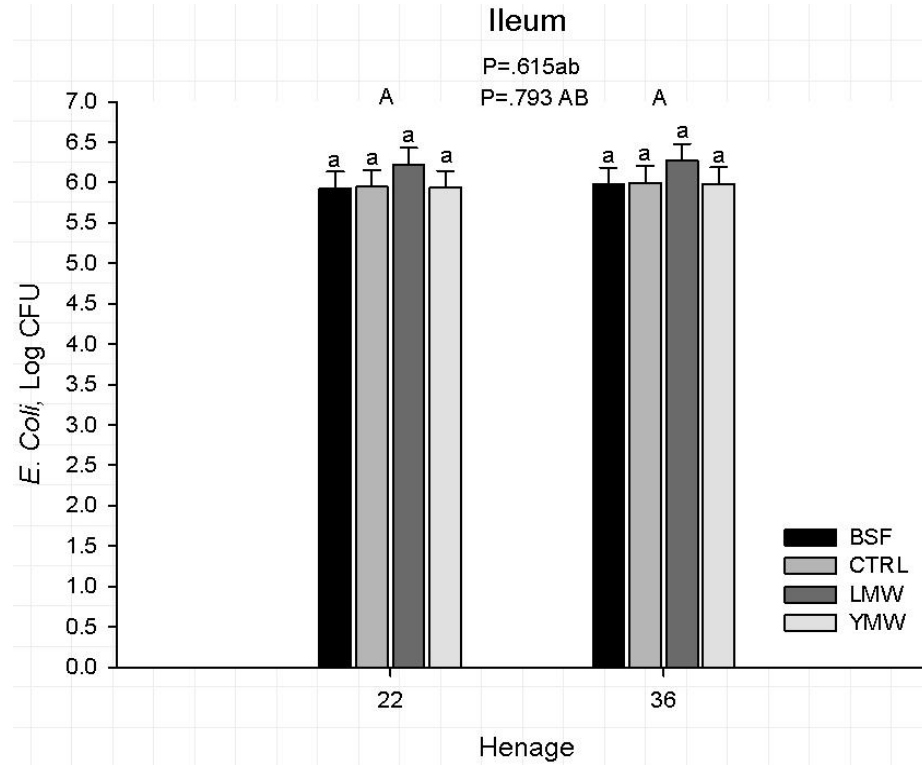
Ceaca: pH LMW reduced compared to BSF and YMW, BUT NOT compared with CTRL

RESULTS: *CLOSTRIDIUM PERFRINGENS*



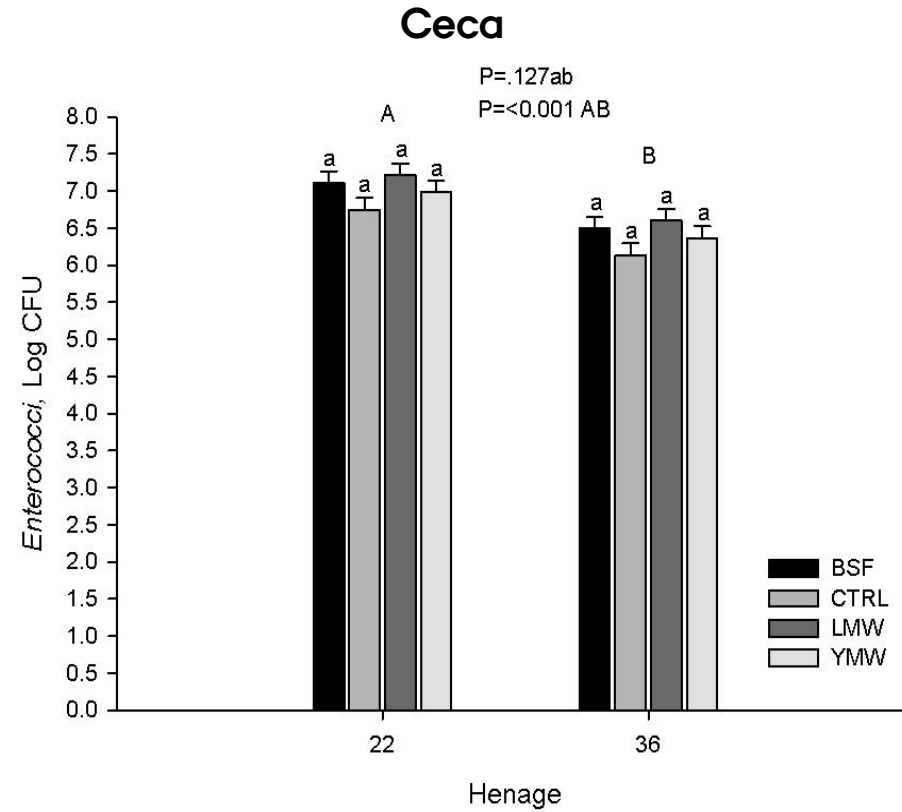
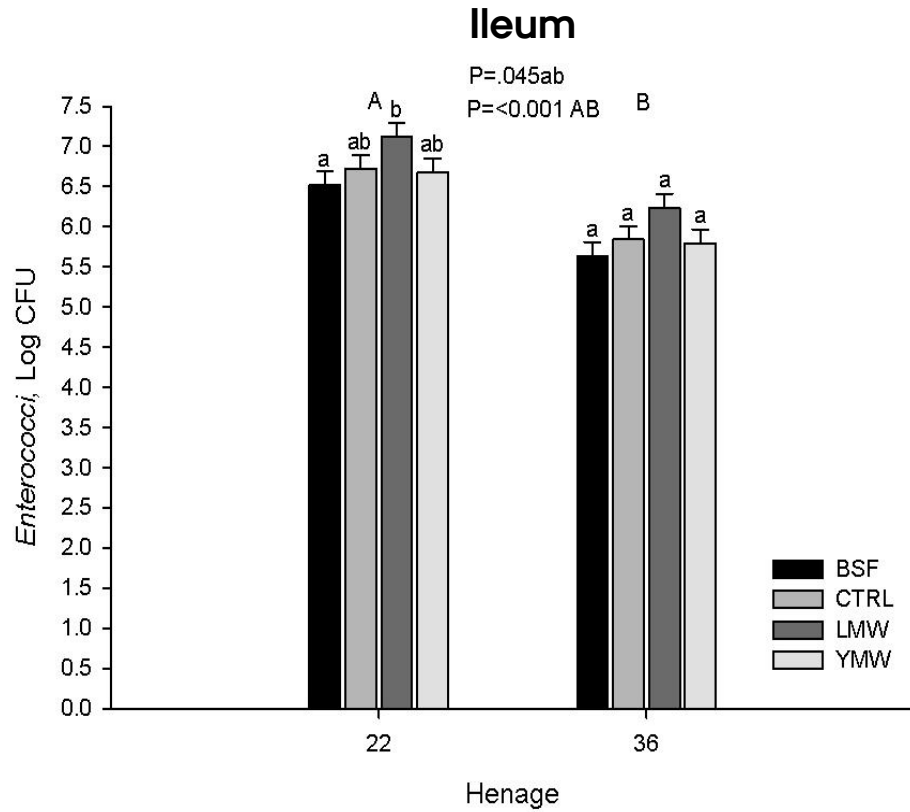
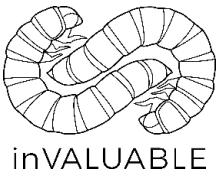
Increased levels of *C. Perfringens* are observed when feeding diets containing insect meal
→ Probable effect of protein level!

RESULTS: *E. COLI*



No significant effect of treatment or age on *E. Coli* coliforms

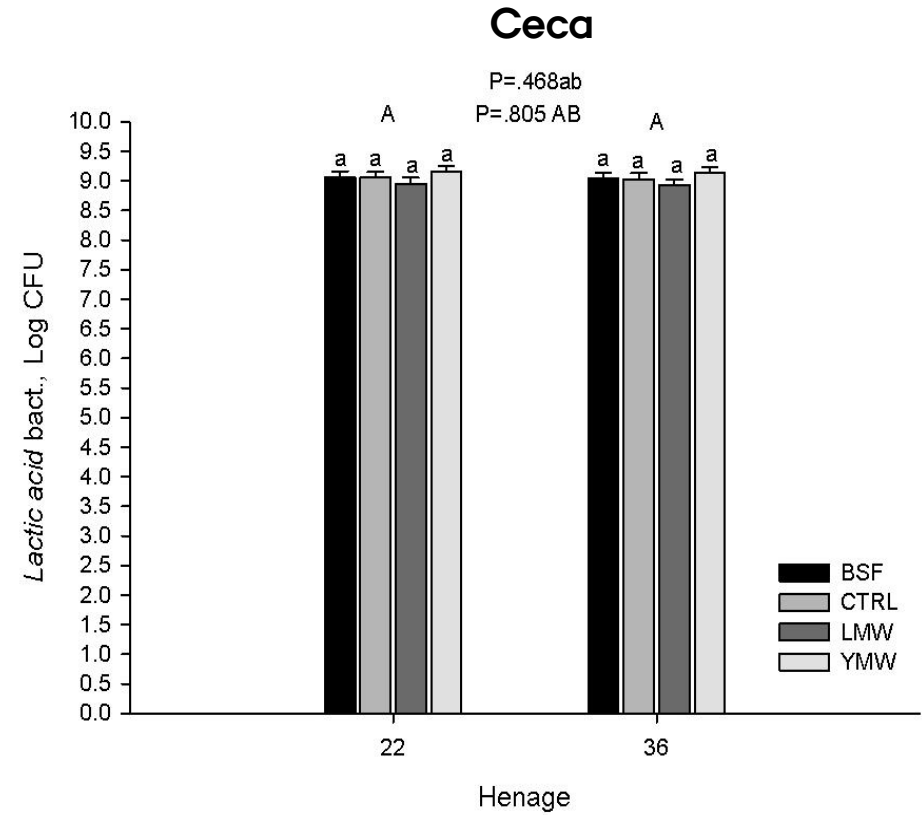
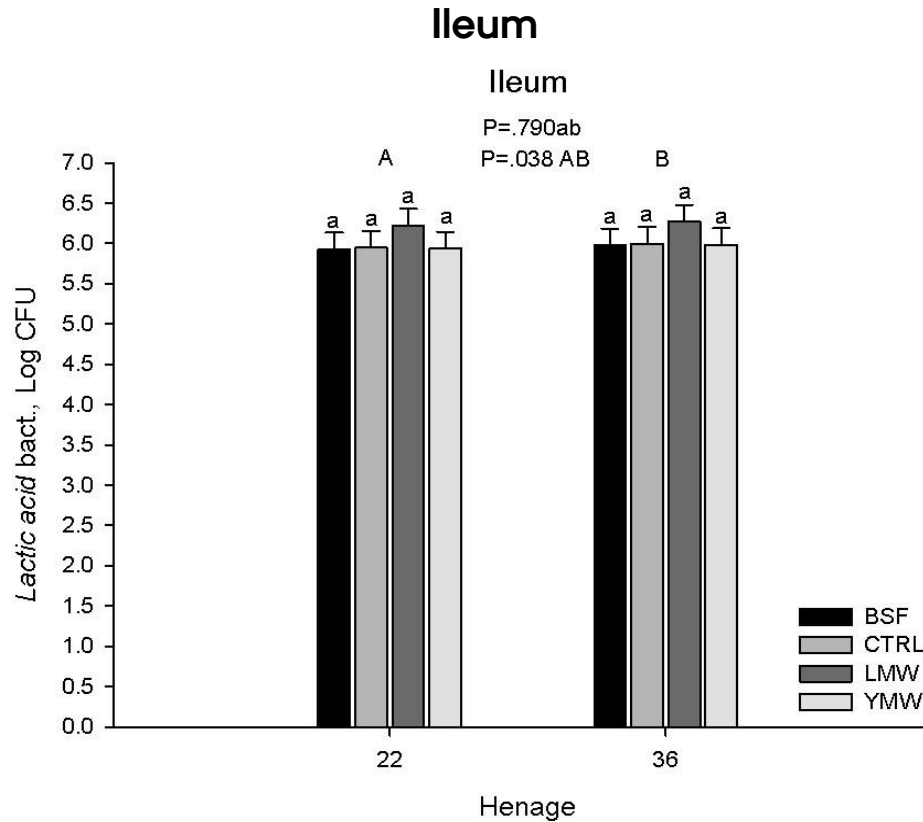
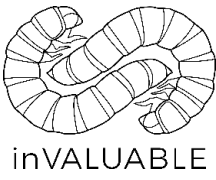
RESULTS: *ENTEROCOCCI*



At 22 weeks less Enterococci CFU's were observed for BSF than LMW

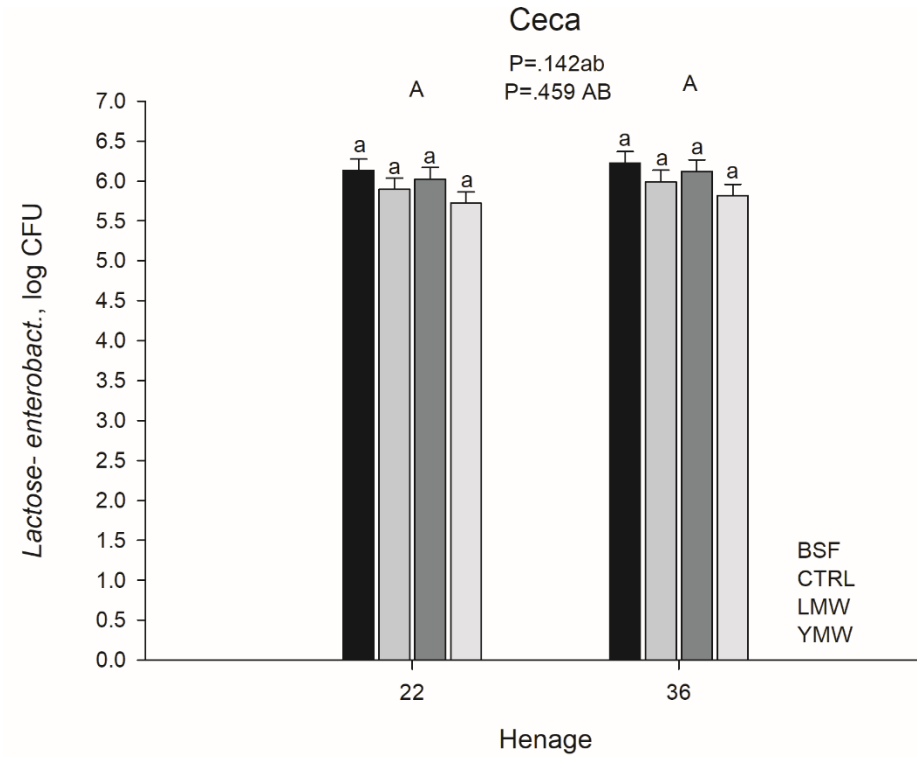
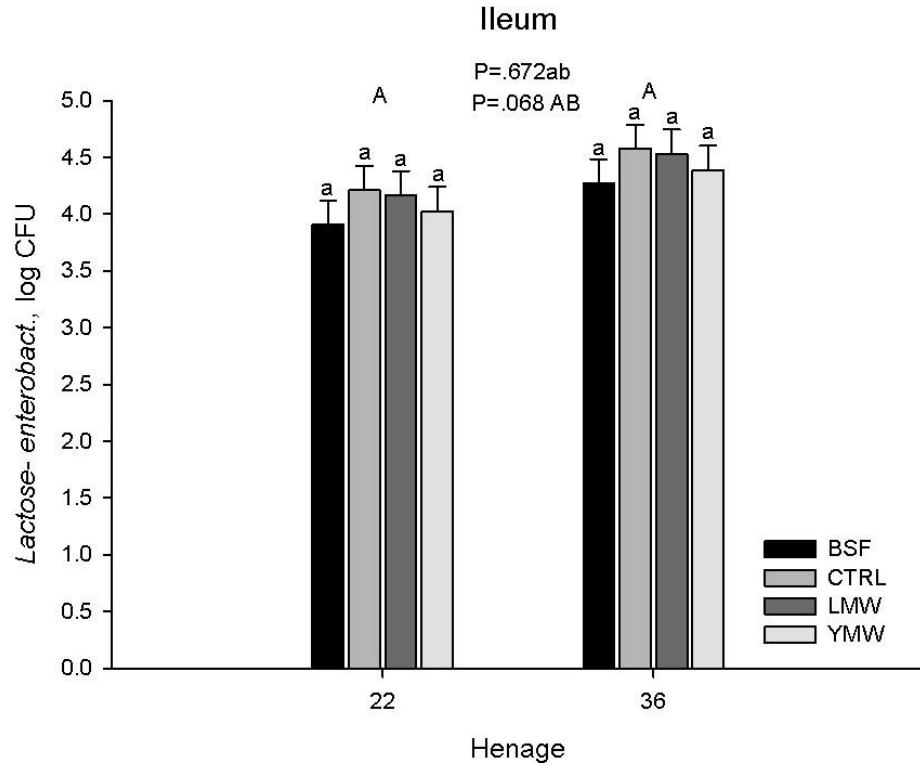


RESULTS: *LACTIC ACID BACTERIA*



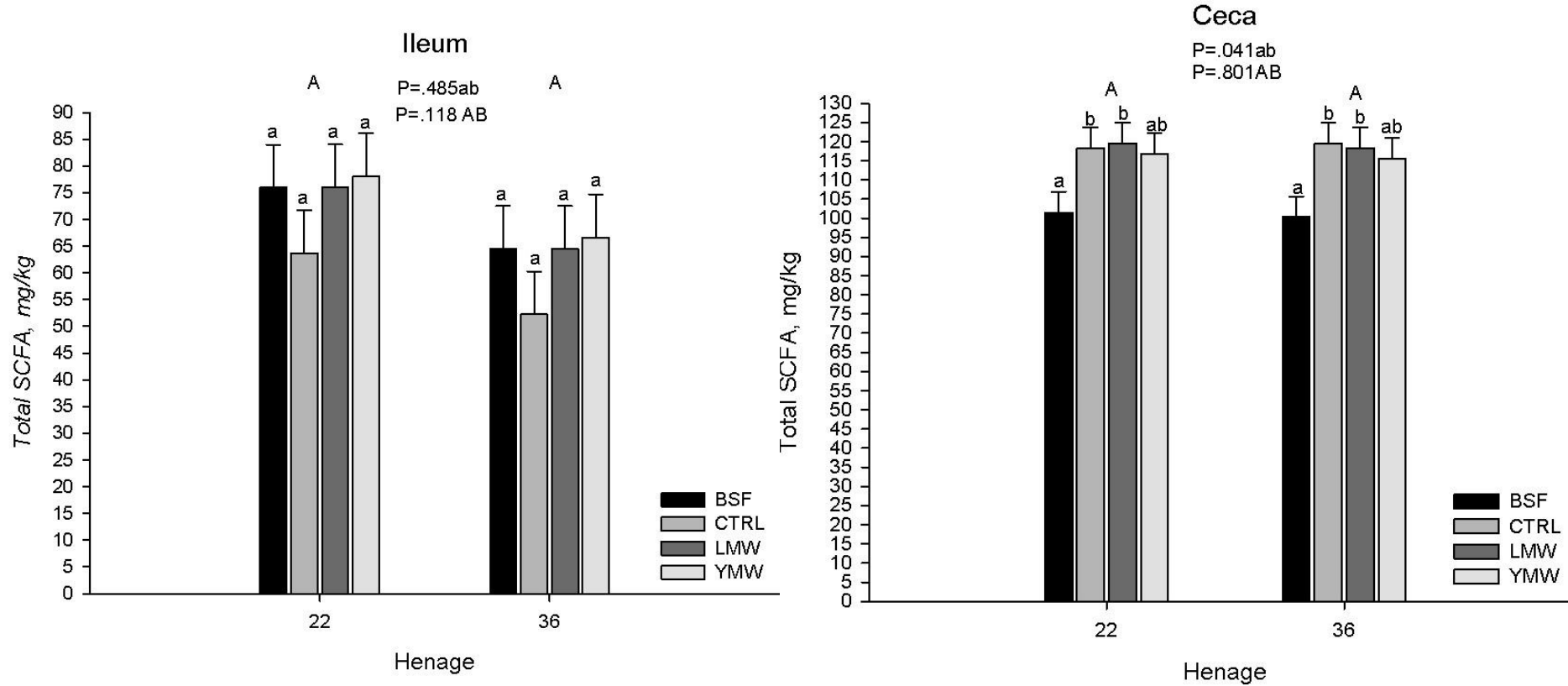
No treatment or age effect on LAB in either ceca or ileum

RESULTS: *LACTOSE- ENTEROBACTERIA*



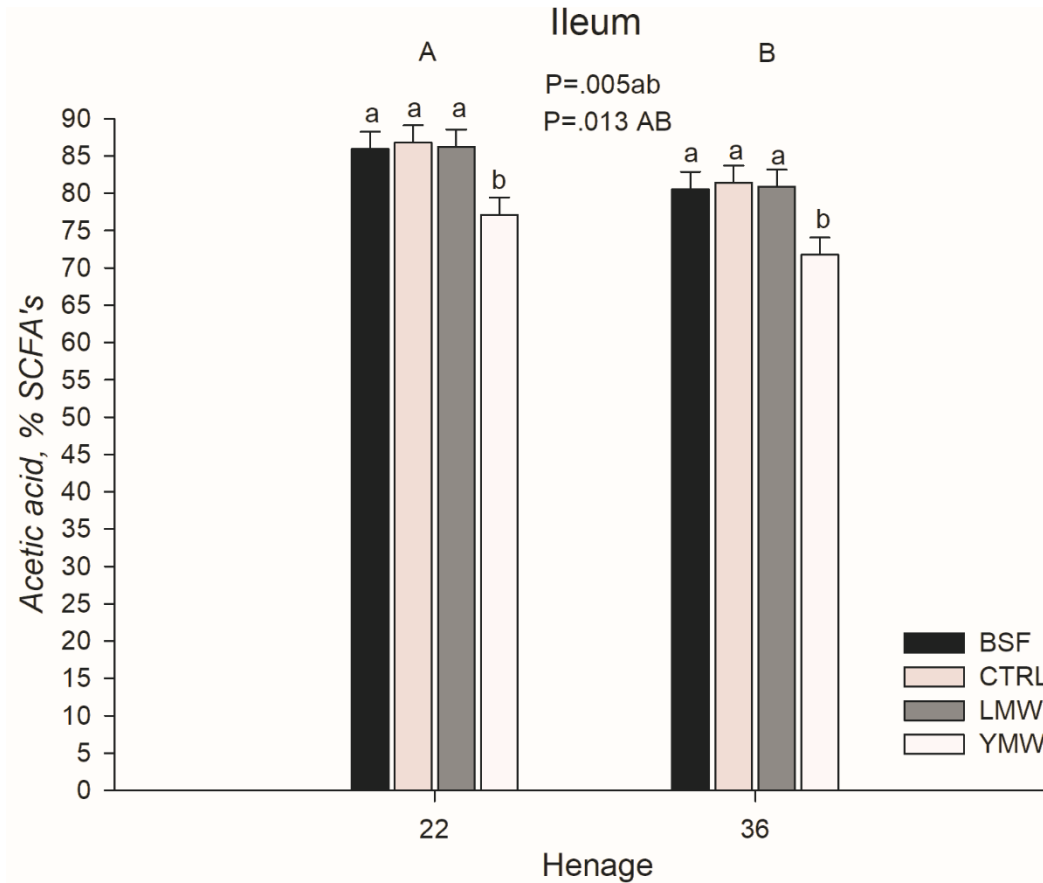
No significant differences

RESULTS: SCFA'S TOTAL



Total concentration of SCFA's was not affected in the ileum
 BSF had lower levels of total SCFA's than CTRL and LMW in the ceca

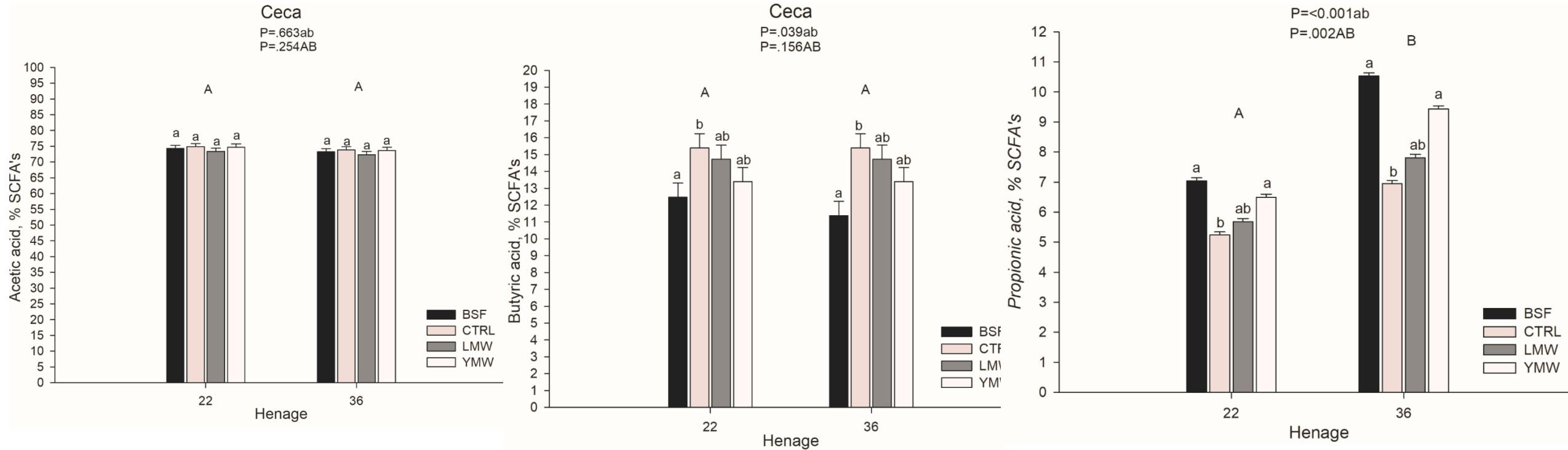
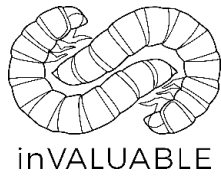
RESULTS: SCFA'S ILEUM



YMW had less acetate than all other treatments.

Butyric acid and proprionic acid were not detected in the majority of samples.

RESULTS: SCFA'S CECA



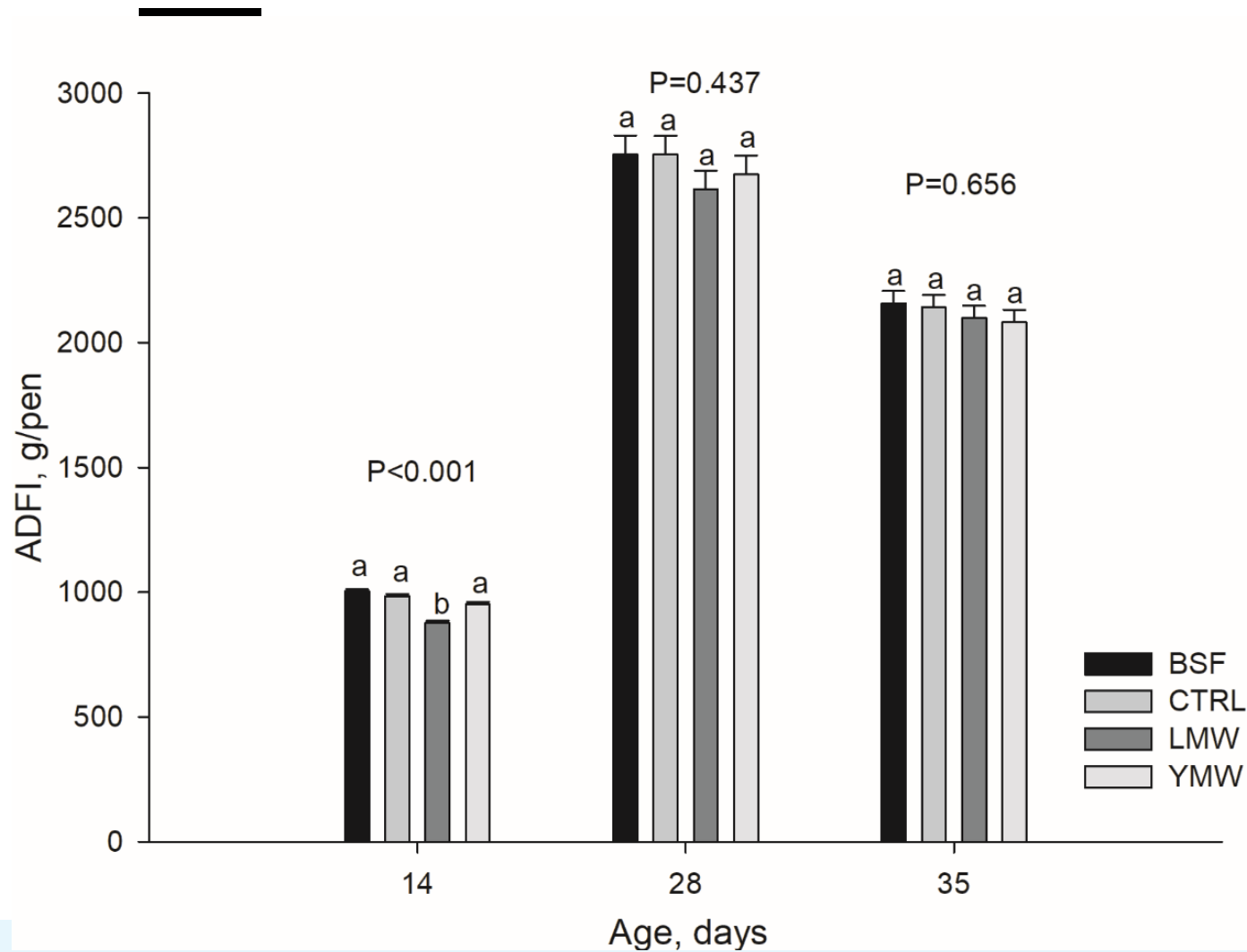
Acetate production was not different between treatments

Propionic acid was significantly higher in BSF and YMW compared with CTRL

Butyric acid was significantly lower in BSF compared with CTRL

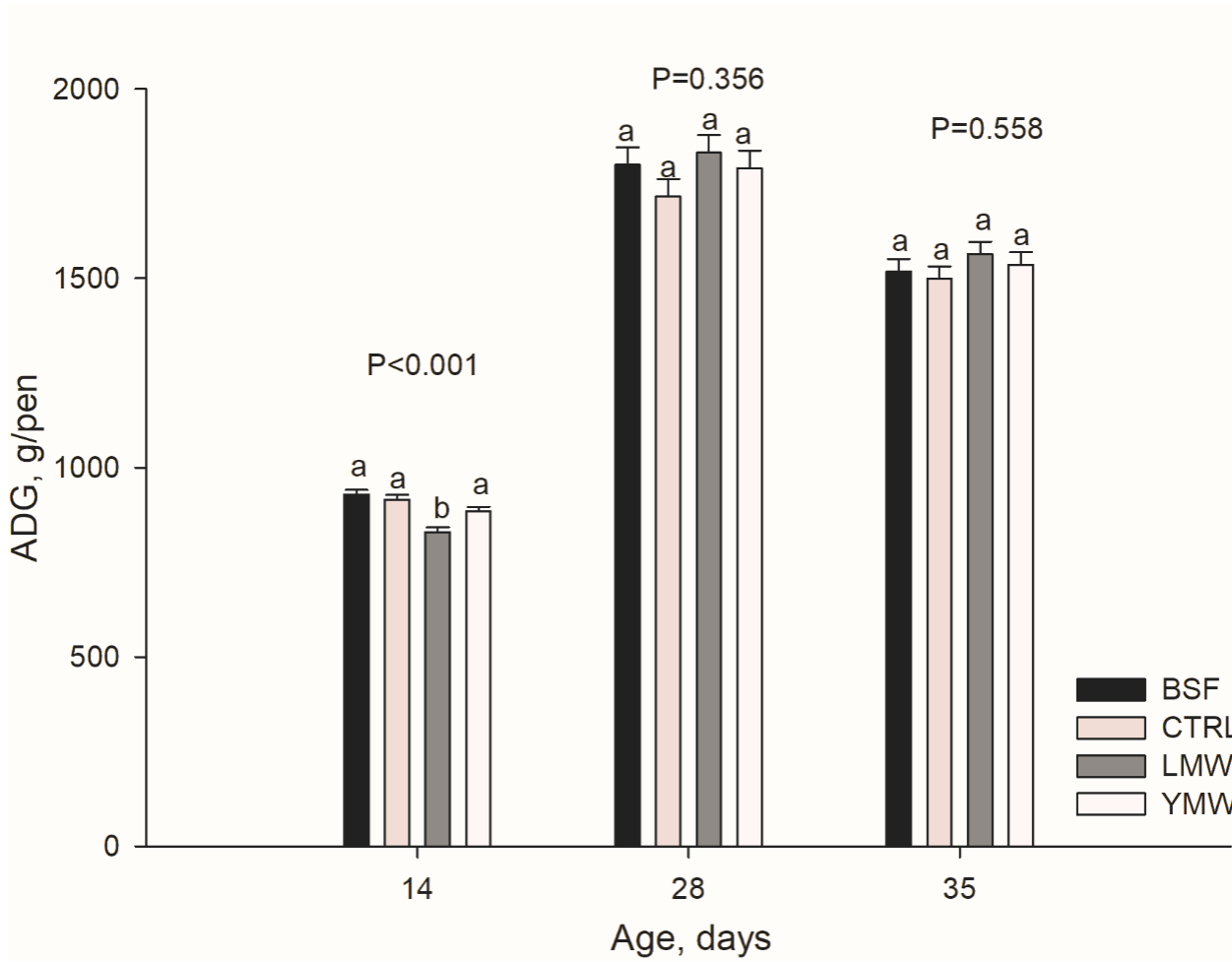
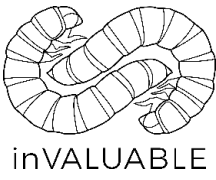


RESULTS: *FEED INTAKE*



Lower ADFI for LMW in the first 2 wks.
No significant differences thereafter.

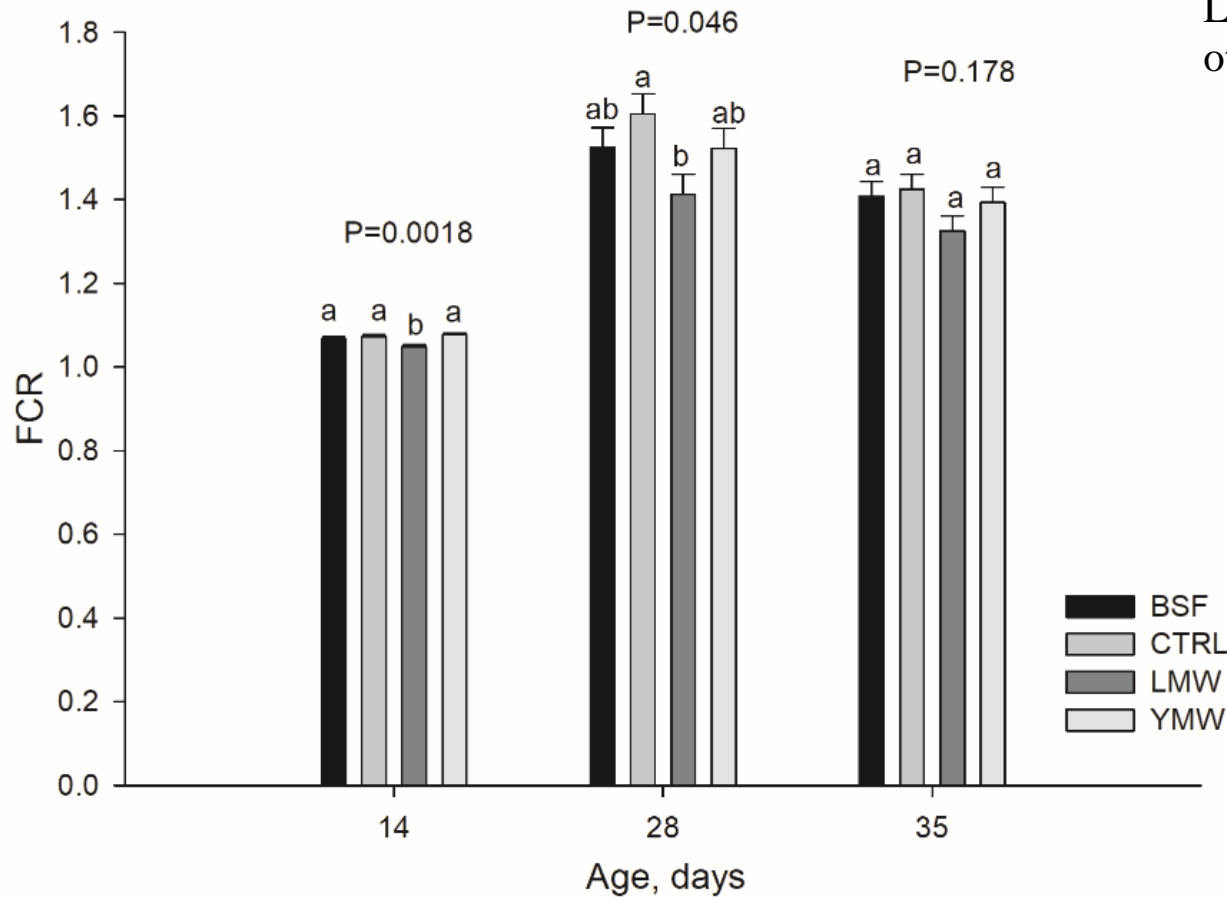
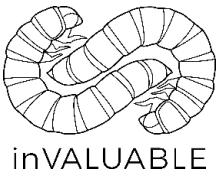
RESULTS: *GAIN*



Reduced ADG for LMW reflects reduced feed intake



RESULTS: *FEED CONVERSION RATIO*



LMW had a significantly lower FCR compared to all other treatments.

CONCLUSIONS

Gut health

- High *C. perfringens* counts in diets likely linked to protein level.
- Reduced total SCFA levels for BSF in the ceca might reflect low potential for fermentation in broilers
- Differences between insect meals → need for more detailed data on nutrients and their potential to alter microbiota/SCFA's.

Performance

- No difference in growth performance for LMW and YMW vs. CTRL.
- Feeding LMW led to improved feed conversion ratio.

Upcoming results: digestibility + trial with weaned piglets.



Thanks for your attention