

Recycling Okara into Sustainable Value-Added Okara Spirulina Biscuits

Abstract

The project aims to develop an innovative, sustainable product using nutrient rich edible food waste in Singapore to develop value added products. Dough formulations consisted of 20%, 40% and 60% of okara were prepared. Sensory evaluation by 50 consumer panellists revealed that 40% okara had the best sensory attributes. The 3-layer okara-spirulina biscuit developed was high in protein and dietary fibre.

Introduction

Okara (豆渣) is a by-product produced by processing of soy product and is discarded as industrial waste, despite being rich in dietary fibre, protein and polyunsaturated fatty acids¹. In Singapore, about 30 tonnes of okara were produced daily in Singapore³. Spirulina provides high biological value protein, essential amino acids, vitamins, minerals and antioxidant.²

Materials & Methods

The ingredients include fresh, cake flour, margarine, castor sugar, coconut milk powder, water, isolated soy protein (ISP), spirulina powder, sodium bicarbonate and tocopherol. Okara and okara-spirulina doughs were extruded to form a 3-layer biscuit dough. After moulding, the biscuits were baked at 150°C/15 min and 160°C/5 min.

Results & Discussion

Table 1: Physiochemical results for okara-spirulina biscuits with 20%, 40% and 60% okara.

Physiochemical Test	Okara-spirulina Biscuits		
	20% okara	40% okara	60% okara
Moisture content (g.100 g ⁻¹)	2.10 ± 0.15	2.68 ± 0.35	4.11 ± 0.06
Water activity (a_w)	0.243 ± 0.002	0.346 ± 0.008	0.411 ± 0.005

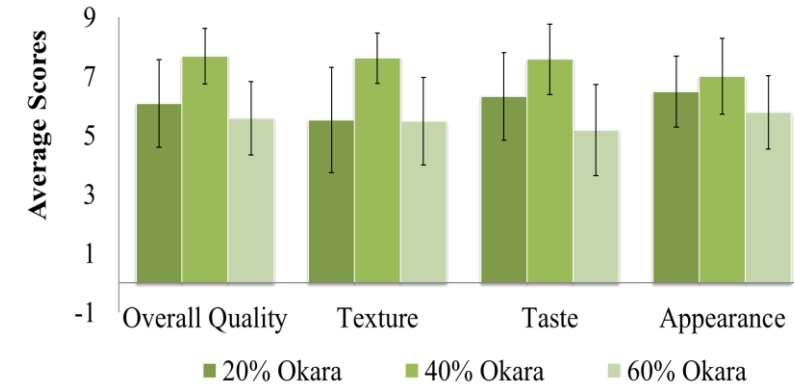


Figure 1: Consumer acceptance test score of okara-spirulina biscuits (n=50)

- ✓ ↑ %okara protein ↑ moisture content & a_w due to increased water holding capacity
- ✓ 88% most preferred 40%-okara biscuits. Okara-spirulina biscuits developed were high in protein (13.7g/100g) and dietary fibre (9.4g/100g).
- ✓ Okara was recycled & converted into a nutrient rich biscuit.

1. El-Shemy, H., 2011. Soybean and Nutrition. Croatia: InTech.

2. De Marco, E., Steffolani, M., Martínez, C. & León, A., 2014.

Effects of spirulina biomass on the technological and nutritional quality of bread wheat pasta. LWT - Food Science and Technology, 58(1), pp. 102-108.

3. AVA, 2013. AVA Vision. [Online]