COMPARATIVE STUDY ON THE EFFECTS OF RABBIT AND CHICKEN MEAT ON THE PHYSICOCHEMICAL PROPERTIES OF LOW-FAT BURGERS WITH AMARANTH FLOUR

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I. INTRODUCTION

In recent years, research has increased to obtain healthier, safer, more sustainable meat products with wide acceptance to satisfy growing consumer demand. Rabbit meat is a food rich in nutrients, with a lower environmental impact than red meat and chicken. It has a lower fat, and cholesterol than other meats, is highly digestible, and has a more unsaturated fatty acid profile [1]. However, it is not widely consumed by Brazilians. Amaranth is a pseudo cereal rich in vitamins and minerals and contains high-biological-value proteins. Due to its neutral sensory profile, amaranth flour can be included in meat products, improving its nutritional value by incorporating essential elements for bone, muscle, and metabolic health [2]. Thus, this study aimed to compare the effects of rabbit and chicken meat on the physicochemical and technological properties of burgers with partial fat reduction and the addition of amaranth flour in search of a healthier alternative to traditional options.

II. MATERIALS AND METHODS

The rabbit meat used to produce the burgers was kindly donated by the Federal University of Viçosa (Brazil), the chicken meat was purchased from a local market in Sete Lagoas (Brazil), and the other ingredients were obtained from New Max Industrial (Brazil). Two control treatments with 70.0% rabbit (FRC) and chicken meat (FCC), 15% pork back fat, and without amaranth flour (AF) were elaborated, and two treatments with 30% fat reduction and 4.5% AF, with rabbit and chicken meat, denominated respectively FRA and FCA. All treatments had 1.0% soy protein isolate, 1.15% spices, 1.7% sodium chloride, 0.05% sodium erythorbate, 0.3% sodium tripolyphosphate, and 10.8% cold water. The burgers were prepared according to Essa & Elsebaie [3]. The analyses included moisture, protein, and ash [4], lipid content [5], and instrumental color determination. Carbohydrate content was calculated by difference. The burgers' technological properties (cooking losses, shrinkage, moisture retention) and texture profile were also evaluated (hardness, springiness, cohesiveness, chewiness). The results were assessed using analysis of variance (ANOVA) with general linear models, considering the treatments as a fixed effect and the experiment replications as a random term (n = 3), using Statsoft. Inc. version 7 software (TIBCO Software Inc., California, USA). Tukey's test at 5% significance level (P \leq .05) was used to determine significant differences between treatments.

III. RESULTS AND DISCUSSION

Table 1 shows the burgers' approximate composition, and technological characteristics. Adding AF reduced the protein and fat content and increased the carbohydrate content. Besides, rabbit burgers had a higher protein and lower lipid content than chicken burgers, possibly attributed to the to the composition of rabbit meat. A fat content reduction of at least 15.3% was observed in FRA, which differed from the other treatments (P <.05). About the technological properties of the products, lower cooking losses and greater moisture retention were observed in samples with AF. Amaranth (rich in proteins and starch) can be a binder because it increases water and fat retention. The samples with AF also showed lower shrinkage than controls (P <.05). Texture data (Figure 1) showed that the control samples (FRC and FCC) had greater cohesiveness and chewiness than the treatments with AF. Lower values of springiness (P<.05) were found in samples with rabbit meat and AF, and lower values of hardness were found in samples with chicken meat and AF, demonstrating that the amaranth had an impact on textural parameters. The effects of reformulation in color parameters and appearance of the products can be observed in Figure 2. The samples with AF (FRA and FCA) were redder than the controls; however, about the b* parameter, the type of meat also influenced the results. In chicken

treatments, amaranth left the samples more yellowish; in rabbit meat samples, AF reduced the yellow tone. Regarding luminosity, amaranth flour provided a darker appearance for the rabbit meat treatment (FRA) and did not influence the chicken meat treatments (P>.05).

Table 1 –	Chemical	composition	and	technological	properties	of	chicken	and	rabbit	grilled	burgers
formulated	with amara	anth									

Parameter	FRC	FCC	FRA	FCA							
Chemical composition grilled samples											
Moisture (%)	50.37±0.19 ^a	50.94±0.36 ^a	50.65±0.83 ^a	48.81±0.47 ^b							
Protein (%)	27.72±0.35 ^a	26.19±0.24 ^b	25.69±0.55 ^b	24.19±0.21°							
Fat (%)	14.68±0.10 ^b	15.55±0.20 ^a	12.44±0.19 ^c	14.22±0.24 ^b							
Ash (%)	5.16±0.03 ^{a,b}	5.26±0.04 ^a	4.73±0.02 ^{b,c}	4.61±0.51°							
Carbohydrates (%)	2.07 ^b	2.06 ^b	6.5 ^a	8.17 ^a							
Tecnological parameters											
Cooking losses (%)	40.18±4.45 ^a	39.58±2.40 ^a	33.08±3.23 ^b	33.96±1.77 ^b							
Shrinkage (%)	22.95±1.76 ^a	8.64±3.02 ^c	15.63±4.84 ^b	6.65±2.58°							
Moisture retention (%)	29.53±2.69 ^b	30.78±1.22 ^{a,b}	33.90±1.64 ^a	33.99±2.28ª							

^{a,b,c} Mean values within the same line horizontally followed by the same lowercase letters did not show any significant difference (P > .05) by Tukey's test. FRC: control with rabbit meat; FCC: control with chicken meat; FRA: 30% fat reduction and 4.5% AF with rabbit meat; FCA: 30% fat reduction and 4.5% AF with chicken meat.



Figure 1. Texture parameters of chicken and rabbit grilled burgers with amaranth.

 $^{\rm a,b,c}$ Mean values next to bars of the same color followed by the same lowercase letters did not show any significant difference (P>.05) by Tukey's

Figure 2. Appearance and color parameters of chicken and rabbit grilled burgers with amaranth. ^{a,b,c,d} Mean values within the same line horizontally followed by the same lowercase letters did not show any significant difference (P > .05) by Tukey's test. L: brightness; a*: green-red; b*: blue-yellow; ΔE : euclidean distance

IV. CONCLUSION

Rabbit burgers can be promising meat product options due to their higher nutritional quality, more sustainable production, and technological properties, similar to traditional options such as products made with chicken meat. Amaranth flour improved the technological properties of burgers and enabled a partial reduction in fat. Further studies are desirable to assess consumers' acceptability of this type of product and promote rabbit meat consumption among the Brazilian population.

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