

## Impact of Varying Malting and Fermentation Durations on Specific Chemical, Functional Properties, and Microstructural Behaviour of Pearl Millet and Sorghum Flour Using Response Surface Methodology

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**Abstract :** The study investigated the effects of malting and fermentation times on some chemical, functional properties and microstructural behaviour of Agrigreen, Babala pearl millet cultivars and sorghum flours using response surface methodology (RSM). Central Composite Rotatable Design (CCRD) was performed on two independent variables: malting and fermentation times (h), at intervals of 24, 48, and 72, respectively. The results of dependent parameters such as pH, titratable acidity (TTA), Water absorption capacity (WAC), Oil absorption capacity (OAC), bulk density (BD), dispersibility and microstructural behaviour of the flours studied showed a significant difference in  $p < 0.05$  upon malting and fermentation time. Babala flour exhibited a higher pH value at 4.78 at 48 h malted and 81.9 fermentation times. Agrigreen flour showed a higher TTA value at 0.159% at 81.94 h malted and 48 h fermentation times. WAC content was also higher in malted and fermented Babala flour at 2.37 ml g<sup>-1</sup> for 81.94 h malted and 48 h fermentation time. Sorghum flour exhibited the least OAC content at 1.67 ml g<sup>-1</sup> at 14 h malted and 48 h fermentation times. Agrigreen flour recorded the least bulk density, at 0.53 g ml<sup>-1</sup> for 72 h malted and 24 h fermentation time. Sorghum flour exhibited a higher content of dispersibility, at 56.34%, after 24 h malted and 72 h fermented time. The response surface plots showed that increased malting and fermentation time influenced the dependent parameters. The microstructure behaviour of malting and fermentation times of pearl millet varieties and sorghum flours showed isolated, oval, spherical, or polygonal to smooth surfaces. The optimal processing conditions, such as malting and fermentation time for Agrigreen, were 32.24 h and 63.32 h; 35.18 h and 34.58 h for Babala; and 36.75 h and 47.88 h for sorghum with high desirability of 1.00. The validation of the optimum processing malting and fermentation times (h) on the dependent improved the experimented values. Food processing companies can use the study's findings to improve food processing and quality.

**Keywords :** Pearl millet, malting, fermentation, microstructural behaviour

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