



RESPONSE SURFACE METHODOLOGY MODELS FOR OPTIMIZATION OF TRADITIONAL FERMENTATION OF COWPEA LEAVES

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Introduction

- Cowpea leaves is one of the African leafy vegetables that has been promoted to mitigate food and nutrition insecurity in arid and semi-arid lands of western and eastern Africa¹.
- Spontaneous fermentation of the leaves improve the keeping quality and sensory attributes while inadvertently imparting health benefits.
- However, the vegetable has been shown to have minimal fermentable sugars for optimal action of the bacteria thus the process tends to be slow and the product quality less optimal.

Objective

- To optimize the fermentative parameters for production of traditional soured cowpea leaves.

Methods

- Cowpea leaves harvested at 6 weeks after emergence was subjected to spontaneous fermentation.
- Low cost processing techniques utilizable in resource constrained settings was used in improving fermentation conditions (Fig 1).



Fig 1. A-fresh cowpea leaves, B-Cowpea leaves under fermentation, C-Dried soured cowpea leaves

Experimental design

- RSM models in the Design Expert were used to generate 20 experimental runs.
- The response variables that were evaluated included pH and tirtratable acidity.
- Statistical analysis:** ANOVA for quadratic model

Results

- The models showed significant ($p < 0.01$) changes in the pH and titratable acidity with R^2 of 0.89 and 0.60, respectively.
- With increasing sugar concentrations, significantly ($p < 0.05$) decreased the pH while increasing TTA.(Fig 1 and 2).

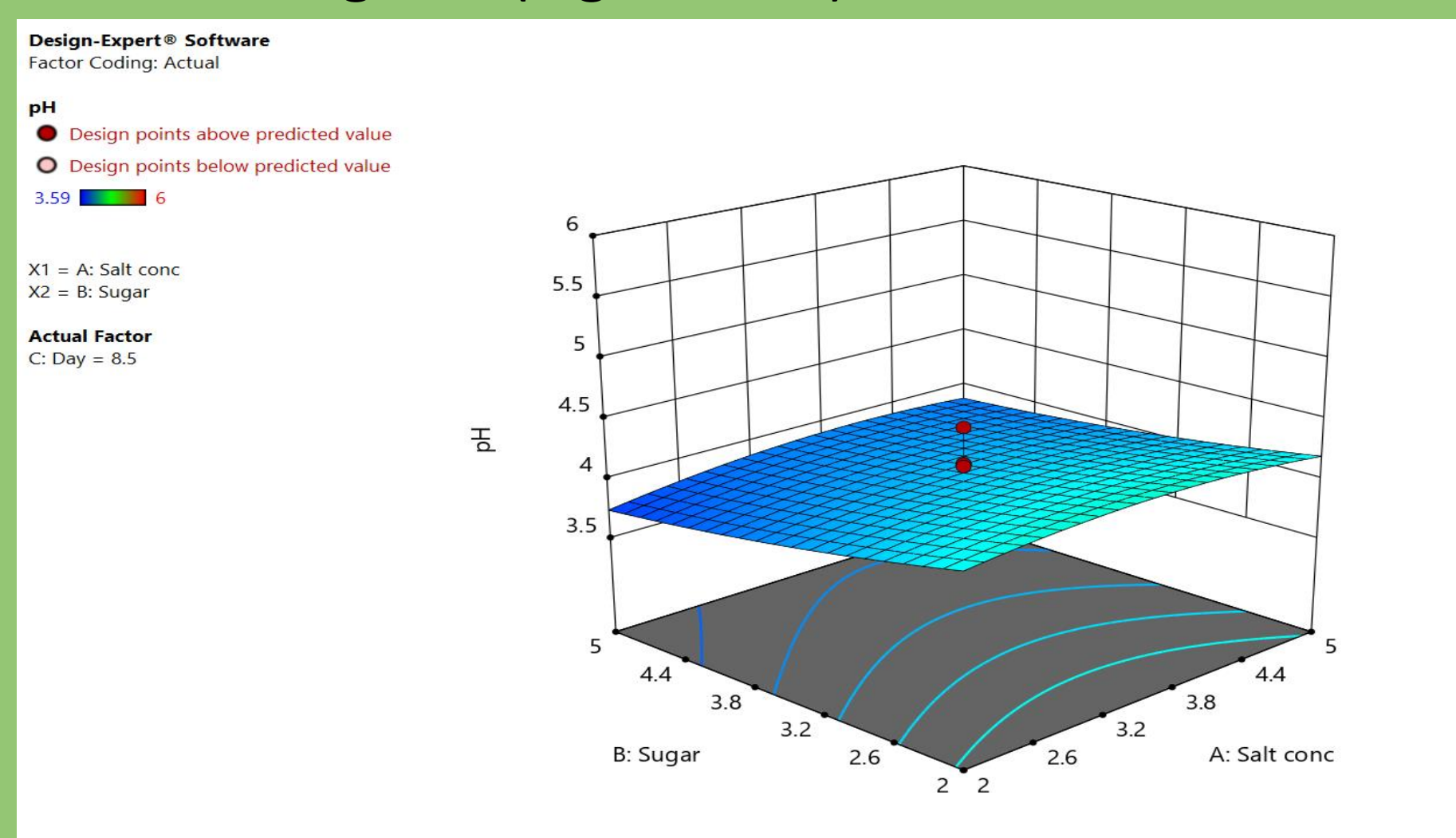


Fig 2. Response of pH for optimization of fermentative parameters of soured cowpea leaves

Results Part 2

- Increasing salt concentration neither affected the pH nor TTA ($p < 0.05$).

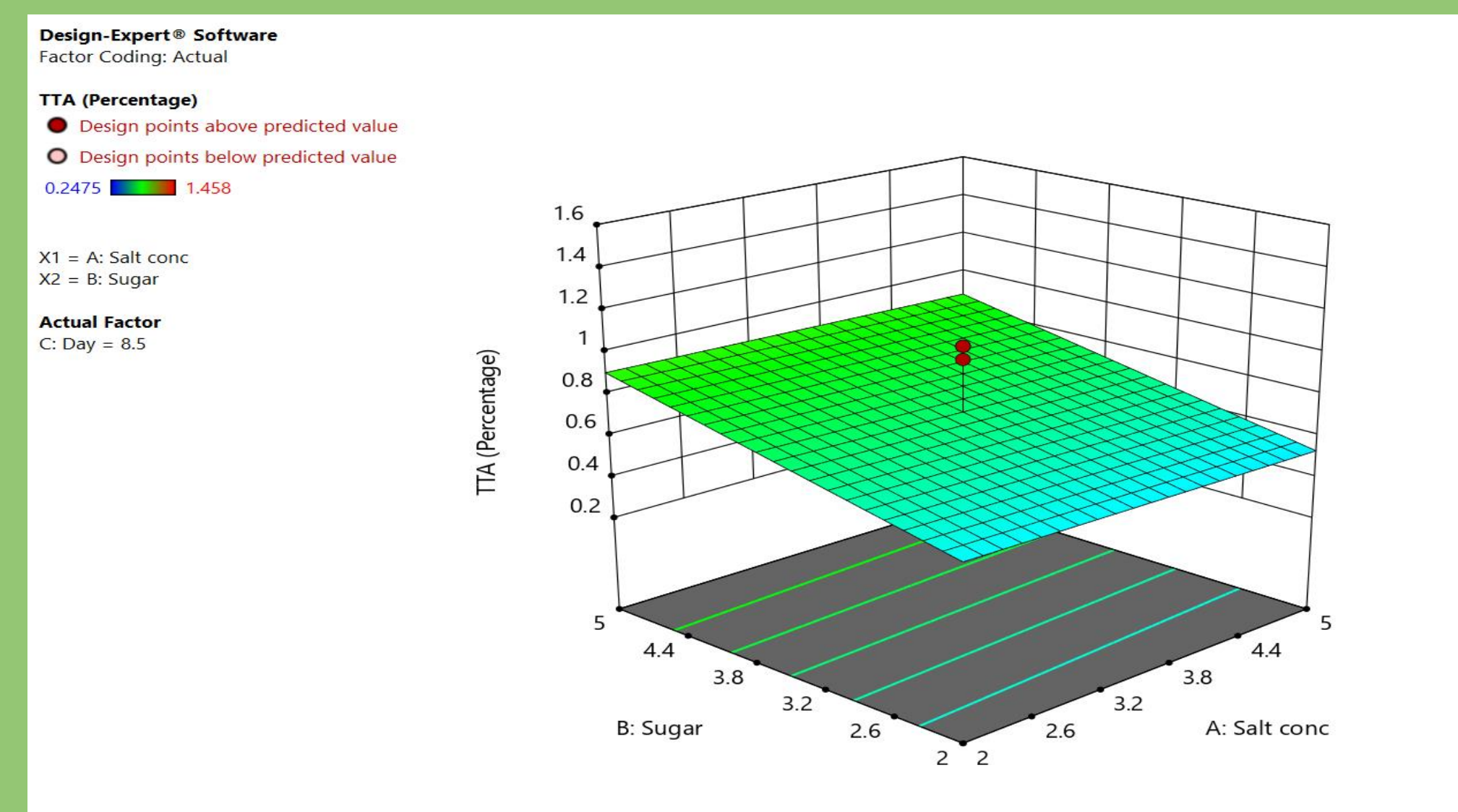


Fig 3: Response of titratable acidity for optimization of fermentative parameters of soured cowpea leaves

- The optimal fermentative parameters were determined as Salt Concentration-2%, Sugar Concentration-5% and Days-16.

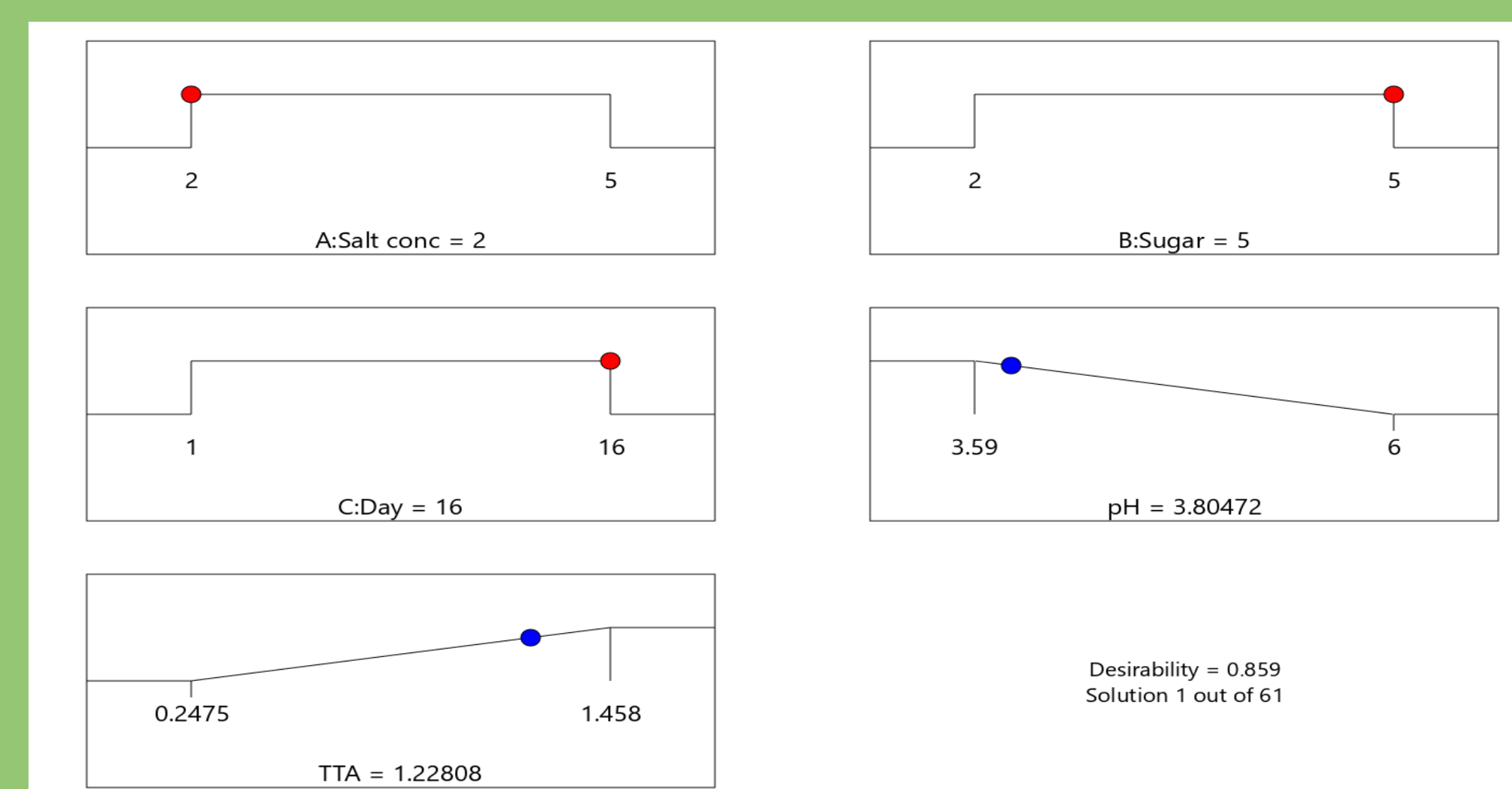


Fig 3. Optimal fermentative parameters for processing low cost soured cowpea leaves

Discussion

- Microbial activity in the fermentation of vegetables is predominantly by LAB².
- With increasing salt, sugar and period of fermentation; the microbial activity increases to a level beyond which osmotic stress sets in limiting further increase in microbial activity^{2,3}.

Conclusion

- To avert the challenges of poor product quality and slow fermentation process among the traditional communities, the addition of sugar and salt to the vegetables and optimization of fermentation period should be observed.

References

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