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REVIEWER'S REPORT

Manuscript No.: IJAR-58980

Title: Traditional Sonru production as a bioprocess for detoxification and nutritional enhancement of Mucuna pruriens seeds.

Recommendation:

Accept as it is .....

Accept after minor revision.....

Accept after major revision .....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality		✓		
Clarity		✓		
Significance	✓			

Reviewer Id: JPR-297

Reviewer's Comment for Publication.

The manuscript addresses an important and relevant topic concerning the utilization of *Mucuna pruriens*, an underutilized protein-rich legume with substantial nutritional potential but limited food application because of its high L-DOPA and other antinutritional factors. The study provides useful information on the potential of traditional Sonru fermentation as a bioprocess for reducing antinutritional compounds and improving the suitability of *M. pruriens* for food applications. The integration of physicochemical, microbiological and antinutritional analyses, together with correlation analysis, PCA and HCA, adds value to the study.

The reported reduction in L-DOPA (98.4%), phytates, oxalates and trypsin inhibitor activity is particularly significant. The study also provides useful evidence of microbial proliferation and changes in pH during fermentation. The subject is relevant to food biotechnology, traditional fermentation, food safety and sustainable protein utilization.

However, several points should be addressed before publication:

1. **Clarification of the experimental design is required.** The study states that two independent processing batches were used and samples were analyzed in triplicate. The authors should clearly distinguish biological/independent replicates from analytical replicates and explain how these were incorporated into the statistical analysis.
2. **The manuscript should provide more details about the traditional starter culture, yanyanku.** Its source, preparation, quantity added, microbiological characteristics and method of inoculation should be clearly described. If the starter culture was not microbiologically characterized, this limitation should be acknowledged.
3. **Microbial identification requires clarification.** The manuscript frequently attributes detoxification to *Bacillus* spp., particularly *Bacillus cereus*, but enumeration on selective/differential media does not establish species identity or demonstrate that these organisms

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are responsible for L-DOPA degradation. The wording should therefore be moderated unless molecular identification or direct functional assays were performed.

4. **The interpretation of the correlation analysis should be revised.** Strong negative correlations between microbial counts and L-DOPA concentration demonstrate association but do not establish causation. Statements suggesting that microorganisms "metabolize" or "transform" L-DOPA should be presented as a hypothesis unless direct evidence of microbial L-DOPA degradation is available.
5. **The presence of *Bacillus cereus* and Staphylococcus spp. deserves particular attention from a food-safety perspective.** Their increase during fermentation may represent a potential safety concern rather than simply evidence of successful fermentation. The authors should discuss whether the detected populations comply with applicable food-safety standards and whether the isolates were tested for relevant toxin-producing characteristics.
6. **The claim of "nutritional enhancement" should be better supported.** The reported decreases in crude protein and crude fat do not necessarily constitute nutritional improvement. The authors should distinguish between detoxification, compositional changes and actual improvement in nutritional quality or nutrient bioavailability. If mineral bioavailability, amino-acid quality or protein digestibility was not measured, this should be acknowledged.
7. **The safety thresholds cited for L-DOPA, phytate, oxalate and trypsin inhibitors should be supported with appropriate and specific references.** The basis and applicability of these thresholds to fermented *Mucuna* products intended for human consumption should be clearly explained.
8. **The methodology for antinutritional-factor analysis requires additional detail.** Particularly for L-DOPA determination by LC-MS/MS, the authors should provide information on the analytical column, mobile phase, mass transitions, calibration range, recovery, limits of detection/quantification and validation parameters. Similar clarification is desirable for phytate, tannin, oxalate and trypsin inhibitor analyses.
9. **The statistical methodology should be strengthened.** Since measurements were obtained at multiple fermentation times, the authors should clearly describe the statistical model used to test differences among fermentation stages. Merely stating that descriptive statistics and Tukey tests were used is insufficient. The assumptions and significance criteria should be clearly stated.
10. **PCA and HCA require fuller presentation and interpretation.** The manuscript refers to PCA and HCA, but the relevant figures/tables and explained variance should be provided and adequately interpreted. The authors should indicate the number of principal components retained and their respective contribution to total variance.
11. **There are some inconsistencies and presentation issues in the manuscript.** Examples include "Mucuna pruriensseeds," "Sonruproduction," "Principle component analysis" instead of "Principal component analysis," and inconsistent spacing and formatting throughout the text. The manuscript requires careful English language and typographical editing.
12. **The introduction contains some repetition.** The research gap is stated more than once, particularly in paragraphs describing the limited information on Sonru production from *M. pruriens*. These sections could be consolidated to make the introduction more concise and focused.
13. **The discussion should distinguish clearly between observations and proposed mechanisms.** Several explanations, such as moisture loss due to metabolic heat, microbial lipolysis, and direct microbial degradation of L-DOPA, are plausible but were not directly demonstrated. Such statements should be supported by additional evidence or expressed more cautiously.
14. **The manuscript should explain the basis for using the term "detoxification."** Reduction in measured antinutritional compounds is important, but comprehensive food safety cannot be

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established solely from these measurements. The authors should avoid implying that the fermented product is completely safe unless this has been demonstrated.

15. **The manuscript would benefit from a clearer description of the processing stages before fermentation.** Because soaking, repeated water replacement, dehulling and boiling can themselves substantially reduce L-DOPA and other antinutrients, the contribution of each processing step versus fermentation should be discussed. Ideally, the study should include appropriate stage-wise measurements or acknowledge this limitation.

Overall, the manuscript contains **valuable and potentially publishable findings**, particularly regarding the substantial reduction of L-DOPA and other antinutritional factors during traditional Sonru processing. The work has good relevance to the valorization of underutilized legumes and traditional fermentation technologies. However, clarification of the experimental design, statistical analysis, microbial interpretation, food-safety implications and analytical methodology is necessary.

Final recommendation: Accept after minor revision, provided the authors adequately address the above comments and revise statements that currently imply causation or nutritional improvement without direct experimental evidence.