Development and evaluation of synbiotic jam from watermelon rind

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Abstract

This study attempted to utilize watermelon fruit rind for the development of synbiotic jam. Results indicated significant reduction in the probiotic count , citrulline and phenols after 90 days. Insignificant reduction was reported in other parameter such carotenoids. Based on the results there is a need to increase chitosan concentration for better protection of probiotics.

Introduction

Reduction of food waste remains key as the world grapples with challenges of providing food to the growing population (United Nations Environment Programme, 2021). Fruits and vegetables contribute an estimated 0.5 billions tons of waste every year globally (Banerjee *et al*. 2017).

Based on the latter the current study explored the use of watermelon rind to develop jam owing to its vitamins, phenols and citrulline content.

Meanwhile synbiotic products are becoming popular around the globe due to their remarkable health properties ranging from antimicrobial, antiallergy and anti-cancer activities (Loo *et al*., 2007).

Synbiotics, have found applications in improving the survival of probiotics through microencapsulation probiotics to protect from environment, thus the current study explored the use microencapsulated probiotics in jam to produce functional product that could be used by patients with non communicable diseases.

Objective

Utilize watermelon rind in the production of synbiotic watermelon jam.

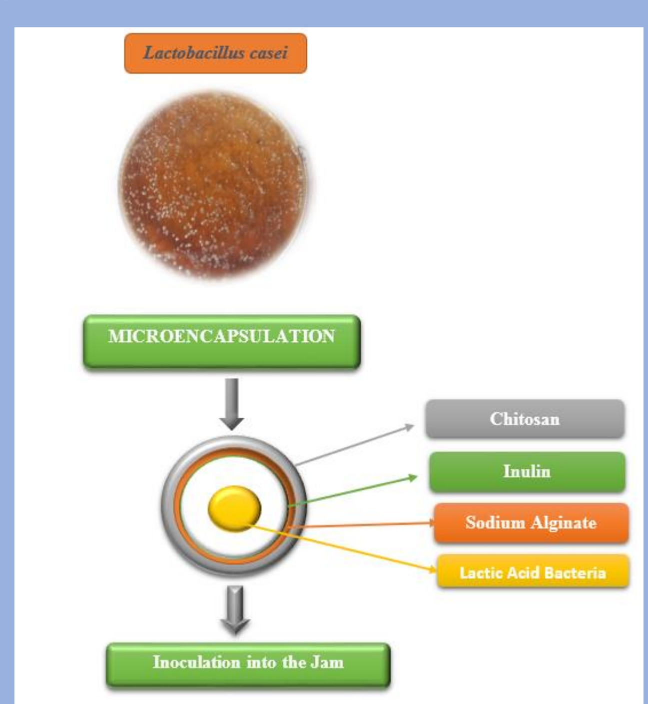

Fig 1. Schematics for microencapsulation of *L.casei*

Methods

Microencapsulation of *L.casei* (MLC) and Inoculation into Jam

Emulsion technique was used for the process of microencapsulation (Donthidi *et al*., 2010).

Jam Preparation

Jam was prepared by blending 1 kilogram of watermelon pulp with 500 g sugar, 5.5 g citric acid, and 6 g pectin (FAO, 1997). The jam was packaged in glass bottles while still hot, with microcapsules bead containing 10^{9} CFU/g *Lactobacillus casei* added at a rate of 5% w/w. The jams were held between 25 and 30 degrees Celsius at room temperature

Results

Microencapsulation

Probiotic count of $7.0 * 10^{9}$ CFU/g was recorded for entrapped cells from calcium alginate beads. The mean encapsulation yield for *L. casei* was 90 %.

Table 1. Physicochemical parameters of fresh watermelon rind

Physicochemical parameters	Mean value
Fruit weight (g)	1590 ±11.5
Flesh weight (g)	737.9 ±4.3
Rind weight (g)	645.9 ±4.5
Yield of flesh (%)	46.4 ±1.5%
Yield of rind (%)	40.6 ±1.6%
Acidity (%)	0.083±0.01%
pH	5.5±0.2
Reducing sugars (%)	5.63±0.91 %
Total sugars (%)	7.83±0.3 %
Pectin (%)	6.43 ±0.63%
Total carotenoids (mg/100 g)	2.42±0.11
Total phenols (mg/100 g)	40.2±0.2
Citrulline content (mg/100 g)	202±2.5

Table 2. Physicochemical parameters of synbiotic watermelon rind jam.

Physicochemical properties	Mean value (After 90 days)	
	C	MLC
Acidity (%)	0.64	0.65
pH	3.38	3.39
Reducing sugars (%)	26.00	26.78
Total sugars (%)	53.10	53.00
Pectin (%)	4.40	4.50
Total Soluble Solids (TSS)	66.00	67.00
Total carotenoids (mg/100 g)	1.22	1.22
Total phenols (mg/100 g)	27.00	27.10
Citrulline content (mg/100 g)	102.o	103.0

Table 3. Microbial parameters of synbiotic watermelon rind jam

Microbial parameters of jam	Mean value (After 90 days)	
	C	MLC
Total plate count(CFU/g)	$4.0*10^{-3}$	$5.0*10^{-3}$
Probiotic count (CFU/g)	0	$4.6*10^{7}$

Discussion & Conclusions

This study indicated that watermelon rind jam contains considerable amount of carotenoids, phenols and citrulline, thus the jam could be used as functional food, helping in fighting communicable diseases. Addition of microencapsulated probiotics experienced significant reduction during 90 days of storage (7.00E+09-4.60E+07 CFU/g), this could be attributed to low chitosan concentration used during encapsulation. Based on the organoleptic properties, all the jams were generally accepted (6.2) using hedonic scale, However jams with microencapsulated *L.casei* had higher overall acceptance (6.52). This may be due to polymers from dissolving microcapsules (Kanman *et al*., 2011).

References:

*Banerjee *et al*. 2017
*Donthidi *et al*., 2010
*FAO, 1997
* Kanman *et al*., 2011
*Loo *et al*., 2007
* United Nations Environment Programme, 2021