# Ultrasound-Assisted Extraction and Alginate Encapsulation of Polyphenols from Hogplum Peels: Impact on Sensory Properties and Functional Groups of Maize Gruel (*Ogi*)


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## Introduction

Food wastes, especially peels, present environmental challenges, but their valorisation can mitigate negative impacts. Hogplum (Spondias mombin) fruit peels, rich in phenolic compounds, may offer significant health benefits. This study aims to extract, encapsulate and characterise the phenolic compounds from Hogplum peels, and evaluate their inclusion in a food matrix.

## Methods

Hogplum peels were dried (45°C, 4 h), milled into powder, and extracted with methanol in three batches: 1:10 w/v (Batch 1), 1:20 w/v (Batch 2), and ultrasound-assisted 1:20 w/v (Batch 3). Extracts were concentrated and encapsulated in 3% w/v alginate, extruded into 0.1 M $CaCl_2$ to form polyphenol microcapsules. The encapsulated and unencapsulated extracts were assessed for total phenolic content (TPC) and antioxidant activity [(DPPH radical scavenging and Ferric Reducing Antioxidant Power (FRAP)]. The microcapsules were evaluated for thermal stability of TPC (70°C, 3 h), then included in maize gruel (Ogi-a food matrix). Sensory attributes and functional groups (Fourier Transform Infrared Spectroscopy) of Ogi with and without microcapsules were evaluated. Data was analysed using ANOVA ($p<0.05$).

## Results

Unencapsulated extracts had significantly lower TPC (0.32–0.41 mg GAE/g), DPPH (18.75–20.06%), and FRAP (0.64–0.95%) compared to encapsulated ones (TPC: 0.98–1.89 mg GAE/g; DPPH: 52.44–92.05%; FRAP: 0.70–0.95%). Encapsulation enhanced TPC by 188-331%, though thermal stability decreased after 1 hour; ultrasound-assisted microcapsules showed superior stability over 2 hours. Ogi with microcapsules had higher sensory acceptability and improved functional groups than the control.

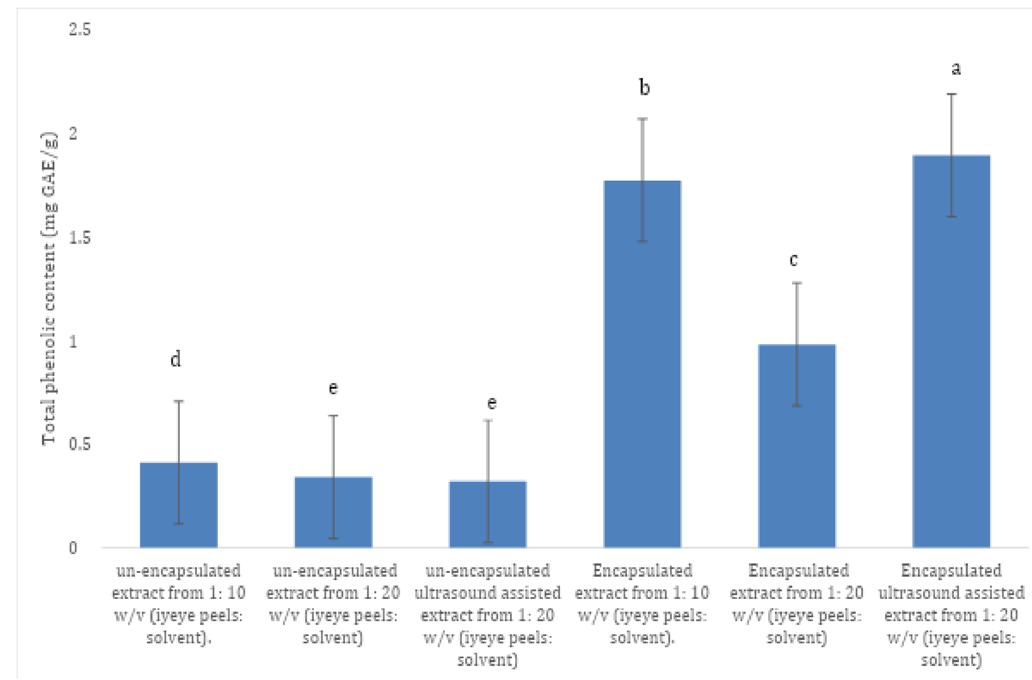


Figure 1: Total phenolic content of encapsulated and un-encapsulated phenolic extracts from iyeye peels

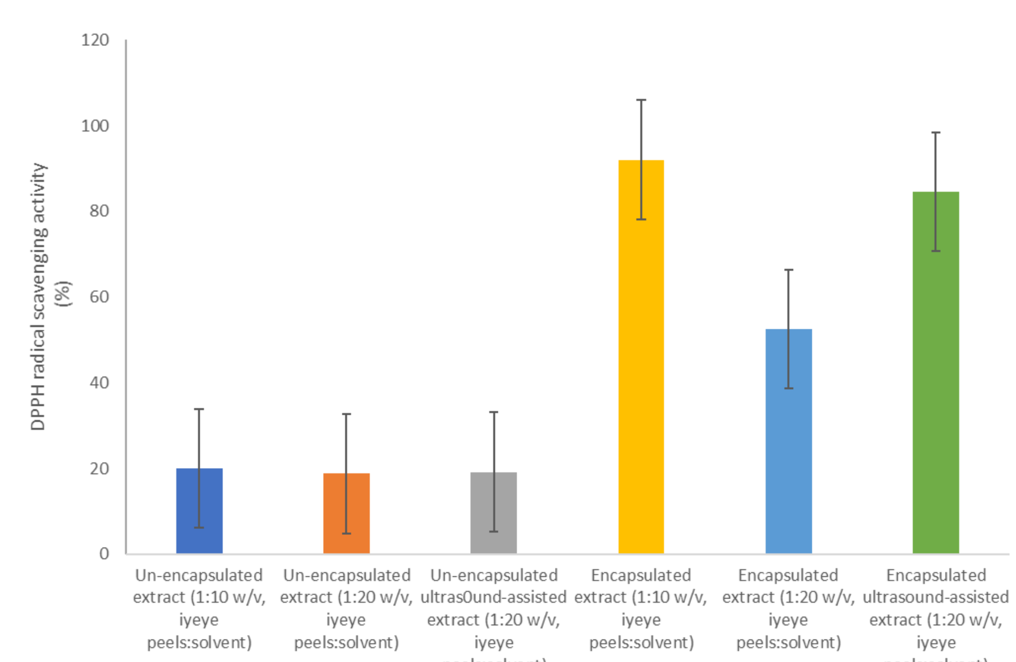


Figure 2: DPPH radical scavenging activity of encapsulated and un-encapsulated phenolic extracts from iyeye peels

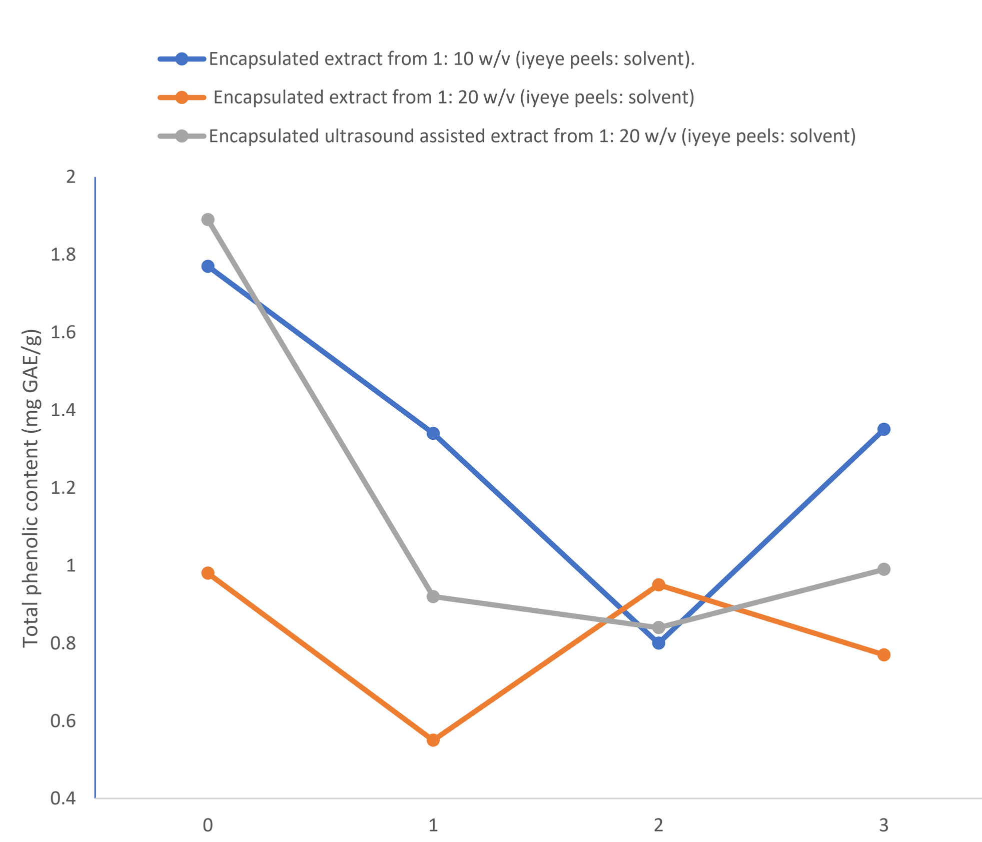


Figure 3: Thermal degradation of encapsulated phenolic extracts at 70°C for 3 h

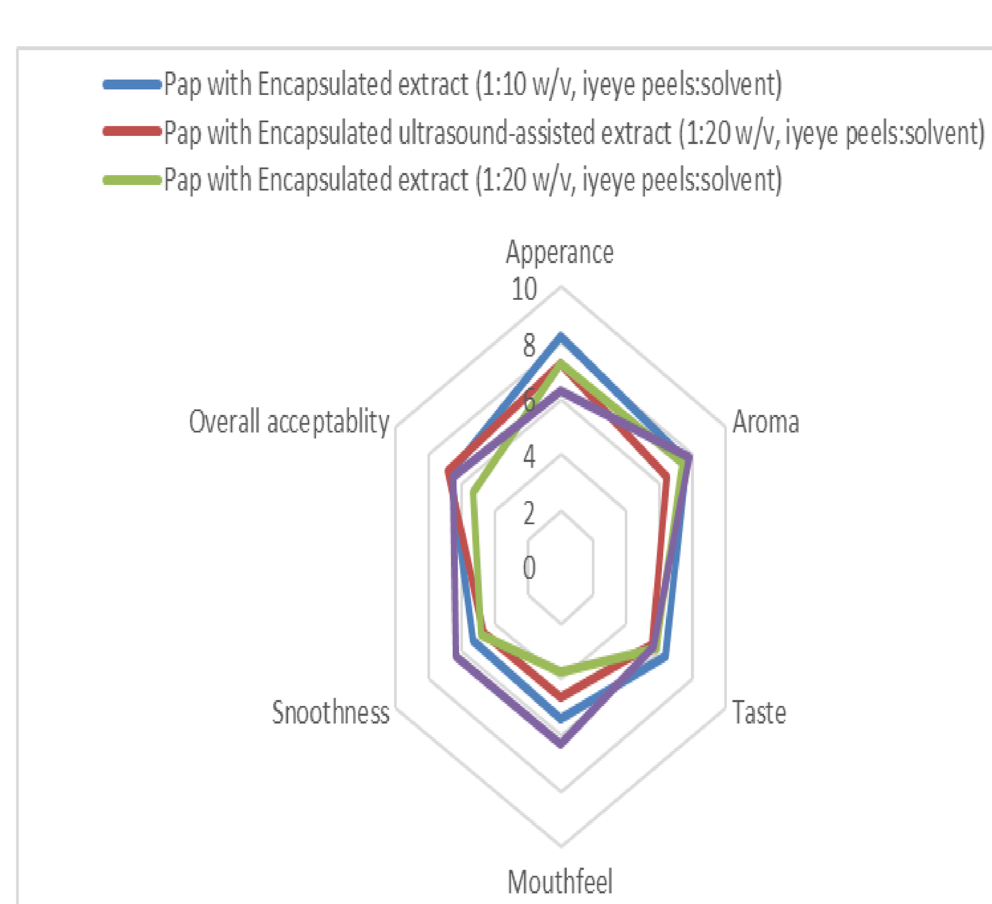


Figure 4: Sensory Evaluation of pap with encapsulated phenolic extracts from iyeye peels

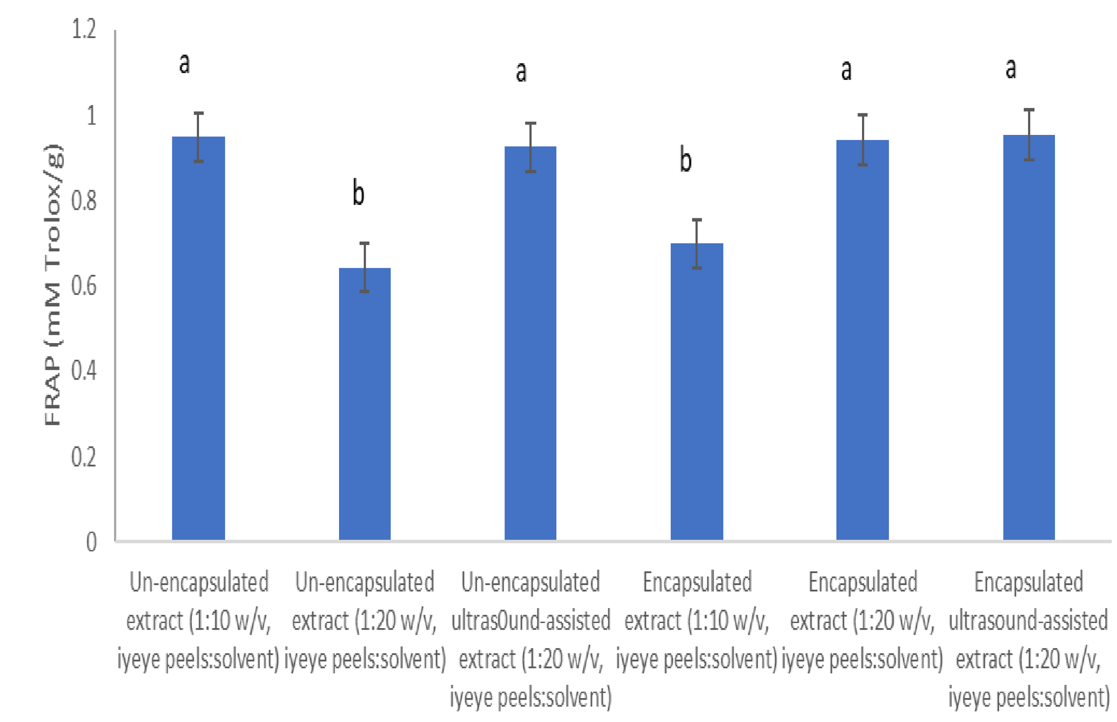


Figure 4: FRAP assay of encapsulated and unencapsulated phenolic extracts from iyeye peels

## Conclusions

Hogplum peels have high anthocyanin and phenolic content with significant antioxidant properties, which are health-promoting compounds. Alginate encapsulation improved the thermal stability, functional groups and sensory properties of Ogi. Incorporating these phenolic microcapsules into gruels, such as Ogi, suggests the potential for enhancing food matrices with health-promoting compounds.

## References


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Conflicts of Interests:

The authors declare no conflicts of interest