EFFECTS OF DRIED PUMPKIN PULP AND SEED ON QUALITY OF BEEF MEATBALLS

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Abstract –The objective of our study was to investigate quality attributes of meatballs produced with dried pumpkin pulp and seed mixture (PM). Four different meatball formulations were prepared as C (0% PM), P2 (2% PM), P3 (3% PM) and P5 (5% PM). Utilization of PM decreased moisture and increased ash content. P5 samples had higher pH compared to C samples. a* values were decreased with PM addition, where L* and b* values were similar in C, P3 and P5. PM was effective in increasing water-holding capacity and maintaining cook loss and diameter changes. Our results indicated that utilization of dried pumpkin pulp and seed mixture presents the opportunity to decrease the amount of meat without causing negative changes in physical, chemical and technological quality of meatballs.

Key Words – pumpkin, pumpkin seed, pumpkin pulp, dietary fiber, meatball.

I. INTRODUCTION

In recent years, since consumers have become increasingly more health conscious, some trends in meat products have become current issues including fat and cholesterol reduction, lipid modification, salt and additive reduction and/or replacement, as well as dietary fiber enrichment [1]. Dietary fibers are stated to be the key ingredients in development of healthier meat product formulations. Besides having many health benefits, dietary fibers have the ability to improve sensory and technological properties of meat products. Pumpkin (*Cucurbita maxima*) is a nutritional fruit which is rich in dietary fiber, protein, carotenoids and ascorbic acid [1-3]. In this study, we investigated the utilization of dried pumpkin seed and pulp mixture in beef meatballs.

II. MATERIALS AND METHODS

Fresh boneless post-rigor beef, beef fat, pumpkin and other additives were supplied from local market. A control meatball formulation (C) was prepared by mixing minced meat and fat with breadcrumb, salt, onion powder, water and other spices, shaping, cooking at 200°C for 7 min and cooling For other treatments, pumpkin pulp and seeds were separately dried at 65°C for 2.5 h, ground and finallymixed (1:1). The mixture (PM) was added to the treatments together with the other ingredients as 2% (P2), 3% (P3) and 5% (P5) of the total formulation. Total moisture [4], ash [4] and lipid [5] content were determined. Protein content was analyzed by Dumas method (LECO, FP-528, USA). pH was measured with a pH-meter (WTW, Germany). Colour was measured with a portable colorimeter (Konica Minolta, CR-200, Japan). Water-holding capacity (WHC) [6], cook loss (CL) [7], and reduction in diameter (RD) [8] were analysed to evaluate technological quality. Data was statistically analyzed by ANOVA and Duncan Post-Hoc tests using SPSS software.

III. RESULTS AND DISCUSSION

Chemical composition and pH values of the samples are presented in Table 1. Moisture, protein, lipid and ash content of the samples were between 55.83-59.71%, 20.18-21.33%, 17.35-20.26% and 2.76-2.95%, respectively. Moisture content tend to decrease with increased amount of PM (P<0.05). No significant differences were obtained in protein content of the samples. Lipid content was similar in C, P2 and P5. Ash content of PM samples were higher compared to C samples (P<0.05). pH values were between 5.89-5.92, where the highest pH value was observed in P5 samples (P<0.05). P3 samples had lower (P<0.05) and P2 samples had similar pH value compared to C samples. Colour is an important visual quality attribute affecting consumer satisfaction. The excess amount of non-meat ingredients added to meat product formulations could lead to undesirable changes in colour. Colour (L*, a*, b*) of samples is shown in Table 1. L*, a* and b* values were within the range of 39.26-40.92, 8.52-14.14 and 9.66-12.38, respectively. Samples had similar L* values to each other, meaning that added PM did not affect the lightness of the meatballs. The highest a* values were measured in C samples (P<0.05), probably due to the highest amount of meat in this treatment. In P2 samples there was a significant decrease in b* values (P<0.05), while P3 and P5 samples had similar b* values to C samples.

Table 1 Chemical composition, pH value and colour (L*, a*, b*) of meatballs

Treatment	Moisture (%)	Protein (%)	Lipid (%)	Ash (%)	pH	L*	a*	b*
C	59.71±0.42^{a}	20.18±2.22	17.35±1.94^{b}	2.76±0.04^{b}	5.89±0.01^{b}	40.45±0.84	14.14±2.83^{a}	12.25±0.76^{a}
P2	58.69±0.37^{a}	20.26±0.44	18.18±0.67^{ab}	2.87±0.07^{a}	5.89±0.05^{b}	39.58±1.87	10.57±1.22^{b}	9.66±0.75^{b}
P3	56.46±0.36^{b}	20.32±0.7	20.26±0.45^{a}	2.95±0.02^{a}	5.86±0.02^{c}	39.26±0.44	9.70±1.23^{b}	11.85±0.46^{a}
P5	55.83±1.64^{b}	21.33±1.51	19.92±1.71^{ab}	2.90±0.05^{a}	5.92±0.01^{a}	40.92±1.11	8.52±0.95^{b}	12.38±1.50^{a}

(ab: means with the different letter in the same column are significantly different (P<0.05), all values are mean ±standard deviation of three replicates).

Maintaining the quality of comminuted meat products is a technological challenge since water can easily expelled with increased surface area. Dietary fibers are known to improve water-holding capacity and resist changes upon cooking process of meat products. WHC, CL and RD results are shown in Figure 1. Increased amounts of PM had a significant effect on WHC, where P5 samples had higher WHC compared to C and P2 samples (P<0.05). No significant differences were recorded in CL and RD of the samples, indicating that added PM could present the option to reduce meat amount in the formulation without loss of any technological quality. Similar studies reported that utilization of pumpkin fiber in frankfurters decreased cook losses and increased emulsion stability [2, 3]. However, Zargar *et al.* [1] reported that increased concentrations of pumpkin could lead higher cook loss and emulsion stabilization.

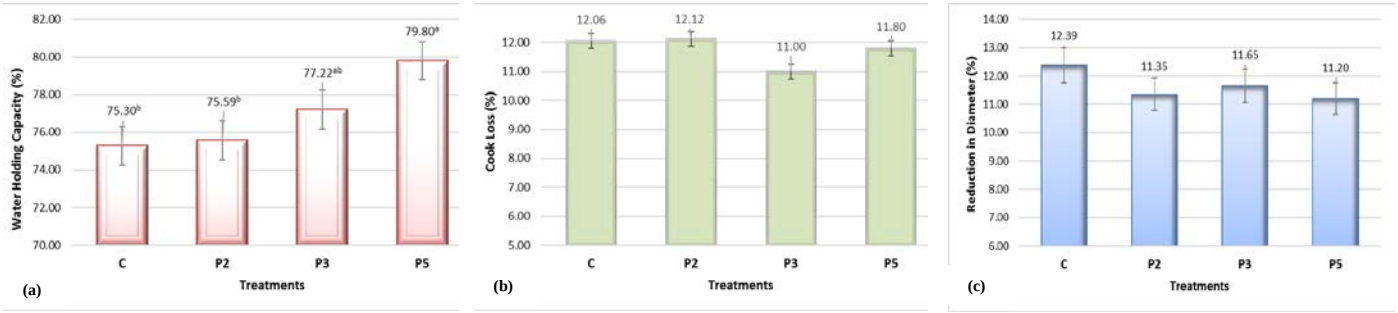

Figure 1. (a) Water-holding capacity, (b) cook loss, (c) reduction in diameter of meatball samples (ab: means with the different letter are significantly different (P<0.05)).

IV. CONCLUSION

The results of our study indicated that beef meatballs produced with pumpkin pulp and seed mixture in which meat amount was reduced had desired quality in terms of chemical, physical and technological properties. Thus it is possible to develop fiber-enriched meat product formulations by pumpkin-based ingredients.

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