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Impact of Dietary Oleaginous Seeds on Health Lipid Indices and Fatty Acids Profile on Broiler's Meat

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Abstract: Over the past few years, there has been a growing preference among consumers for broiler meat. In this context, a 42-day feeding trial was conducted on 192, day-old Ross 308 chicks obtained from a local hatchery and kept in an experimental hall on permanent wood shaves litter (16 broilers/m² capacity). The broilers were divided into 4 groups (C, E1, E2, and E3), fed as follows: C group (basal diet), 6% flaxseed (E1), 10% camelina seeds (E2) and 15% hemp seeds (E3). At the end of the study, 32 broilers (8 chick/group) were slaughtered and thigh samples were collected for meat quality analyses and serum lipid parameters. The concentration of polyunsaturated fatty acids (PUFA), especially the n-3 fatty acid alpha-linolenic acid (ALA, g/100g total FAME) increased significantly ($P=0.0001$) in thigh samples for all experimental groups compared to C group, but the n3-PUFA concentration decreased inversely proportional to the rate inclusion of raw materials rich in PUFA. The healthy lipid indices, especially the atherogenicity (IA) and thrombogenicity (IT) indices, registered lower values ($P\leq 0.05$) in all experimental groups compared to C group. In conclusion, the supplementation of broilers' diet with oleaginous seeds positively influenced meat characteristics, including the health lipid indices and n-3 fatty acid with beneficial implications for human health.

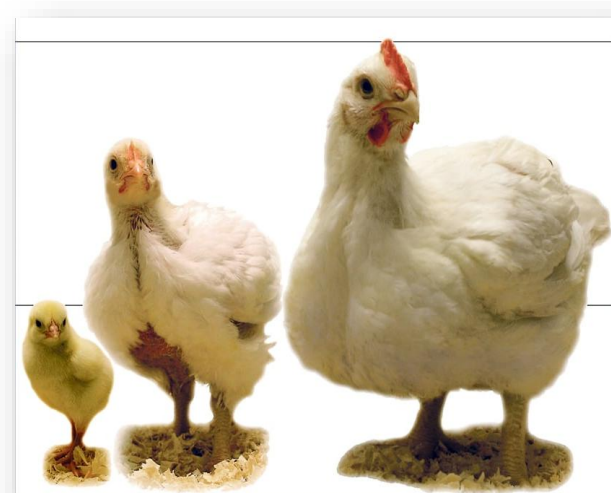
• Introduction:

Inclusion of oilseeds (**flaxseeds**, **hemp** and **camelina**) rich in PUFA acids in broiler chicken nutrition represents a functional feeding strategy aimed at improving the fatty acid profile of poultry meat (Orczewska-Dudek & Pietras, 2019; Tufarelli et al., 2023). Additionally, changes in fatty acid composition influence the health lipid indices of meat adding value to poultry products, beneficial to human diets (Albergamo et al., 2023).

Aim of this study: → effect of oleaginous seeds inclusion (flax, camelina and hemp) as protein alternative to soybean meal substitution in broiler diet enriched PUFA to improve the health lipid indices and fatty acids profile on broiler's meat quality

• Material and method

- 4 groups x 6-week
- 192, day-old Ross 308, kept in an experimental hall on permanent wood shaves litter (16 broilers/m² capacity)
- 4 treatments:
 - ✓ Control
 - ✓ E1 (with 6% flaxseed);
 - ✓ E2 (with 10% camelina seeds);
 - ✓ E3 (with 15% hemp seeds);
- 8 blood samples were aseptically collected to determine the serum lipid parameters
- 12 chicks from each group were slaughtered and thigh samples were collected to determine the meat quality (fatty acids profile, cholesterol content and health lipid indices)



• Results and discussions:



Effects of oleaginous seeds dietary inclusion on health indices

Indices	C	E1	E2	E3	SEM	p-value
LA/ ALA	45.09 ^a	3.85 ^c	4.87 ^c	11.23 ^b	0.764	0.0001
EPA + DHA	1.51 ^a	0.60 ^b	0.87 ^{ab}	0.77 ^{ab}	0.198	0.022
UI	113.62 ^c	133.82 ^a	131.45 ^{ab}	122.31 ^{bc}	2.64	0.0001
PI	46.48 ^c	64.54 ^a	60.46 ^{ab}	55.75 ^b	2.20	0.0001
NVI	2.15 ^c	2.40 ^a	2.31 ^{ab}	2.19 ^{bc}	0.038	0.001
IA	0.29 ^a	0.23 ^b	0.24 ^b	0.27 ^{ab}	0.010	0.002
IT	0.63 ^a	0.37 ^c	0.39 ^c	0.49 ^b	0.020	0.0001
HH ratio	3.54 ^b	4.52 ^a	4.44 ^a	4.08 ^{ab}	0.164	0.001
HPI	3.46 ^b	4.34 ^a	4.26 ^a	3.85 ^{ab}	0.153	0.002

Correlation between the fatty acids profile and healthy indices in broiler thigh

Item	LA/ALA	EPA + DHA	UI	PI	NVI	IA	IT	HH ratio	HPI
ΣSFA	,585**		-,924**	-,841**	-,759**	,943**	,871**	-,899**	-,928**
ΣMUFA	,705**		-,758**	-,808**	-,440*	,740**	,712**	-,801**	-,756**
ΣPUFA	-,741**		,962**	,945**	,687**	-,960**	-,906**	,972**	,962**
Σn-6	-,472*	-,693**		,504*	,528**				
C18:2n6			,583**	,547**		-,664**	-,433*	,676**	,663**
C20:2n6			,462*	,455*		-,548**		,573**	,548**
C20:4n6	-,416*								
Σn-3	-,887**	-,470*	,885**	,892**	,772**	-,804**	-,948**	,810**	,808**
C18:3n3	-,872**	-,418*	,873**	,855**	,755**	-,796**	-,943**	,792**	,796**
C20:5n3		,775**							
C22:6n3	-,761**	-,742**	,481*	,600**	,434*		-,574**	,464*	,411*
n-6/n-3	,986**	,562**	-,775**	-,798**	-,618**	,685**	,896**	-,724**	-,693**
SFA / UFA	,572**		-,920**	-,837**	-,756**	,941**	,866**	-,895**	-,924**
PUFA/MUFA	-,707**		,885**	,897**	,573**	-,881**	-,818**	,916**	,891**
PUFA/ SFA	-,709**		,978**	,932**	,748**	-,981**	-,923**	,974**	,980**

^{a-c}Mean values within a row having different superscripts are significantly different at $p \leq 0.05$;

• Conclusions

Supplementation of broilers' diet with oleaginous seeds positively influenced meat characteristics, including the health lipid indices and n-3 fatty acid ALA to promote an efficient conversion of ALA to eicosapentaenoic acid (EPA) and docosahexaenoic fatty acids (DHA), with beneficial implications for human health.

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