

# EFFECTS OF THE INCLUSION OF PROCESSED FORMER FOODSTUFF BASED ON BAKERY BY-PRODUCTS IN BROILER DIET ON FATTY ACID PROFILE AND CHEMICAL PROPERTIES OF MEAT

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## I. INTRODUCTION

Sustainable meat production is a crucial in today's world and sustainable feed plays a vital role in achieving this goal [1]. The use of Former Foodstuffs (FFs) in animal nutrition represents a new area of research emerging from the principle of circular economy [2]. The estimated 5 million tons of FFs processed annually in Europe could be a resource [3]. Among FFs, bakery by-products (BBP) have been shown to be effective in ruminant [4] and swine diets [5]. However, there is a lack of research on its impact on poultry diets and meat quality. Therefore, the aim of this study was to investigate if the inclusion of BBP in broiler diet can affect the nutritional and quality traits of meat, including changes in fatty acid (FA) profile, oxidation and shelf-life.

## II. MATERIALS AND METHODS

A total of 200 one-day-old male ROSS-308 chicks were divided into four iso-energetic and iso-nitrogenous dietary groups based on their average live weight (LW; 38.05 g  $\pm$  0.11) (5 replicates/group and 10 birds/pen): Control (CTR: commercial feed), L-BBP (6.25% BBP), M-BBP (12.5% BBP), and H-BBP (25% BBP). BBP included as a substitute for corn-soybean meal. *In vivo* performance was evaluated throughout the trial. At day(d) 36, birds were slaughtered, and chicken breast samples (n=5/group) were taken for oxidation and shelf-life analysis at 5 different time points: d0 = (T1), d3 = (T2), d5 = (T3), d7 = (T4), d9 = (T5) during refrigerated storage (4°C $\pm$ 1). Lipid oxidation was measured as mg malondialdehyde (MDA/kg) muscle using the TBARS (Thiobarbituric Acid Reactive Substances) test [6]. Nitrogenous compounds in the meat were determined by calculating TVBN (Total Volatile Basic Nitrogen) was calculated according to Castrica *et al.* [6]. The FA profile of thigh and breast meat (n=5/group) was analysed using gas chromatography following Jia *et al.* [7]. Data were analysed using SPSS. A general linear mixed model compared the TBARS and TVBN based on two fixed factors (treatment, time, and their interaction). The FA data were tested using one-way ANOVA.

## III. RESULTS AND DISCUSSION

The FA profile of breast and thigh meat showed a linear increase for saturated FA (SFA), monounsaturated FA and the  $\omega$ -6 to  $\omega$ -3 ratio, while polyunsaturated FA (PUFA) and the ratio of PUFA to SFA decreased linearly with increasing BBP levels (P<0.05) (Table 1). Meat FA results correspond to the FA profile of the feed due to fat components derived from raw materials in bakery production. However, the dietary inclusion of BBP and corresponding modification in FA profile had no effect on lipid oxidation of chicken meat at slaughter. The type of fat used in the diet and the presence of antioxidants may contribute to the observed results. As expected, the total values of TBARS (mg

MDA/kg) and TVBN (mg N/100 g) progressively increased ( $P<0.05$ ) during the storage period (T1: 0.033, 14.36, T5: 0.498, 17.08, respectively). Notably, the H-BBP diet showed lower TVBN values ( $P<0.05$ ), which can be attributed to its feed composition and potential impact on microbial growth in meat. This suggests that the degree of spoilage in H-BBP fed meat can be influenced by TVBN. Significant interactions between diet and storage time were observed for both TBARS and TVBN, indicating that the dietary treatment tested can affect meat quality and safety.

Table 1. Effect of BBP on thigh and breast meat fatty acid indexes

Fatty acid indexes	Samples	Dietary treatments				Standard Error	P- value
		CTR	L-BBP	M-BBP	H-BBP		
$\Sigma$ SFA	Thigh	24.0	24.8	26.2	28.0	0.356	<0.001
	Breast	0.28	0.28	0.29	0.30	0.003	<0.001
$\Sigma$ PUFA	Thigh	45.9	43.8	38.4	32.0	1.249	<0.001
	Breast	0.46	0.44	0.40	0.35	0.010	<0.001
$\Sigma\omega-6/\Sigma\omega-3$	Thigh	10.6	10.7	11.5	12.8	0.212	<0.001
	Breast	11.5	11.7	13.1	14.6	0.296	<0.001
$\Sigma$ PUFA/ $\Sigma$ SFA	Thigh	1.91	1.77	1.47	1.14	0.069	<0.001
	Breast	1.66	1.60	1.37	1.14	0.048	<0.001

$\Sigma$ SFA: Total saturated fatty acid,  $\Sigma$  PUFA: Total polyunsaturated fatty acid,  $\Sigma\omega-6/\Sigma\omega-3$ : Total omega-6/Total omega-3 ratio,  $\Sigma$ PUFA/ $\Sigma$ SFA: Total polyunsaturated fatty acid/Total saturated fatty acid ratio, CTR: Control feed, BBP: Bakery by-products, L-BBP: 6.25% BBP, M-BBP: 12.5% BBP, H-BBP: 25% BBP

#### IV. CONCLUSION

The results suggest that including BBP in broiler feed can modify the FA profile of the meat without affecting oxidation and can reduce TVBN values during storage. Further studies are needed to confirm these findings and promote sustainable poultry feeding practices.

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