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Peer Review

Review of: "The Effect of Fermentation on the Physicochemical Quality and the Presence and Levels of Pesticide Residue in Cow Milk"

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Introduction:

The article by Akabanda et al. investigates two central concerns: the physicochemical changes in cow milk during fermentation and the potential for spontaneous fermentation to reduce pesticide residues. These topics are crucial, as milk quality and safety are key public health issues, particularly in developing countries like Ghana, where pesticide use is widespread. The research is both timely and relevant, addressing the dual concerns of food safety and the effectiveness of fermentation in reducing contaminants like pesticides.

Strengths:

1. Relevance and Timeliness: The issue of pesticide residues in food, particularly milk, is of significant public concern due to the harmful effects of long-term exposure. By investigating the effect of fermentation on these residues, the authors address an important aspect of food safety that could have implications for improving milk quality in Ghana and similar regions.

2. Experimental Design: The study uses sound methodology with clear descriptions of how milk samples were collected, fermented, and analyzed for physicochemical properties and pesticide residues. The use of multiple time points (0, 12, and 24 hours) to monitor changes in milk quality during fermentation is a strength, providing a comprehensive picture of the fermentation process.

3. Statistical Significance: The authors perform statistical analysis (using Genstat Discovery Edition 4 Software), and the results are clearly presented, with significant changes in physicochemical parameters like pH, titratable acidity, and total soluble solids. This adds credibility to the study's findings.

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4. Pesticide Residue Analysis: The study employs rigorous methods for detecting pesticide residues, including the use of Gas Chromatography (GC) with various detectors for different pesticide groups. This ensures high sensitivity and accuracy in detecting even low levels of pesticide contamination.

5. Pesticide Degradation via Fermentation: One of the most significant findings of the study is that chlorpyrifos, a commonly used pesticide, was not detected in the milk after 24 hours of spontaneous fermentation. This suggests that fermentation, particularly through the activity of lactic acid bacteria (LAB), might offer a potential method for detoxifying pesticide residues, which is an interesting and promising avenue for future research.

Weaknesses and Areas for Improvement:

1. Limited Sample Size: The study uses only 13 milk samples, which may limit the generalizability of the results. A larger sample size would strengthen the findings and make them more applicable to a wider population of milk producers and consumers. In addition, it is unclear whether the study controlled for variations in milk quality due to factors like

breed, diet, or seasonal changes, which could affect both physicochemical properties and pesticide levels.

2. Scope of Pesticide Analysis: While the study analyzes chlorpyrifos, other commonly used pesticides in Ghana, such as dimethoate and endosulfan, are not mentioned as being tested. This could limit the scope of the study, as other pesticides may exhibit different degradation patterns during fermentation. Expanding the analysis to include a broader range of pesticides would provide a more complete picture of how fermentation affects pesticide residue levels.

3. Mechanism of Pesticide Degradation: The study does not delve into the specific mechanisms by which fermentation reduces pesticide residues. While the authors mention the potential role of LAB in pesticide degradation, more detailed discussion and further studies on the biochemical pathways involved would be valuable. Understanding whether the pesticides are metabolized, absorbed, or degraded by the bacteria would enhance the scientific understanding of the fermentation process.

4. Lack of Comparison with Other Detoxification Methods: The study primarily focuses on fermentation without comparing it to other potential detoxification methods, such as physical processing techniques (e.g., washing, centrifugation) or chemical treatments. A comparison of the effectiveness of spontaneous fermentation against other methods could help contextualize the results and guide practical applications.

5. Pesticide Concentrations in the Context of Health: While the study reports that chlorpyrifos was present in about 15% of the milk samples above the Maximum Residue Limit (MRL), it would be

helpful to provide context regarding the health risks associated with these pesticide levels. For instance, how does the detected concentration compare to the levels considered safe for human consumption, especially for vulnerable populations like infants? Further elaboration on this would enhance the public health relevance of the findings.

Conclusion:

Overall, this study provides valuable insights into the impact of spontaneous fermentation on both the physicochemical quality and the reduction of pesticide residues in cow milk. The findings that chlorpyrifos was not detected after 24 hours of fermentation are promising and suggest that fermentation could be a viable method to reduce pesticide contamination in milk. However, there are several areas for improvement, including increasing the sample size, expanding pesticide analysis, exploring the mechanisms of pesticide degradation, and comparing fermentation to other detoxification methods. Despite these limitations, the study contributes to an important field of

Attachments: available at https://doi.org/10.32388/LQCM7X

Declarations

Potential competing interests: No potential competing interests to declare.