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21º CONFERENCIA INTERNACIONAL SOBRE PALMA DE ACEITE

21st International Oil Palm Conference

Feeding palm oil to pigs and broilers

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Palm oils as dietary lipids for monogastrics: chemometric profiles, energy values, and metabolic effects

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Dr. Jerry Shurson

UMN

Dr. Brian Kerr

USDA

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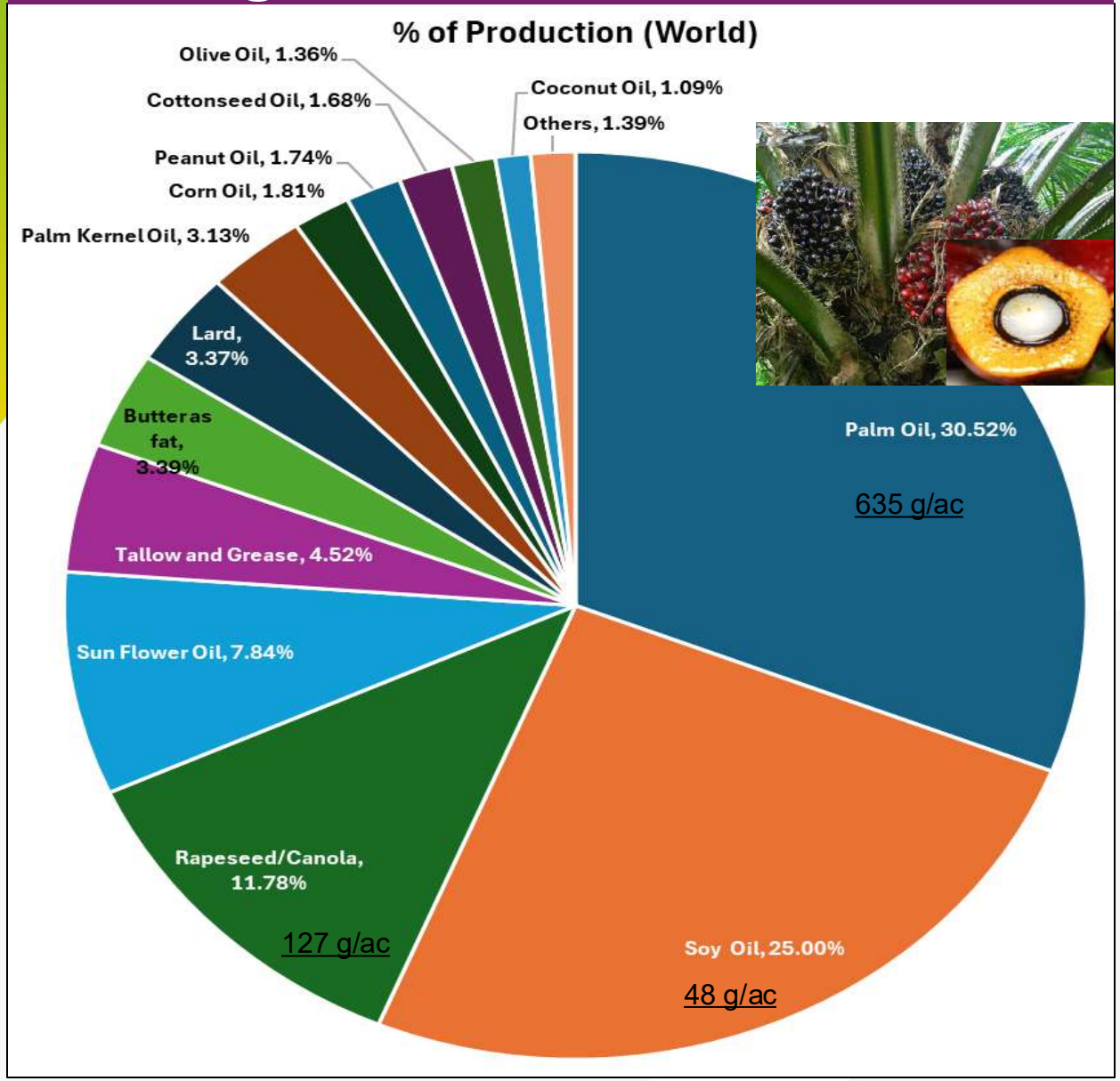
Palm oil is the most produced vegetable oil in the world



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Rank	Type	Total amount, tons
1	Soy oil	1,124,702
2	Poultry Fat	937,294
3	Yellow grease	347,542
4	Choice White Grease	289,680
5	Corn crude oil	234,677
6	Inedible tallow	218,274
7	Distiller corn oil	188,215
8	Canola oil	177,679
9	Used cooking oil	43,125
10	Fish oil	11,323

Annual Feed Consumption Report from IFEEDER

But palm oil is not a major feed grade oil in the United States

Objectives of our Fedepalma project

To compare palm oils with other lipids in monogastric feeding

1. *Chemometric profile*
2. *Performance & Energy values in pigs and broilers*
3. *Metabolic effects in pigs and broilers*

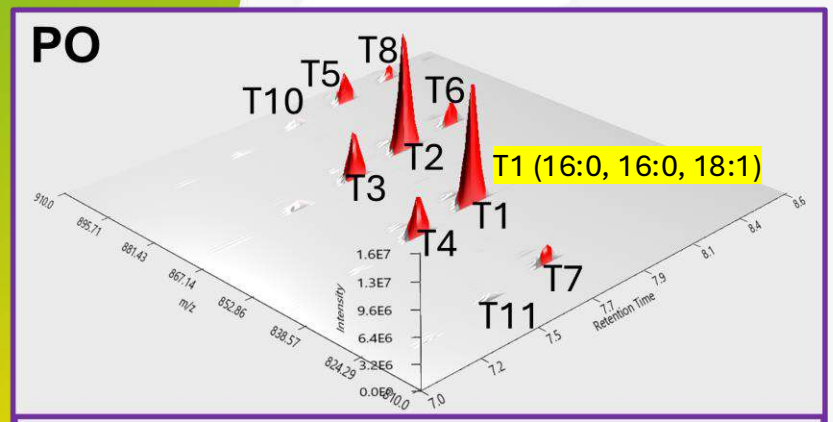
1. Chemometric profile

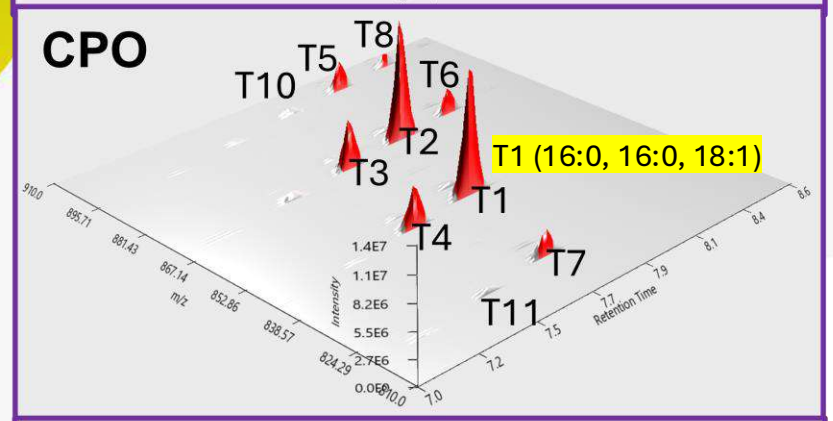
PO CPO CHOPO SO CSO CO DCO CWG

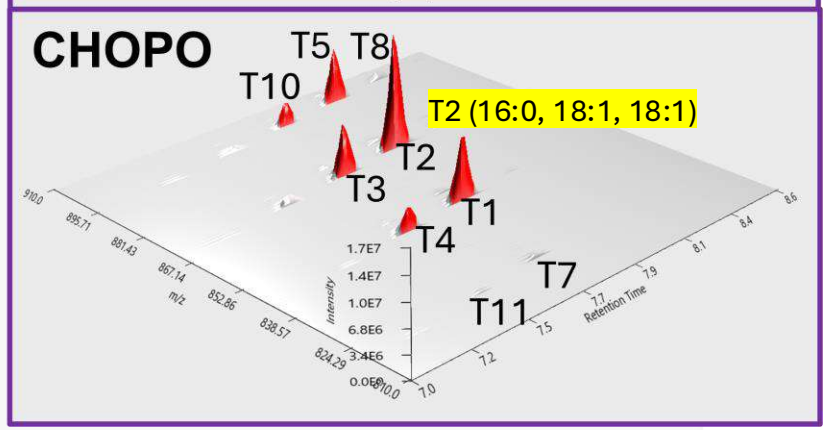
1	PO	RBD palm oil
2	CPO	Crude palm oil
3	CHOPO	Crude high oleic palm oil
4	SO	RBD soy oil
5	CSO	Crude soy oil
6	CO	RBD corn oil
7	DCO	Distiller corn oil
8	CWG	Choice white grease

Major component: triglycerides

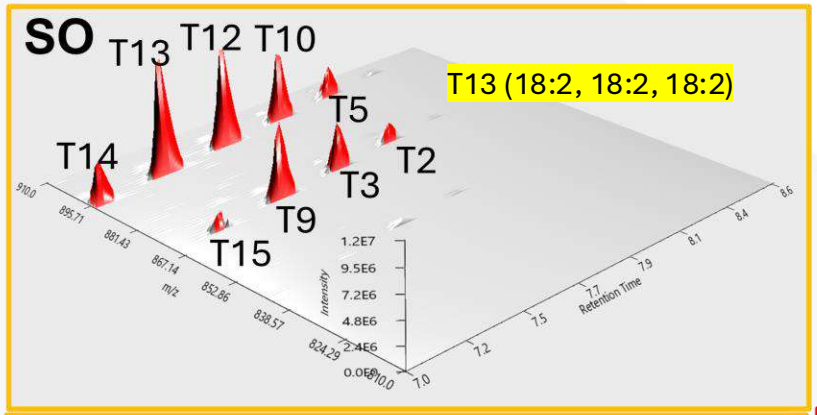
Palm oil

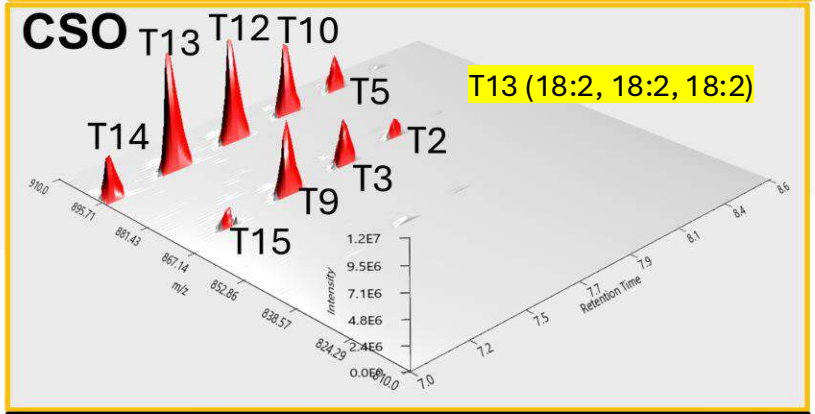


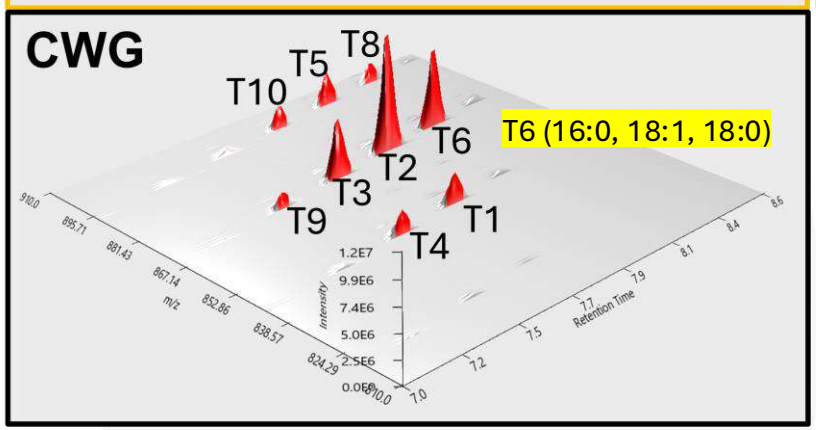




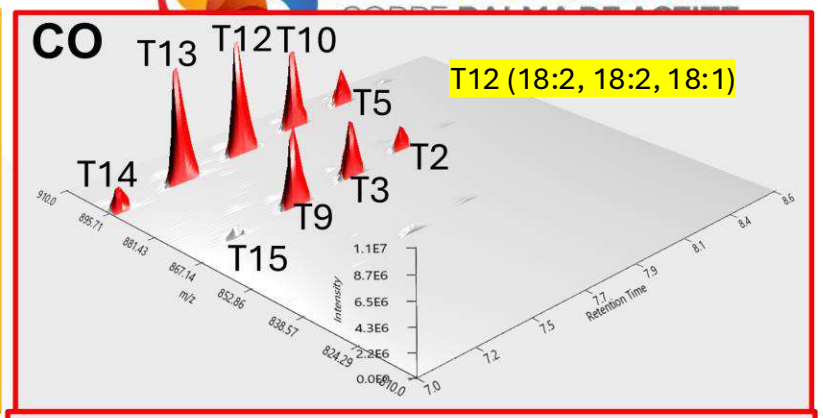
Soy oil

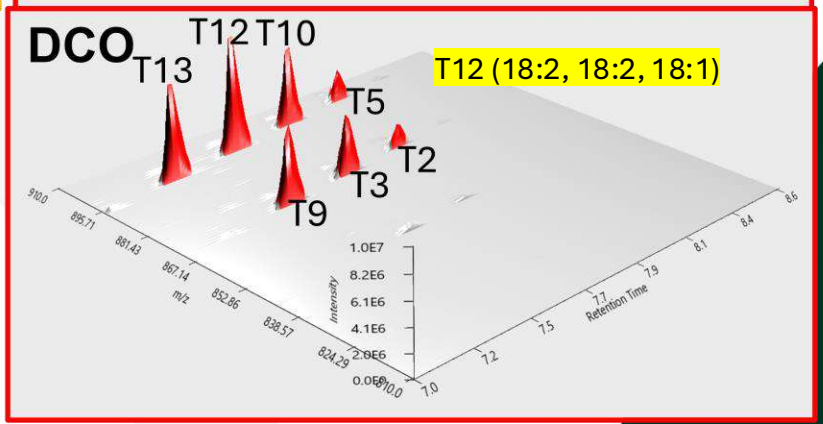






Corn oil

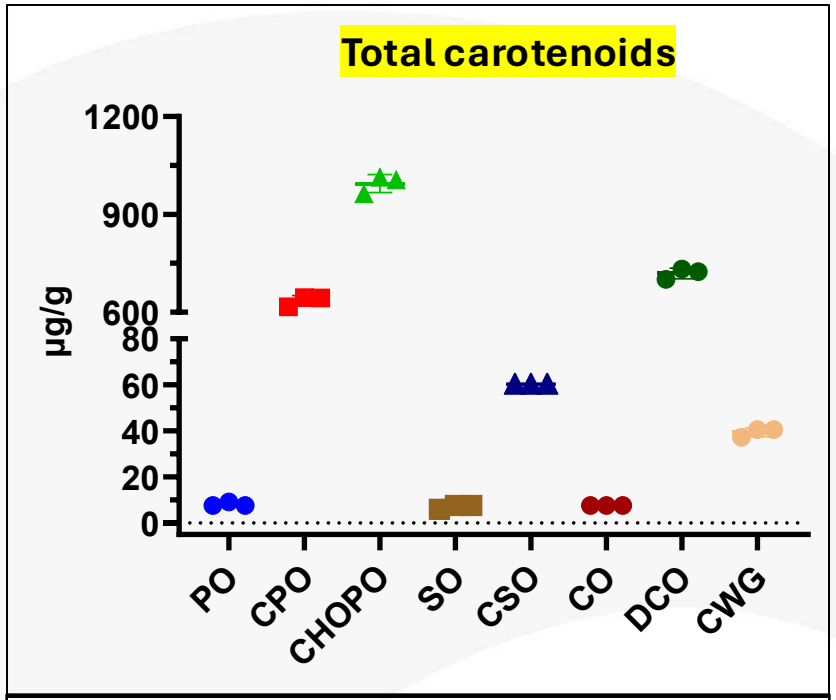


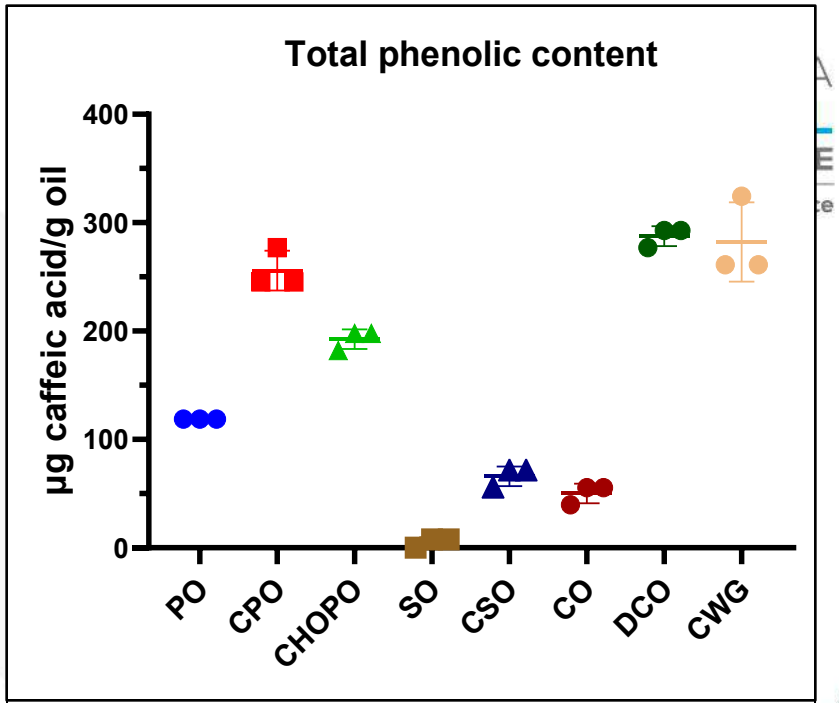


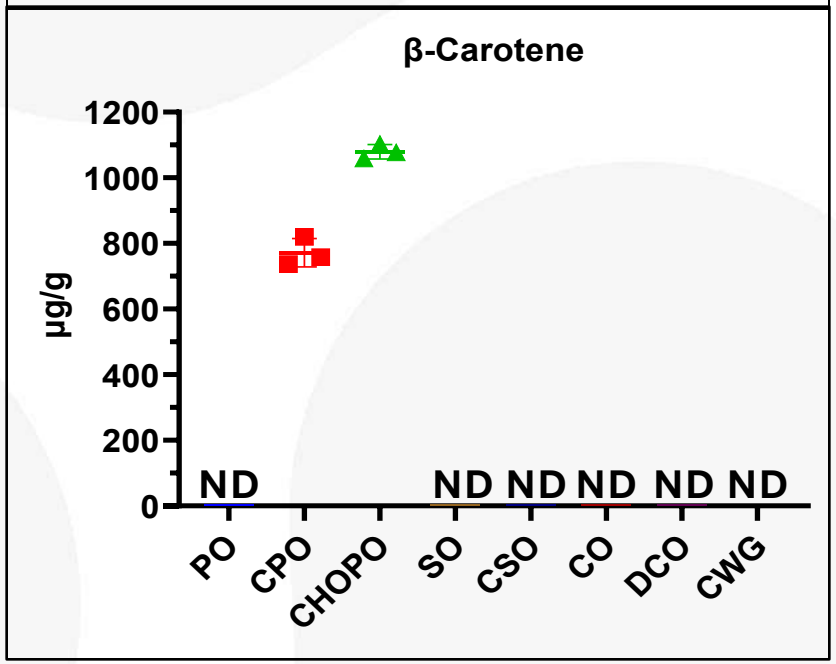
- Palm oils differs clearly from soy and corn oils.
- CHOPO shares some features with CWG.

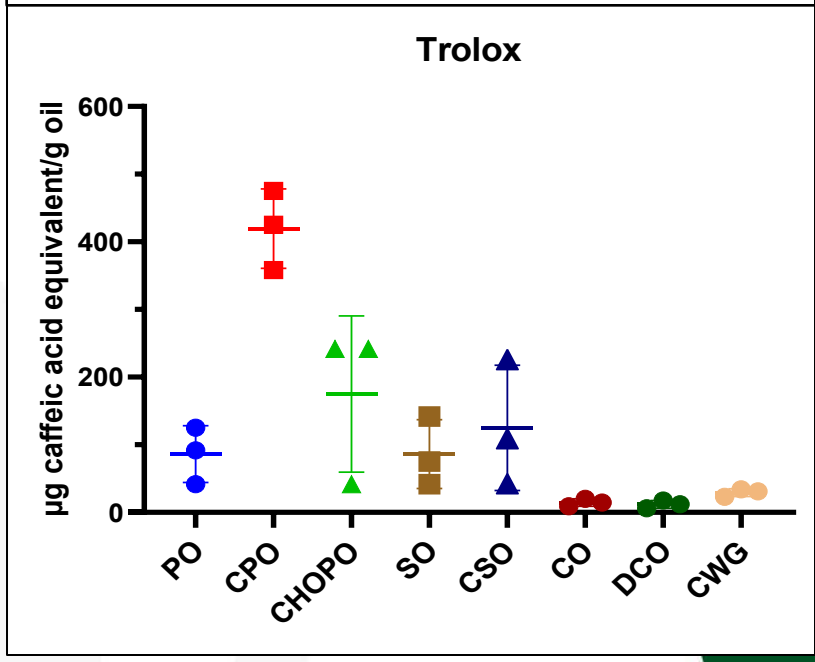
Minor component: carotenoids, phenolics, vitamin E

- β-Carotene is the dominant carotenoid in CPO and CHOPO.
- CPO stands out in its antioxidant content.



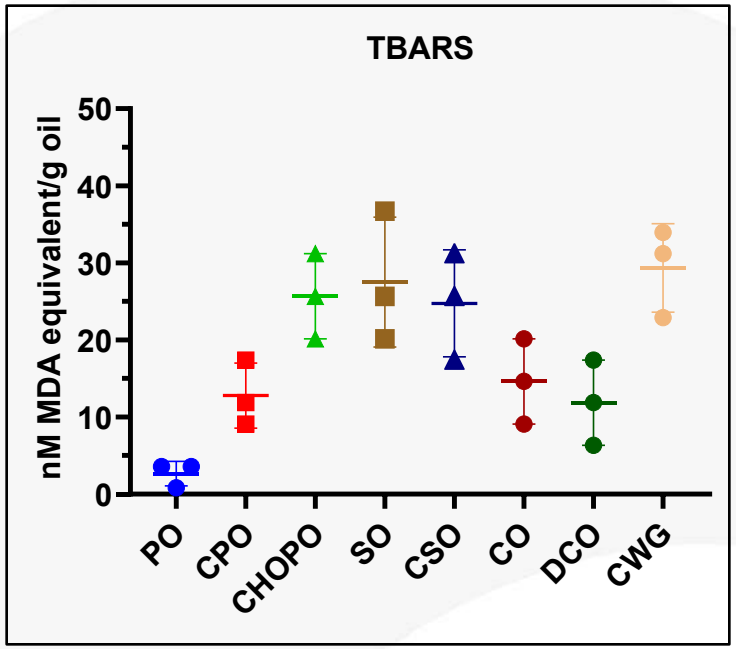


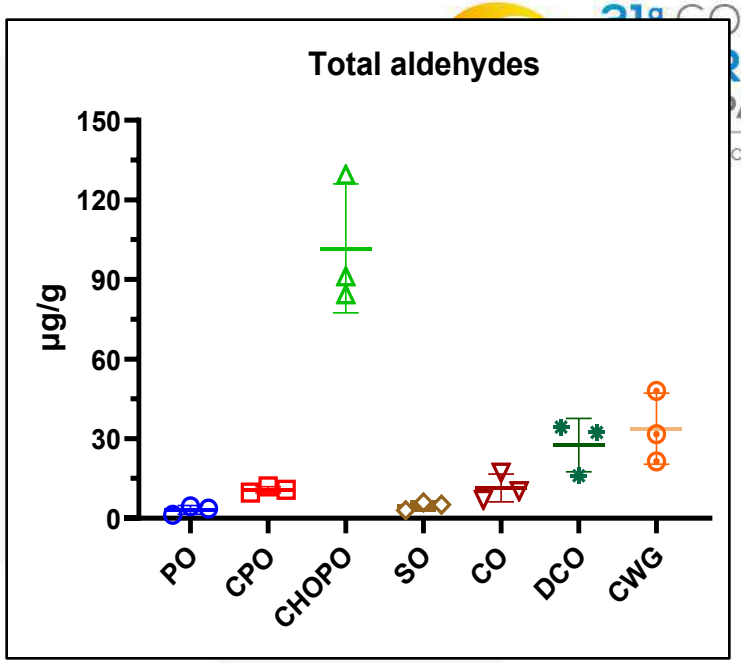


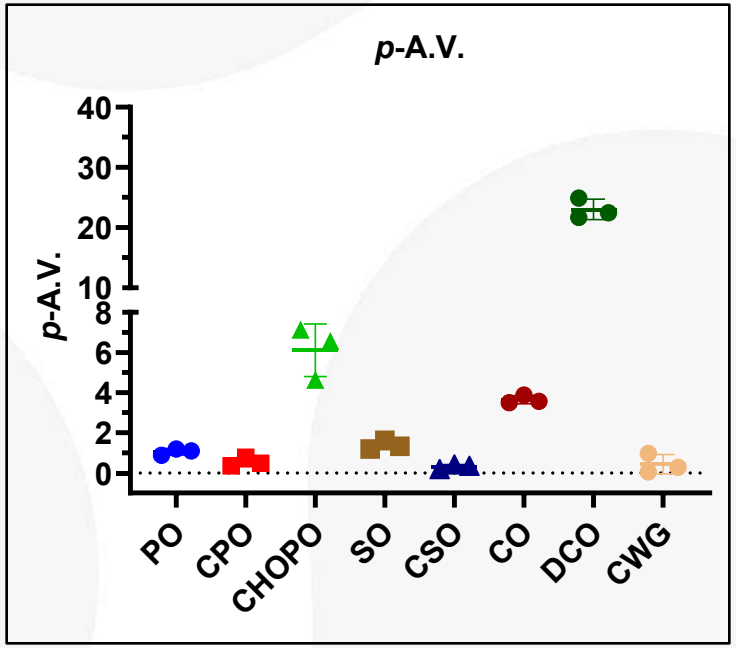


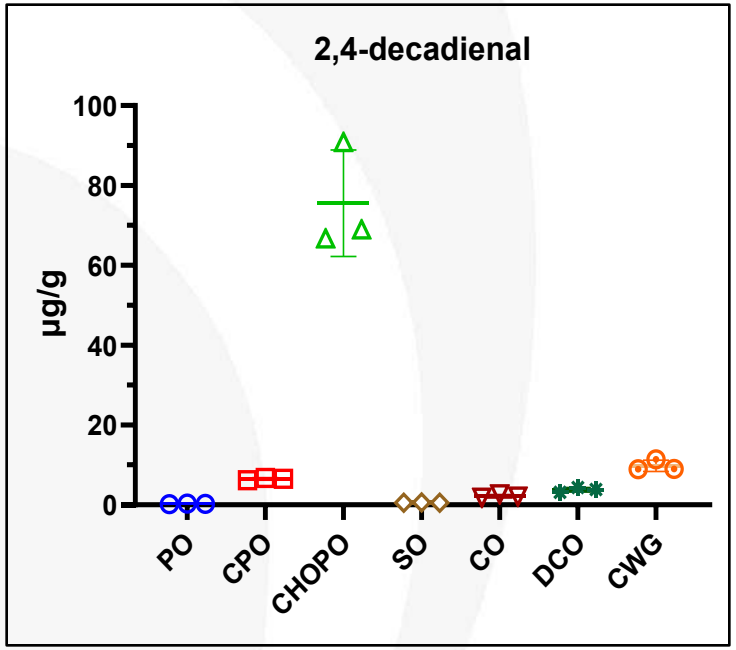
Status of oxidation

- PO and CPO contain little lipid oxidation products (LPO).
- CHOPO is more oxidized than PO and CPO.









* n=3

2. Performance & energy value in pigs and broilers

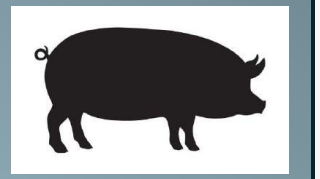
ISU swine nutrition farm

ISU poultry teaching farm

Designs of swine & poultry trials

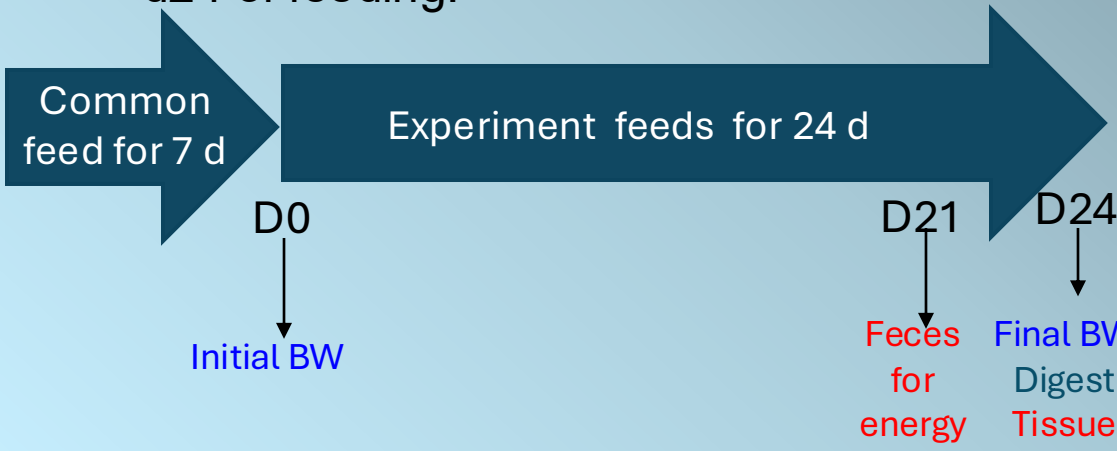
21º CONFERENCIA INTERNACIONAL

Growing pigs



Experiment Design

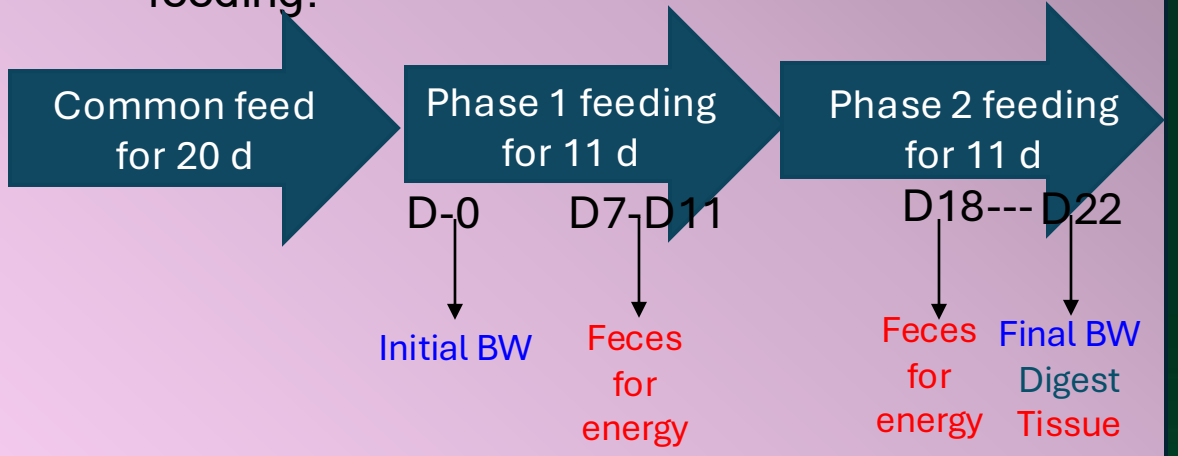
- Nine experimental diets: control (no oil added), PO, CPO, CHOPO,SO, CSO, CO, DCO, CWG
- 7.5% added lipid in place of control diet
- 8 replications/trt, total 72 pigs
- TiO2 for digestibility
- Digesta, blood, tissue samples collected on d24 of feeding.



Young broilers

Experiment Design

- Nine experimental diets: control (sand), PO, CPO, CHOPO,SO, CSO, CO, DCO, CWG
- 7.5% added lipid in place of sand
- 14 replications/trt, total 112 broilers
- TiO2 for digestibility
- Urine and fecal samples collected on d22 of feeding.

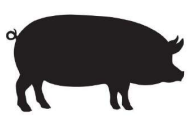


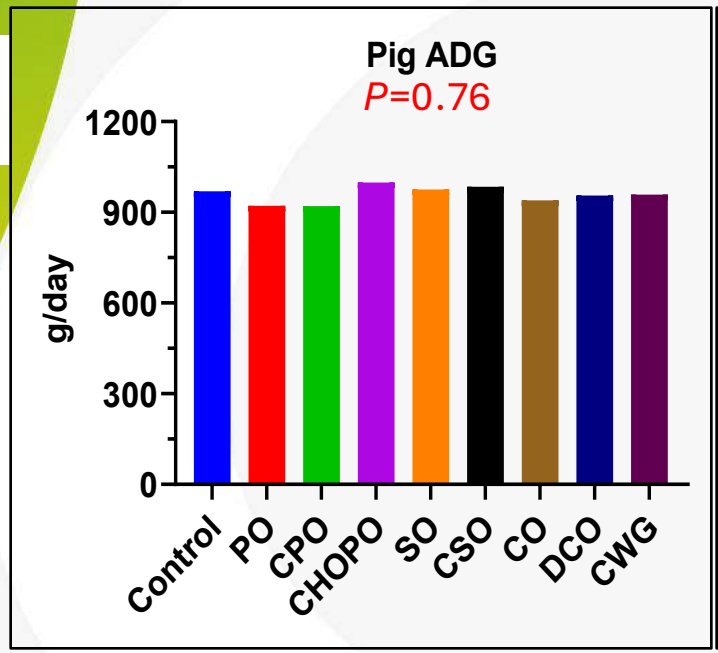
---Growth performance (AGD, ADFI, G:F); digestible energy

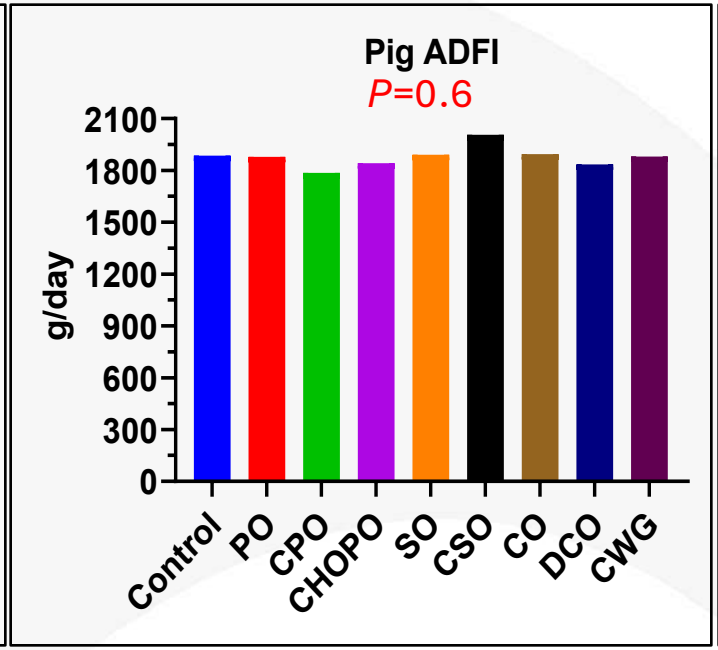
---Blood chemistry; LC-MS metabolomics

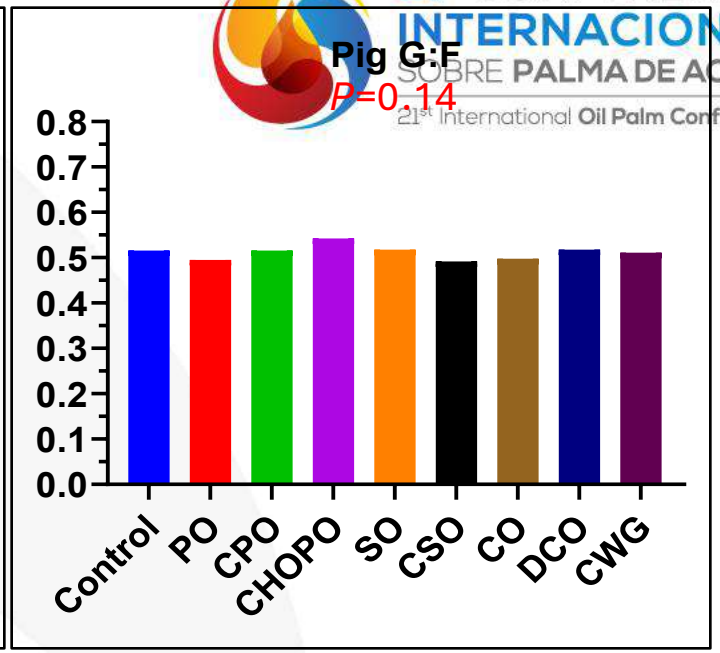
Growth performance

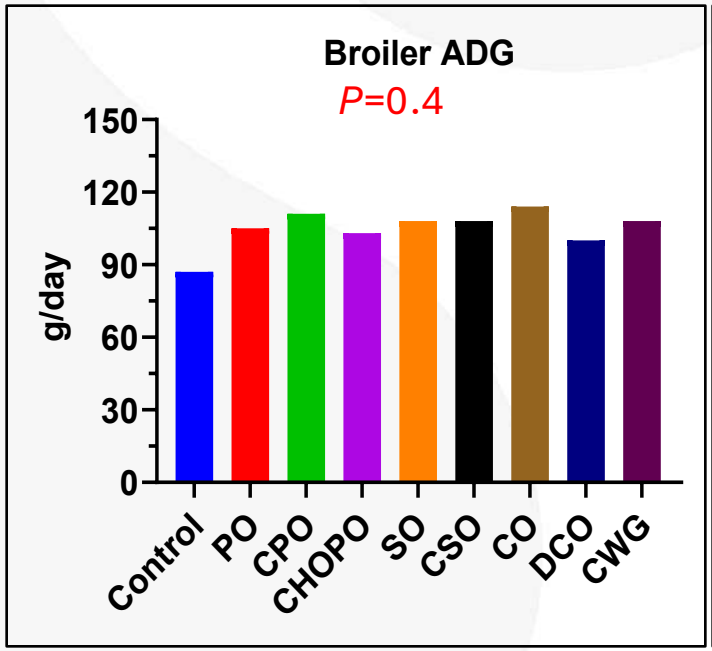
Palm oils were comparable with other oils.

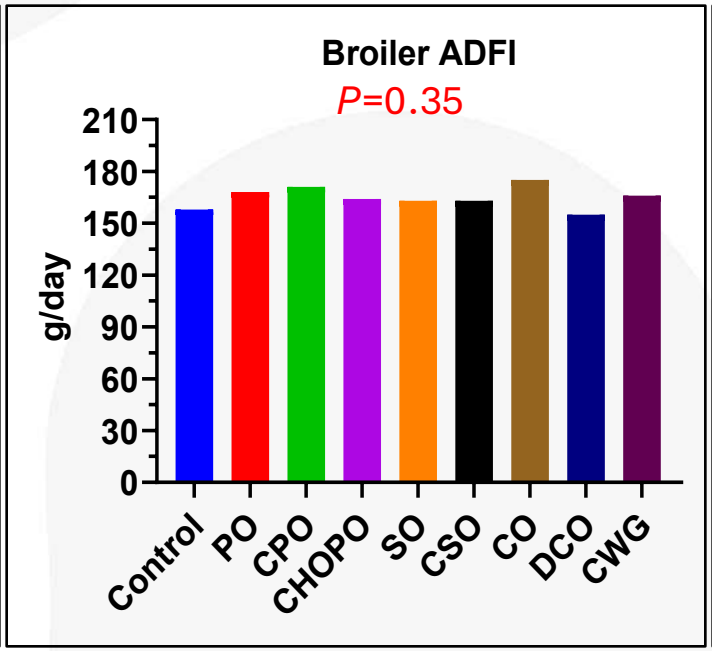


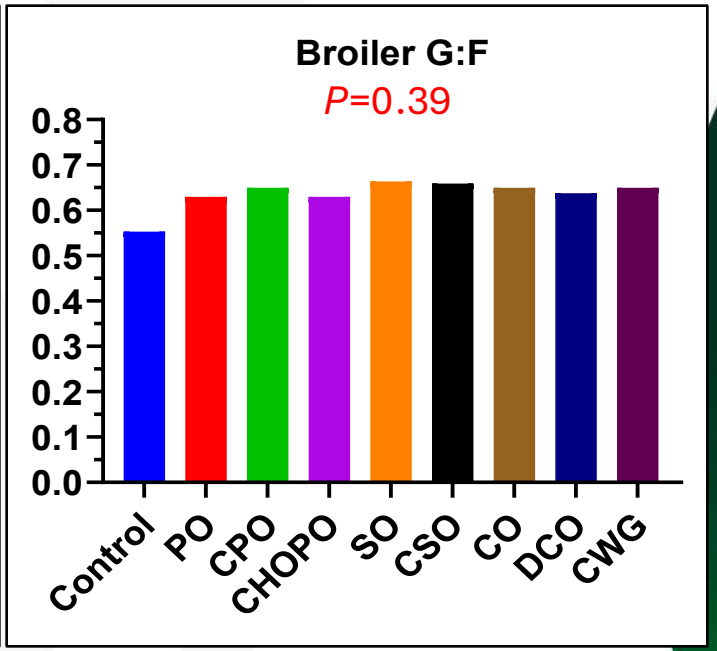






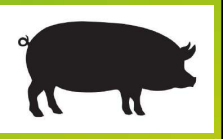


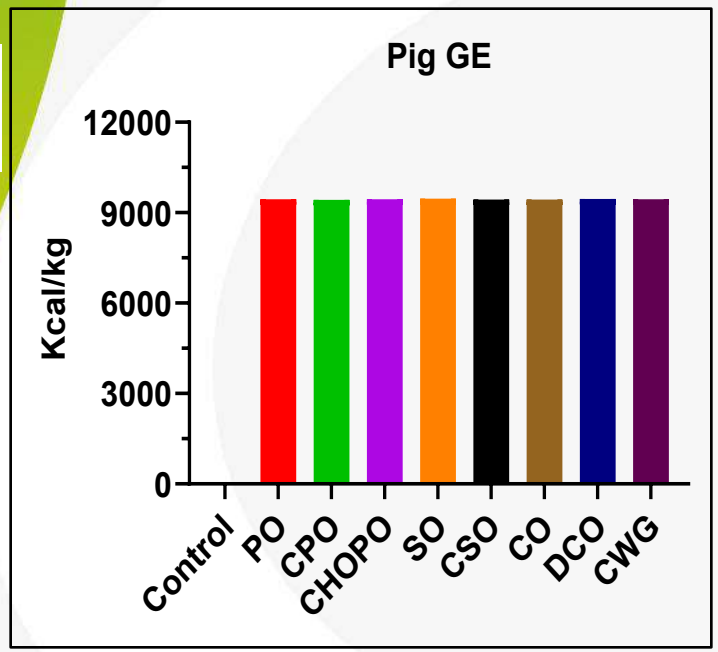


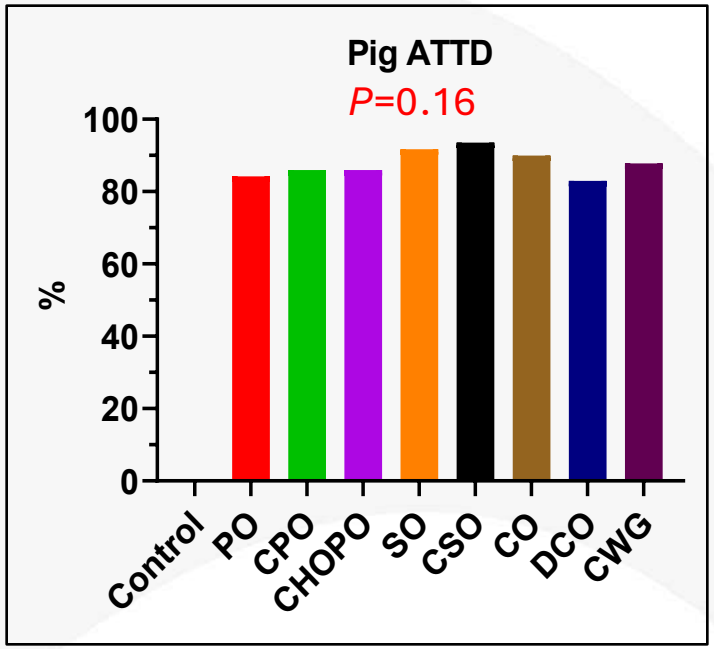


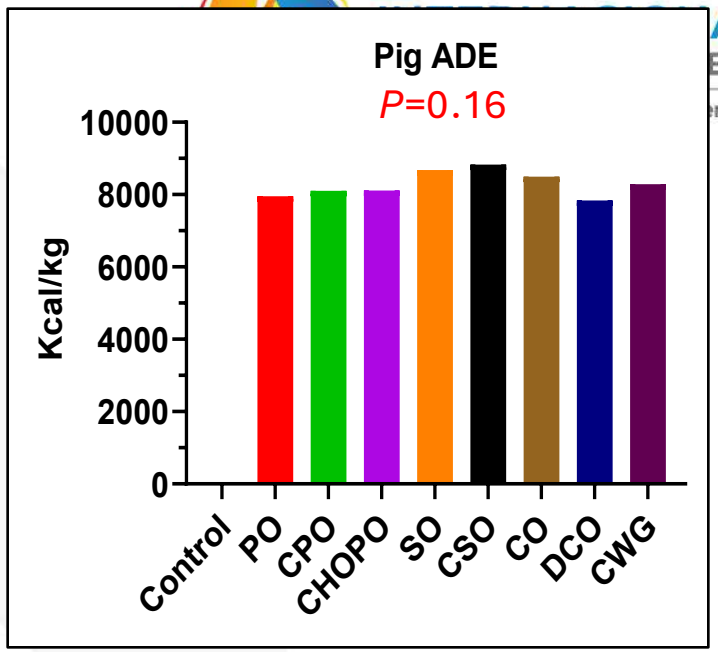
Energy value

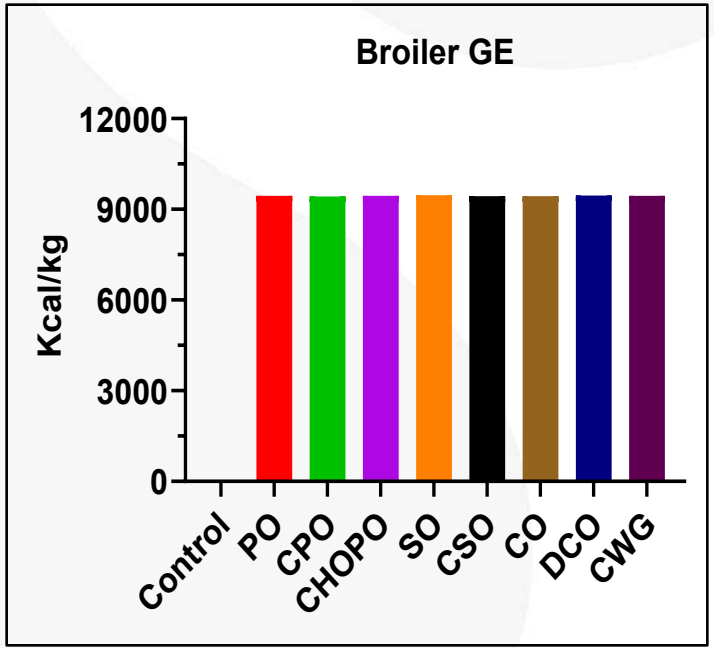
Palm oils had less digestible energy in broilers

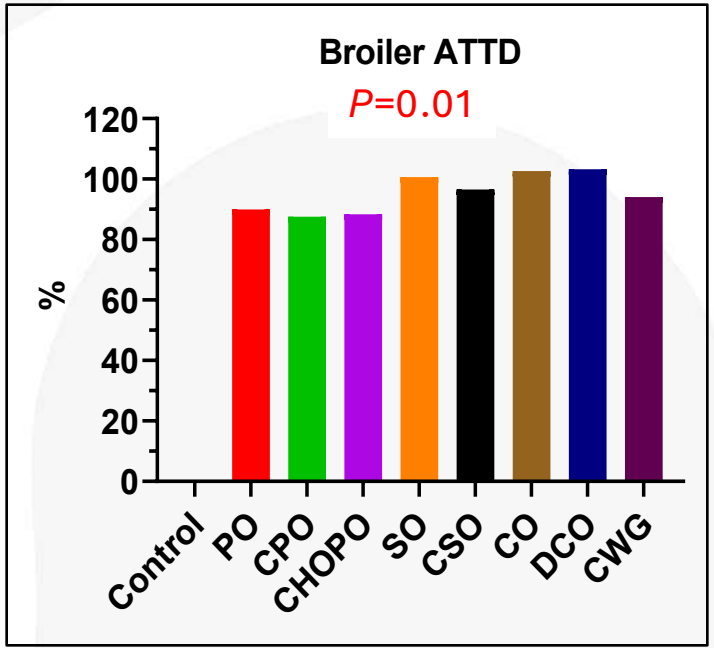


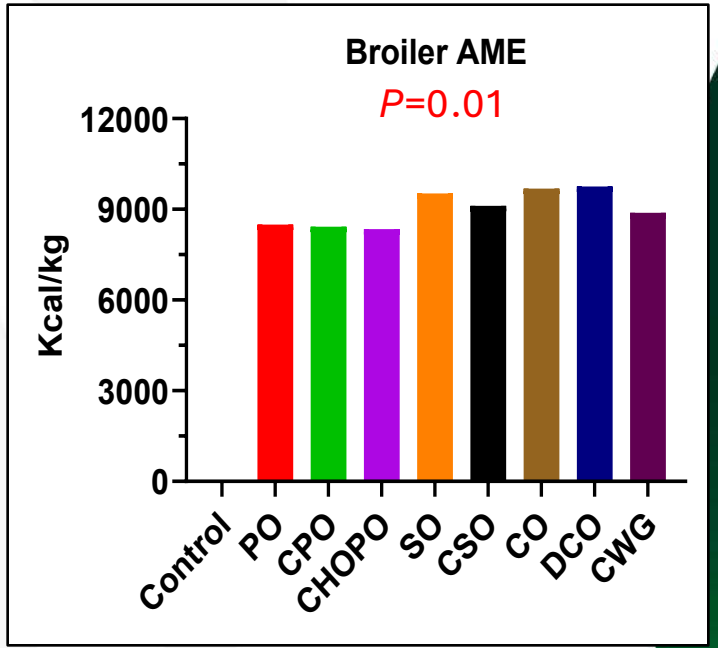




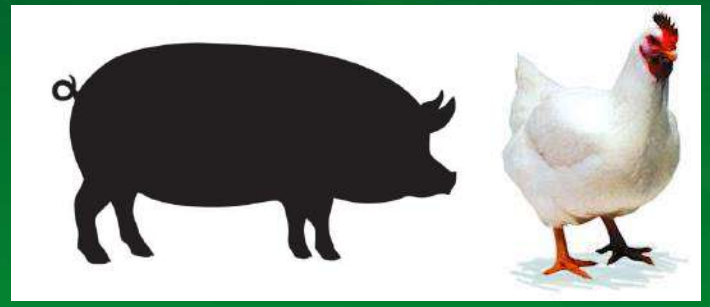




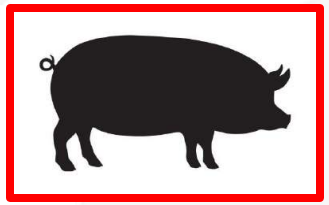


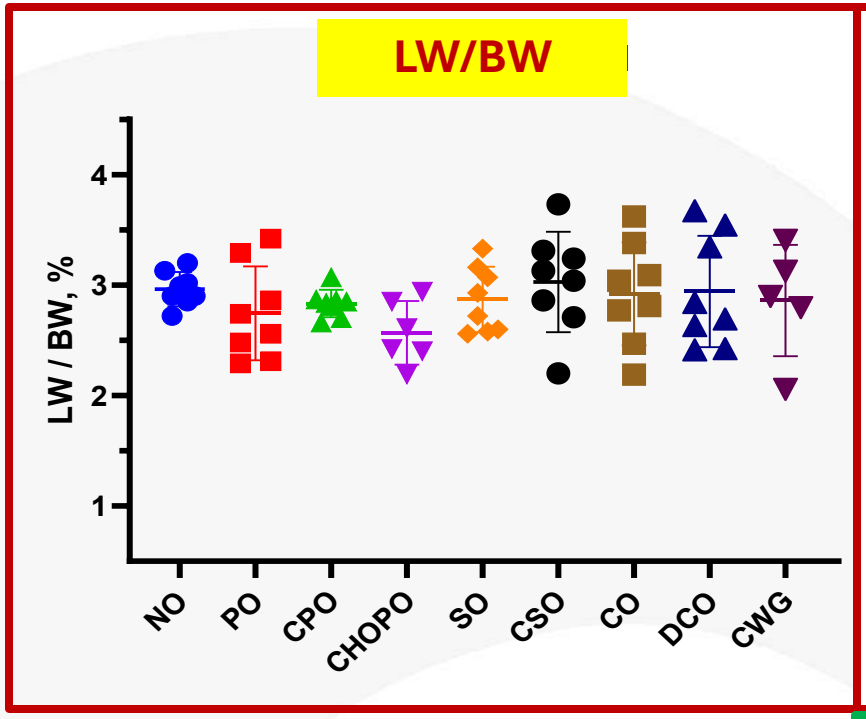


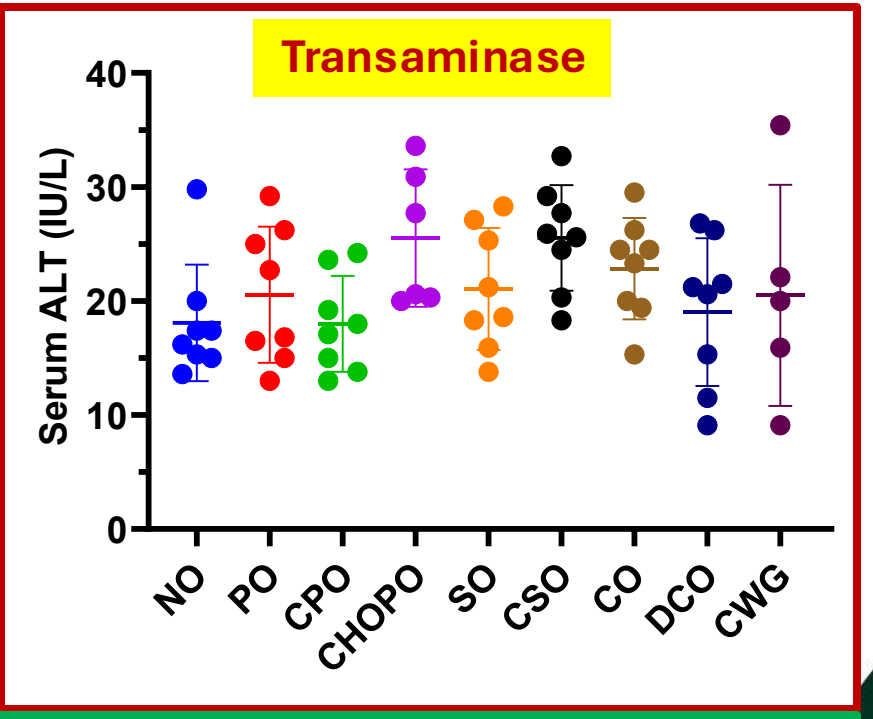
3. Metabolic effects in pigs and broilers

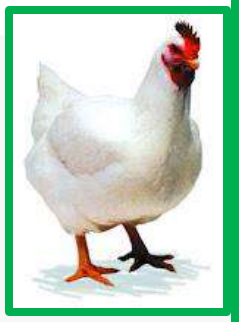


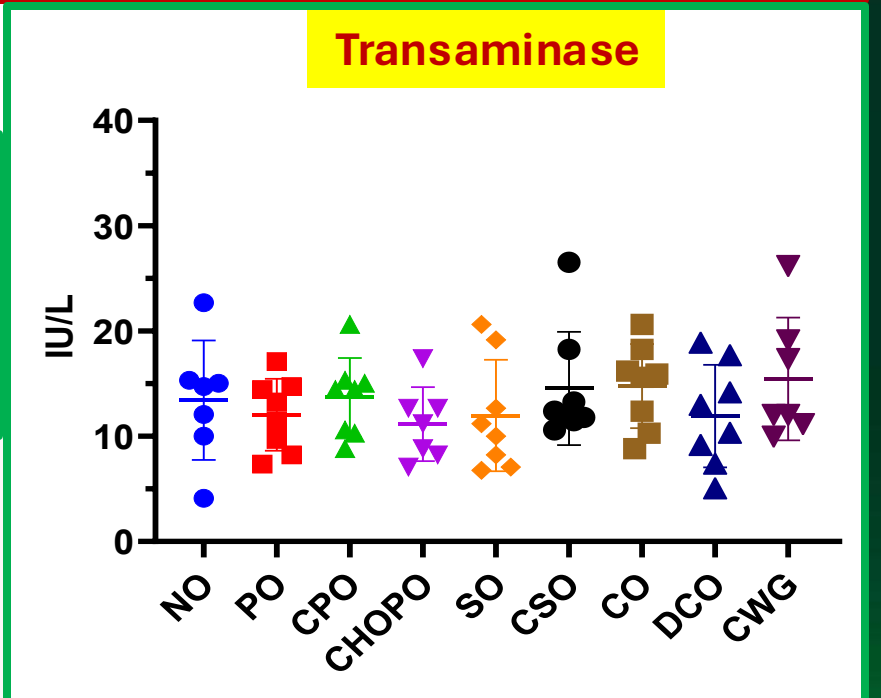
Liver health





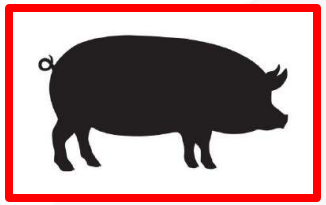


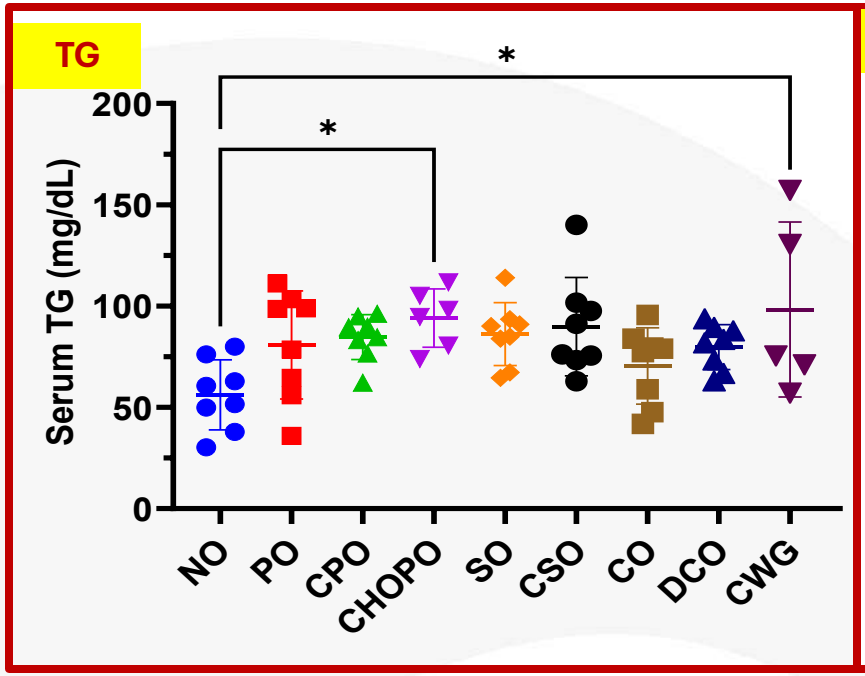


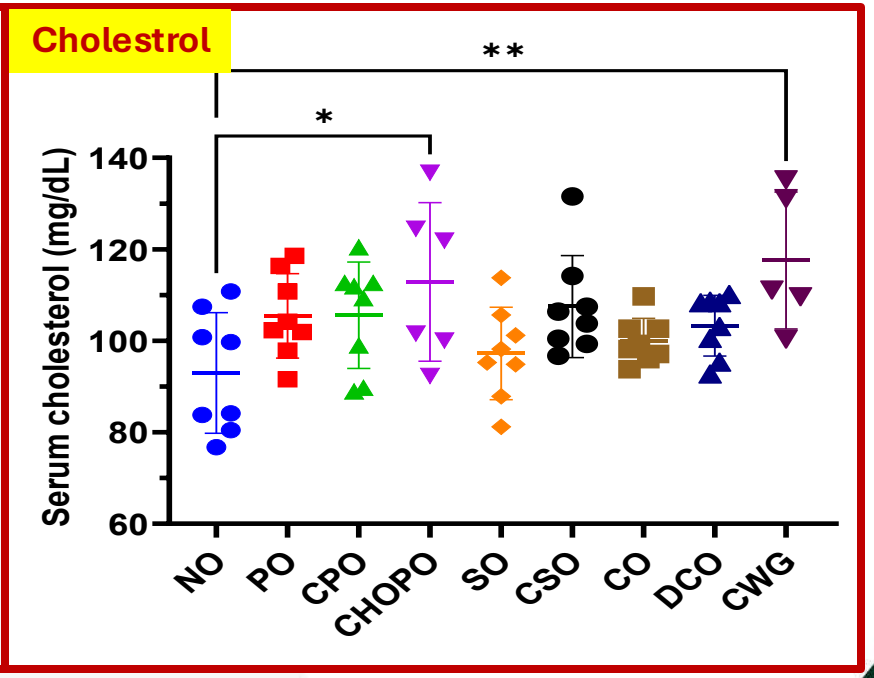


---No sign of hepatotoxicity was observed after feeding palm oils in growing pigs and broilers.

Lipid metabolism

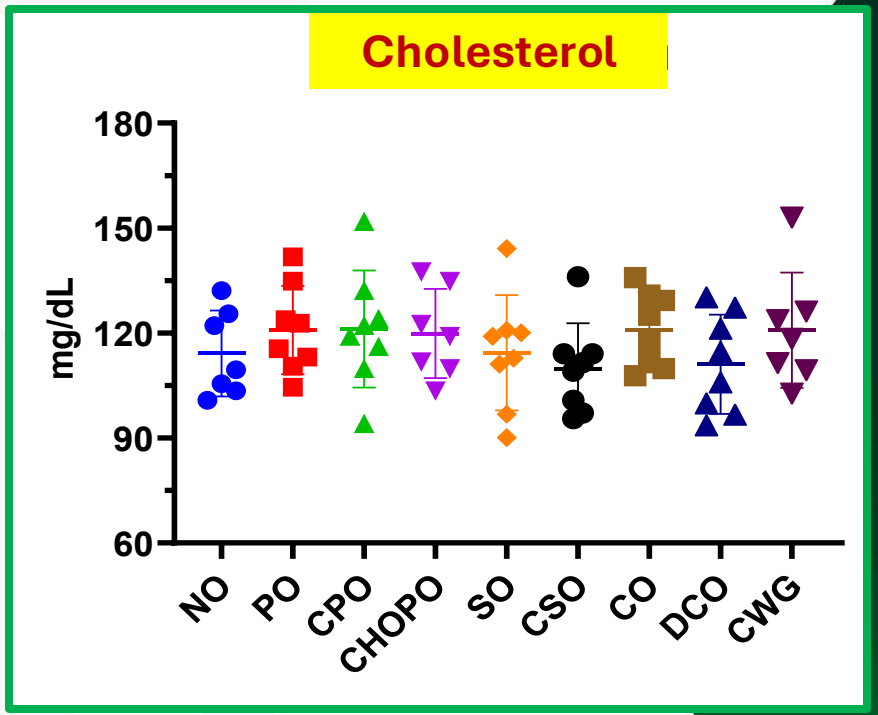




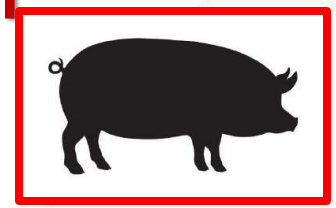


---PO and CPO did not change lipid metabolism in pigs and broilers.

---CHOPO and CWG increased blood lipids in pigs.



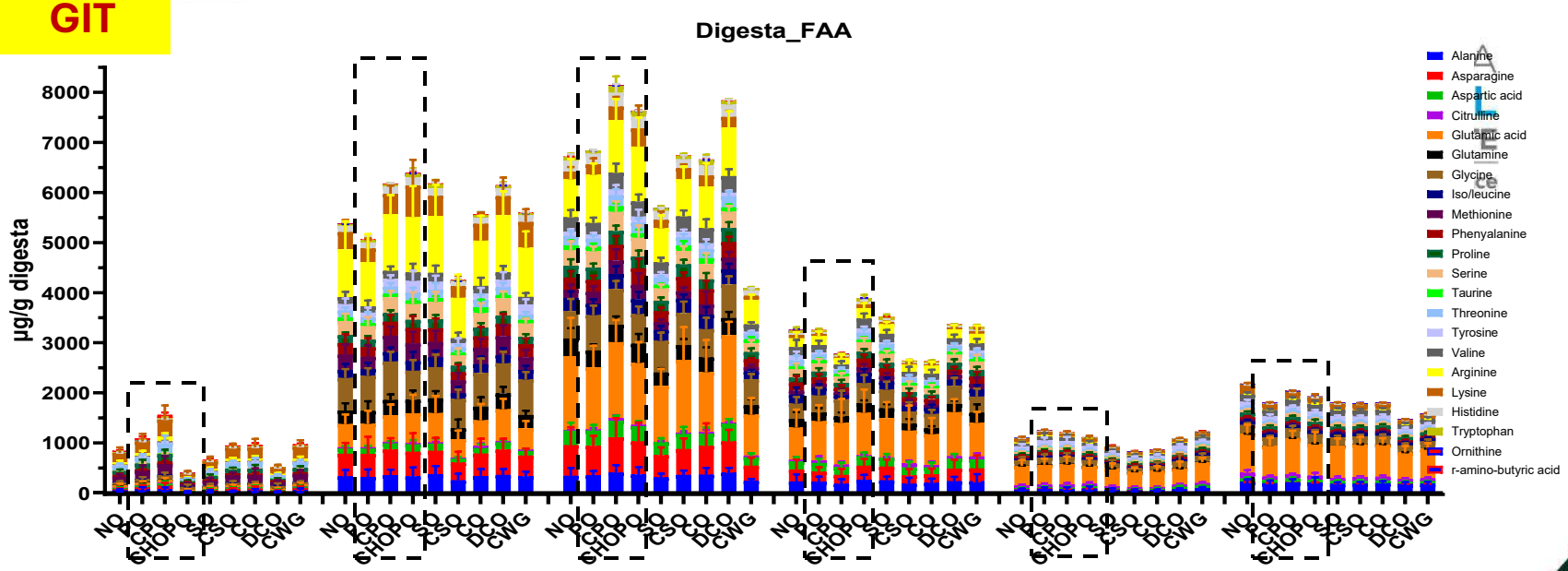
Amino acid metabolism



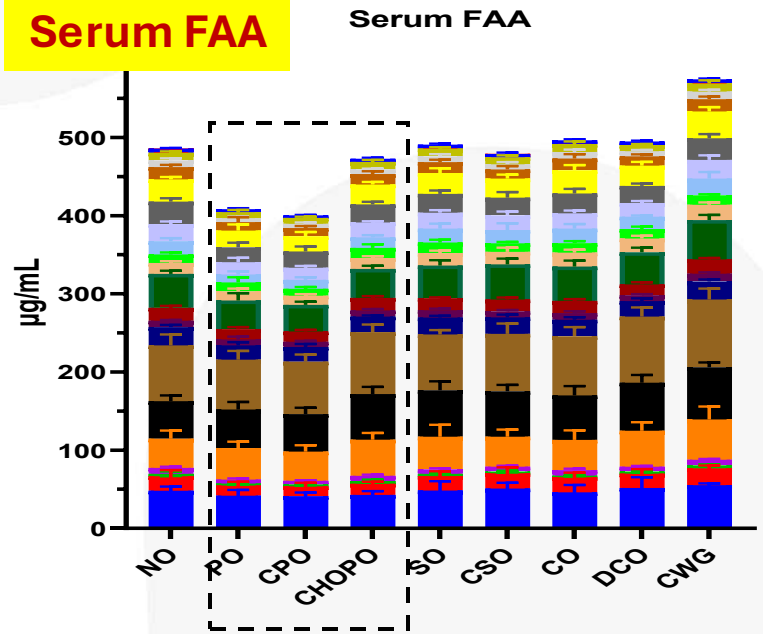
---Comparable protein digestion was observed in pig's GI tract.

---CHOPO behaved different from PO and CPO on amino acid metabolism.

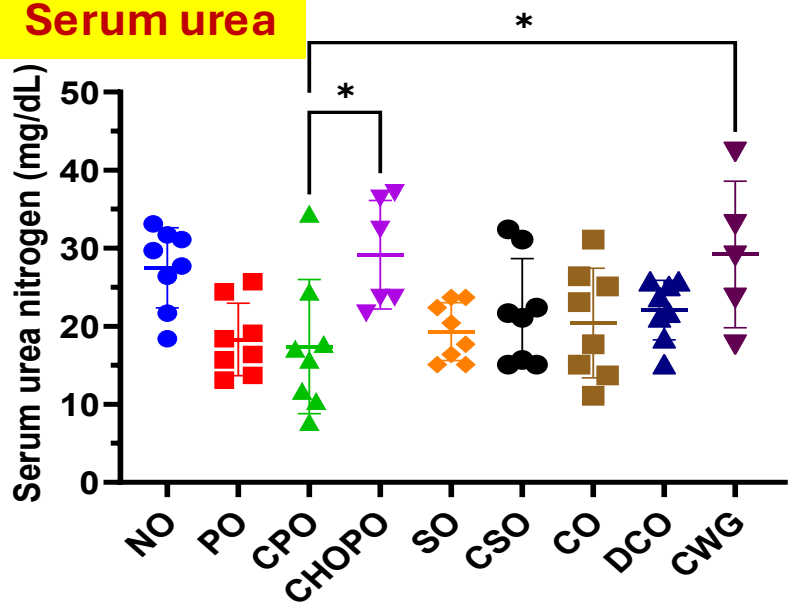
GIT



Serum FAA



Serum urea



Conclusions

- **Palm oils are acceptable dietary lipids for monogastric production animals (pig & broiler).**
- *CHOPO differs from PO and CPO in chemical composition, oxidative status, and metabolic effects on lipids and amino acids.*
- *More studies are needed to examine the health and metabolic effects of long-term feeding and the digestible energy of palm oils.*

Questions?