Review of: "The anti-staphylococcal activity of probiotic-contain gelatin and whey coatings on processed chicken breast"

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Potential competing interests: No potential competing interests to declare.

Manuscript review

The anti-staphylococcal activity of probiotic-contain gelatin and whey coatings on processed chicken breast

ABSTRACT

This study lacks of control over other variables that could potentially affect the results. The study does not mention if all samples were stored under the same conditions, such as temperature and humidity. These factors could influence the growth rate of Staphylococcus aureus and therefore affect the observed antimicrobial activity of the coatings.

Another concern is the lack of specific information regarding the compositions of the gelatin and whey protein coatings. It is important to know the concentration and formulation of these coatings in order to assess their potential antimicrobial activity. Without this information, it is difficult to compare the results of this study to those of other studies or to assess the practical implications of the findings.

Additionally, the statistical analysis used in the study is not clearly described. The study mentions that data were analyzed for statistical significance using analysis of variance (ANOVA) and the Kruskal-Wallis test, but does not provide further details on how these tests were applied or what specific statistical comparisons were made. This lack of information makes it difficult to fully evaluate the reliability and validity of the statistical results.

Furthermore, the study does not provide any information on the sample size or the number of replicate experiments conducted. Details on these factors are essential for assessing the robustness and generalizability of the findings. Without this information, it is unclear if the results are statistically representative and can be extrapolated to a larger population.

Finally, the study presents limited information on the potential risks and safety considerations associated with the use of probiotics in edible coatings. While it suggests that using probiotics in edible coatings may be a hopeful way to cover meat products, no information is provided on potential adverse effects, allergenicity, or regulatory considerations. These factors are important to consider when evaluating the practicality and safety of implementing such coatings in food products.

INTRODUCTION

The introduction makes several claims about the role of poultry production, the perishability of chicken meat, and the potential pathogens associated with it. However, these claims are not backed up with specific scientific literature or studies. Without proper references, it is difficult to determine the validity and accuracy of these statements.

Furthermore, the introduction provides a broad overview of the potential pathogens associated with chicken meat, but it lacks specificity regarding the prevalence and significance of each pathogen. It mentions salmonella, Campylobacter, Staphylococcus aureus, Escherichia coli, and Listeria monocytogenes, but without providing further details on their prevalence, impact on public health, or specific relevance to the study. This lack of specificity weakens the contextualization of the research and makes it challenging to understand the importance of focusing specifically on the anti-staphylococcal effect of whey protein concentrate and gelatin edible coats.

Additionally, the introduction discusses the use of natural compounds such as essential oils and plant extracts in edible coatings and films to enhance the shelf life of food products. It mentions that the use of these natural compounds has notably increased, but does not provide any evidence or references to support this claim. Without specific studies or data, it is difficult to assess the actual trend or the effectiveness of using these natural compounds in food preservation.

Another criticism is the lack of information on the methodology of the study. The introduction mentions that the anti-staphylococcal effect of whey protein concentrate and gelatin edible coats containing L. plantarum and B. bifidum was investigated on processed-cooked chicken breast during cold storage, but no details are provided on the experimental design, sample size, or specific methods used for coating application, pathogen contamination, and bacterial enumeration. This lack of information makes it difficult to evaluate the reliability and reproducibility of the results.

Materials and Bacteria strain

This text lacks of detailed information about the specific strains used for the probiotic bacteria and Staphylococcus aureus. The study only lists the strain numbers (L. plantarum 1058, B. bifidum 1644, and S. aureus ATCC 6538) without providing any additional information about their characteristics, origin, or relevant research background. This information is crucial for understanding the potential variability and characteristics of these bacterial strains and their relevance to the study.

Furthermore, the text does not provide any information on the preparation and storage of the bacterial strains. It is important to know if the strains were revived from freeze-dried form, subcultured, and grown to a specific growth phase before being used in the study. Proper handling and cultivation of bacteria are critical for maintaining bacterial viability and ensuring accurate and reproducible results.

The lack of information about the cultural media used is also a limitation. The text mentions that all cultural media were obtained from Merck, Germany, but does not specify the exact media used for the bacteria strains. Different types of media can have varying effects on bacterial growth and metabolism, so not providing this information makes it difficult to assess the suitability of the media for the study.

Another concern is the lack of details about the storage and handling of the cooked-processed chicken breast. The text only mentions that the chicken was purchased from Andre Meat Products Company in Iran, but does not provide

information about the storage conditions or handling procedures prior to the experiments. These factors can have a significant impact on the quality and safety of the chicken meat, as well as the potential microbiological contamination.

Formulation and coat solution preparation

This text lacks of information on the specific brands or sources of the whey protein concentrate and gelatin powder used in the coat solutions. Different brands or sources may have variations in their composition, quality, and functionality, which can affect the properties and performance of the coatings. Without this information, it is challenging to evaluate the consistency and comparability of the results.

Additionally, the text does not provide details on the method used to ensure the accuracy of the 10% (w/v) concentration of the whey protein concentrate or the 3 g of gelatin powder. It is important to specify the weighing method and equipment used to guarantee precision in the measurements. Any variation in the concentration of the coating solutions could affect their characteristics and subsequent antimicrobial activity.

Furthermore, the text does not provide any information on the sterilization process used for the coat solutions. It states that the solutions were placed in a water bath at 80°C for 20 minutes to kill potential pathogens but does not mention if this procedure is sufficient for sterilization. Without proper sterilization, there is a risk of introducing unintended contamination into the coat solutions, which can affect the accuracy and reliability of the experimental results.

Another concern is the lack of details on the storage and stability of the coat solutions after preparation. It is essential to know how the solutions were stored, the duration of their stability, and any precautions taken to prevent microbial growth or degradation of the coatings. Without this information, it is difficult to assess the consistency and reliability of the coat solutions over time, which can impact the accuracy and reproducibility of the study.

Coating Chicken Breast Samples with the solutions

This text lacks of details on the specific procedure used for deliberate contamination with Staphylococcus aureus (10^5 CFU/g). It is important to know how the samples were inoculated with the bacteria to ensure consistency and reproducibility. Details such as the method of bacterial suspension preparation, the procedure for applying the bacteria to the samples, and the confirmation of the initial bacterial load are missing. These factors are crucial for accurately assessing the antimicrobial activity of the coatings and interpreting the results.

Furthermore, the text does not provide information on the specific vacuum packaging conditions used for the coated chicken breast samples. Vacuum packaging can have a significant impact on the growth and survival of microorganisms, including Staphylococcus aureus. Details such as the type of packaging material, vacuum pressure, and quality control measures are important for evaluating the suitability of the packaging conditions and their potential influence on the bacterial population.

The text also lacks information on the number of replicates performed for each sample condition. The use of an appropriate sample size is essential for obtaining statistically robust and reliable results. Without information on the number of replicates, it is challenging to assess the statistical significance and variations in the observed bacterial counts.

Additionally, the text does not provide details on the specific culture media used for the surface culture method. Different types of culture media can selectively enhance the growth of specific bacteria or inhibit the growth of others. Therefore, information on the selectivity and specificity of the media used is important for evaluating the accuracy and reliability of the microbial counts reported.

Statistical analysis

There are a few comments that can be made of this text:

Lack of information on sample size: The text does not provide any information on the sample size used in the study. Without knowing the sample size, it is difficult to determine the validity and reliability of the statistical tests used.

Lack of information on data collection process: The text mentions that data were collected from three repetitions of the treatments, but it does not provide any information on how the data were collected. It is important to have a clear and well-defined data collection process to ensure the accuracy and representativeness of the collected data.

Inadequate reporting of statistical methods: The text only mentions the use of One-Way ANOVA and Kruskal Wallis tests at $p < 0.05\%$ significance level. However, no information is provided on how these tests were applied or what specific hypotheses were tested. A more detailed description of the statistical methods used would allow for better assessment of the appropriateness and robustness of the analyses.

Lack of information on assumptions and data transformation: The text does not mention whether the assumptions of the statistical tests were met or if any data transformations were applied. It is important to assess the assumptions of the statistical tests used and, if necessary, apply appropriate transformations to ensure the validity of the results.

Limited software information: The text mentions the use of SPSS software Version 22 for statistical analysis. However, it does not provide any information on why this software was chosen or if any specific procedures or options were used. A more detailed description of the software and its functionalities would allow for better evaluation of its appropriateness for the analysis conducted.

Results and Discussion

This text presents a results and discussion section discussing the antimicrobial activity of gelatin/whey coatings containing probiotics against S. aureus on chicken breast. While the text provides some relevant information, there are a few scientific criticisms that can be made:

Lack of statistical analysis details: The text mentions that certain results were significant ($p<0.05$) or not significant ($p>0.05$), but it does not provide information on the specific statistical tests used or the sample size. Without this information, it is challenging to assess the reliability and validity of the statistical analysis or the reported significance levels.

Inadequate interpretation of results: The text presents the observed results of the experiment, but it does not provide a

comprehensive interpretation of the findings. The discussion mainly focuses on differences in antimicrobial activity between various coatings or the potential mechanisms of action, but it fails to address potential limitations, alternative explanations, or the broader implications of the results.

Lack of citations to support claims: The text makes several statements about the effectiveness of different coatings or the potential mechanisms of action but fails to provide relevant references or citations to support these claims. Including appropriate citations would add credibility and strengthen the scientific basis of the discussion.

Limited discussion of previous studies: The text briefly mentions a few previous studies that investigated the antimicrobial effects of different coatings or film materials. However, the discussion is limited to stating the findings of these studies without providing a comprehensive comparison or critical evaluation. Expanding on the discussion of previous studies and providing a more thorough comparison with the current findings would improve the scientific rigor and context of the discussion.

Lack of discussion on experimental limitations: The text does not address any limitations or potential sources of error in the experimental design or methodology of the study. It is essential to acknowledge and discuss potential limitations to provide a balanced and transparent interpretation of the results.

Overall, while the text provides some information on the antimicrobial activity of gelatin/whey coatings containing probiotics against S. aureus on chicken breast, there are scientific criticisms regarding the lack of statistical analysis details, limited interpretation of results, lack of supporting citations, limited discussion of previous studies, and failure to address experimental limitations. Addressing these criticisms would enhance the scientific rigor and completeness of the discussion.

Conclusion

The text would focus on the study's limitations and potential issues with the methodology or data analysis. Here are a few possible commments:

Lack of experimental controls: The study does not mention whether there were control samples (e.g., uncoated samples without probiotics) included in the experiment. Without proper controls, it is difficult to determine the specific effect of the probiotics-containing coatings on inhibiting S. aureus growth.

Limited sample size: The text does not provide information about the number of replicates used for each treatment group. In order to draw reliable conclusions, a sufficient sample size is necessary to account for variability and ensure statistical significance.

Absence of specific measurement parameters: The text does not mention the specific measurements or criteria used to assess the inhibition of S. aureus during the storage period. Important aspects such as bacterial counts, growth rates, or sensory evaluations could have provided a more detailed understanding of the effectiveness of the coatings.

Lack of standardized storage conditions: The study does not provide details about the storage conditions (e.g.,

temperature, humidity) to which the coated and uncoated samples were exposed. Standardizing these conditions is important to ensure that any observed effects are not influenced by external factors.

Questionable generalization: The conclusion states that the findings of this study apply to "types of meat products, especially cooked processed meats," without providing specific evidence to support this claim. Additionally, it suggests these findings generalize to all types of sensitive food. However, without investigating a wider range of food products and assessing their specific characteristics, it is premature to make such broad generalizations.

Overall, while the text suggests beneficial effects of probiotic-containing coatings on inhibiting S. aureus growth, it lacks important details, controls, and generalizability, limiting its scientific strength. Further research with improved methodology and greater experimental rigor is necessary to confirm these initial findings and better understand the potential of edible films and coatings containing probiotics.