INCLUSION OF HEMP IN THE DIETS CAN IMPROVE MEAT NUTRITIONAL QUALITY OF ORGANICALLY REARED SLOW-GROWING BROILERS

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I. INTRODUCTION

In recent years, the use of industrial hemp as an alternative crop has rapidly expanded in hilly areas of southern Italy to mitigate the effects of cereal monoculture and differentiate farm income [1]. Accordingly, the availability of insect- and weather-damaged, culls, broken, and odd-size hemp seed lots has increased, providing local livestock producers the opportunity to exploit these poor-quality seeds for feed purpose. This study investigated the effects of including feed-grade hemp seeds in the grower-finisher diets of organically raised broilers on carcass parameters and meat quality.

II. MATERIALS AND METHODS

The study was carried out at a private poultry farm located in southern Italy (41°03'63'' N, 14°42'14'' E; 430 m a.s.l.) raising slow-growing broilers under an organic free-range system. One hundred and fifty 30-day-old male Kabir chickens were individually weighed (initial BW of 0.75 ± 0.15 kg) and equally and randomly housed in 6 adjacent pens (10 m^2/bird) equipped with shelters, drinkers, and pens. Immediately after housing, the birds were assigned to 3 dietary treatments (2 pens of 25 birds per treatment) consisting of a standard commercial grower-finisher diet (Control diet, 19% crude protein, 4.5% crude fat on dry matter basis) and 85% and 70% of the same diet respectively integrated with 15 (Hemp15) and 30% (Hemp30) of feed-grade hemp seeds. All diets were presented in crumble form and were provided for ad libitum consumption through the whole feeding trial, i.e., until 120 d of age. At slaughter, the chickens were individually weighed and 3 birds per pen were randomly selected, labelled, and used to determine carcass traits [2] and meat quality. Proximate composition, Warner-Bratzler Shear Force (WBSF), pH, amino acids and fatty acids profiles were analysed on breast fillets as reported by Franco *et al.* [3]. The nutritional indexes PUFA/SFA, atherogenic index (AI), thrombogenic index (TI) and hypocholesterolemic/hypercholesterolemic ratio (h/H) were also calculated according to Chen and Liu [4]. Final body weight, carcass traits and meat breast quality were subjected to a mixed procedure of SAS (2009) with the pen as a random factor. Least square means were compared using the Tukey test; significance and tendencies were discussed at $P < 0.05$ and $P < 0.10$, respectively.

III. RESULTS AND DISCUSSION

Compared to the Control, the inclusion of hemp seeds tendentially increased the live body weight of birds ($P < 0.1$), but the differences were detected only for the highest level of inclusion (3.87 vs 4.06 vs 4.46 kg, SEM= 0.166, for Control, Hemp15 and Hemp30, respectively). A similar trend was observed for the eviscerated carcass weight, although only a tendency to statistical significance ($P < 0.1$) was observed (3.11 vs 3.26 vs 3.61 kg, SEM= 0.150, for Control, Hemp15 and Hemp30, respectively). The dressing percentage and breast and thigh + drumstick yields were not different among treatments, suggesting that the hemp diets did not affect the commercial meat cuts yield. Likewise, meat quality, drip and cooking loss, pH, proximate composition, amino acids profile and

WBSF of breast meat were not different among the groups (data not shown). By contrast, the fatty acids profile was affected by the highest level of inclusion. As presented in Table 1, the amount of SFA in Hemp30 was significantly lower ($P < 0.05$) than in both Control and Hemp15, in particular palmitic and stearic acids (data not shown). Conversely, PUFA, n-3 and n-6 PUFA were significantly higher in Hemp30 than in the Control group ($P < 0.05$), while MUFA were not affected by the treatments. As overall results, all nutritional parameters were strongly influenced by the diet, showing a positive effect of hemp seeds on the nutritional value of chicken breast meat.

Table 1. Fatty acids composition (% of total fatty acids) and nutritional parameters of breast chicken meat.

	Diets				P value		
	Control	Hemp15	Hemp30	SEM	C vs H15	C vs H30	H15 vs H30
SFA	32.04	30.30	26.33	0.63	ns	0.0057	0.0160
MUFA	21.42	20.23	21.99	0.80	ns	ns	ns
PUFA	46.55	49.47	51.68	1.05	ns	0.0334	ns
n-3	3.64	4.45	5.13	0.32	ns	0.0373	ns
n-6	42.71	45.03	46.44	1.06	ns	0.0764	ns
UFA/SFA	2.13	2.30	2.80	0.07	ns	0.0052	0.0124
PUFA/SFA	1.46	1.64	1.97	0.07	ns	0.0099	0.0331
n-6/n-3	11.80	10.15	9.17	0.73	ns	0.0729	ns
AI	0.31	0.27	0.23	0.01	0.0764	0.0098	0.0546
TI	0.72	0.63	0.51	0.02	0.0456	0.0035	0.0154
h/H	2.69	3.16	3.94	0.13	0.0710	0.0048	0.0184

SFA=Saturated Fatty Acids; MUFA= Monounsaturated Fatty Acids; PUFA= Polyunsaturated Fatty Acids; AI=Atherogenic Index; TI= Thrombogenic Index; h/H=hypocholesterolemic/Hypercholesterolemic ratio.

IV. CONCLUSION

Our results show that including a high level of feed-grade hemp seeds to increase feed self-sufficiency and crop-livestock integration in organic poultry farming can also improve the nutritional quality of chicken meat without impairing the yield and commercial parameters of the carcass.

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