

Modification of Date Seed Waste and its Utilization in Composite Flour Formulation

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ABSTRACT

Introduction: The food industry is increasingly focusing on new, effective and sustainable way to add nutritional value to its product. This study explores the potential for producing healthy and environmentally friendly flour by adding date seed powder to wheat flour.

Objective:

1. To produce a nutritious flour by mixing wheat flour and date seed powder.
2. To used date seed powder, a waste product, a durable, recyclable material to reduce environmental waste.
3. To increase the nutritional value and other components of regular wheat flour.
4. To examine the improvement of performance and nutrition due to the addition of date seed powder.
5. To accesses the impact of ultrasonication on modifying protein and starch structures to improve product quality.

Methodology: To access the composition of flour blends, AACC international, (2000) methodology was followed. The composite flours were treated through the ultrasonic bath technique Vidhyalakshmi & Meera, (2023). Swelling power and oil holding of wheat flour and ultrasonicated composite flour was analyzed by using protocol of Ahsan *et al.*, (2023). Similar methodology of Traynham *et al.*, (2007) was used to estimate the solvent retention capacity of wheat flour and ultrasonicated composite flour. The color characteristics of the composite flours were assisted using a colorimeter Ahsan *et al.*, (2023).

Results: The composite flours were prepared by incorporating date seed powder at levels of 5% and 10%, as well as ultrasonicated composite flour containing 5% and 10% date seed. There was insignificant difference in the oil holding capacity among all flour samples. The mean swelling capacity ranged from ultrasonicated composite flour to wheat flour showing a decreasing trend with increasing date seed incorporation and ultrasonication treatment. The inclusion of date seed powder (5 to 10%) and ultrasonication treatment produced slight variations in lactic acid, distilled water, sodium carbonate, sucrose properties of composite flour. The incorporation of date seed powder and ultrasonication significantly affect the L^* , a^* and b^* values of composite flour samples ($p < 0.05$) lightness (L^*) decrease with the higher date seed levels, while redness (a^*) and Yellowness (b^*) increase due to the natural pigments and fiber content of date seeds ultrasonication caused slight reductions in a^*b^* values by improving pigment dispersion flour uniformity. Overall addition of date seed powder in both treated and untreated samples, led to significant changes in color due to alteration in pigment composition and particle microstructure. These finding suggest that functional and chemical integrity of wheat flour is largely maintained, making date seed a viable ingredient for nutrient enhancement without compromising key functional properties.

Conclusion: The study demonstrates that incorporating date seed powder into wheat flour, with or without ultrasonication, significantly modifies the color properties of flour while maintaining its functional and chemical integrity. Key parameters such as oil holding capacity, swelling capacity and chemical attributes

(lactic acid, sucrose, distilled water, sodium carbonate) showed no significant changes. These result indicate that date seed powder is as viable, sustainable ingredient for developing nutrient rich, high fiber composite flours without compromising quality, offering a promising approach for health- oriented and ecofriendly flour formulations.

Keywords: Date Seed, Composite Flour, Ultrasonication, Sustainable Ingredient, Ecofriendly Formulation..

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