



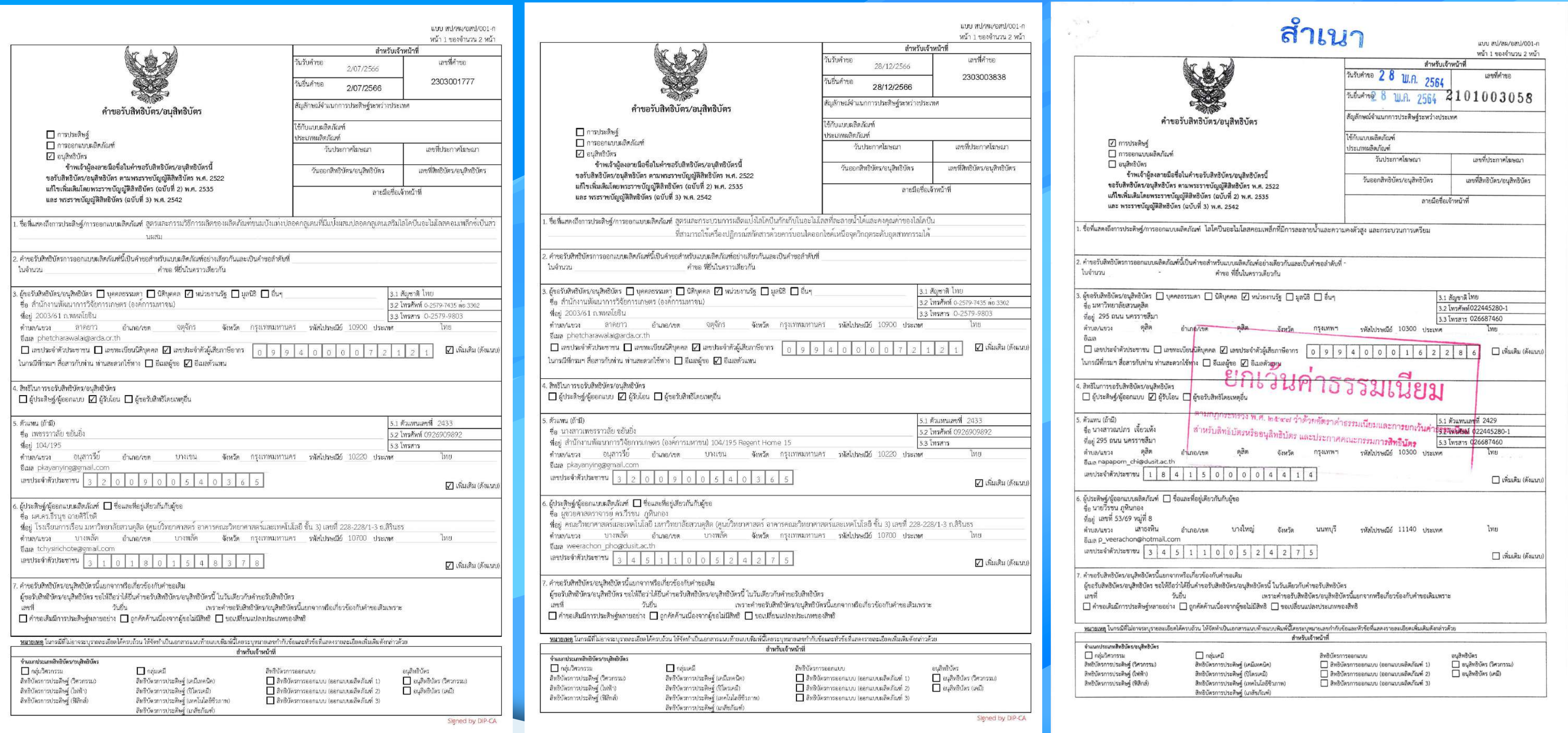
Gluten-free Functional Breadsticks

Gressins fonctionnels sans gluten

Tita Foophow¹, Teeranuch Chysirichote¹, Weerachon Phooinkong² and Phanarat Phomma³

¹School of Culinary Arts, Suan Dusit University
²Faculty of Science and Technology, Suan Dusit University
³Research and Development Institute, Suan Dusit University

IP provisional of petty patent no.
2303001777, 2303003838, 2101003058



Origin and Significance

Currently, over 1% of the global population experiences gluten intolerance¹. In addition, health-conscious consumers are increasingly choosing gluten-free products and functional foods. However, gluten-free products often exhibit inferior appearance and texture, leading to low consumer acceptance. Moreover, antioxidants derived from natural sources are highly sensitive to food processing². Therefore, this research aims to develop a gluten-free functional breadstick with high antioxidants and characteristics similar to those made from gluten-containing flour.

Technology or Process

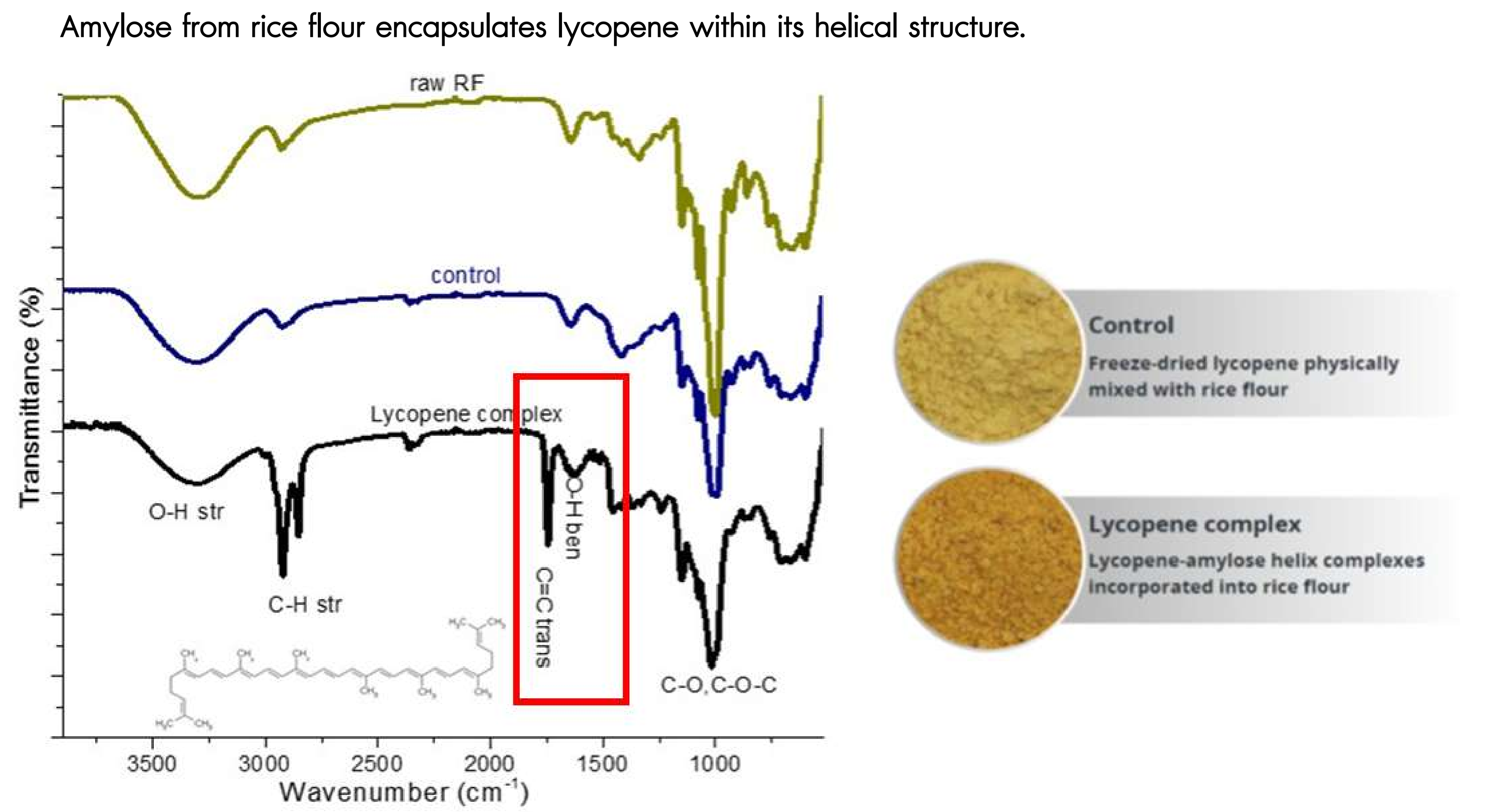
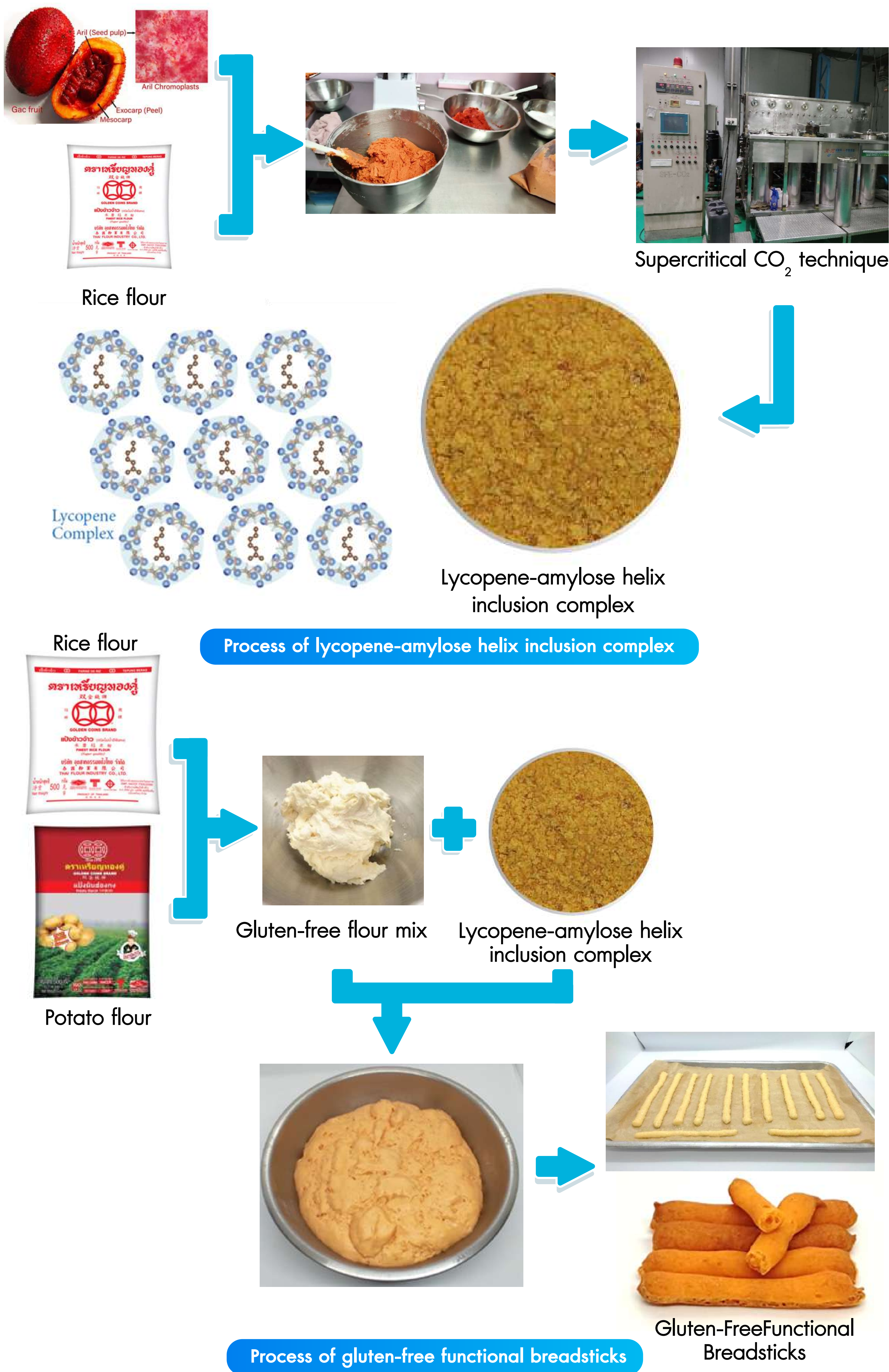


Figure 1 The FTIR spectra illustrate the structural evolution of lycopene in raw rice flour (raw RF), freeze-dried lycopene physically mixed with rice flour (control), and lycopene-amylose helix complexes incorporated into rice flour (lycopene complex).

Highlights or Originality of This Research

The resulting gluten-free flour demonstrates enhanced antioxidant properties and improved lycopene stability, maintaining its functional integrity throughout the breadstick production process. Moreover, the resulting gluten-free product retains physical characteristics comparable to those of wheat-flour-based products. This innovative product demonstrates superior properties compared to current market alternatives, as no similar gluten-free breadsticks with these enhanced features are currently available.

Table 1 Properties of gluten-free flour and gluten-free functional flour

Properties	Gluten-free flour	Gluten-free functional flour*
Amylose (%)	27.75±0.40	26.74±0.78
Antioxidant activity		
- DPPF (mmol TE)	69.70±1.15	74.21±1.02
- FRAP (μmol TE)	27.89±1.65	36.79±1.41
Total polyphenol (mg eq GA/100 g)	28.32±1.00	46.64±1.15
Water solubility index (%)	0.164±0.030	0.087±0.014
Water absorption index	3.13±0.52	2.86±1.08

* Gluten-free functional flour refers to gluten-free flour fortified with a lycopene-amylose helix inclusion complex.

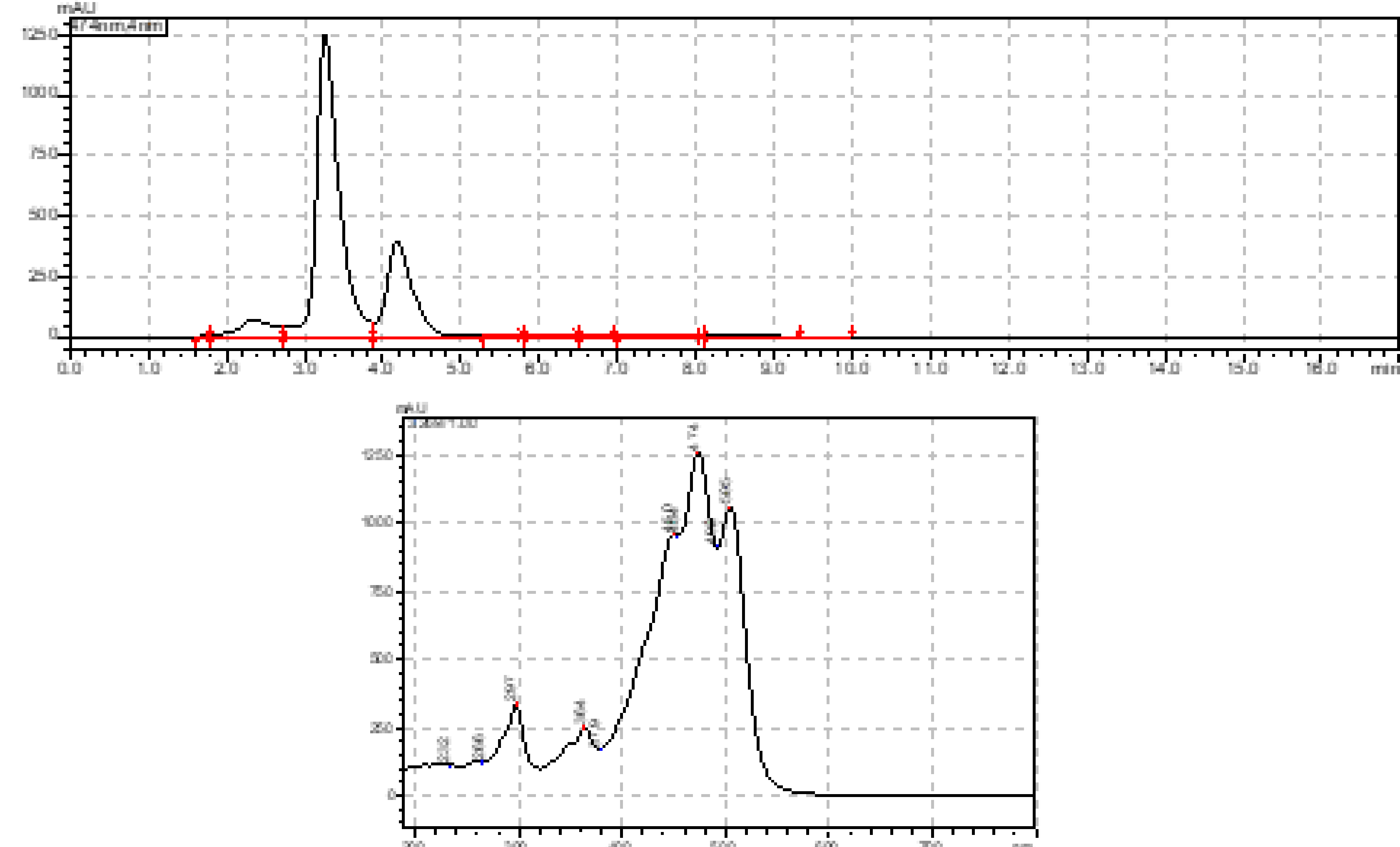


Figure 2 HPLC chromatogram (a) and lycopene absorption spectra (b) of lycopene in gluten-free functional breadsticks

Utilization

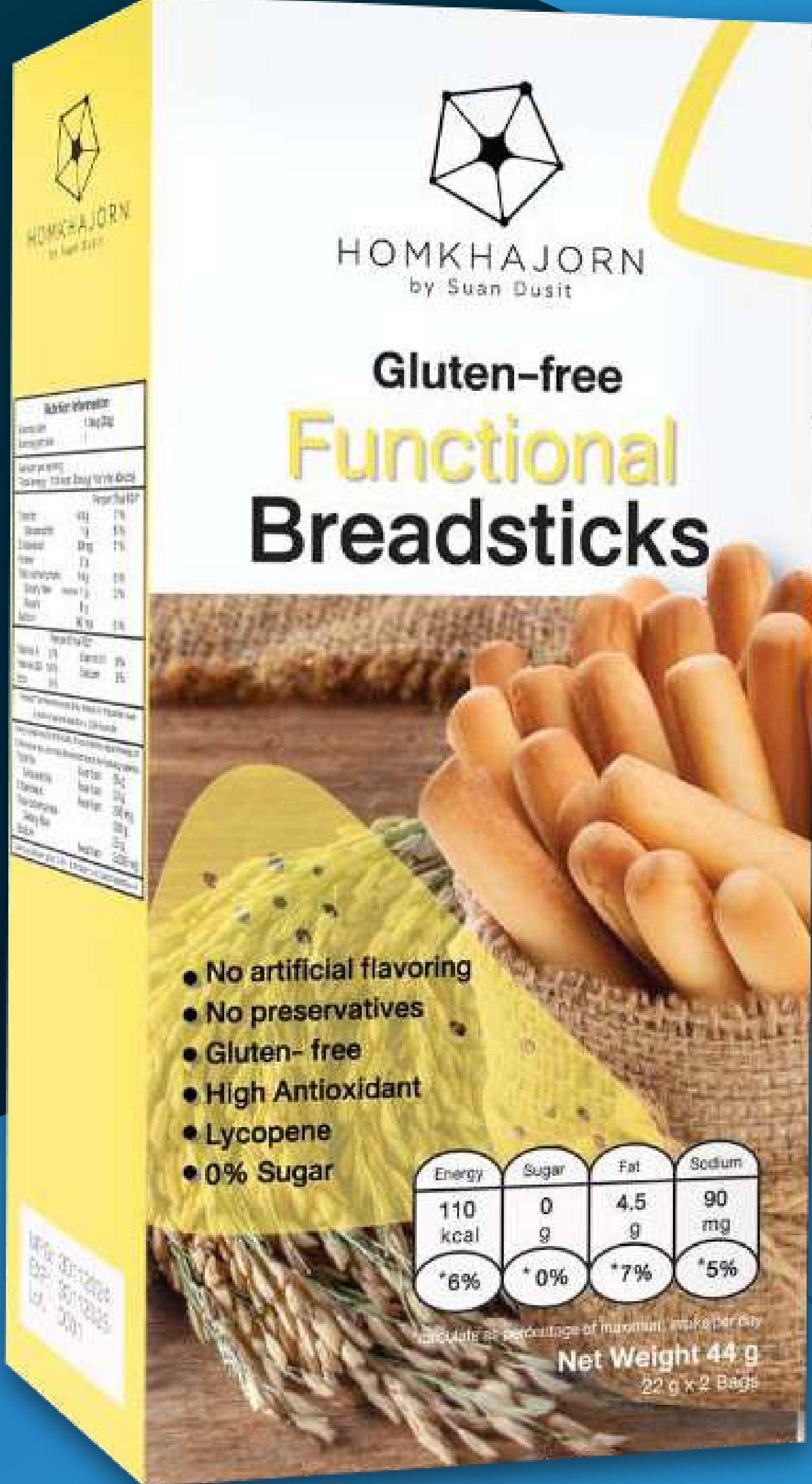
The gluten-free flour mix containing the lycopene-amylose helix inclusion complex can be applied to various baked products, providing an alternative for consumers with gluten intolerance and those seeking healthier food options.

Nutrition Information			
Serving size	: 1 Bag (22g)		
Serving per box	: 1		
Amount per serving			
Total energy	110 kcal (Energy from fat 40 kcal)		
Percent Thai RDI*			
Total fat	4.5 g	7 %	
Saturated fat	1 g	5 %	
Cholesterol	20 mg	7 %	
Protein	2 g		
Total carbohydrate	14 g	5 %	
Dietary fiber	less than 1 g	3 %	
Sugars	0 g		
Sodium	90 mg	5 %	
Percent Thai RDI*			
Vitamin A	2 %	Vitamin B1	0 %
Vitamin B2	10 %	Calcium	2 %
Iron	0 %		
* Percent Thai Recommended Daily Intake for Population over 6 years of age are based on a 2,000 kcal diet.			
Energy needs vary by individuals. If your activities require energy of 2,000 kcal per day, your daily diet should provide the following nutrients.			
Total fat	less than 65 g		
Saturated fat	less than 20 g		
Cholesterol	less than 300 mg		
Total carbohydrate	less than 300 g		
Dietary fiber	less than 25 g		
Sodium	less than 2,000 mg		
Energy (kcal) per gram : Fat = 9; Protein = 4; Carbohydrate = 4			



Energy	Sugar	Fat	Sodium
110 kcal	0 g	4.5 g	90 mg
*6%	*0%	*7%	*5%

* calculate as percentage of maximum intake per day



References

- Singla, D., Malik, T., Singh, A., Thakur, S., & Kumar, P. (2024). Advances in understanding wheat-related disorders: A comprehensive review on gluten-free products with emphasis on wheat allergy, celiac and non-celiac gluten sensitivit. *Food Chemistry Advances*, 4, 100627.
- Toydemir G, Gultekin Subasi B, Hall RD, Beekwilder J, Boyacioglu D, Capanoglu E. (2022). Effect of food processing on antioxidants, their bioavailability and potential relevance to human health. *Food Chem X*, 14, 100334



Research and Development Institute, Suan Dusit University,
295 Nakhon Ratchasima Rd, Dusit, Dusit District, Bangkok 10300
Telephone: +66 2244 5280 , Fax: +66 2668 7460
Website: <https://www.research.dusit.ac.th/>