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Evaluation of Sous-vide Chicken Breast Properties During Storage

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Poultry meat is growing in popularity across the globe because of its nutritional advantages and affordable price compared to other meats,. In the last few years, sous-vide cooking has gained popularity in the food industry, among producers of ready-to-eat meals, and in households, due to the demand for minimally processed, convenient food with enhanced natural qualities and high nutritional value.

Breast meat (*pectoralis major*) of chicken has several advantages when compared to other parts, it is low in fat, making it an excellent choice for those looking to maintain a healthy diet and it is high in protein. However, breast muscles tend to show higher toughness and crumbliness as compared to other parts for example chicken legs' muscles. In this case, it needs to develop novel poultry-based ready-to-eat products with an improved texture and maintain high nutritional value.

Sous-vide cooking can be conducted by using two methods: **double-step and single- step**. The double-step method involves applying two temperature conditions, while the single- step method only applies one temperature. Chicken breast treated with the double-step temperature method showed improvements. Based on some literatures, a two-stage sous vide method using temperature between 45-50°C resulted in enhanced texture, cooking loss, acceptable redness values, decreased lipid oxidation levels, and increased total protein solubility, compared to the single-step method.

Even though it is cooked in a lower temperature, double-step sous-vide still **consider safe to eat** because it was successfully inactivating heat-resistant microorganism *Enterococcus faecalis* at the utilized pasteurization levels. Chilling is an effective method of preserving the chemical, organoleptic, and nutritional properties of the product while preventing the harmful impacts of microorganisms and enzymes.

The objective of this research is to assess the impact of the **storage time (0, 7, 14, and 21 days)** and different storage temperature **(4°C and 10 °C)** on different quality properties of three sous-vide treatment, which are **T1 (60 ◦C/120 min), T2 (50 ◦C/40 min + 60 ◦C/80 min), and T3 (50 ◦C/60 min + 60 ◦C/60 min)** of chicken breast sample. The statistical analysis of

the data applied descriptive analysis and analysis of variance (ANOVA) with post hoc Tukey's, to evaluate the effects of **treatment, storage time, and storage temperature** on **moisture content, cooking loss, colour parameters (L*, a*, b*, and ΔE), TBARS, and odour acceptability.**

Based on our result, each treatment (T1, T2, and T3) differs significantly in terms of **moisture content (%) and cooking loss** (%) ($p<0.05$). The double step treatments (T3 and T2) had significantly lower in cooking loss (%) and higher in moisture content (%). There was a significant difference in moisture content (%) ($p = 0.016$) in storage temperature where 4°C showed higher moisture content. While in cooking loss, storage days had significant effect which there was an increasing during storage times for both 4°C and 10 °C.

Regarding color, double stage (T2 and T3) and single step (T1) differed significantly in terms of lightness (L*), redness (a*), and yellowness. In T1, lightness was greater than in T2 and T3, but the opposite for redness and yellowness. During storage at both temperatures (4°C and 10°C), lightness tended to decrease significantly while yellowness increased substantially. However, redness only decreased significantly under storage conditions of 10°C. In terms of storage temperature, only redness exhibited a statistically significant (p-value 0.003) difference, with the 4°C storage condition being higher to the 10°C storage condition.

The storage temperatures reveal that category IV (indicates a clear difference in colour is detectable) were perceived more significantly at 4°C than at 10°C for the **total colour difference**. The most indicate a clear difference in colour is was observed between day 0 and 21 of storage.

Regarding the **TBARS value** (mg MDA/kg of meat product), double stage (T2 and T3) and single phase (T1) significantly differed ($p<0.05$), with T1 having a higher value. With a p-value of 0.044, there was a significant difference between 4°C and 10°C regarding the storage temperature, indicating that the value was greater at 10°C than at 4°C. During storage at both temperatures (4°C and 10°C), there was a significant difference in lipid oxidation ($p<0.05$), implying that lipid oxidation increased over time. On the 21st day of storage at 10°C, an **unacceptable odour** was detected significantly ($p<0.05$) due to the formation of secondary lipid oxidation products that exceeded the sensorial threshold limit of 1 milligram MDA/kg sample.

This research suggests conducting additional analysis, such as advanced sensory analysis with more panellists, in order to better observe the significant differences between the three treatments. In addition, economic and efficiency calculations must be performed before it can be implemented in the food industry.