

Potentials of Edible Flowers on Reducing Lipid and Protein Oxidation in Ground Beef

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I. INTRODUCTION

Edible flowers, rich in antioxidants, have been used in traditional medicine and food for centuries and show potential for preserving meat products [1]. Among edible flowers, roses, and hibiscus stand out for their antioxidant properties. Roses, known for their various health benefits, effectively inhibit lipid oxidation in meat products [2]. Similarly, hibiscus extracts, rich in phytochemicals, combat oxidative damage and enhance meat quality and taste. Incorporating these flowers into beef products offers improved quality and nutritional value, making them valuable additions to the industry (Santos et al., 2022). This study evaluates the potential role of rose and hibiscus flowers on lipid and protein oxidation in fresh ground beef stored under simulated retail conditions for seven days. By understanding the mechanisms behind oxidation in beef products and exploring natural antioxidants, this research aims to enhance the quality and shelf life of meat-based products.

II. MATERIALS AND METHODS

The raw ground beef patties were mixed with the treatment ingredients and molded into patties. They were then stored and displayed in a retail display case for 7 days under retail display conditions. This entails dividing the raw ground beef into seven treatments, each consisting of 30 grams: raw ground beef patties (control), raw ground beef patties mixed with 1, 2, and 3 % hibiscus powder, ground beef patties mixed with 1, 2, and 3 % rose powder. All preparation procedures, including mixing, patty formation, packaging, and storage, were conducted at 4°C for intervals of 0, 1, 3, 5, and 7 days. The 1, 2, and 3 percentages focus on parameters such as pH, water holding capacity (WHC), textural attributes, and color. Additionally, the study evaluated oxidative degradation using four oxidation markers (protein carbonyls, Schiff bases, and free thiols), and antioxidant capacity was determined using the DPPH assay.

III. RESULTS AND DISCUSSION

The edible flowers exhibited significant improvements in several key parameters associated with oxidative stability, including increased scavenging of free radicals, enhanced water-holding capacity, reduced TBARS values, decreased protein carbonyls, and improved retention of free thiols and Schiff bases. Additionally, the inclusion of hibiscus and rose powders helped in maintaining favorable color attributes and textural properties in the patties. Our study highlights the beneficial effects of incorporating hibiscus and rose powders at varying concentrations (1%, 2%, and 3%) in raw ground beef patties to mitigate lipid and protein oxidation. These edible flowers exhibited significant improvements in several key parameters associated with oxidative stability, including increased scavenging of free radicals, enhanced water-holding capacity, reduced TBARS values, decreased protein carbonyls, and improved retention of free thiols and Schiff bases. The incorporation of roselle and rose powders led to heightened scavenging activity, resulting in reduced oxidative activity, carbonyls, Schiff bases, and free thiols during storage (Figure 1). Additionally, the inclusion of hibiscus and rose powders helped in maintaining favorable color attributes and textural properties in the patties.

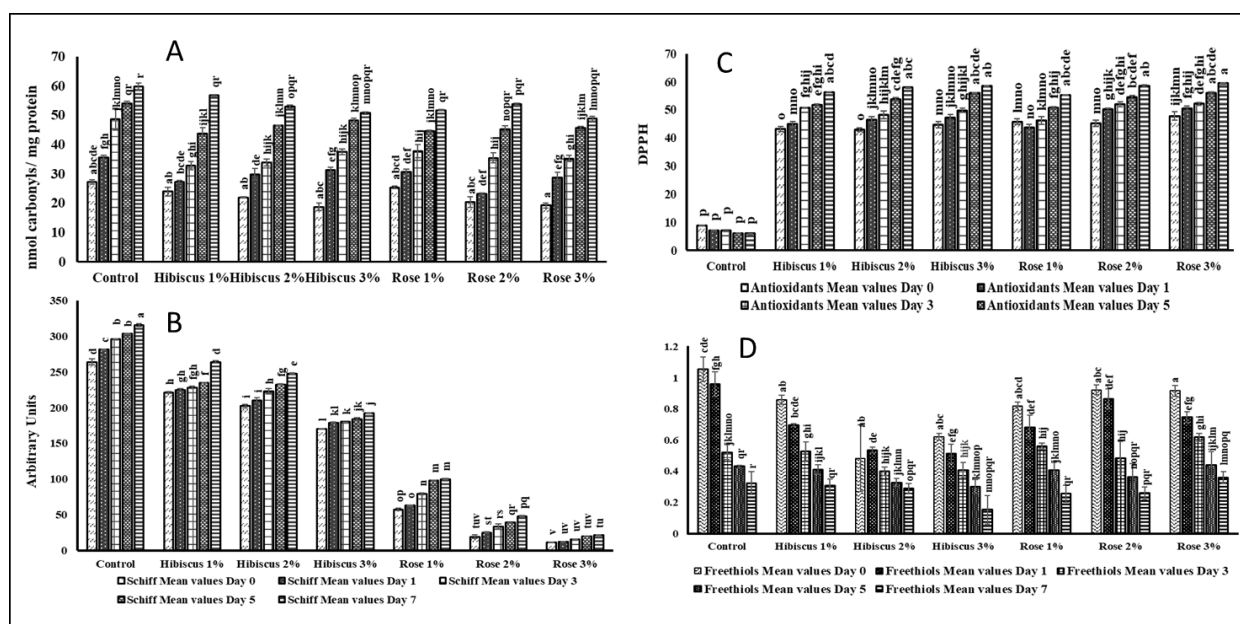


Figure 1. The graph represents the concentration of protein carbonyls (1A), Schiff bases (1B), antioxidant capacity (1C), and free thiols (1D) obtained from Days 0 - 7 with different treatments. Results are presented as mean \pm SD of three independent determinations. Letters connected by different letters are significantly different. Significant difference within the treatment ($p < 0.05$).

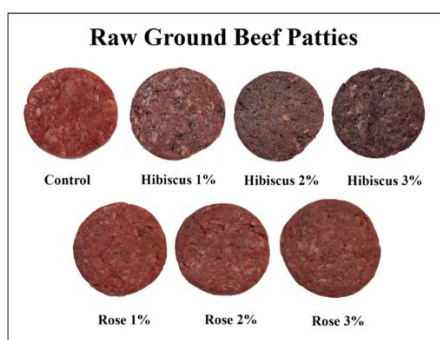


Figure 2. The visual appearance of the raw ground beef patties is evaluated after preparation with seven treatments: Raw ground beef patties (control), ground beef patties with 1, 2, and 3 % Hibiscus sabdariffa L. powder, including ground beef patties treated with 1, 2, and 3 % Rosa canina L. powder.

CONCLUSION

Notably, our findings suggest that higher concentrations of hibiscus and rose powders, particularly at 3% powder, demonstrate the greatest potential in reducing lipid and protein oxidation compared to untreated patties and those treated with lower concentrations. Overall, the inclusion of rose powder exhibited more favorable effects than untreated raw ground beef patties and those treated with roselle. Consequently, raw ground beef patties treated with rose powders demonstrated greater efficacy in enhancing the quality attributes under investigation.

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