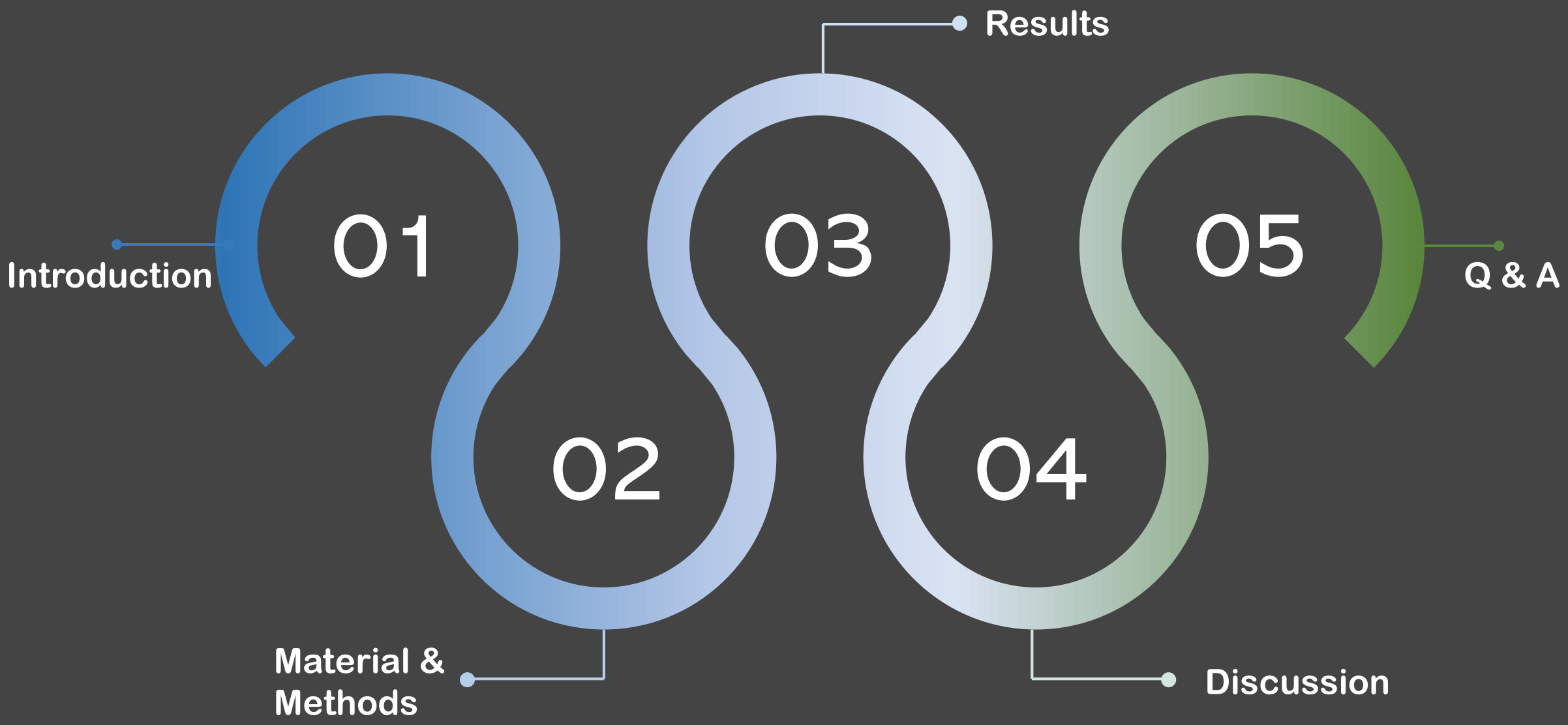
Effects of microencapsulated complex of organic acids and essential oils in weaing to finishing pigs

Division of Animal, Horticultural and Food Sciences

Major in Animal Science

Hanjin, OH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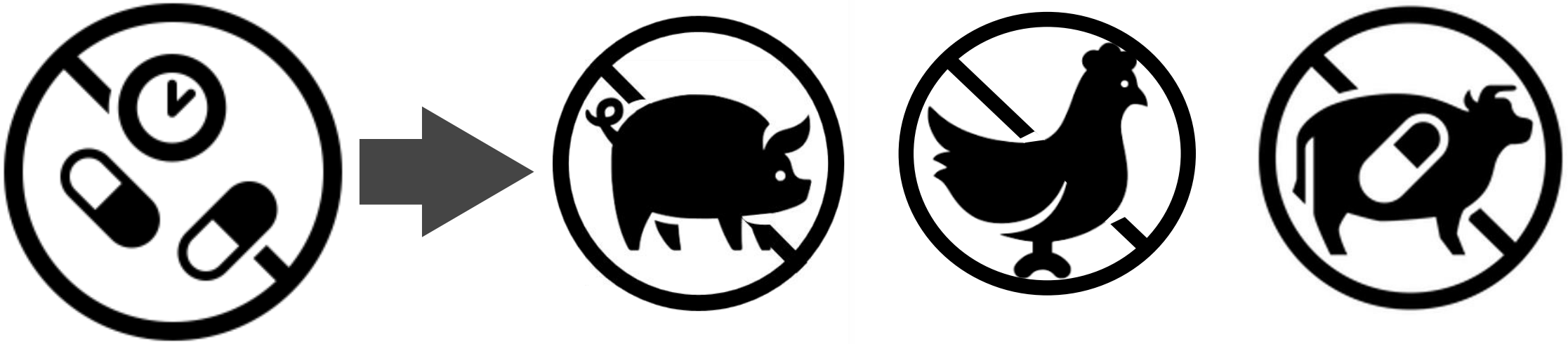
Introduction

- **The first ban on the farm use of antibiotic growth promoters was enacted in 1986 in Sweden**
- **Antibiotics in livestock feed increase numbers of antibiotic-resistant pathogens and antibiotic residue problem in animal products (Kelly et al., 1998)**



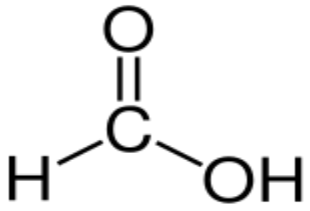
Antibiotics

Introduction

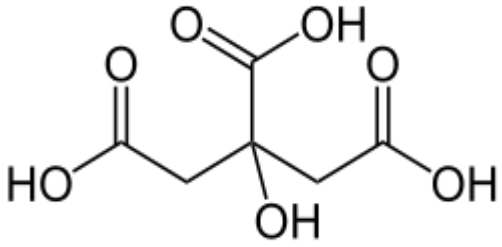
- **Consumers are interested in environment-friendly agricultural products**
- **So, we need for alternative method to improve growth and efficiency of pig production**

Introduction

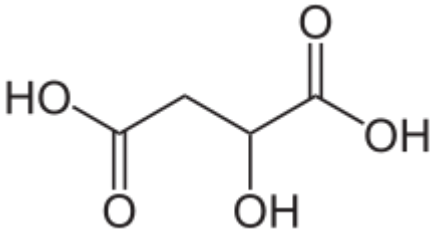
- **Organic acids can positively influence the microflora in gastrointestinal tract, thus improving the health (Camobe et al., 2001)**
  - ✓ **Antimicrobial activity of non-dissociated organic acids**
  - ✓ **Lowering the pH of digesta in stomach**
  - ✓ **Stimulating enzyme production and activity in small intestine**
  - ✓ **Providing nutrients to intestinal tissue**



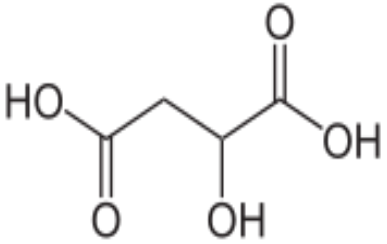
Formic acid



citric acid



Fumaric acid

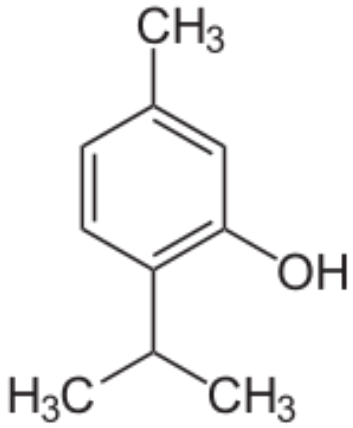


Mallic acid

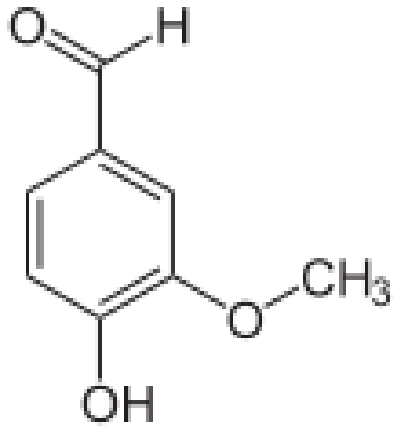
Introduction

- **Essential oils extracted from edible plants such as thymol and vanillin can improve performance and reduce diarrhea**
  - ✓ **Antimicrobial activity due to high content of phenolic derivatives (Falcone et al., 2005)**
  - ✓ **Improving immune status and intestinal ecology and nutrient digestibility in pigs (Li et al., 2012)**

Essential oil



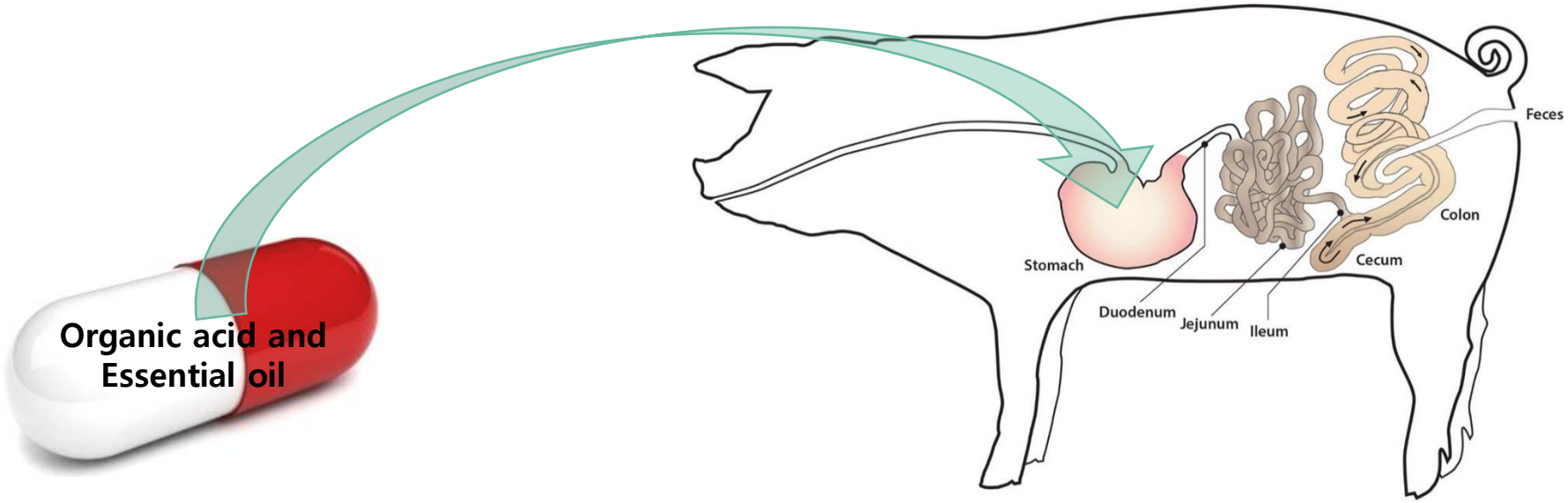
Thymol



Vanllin

Introduction

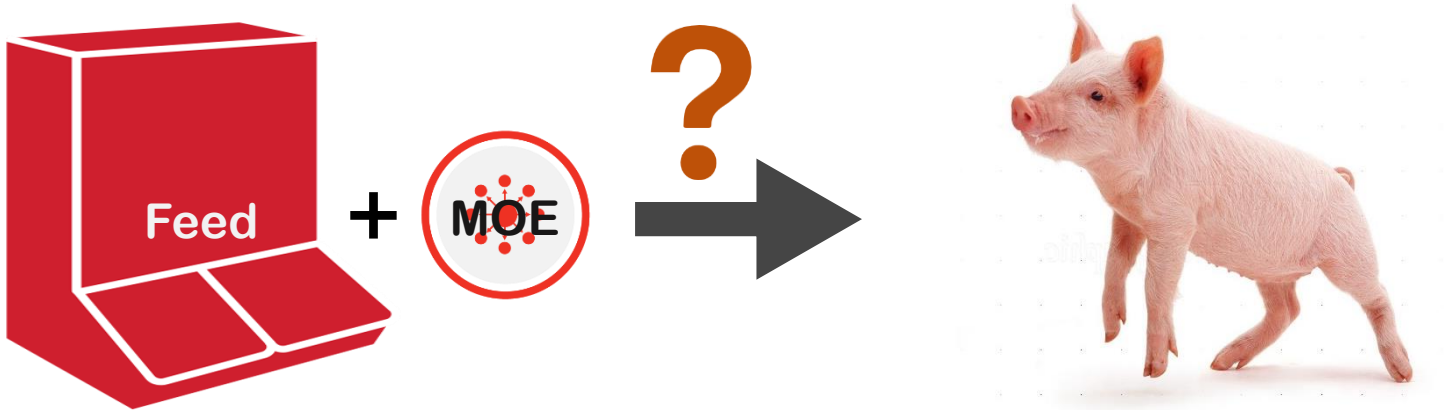
Why we used microencapsulated complex?



- Organic acids and essential oil with microencapsulation (MOE) for targeted delivery to different gut
- Improving the growth of beneficial micro organisms and interfering the survival rate of enteric pathogens

Introduction

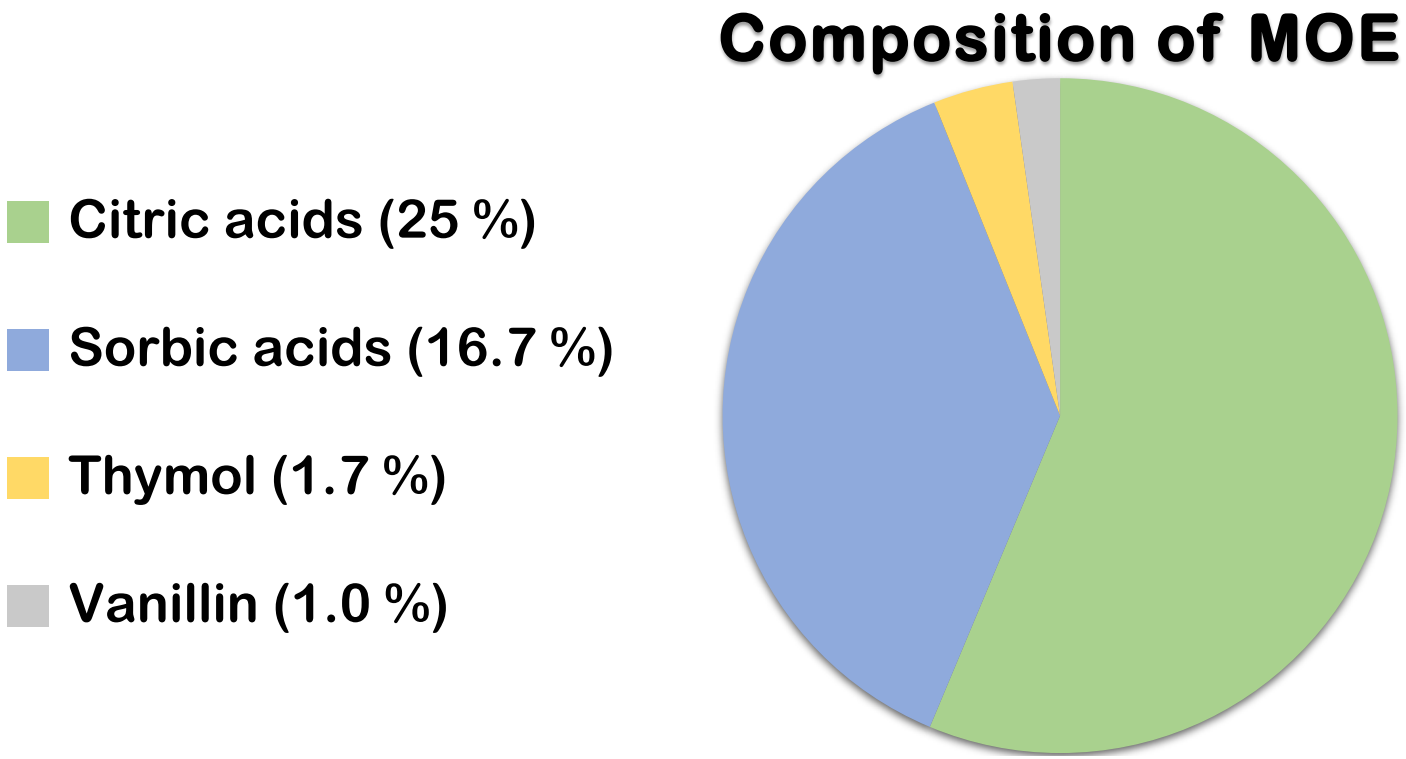
The objective of this experiment



- To evaluate the effect of microencapsulated complex of organic acids and essential oils (MOE) supplementation on growth performance, nutrient digestibility, blood profiles, fecal microflora and meat quality in weaning to finishing pigs

Material & Method

- The Microencapsulated organic acids and essential oils(MOE) is feed additive from VetAgroSpA (Aviplus®-S, 42100 Reggio Emilia, Italy)



Material & Method

Animals

Total 90 weaned pigs
(LYD, initial body weight : 6.47+0.2 7kg)

Grouped as

CON : basal diet (Formulated to NRC, 2012)

MOE1 : basal diet + 0.1 % MOE(weanling phase) & 0.025 % MOE (growing – finishing phase)

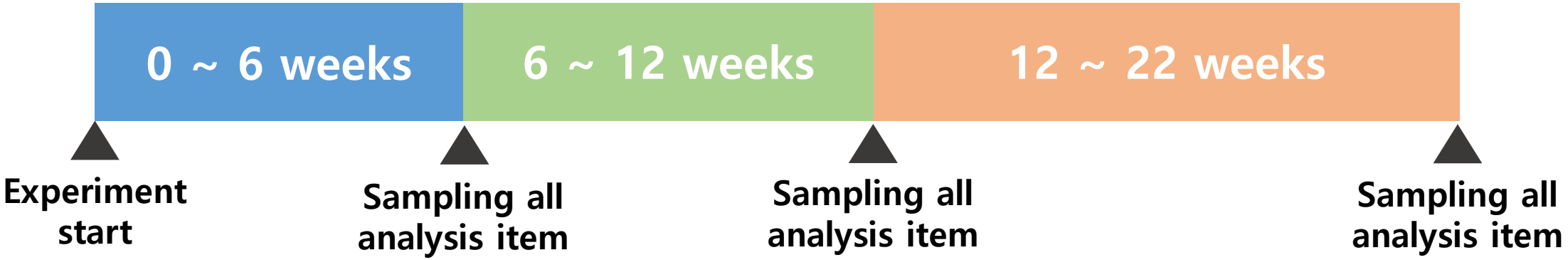
MOE2 : basal diet + 0.2 % MOE(weanling phase) & 0.050 % MOE (growing – finishing phase)

Experimental design : 6 replicates with 5 pigs per pen / 3 treatment – Complete block design

All pigs were allowed *ad libitum* access to feed and water

Material & Method

Experimental periods



Feed intake everyday, **Body weight** 3, 6, 12, 17, 22 weeks

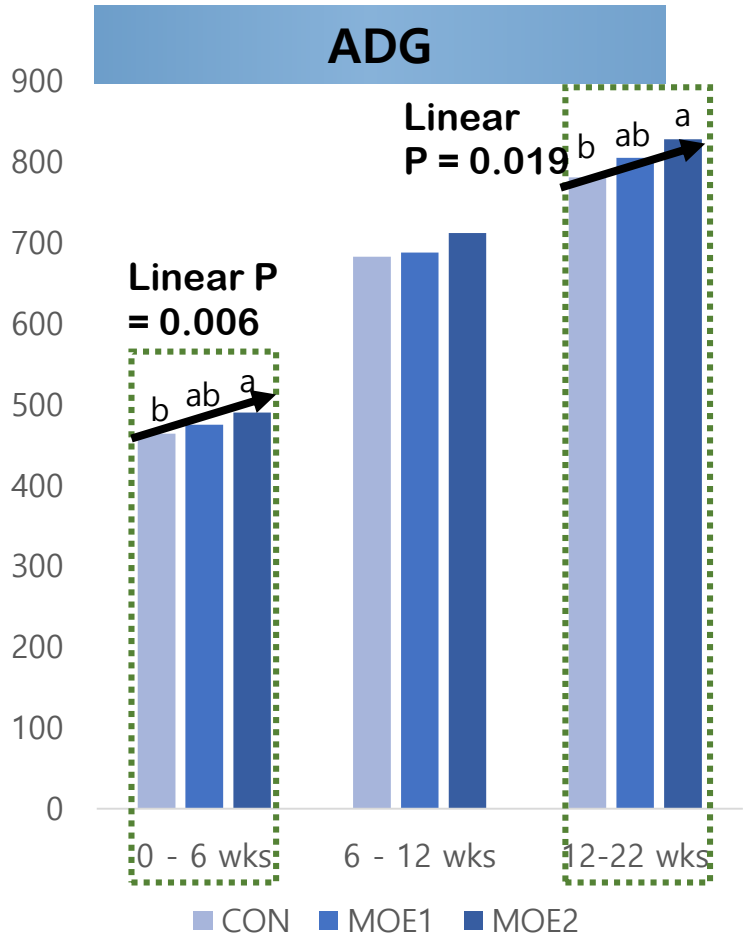
Material & Method

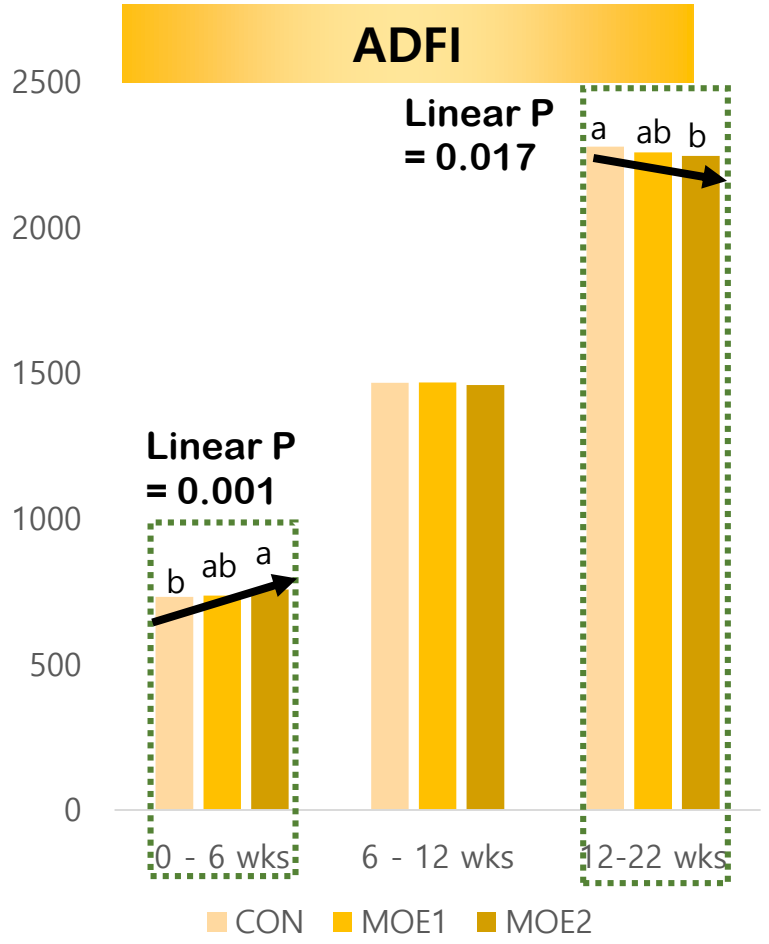
- **Analysis items**
  - ✓ Growth performance – Average daily gain(ADG), Average daily feed intake(ADFI), Feed efficency(G/F)
  - ✓ Digestibility – Dry matter(DM), Crude protein (CP), Energy
  - ✓ Blood profiles – White blood cell(WBC), Red blood cell(RBC), Lymphocyte, Immunoglobulin G(IgG)
  - ✓ Microbiota – *E.Coil, Lactobacilius*
  - ✓ Carcass trait – Backfat thickness, Lean meat percentage(LMP)
  - ✓ Meat quality – Meat color(L*, a*, b*), Cooking loss, Drip loss, pH, Water holding capacity (WHC)
- **Statistical analyses**
  - ✓ GLM procedures – Turkey's multiple range test

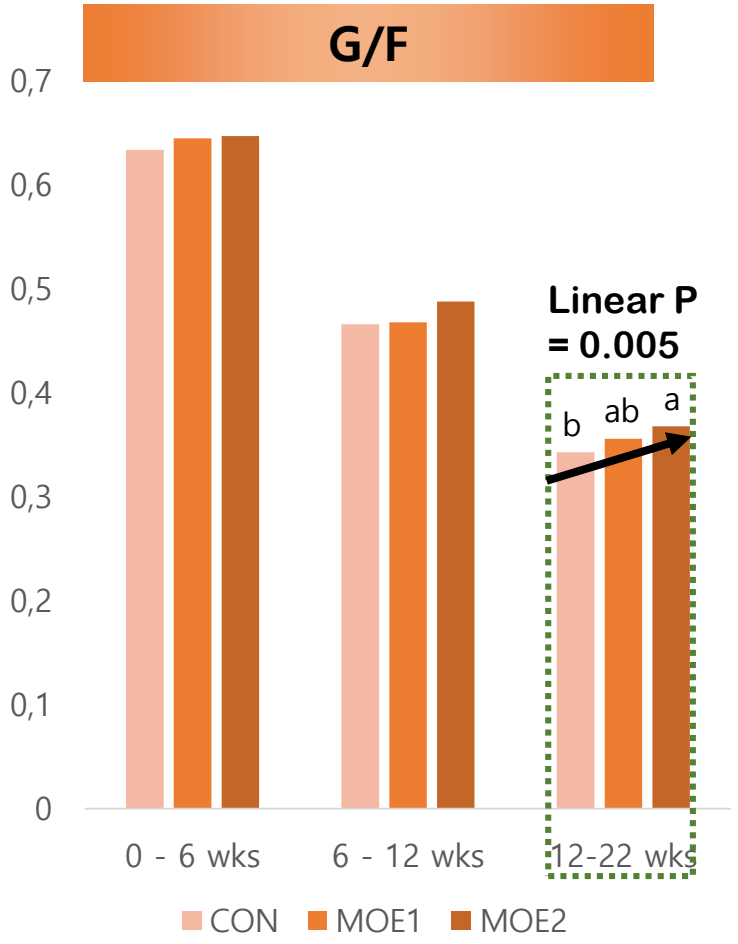
Results – Growth performance

Item	CON	MOE1	MOE2	SEM	Linear	Quadratic
Body weight, kg						
Initial	6.47	6.47	6.48	0.05	0.924	0.951
22wks	109.29b	111.65b	114.89a	1.10	0.001	0.734
Week 0-6						
ADG, g	464b	475ab	490a	5.98	0.006	0.803
ADFI, g	732b	737b	757a	3.92	0.001	0.123
G/F	0.634	0.645	0.647	0.008	0.341	0.678
Week 6-12						
ADG, g	683	688	712	19.96	0.302	0.677
ADFI, g	1467	1469	1460	3.69	0.267	0.220
G/F	0.466	0.468	0.488	0.013	0.224	0.571
Week 12-22						
ADG, g	781b	805ab	828a	13.85	0.019	0.967
ADFI, g	2279a	2259ab	2247b	8.57	0.017	0.625
G/F	0.343b	0.356ab	0.368a	0.006	0.005	0.905

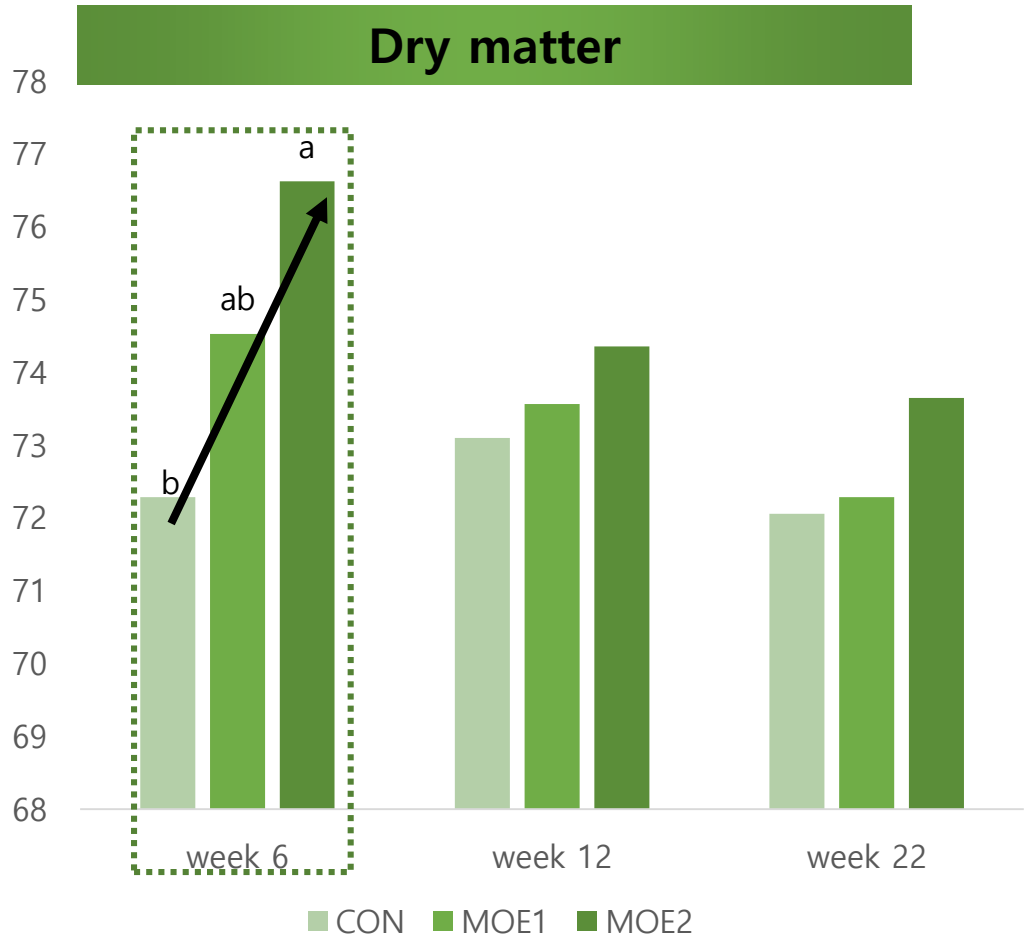
Results – Growth performance





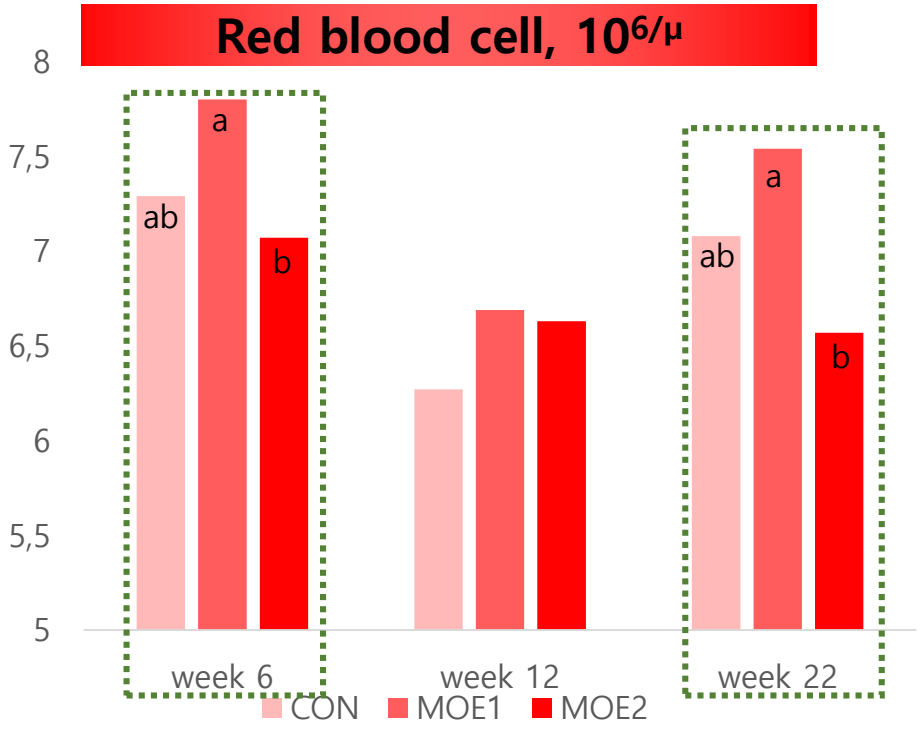


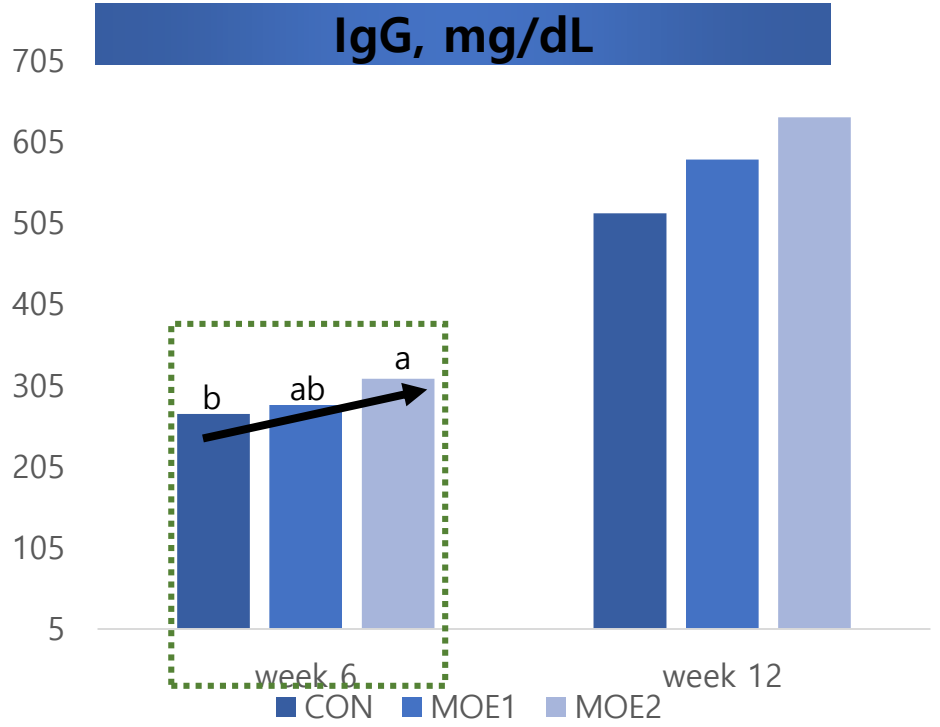
Results – Nutrient digestibility



- At 6 week, The ATTD of DM increased in pigs fed with MOE2 compared with pigs fed CON ($P < 0.05$; linear $P = 0.007$)
- The ATTD of Nitrogen and Energy were not affected by supplementing MOE ($P > 0.05$)

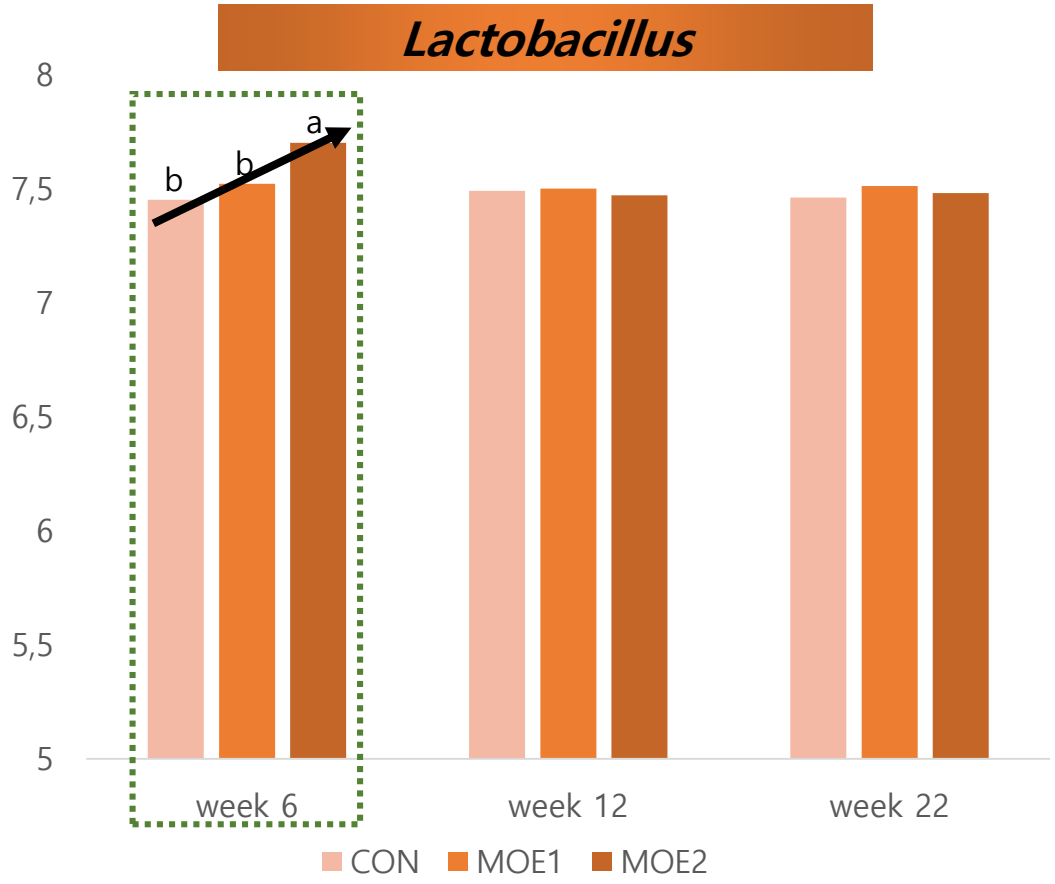
Results – Blood profile





- At 6 week and 22 week, The RBC concentrations showed quadratic effects with MOE density (P = 0.020; P = 0.030).
- At 6 week, IgG concentration was higher (P < 0.05; linear P = 0.027) in pigs fed the MOE 2 diet than in those fed the CON diet.

Results – Fecal microflora



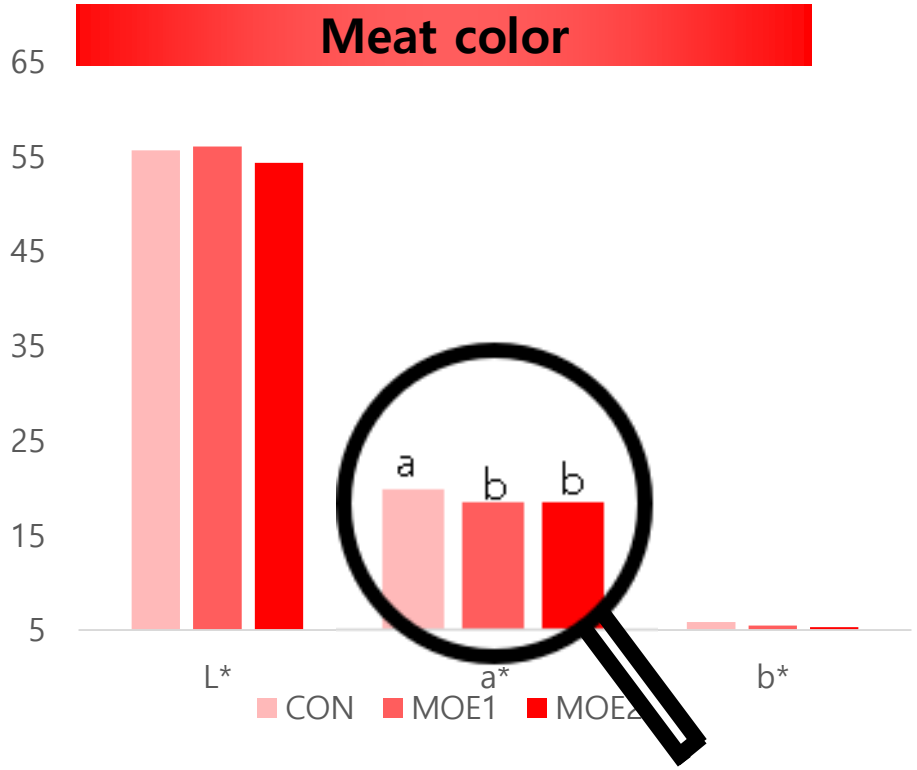
- At wk 6, fecal *Lactobacillus* concentration increased ($P < 0.05$; linear $P = 0.044$; quadratic $P = 0.045$) in MOE2
- Fecal *E.coli* concentration was not affected by supplementing MOE ($P > 0.05$)

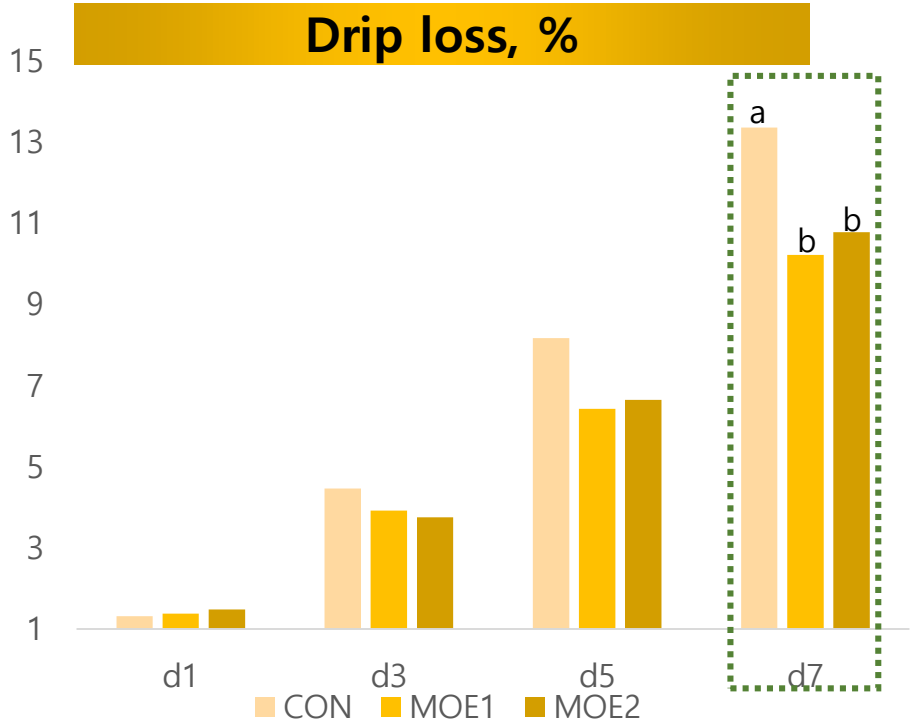
Results – Carcass trait

Items	CON	MOE1	MOE2	SE	Linear	Quadratic
Backfat thickness, mm	21.50	22.40	22.40	0.38	0.117	0.361
LMP, %	53.27	53.55	54.68	0.54	0.069	0.521

- **We observed no significantly differences (P > 0.05) in carcass among treatments.**

Results – Meat quality





- The meat color (a*) and drip loss on d 7 decreased ($P < 0.05$; linear $P = 0.028$ and linear $P = 0.026$) in MOE1, MOE2 treatments compared with CON treatmeant

Conclusion

- Supplementing the diets with 0.2 % MOE could increase BW, ADG and G/F linearly also MOE had positive effect on the ATTD of DM .

- Supplementing the diets with 0.2 % MOE increased the levels of RBC and IgG also they had positive influence on increasing fecal lactobacillus counts.

- MOE had a significant effect on reducing meat color (a*) and drip loss on day 7.

- In conclusion, MOE supplementation could improve growth performance, nutrient digestibility, blood profile, fecal microflora and meat quality in weaning to finishing pigs.

Thank you