Palm kernel fatty acid distillates as main added fats in broiler feeds: effects on meat fatty acids, tocols and secondary oxidation

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BACKGROUND

CRUDE PALM KERNEL OIL (PKO)

High content of medium-chain fatty acids → Nutritional value as energy source

Physical refining

By-products
PALM KERNEL FATTY ACID DISTILLATES (PKFAD)
- Less waste in food industry
- Cheaper

Refined palm kernel oil

Livestock sector interest

AIM

To evaluate **the lipid composition and secondary oxidation of chicken meat** when feed contained PKFAD as main added fat instead of PKO or soybean+palm oils

STUDY DESIGN

3264 chickens / 24 pens
Fed with basal feed supplemented with 3 fat types:

- n= 8 pens → **Crude soybean oil** (from day 0 to 21 days) + **crude palm oil** (from 22 days to 35 days) usual commercial diet
- n= 8 pens → **PKO** (day 0 to 35 days)
- n=8 pens → **PKFAD** (day 0 to 35 days)

4 chickens from each pen → 8 deboned legs (thigh plus drumstick) with skin → T= 0 days; T= 7 days (Commercial conditions: at 3-5°C in PET/PE trays, packed in a O_2/CO_2 (70/30) modified atmosphere)

48 chicken meat samples

METHODS

Chicken meat

[1]**TBA value**:	Acid extraction and derivatization with TBA	Spectrum-VIS (450-650nm)	Third derivative
[2]**Fatty acid composition**:	Extraction of the lipid fration and methylation of fatty acids	GC-FID	Internal normalization
[3]**Tocopherol and tocotrienol content:**	Saponification and extraction with petroleum ether	HPLC-FLD	External standard

Statistics:
- Multifactor ANOVA: Fat type x Refrigeration (n=48) (IBM SPSS® 25.0)
- ANOVA & Scheffe's post-hoc test for Fat type (n=24 fresh meat ; n=24 refrigerated meat)
- PCA (n=24, vars=25 fatty acids, auto-scaled data) (SIMCA® v 13.0)

RESULTS

TBA Value

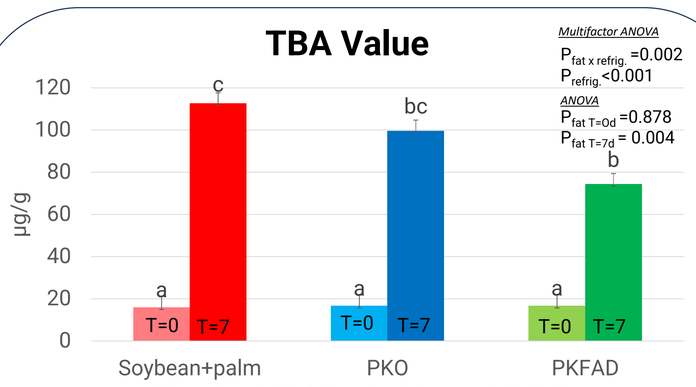

Fig.1. Fresh (T=0d) and refrigerated (T=7d) meat

- Refrigeration: ↑ Secondary oxidation
- There was an interaction between the diet used and the increase in oxidation after oxidation, with less oxidation occurring in the PKFAD diet than in the palm+soybean diet.

Fatty Acid Composition

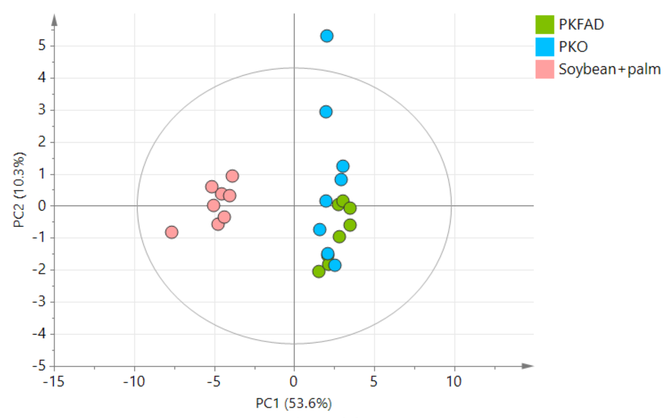

Fig.2. PCA scores plot of fresh meat

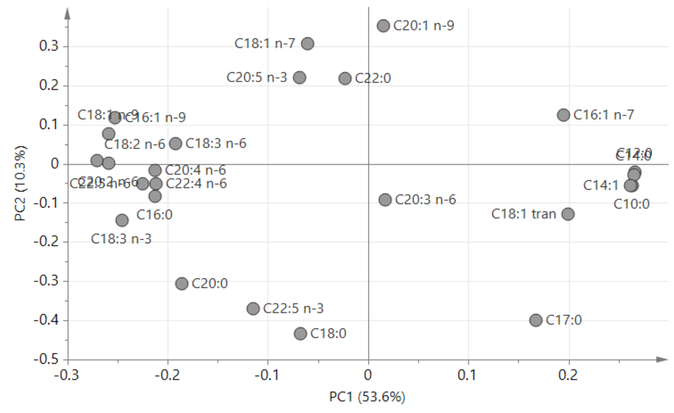

Fig.3. PCA loadings plot of fresh meat

- Fresh meat from PKFAD and PKO diets clustered separately than meat from soybean+palm diet (Fig.2).
- PUFAs and palmític acid were related with the Soybean+palm group, and medium chain fatty acids with the PKFAD and PKO meat (Fig.3).

Tocopherol and Tocotrienol Content

α-TOCOPHEROL

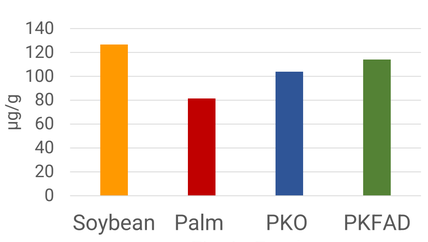

Fig.4. Feed

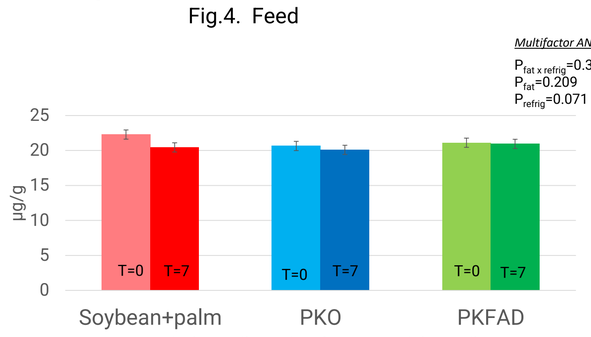

Fig.5. Fresh (T=0d) and refrigerated (T=7d) meat

α-TOCOTRIENOL

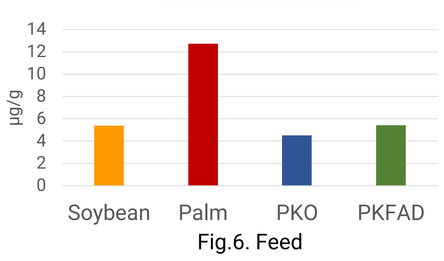

Fig.6. Feed

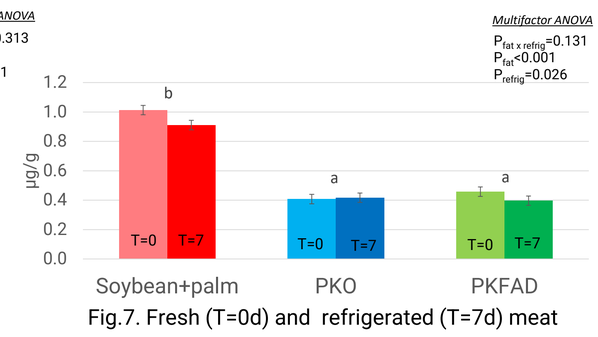

Fig.7. Fresh (T=0d) and refrigerated (T=7d) meat

γ-TOCOPHEROL

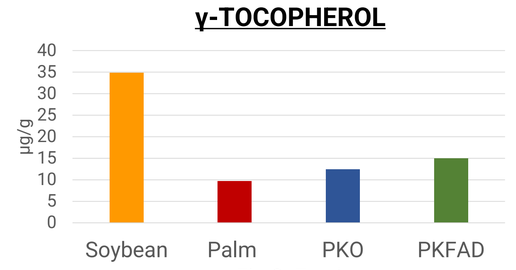

Fig.8. Feed

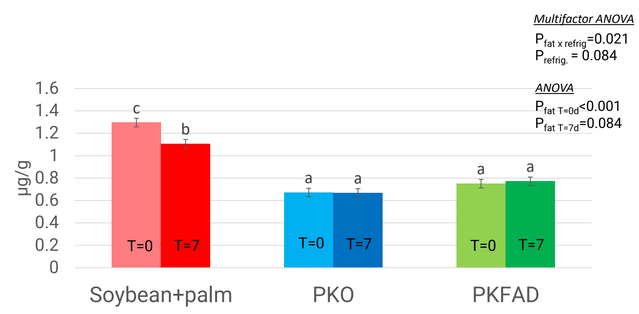

Fig.9. Fresh (T=0d) and refrigerated (T=7d) meat

γ-TOCOTRIENOL

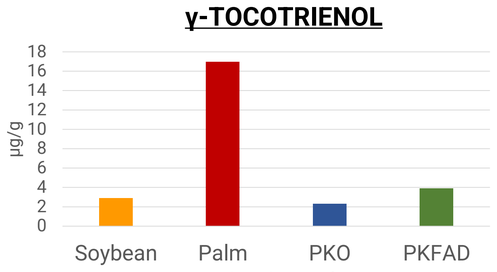

Fig.10. Feed

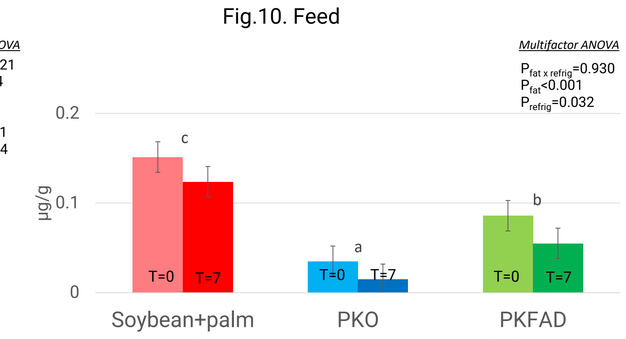

Fig.11. Fresh (T=0d) and refrigerated (T=7d) meat

- The main tocol in feeds was **α-tocopherol** because starter and grower feeds respectively included 100 and 60 µg of α-tocopheryl acetate/g of feed.
- γ-tocopherol, which is characteristic of soybean oil, was higher in soybean feed. α- and γ-tocotrienol which are characteristic of palm oil were higher in palm feeds. The three tocols were higher in meat from soybean-palm.
- After meat refrigeration, α- and γ-tocotrienol significantly decreased in all treatments, while γ-tocopherol decreased only in the soybean-palm group.

CONCLUSION

The use of **PKFAD** in feeds let to similar meat fatty acid composition as the use of PKO, and both led to meat richer in medium chain saturated fatty acids than the commercial control. It did not affect meat alpha-tocopherol but reduced the content of minor tocols. Overall, this resulted in a lower increase in secondary oxidation of meat after refrigeration.

REFERENCES

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[2,3]Albendea et al, 2023 , *Animals* , 13, 1343.

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