Effect of various processing techniques on nutritional, biological. Techno functional, structural and molecular interactions of finger millet (*Eleusine coracana*)

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Introduction

- **Finger millet is a nutraceutical crop and a "super cereal" (Sathiyabama & Manikandan, 2021).**
- **Good source of dietary fiber and minerals (Sharma et al. 2022).**
- **Associated with anti-nutritional factors - Tannins, Saponins and Phytates (Krishnan & Meera, 2018).**
- **Limited data is available for techno-functional and compositional changes in millet types (Kumari et al., 2022).**
- **SEM and FTIR spectroscopy were used since there is no literature available on using them on differently bio-processed finger millet.**
- **The impact of different processing techniques was accessed to increase the utilization and potential in the food industry.**

Objectives

To evaluate the impact of different biological processing techniques on biological, functional, structural, and molecular characteristics of the Sri Lankan recommended variety of finger millet.

Methodology

Sample preparation

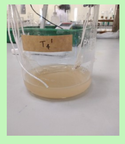
T0	T1	T2	T3	T4
Control (U-FMF)	Soaking (S-FMF)	Germination (G-MF)	Fermentation (F-FMF)	Combination (SGF – FMF)

Anti –nutritional factors

1. Tannin
2. Phytate
3. Saponin

***In vitro* nutrient digestibility**

1. *In vitro* starch digestibility
2. *In vitro* protein digestibility
3. Bio- accessibility and availability



Techno – functional properties

1. Water absorption capacity – WAC
2. Water solubility index – WSI
3. Oil absorption capacity – OAC
4. Paste clarity – PC
5. Swelling power – SP
6. Emulsion activity – EA
7. Emulsion stability – ES
8. Viscosity

Structural and Molecular Interactions

1. SEM
2. FTIR

Statistical analysis

- Obtained data were analyzed using Microsoft Office Excel and SPSS software. Analysis of Variance (ANOVA) at a 5% level of significance was used. The relationships were evaluated by using the Spearman rank correlation test at 5% and 1% significant levels.

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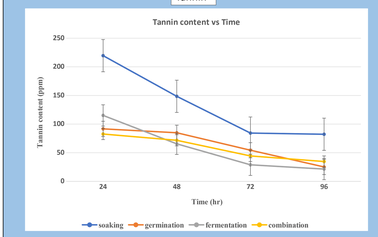
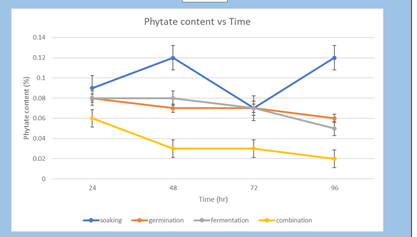
Results

Anti-nutritional factors

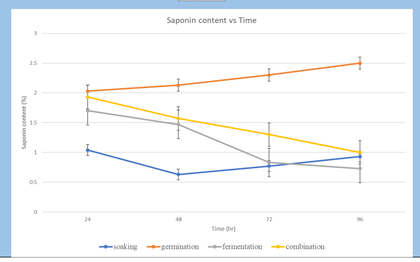
Tannin



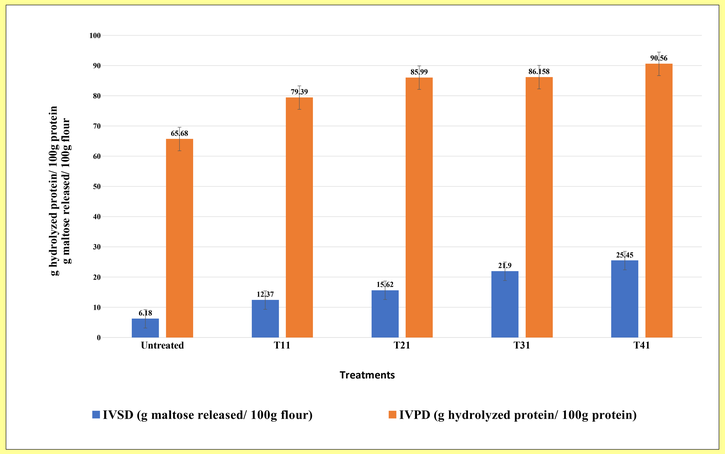
Phytate



Saponin



In vitro digestibility



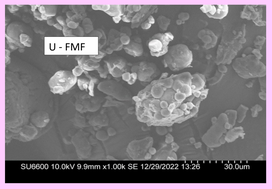
Treatment	Bio-accessibility	Bioavailability
Control	51.538%	37.219%
T11	60.767%	22.187%
T21	81.770%	25.554%
T31	88.420%	19.918%
T41	91.710%	15.715%

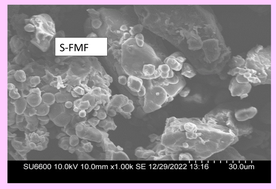
Techno-functional properties

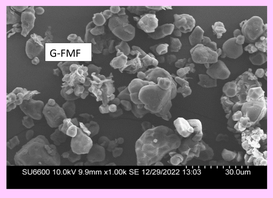
In every processing technique with time,

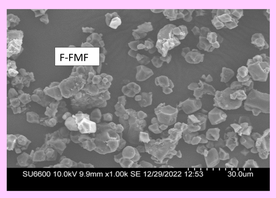
- Increased - WSI and OAC
- Slightly modified – SP, EC and ES.
- Decreased – WAC, PC and viscosity.,

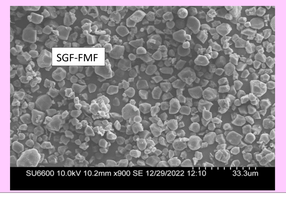
Structural interactions - Scanning electron micrographs



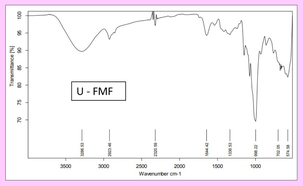


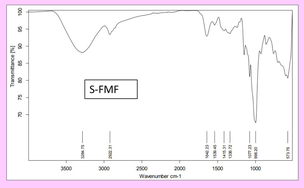


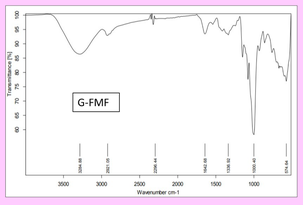


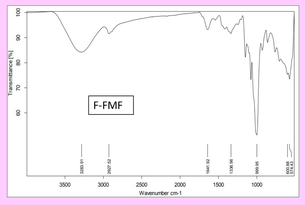


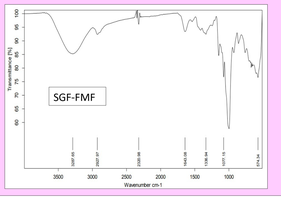
Molecular interactions – ATR-FTIR spectra











Conclusion

- **All processing techniques significantly reduced tannin content and phytate content but the saponin content of germinated flour increased.**
- **All processed techniques increased *in vitro* starch and *in vitro* protein digestibility.**
- **The combination of soaking, germination, and fermentation greatly improved most of the functional properties of flour with reduced antinutrients.**