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EXPLORING ORGANIC AND CONVENTIONAL CURING INGREDIENTS: IMPACTS ON DELI-STYLE TURKEY QUALITY AND SENSORY TRAITS

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I. INTRODUCTION

This research examines the effects of various nitrite sources including sodium nitrite, celery (organic and conventional), and Swiss chard (organic and conventional) on the quality and sensory attributes of deli-style turkey breast. The study aims to understand the effects of differences in the physicochemical properties of the organic sources on cure deli-turkey along with an understanding of the consumer's perception of such processed meats. Key quality attributes such as cured meat pigments, myoglobin content, color stability, pH, and residual nitrite levels were analyzed over a 60-day storage period and under light exposure. Sensory evaluations and volatile compound profiling were conducted to understand consumer acceptance on organic source ingredients. Results highlighted that organic Swiss chard exhibited distinct sensory characteristics, such as higher ($p<0.05$) perception of earthiness and non-meat aftertaste, attributed to terpene alcohol and aldehydes. However, alternative curing sources, regardless of plant type or growing method, showed comparable overall liking and purchase intent to sodium nitrite treatments. This study contributes valuable insights into organic meat processing by demonstrating the potential of organic and conventional vegetable-based nitrite sources as viable curing alternatives.

II. MATERIALS AND METHODS

Five treatments (TRTs) were prepared, comprising synthetic sodium nitrite (SN) and vegetable-based nitrite sources: celery powder (CEL), organic celery powder (OCEL), Swiss chard powder (SW), and organic Swiss chard powder (OSW). Each TRT was formulated to contain 150 ppm nitrite equivalent and 1.60% sodium chloride. Samples were monitored over a 60-day storage period for physicochemical properties, including color, pH, residual nitrite, and meat pigments, as well as sensory attributes. Nitrite content was analyzed using an HPLC-UV/Vis method specifically designed for nitrite and nitrate measurement in meats [1]. Volatile compounds in the TRTs were also analyzed accordingly based on a previous reported method to establish correlations between chemical profiles and sensory results [2]. A two-way analysis of variance (ANOVA) was employed to examine the main effects of nitrite source and time (sampling day), as well as their interaction on color parameters (CIE L*, a*, b*, Hue angle, and Chroma C*). One-way ANOVA was applied to assess the effects of nitrite sources on proximate composition (moisture, fat, and protein), salt content, cooking loss, and meat pigment attributes. Pearson correlation coefficients ("r") were calculated to determine positive or negative relationships between variables. Principal component analysis (PCA) was used for dimensional reduction, summarizing variables into two principal components to provide insight into sensory attributes and volatile compound profiles.

III. RESULTS AND DISCUSSION

During storage and light display, synthetic sodium nitrite (SN) consistently exhibited the lightest color and significantly lower levels of yellowness ($P < 0.05$) compared to vegetable-based treatments. At hour 0, celery treatments (TRTs) demonstrated a lower hue angle ($p < 0.05$) than Swiss chard TRTs, although these differences diminished and became unnoticeable by the end of the test. The analysis revealed that whether nitrite sources were organic or conventional did not result in significant overall effects on color. Consumer Sensory evaluation highlighted that OSW displayed greater earthiness than all other treatments, except for CEL, which showed no difference. OSW was further identified as having the strongest non-meat aftertaste ($p < 0.001$) and less bitterness ($p = 0.009$) compared to SN. Despite variations in sensory attributes, consumer evaluations indicated no differences ($P > 0.05$) in overall liking or purchase intent among treatments, demonstrating equivalence between alternative cures and SN. The Volatile compound analysis revealed a distinct profile across treatments, particularly with OSW exhibiting the highest abundance of aromatic hydrocarbons. Organic treatments showed reduced aldehyde content compared to their conventional counterparts, suggesting differences in chemical composition influenced by growing practices.

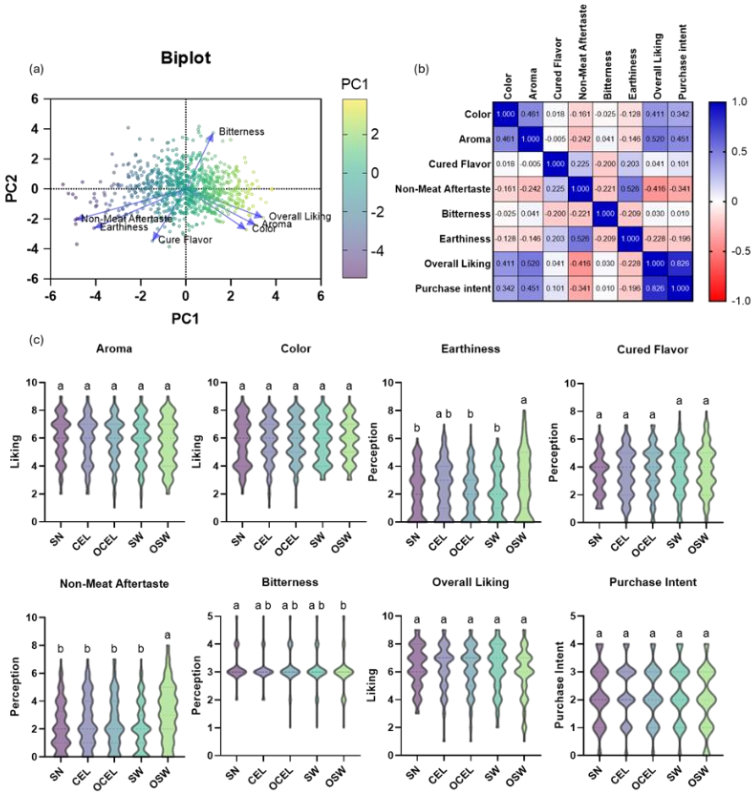


Figure 1. Sensory attributes analysis of all Deli Turkey TRTs. (a) Biplot of Deli-Turkey sensory attributes using PCA Analysis; (b) Correlation Analysis of all sensory attributes of Deli-turkey; (c) Violin plot of sensory attributes of all TRTs. In figure c, unlike letters denote difference ($p < 0.05$). Treatments: SN = Sodium Nitrite; CEL= Celery powder; OCEL=Organic celery powder; SW= Swiss chard powder; OSW = Organic Swiss chard.

IV. CONCLUSION

This study investigated the effects of various nitrite sources, including synthetic sodium nitrite and vegetable-based powders (organic and conventional celery and Swiss chard), on the quality, sensory attributes, and volatile compound profiles of deli-style turkey. Findings revealed that nitrite source influences product color, with sodium nitrite maintaining lighter color and lower yellowness throughout light display. Organic and non-organic treatments exhibited comparable color and sensory attributes, with celery and Swiss chard showing subtle differences in redness, saturation, and hue. Sensory evaluation identified non-meat aftertaste and earthiness as negatively correlated with overall liking, while color and aroma positively influenced consumer preference. Volatile compound analysis demonstrated distinct profiles among treatments, with organic sources yielding fewer aldehydes and unique terpenes. Despite minor differences, vegetable-based nitrite sources, irrespective of growing practices, were equivalent to sodium nitrite in overall consumer acceptance and purchase intent. These findings advance clean-label meat curing practices while aligning with consumer trends toward sustainable, organic products.

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