PUMPKIN FLOWER AS A NATURAL ANTIOXIDANT IN CHICKEN PATTIES

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I. INTRODUCTION

One of the main deterioration processes in meat that impacts its nutritional value, and sensory properties is lipid oxidation [1]. Maintaining lipid stability often requires the incorporation of antioxidant compounds. However, their use has been limited by international organizations like the U.S. FDA and the WHO due to several safety concerns about their presence in foods [1,2]. Consequently, there is a growing interest in obtaining antioxidants from natural sources. Recently, pumpkin flower (*Cucurbita maxima*) has emerged as a potential source of interesting biocompounds. These flowers are abundant in minerals, polyunsaturated fatty acids, and antioxidants. In this study the antioxidant effect of pumpkin flower powder (*Cucurbita maxima*) dehydrated by foam-mat drying, freeze drying and oven drying was evaluated in chicken patties.

II. MATERIALS AND METHODS

Three different drying methods were evaluated to obtain pumpkin flower powders. These methods included foam-mat drying (FF, CF), freeze drying (LF), and oven drying (OF) [3]. In foam-mat drying, the edible flowers were converted into a stable foam by using albumin maltodextrin, hydroxyethyl cellulose, and Tween-80 as foaming agents and stabilizers, and then dried by application of hot air. Four formulations of chicken patties composed by chicken breast meat, NaCl, binding protein, and pumpkin flower were designed. FF and CF batches included 1.5% of the flower powder, LF and OF additives consisted only of the dried pumpkin flower (0.05%). A control sample without pumpkin flower was also considered. All samples were vacuum packaged and stored at 4 °C for 7 days [4]. Antioxidant assays and color evaluation were performed on days 0 and 7, before and after cooking at 69 °C internal temperature in a microwave. The evaluation of the antioxidant profile of the chicken patty samples was carried out by DPPH, ABTS, and FRAP methodologies [5]. Lipid oxidation was evaluated following the development of thiobarbituric acid reactive substances (TBARS) [6]. Moisture content in chicken patties was measured and CIELa*b* parameters were determined.

Sensory evaluation of the cooked patties was performed using a 5-point hedonic test conducted by fifteen trained panelists. Hedonic scores ranged from 1 to 5 representing from very unpleasant (1) to excellent (5). The test included the evaluation of color, odor, texture, taste, and overall acceptability [4, 7]. Statistical analysis of the data obtained was performed using Minitab 17 software. Mean values were compared using the one-way ANOVA and Tukey multiple range tests were used to estimate the level of significance among chicken patties. Principal component analysis (PCA) was performed to outline differences and groupings among samples.

III. RESULTS AND DISCUSSION

Four formulations were developed to be evaluated as chicken patties additives to provide color and increase antioxidant activity in the final product (Figure 1). In fresh chicken patties a significant improvement of the antioxidant properties was observed with the incorporation of the pumpkin flower additives. However, this antioxidant effect was affected by cooking process. Nevertheless, the formulations containing the additives continued presenting higher scores compared to the control samples. After cold storage, this trend remained.

Figure 1. Pumpkin flower powders.

The FF, CF, and LF formulations exhibited the higher antioxidant activity compared to the samples with oven dried pumpkin flowers. The addition of the flower additives in the formulation prevented the oxidation process of lipids determined by TBARs during storage and cooking compared with the control samples. According to the results obtained in the analysis of antioxidants, the drying process of the powder played an important role in the preservation of bioactive compounds. The foam-mat drying method allowed the preservation of bioactive compounds after cooking and after cold storage compared with the conventional drying method due to the encapsulation-like mechanisms of the added proteins. Sensory evaluation of the chicken patties was carried out on the cooked patties on day 0 and day 7 of storage. On the first day, hardly any difference between samples was found. The panelists gave the highest score to CF formulation with an overall acceptability of 4.62. For odor, FF, CF, and LF formulations presented the most attractive aroma to panelists. After 7 days of storage (4°C) no changes in color were appreciated. Related to odor, no unpleasant odors were perceived in CF and LF patties. In evaluation of taste, a similar pattern was observed.

IV. CONCLUSION

This study pioneers the use of pumpkin flower (*Cucurbita maxima*) as an antioxidant additive in chicken patties. Assessment through DPPH, ABTS, and FRAP assays showed the effectiveness of pumpkin flower in reducing oxidation during cooking and storage, enhancing sensory qualities. Foam-mat and freeze-drying methods exhibit superior antioxidant and sensory effects compared to oven-drying. Antimicrobial activity can be inferred by control and OF samples' higher spoilage. Foam-mat drying emerged as the preferred method to incorporate fresh pumpkin flowers into chicken patties, given its simplicity, efficiency, and cost-effectiveness.

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