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Enhancing the Texture and Stability of Low-Fat Yogurt using Inulin and Durian Rind-Derived Low-Methoxyl Pectin

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The present study evaluated the combined effects of low-methoxyl pectin (LMP) extracted from durian (*Durio zibethinus*) peel and inulin on the physicochemical, textural, and stability properties of low-fat yogurt. LMP was prepared in solution with concentrations of varying 0.05–0.60 % w/v and added to skim milk (1.5 wt% fat) while inulin was varied from 0.5 to 3.0 % w/v, with each formulation fermented at 40 °C for 9-15 h. Key parameters—pH, total soluble solids (°Brix), firmness (texture analyzer), and syneresis—were measured, and sensory attributes (texture and flavor) were assessed. Results showed that using pectin at 0.10 % combined with 2.0 % inulin restored firmness (0.62 N) to levels comparable to full-fat yogurt (0.65 N), while reducing whey separation by 25 % relative to the low-fat control (28.5 % vs. 38.1 %, $p < 0.05$). The inclusion of these hydrocolloids had no significant impact on the final pH (3.80–3.84) or total soluble solids (°Brix: 9.8–10.1). Extending fermentation from 9 to 15 h further enhanced gel strength and minimized syneresis (down to 29.1 %). This work demonstrates that the judicious use of durian rind-derived pectin and inulin can effectively compensate for the textural and stability deficits of low-fat yogurt, offering a sustainable valorization route for durian rind and a formulation strategy for health-oriented dairy products.

1. Introduction

Durian has become one of Vietnam's most important tropical fruit crops, with rapidly expanding plantations and production. Government plans aim to continue this growth through 2025, and recently, Vietnam's durian exports have achieved significant value, driven mainly by increased demand for frozen durian products. Yet this boom generates an equally impressive mountain of by-products: the spiny rind represents 60–75 % of the whole fruit and is currently discarded—more than 150 kt per y—creating disposal and odor problems near packing facilities (Tam, 2024). Crucially, the peel is a natural reservoir of low-methoxyl pectin (LMP). Although the global pectin market primarily relies on citrus and, to a lesser extent, apple pomace, recent research has demonstrated that durian rind yields an LMP with galacturonic acid content and gelling performance comparable to commercial grades (Pagán et al., 2001). Valorizing this waste stream would both mitigate environmental burdens and diversify the pectin supply chain for Southeast Asia.

In dairy applications, inulin and LMP occupy complementary roles. Inulin, a β-2,1 fructan, acts as a prebiotic, stimulating the growth of beneficial bacteria and enhancing the viscosity and mouthfeel of yogurt (Qin et al., 2023). Multiple authors report that 1–2 % inulin can raise the viscosity of low-fat yogurt to full-fat levels (Crispín-Isidro et al., 2015), although excessive addition (>3%) may aggravate syneresis (Żbikowska et al., 2020). LMP (degree of esterification, DE < 50 %) forms gels in the presence of Ca^{2+} ions across a broad pH range (2.0–6.0). It stabilizes yogurt through electrostatic complexation between $–COO^-$ groups and casein, preventing whey separation and maintaining the gel structure (Wijaya et al., 2017). Although LMP lacks the pronounced prebiotic effect of inulin (Demirci et al., 2020), its superior gel-forming and rheological properties make it ideal for low-fat yogurts and other fermented dairy products (Xu et al., 2019). Khubber et al. (2021) used commercial citrus LMP (0.2 %) to stabilize skim milk yogurt, while Xu et al. (2019) replaced LMP with okra polysaccharide to obtain a softer gel; neither study examined the combined use of inulin and any pectin source.

To our knowledge, no published work has yet integrated inulin with LMP extracted from durian rind in a yogurt system. Pursuing the fruit waste valorization strategies previously reported (Huynh et al., 2024), this study aims

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to recover low-methoxyl pectin from durian peel, optimize the combined use of inulin and LMP in low-fat yogurt formulations, and evaluate their effects on physicochemical properties, gel structure, syneresis, and sensory attributes.

2. Material and methods

2.1 Materials and Chemicals

Fresh Ri6 durian rinds were collected from a retail outlet in Ho Chi Minh City, Vietnam. Fresh rinds were rinsed, air-dried, and trimmed to remove the green outer layer, retaining only the white mesocarp for pectin recovery. The mesocarp was diced into 2 × 2 × 2 cm pieces, dried overnight at 60 °C to a moisture content of 7 %, milled, sieved to < 250 µm, vacuum-packed, and stored in a desiccator until use.

Unless stated otherwise, the following chemicals and ingredients were used: Absolute ethanol (99.5 %, Chemsol; Viet Nam), ethanol (95 %, Chemsol; Viet Nam), hydrochloric acid (37 % w/w, Xilong Scientific; China), sodium-hydroxide pellets (≥ 98 %, Xilong Scientific; China), citric acid monohydrate (≥ 99.5 %, Xilong Scientific; China), and phenol-red indicator (Xilong Scientific; China). For yogurt preparation, pasteurized low-fat milk (1.5 % fat, Anchor™; Fonterra, New Zealand), freeze-dried starter culture (Yógourmet™; Lyo-San, Canada), chicory inulin (Orafti® GR; BENEO-Orafti, Belgium) and granulated sugar (Bien Hoa Sugar JSC, Viet Nam) were purchased locally.

2.2 Pectin extraction from Ri6 durian rinds

Pectin was isolated according to Tran et al. (2022) and Huynh et al. (2024) with minor modifications. A 10 g portion of powder was mixed with 200 mL of 0.5 M citric acid (pH 1.60) and extracted at 80 °C for 60 min under continuous stirring (300 rpm). The hot slurry was cooled to 25 °C and vacuum-filtered; the residue was rinsed with 50 mL of deionized water. Two volumes of 96 % (v/v) ethanol were added to the filtrate to precipitate pectin. The precipitate was collected, washed twice with 70 % ethanol, dried overnight at 55 °C, ground (< 100 µm), and stored over silica gel. The process yielded 22.8 ± 1.4 % pectin (dry basis). The MeO, DE, and AUA content were determined by titration, following José et al. (2022). Fourier-transform infrared spectroscopy (FTIR) was performed using a Jasco spectrometer (FTIR-4700A) to determine the unique structure of pectin.

2.3 Preparation of low-fat yogurt

2.3.1 Investigation of Low-Methoxyl Pectin (LMP) Concentration

A low-methoxyl pectin (LMP) solution was prepared at LMP–skim milk ratios of 0.05, 0.10, 0.20, 0.40, or 0.60 % w/v, as described by Jong et al. (2023), with the following modifications. Pectin powder and granulated sugar were first mixed at a 1:1 mass ratio to promote uniform dispersion and prevent lumping. This dry blend was then dissolved in distilled water at a pectin-to-water ratio of 1:50 (% w/v), with additional sugar added to ensure the final solution contained 30 % w/v total solids. The mixture was heated to 75 °C and stirred at 1,500 rpm for 30 min using a magnetic stirrer until the pectin was fully dissolved and a clear solution was obtained. The resulting LMP stock was cooled to room temperature and stored at 4 °C until use. Commercial skim milk (500 mL, 1.5 % fat) was heated to 45 °C and supplemented with inulin (with an inulin–milk ratio of 2.0 % w/v) and LMP solution. The mixture was stirred at 45 °C and 1,500 rpm for 30 min, cooled to 40 °C, inoculated with 1.5 g of yogurt starter culture per 500 mL, homogenized, and then filled into sterile glass jars (60 mL). Samples were incubated at 40 °C for 15 h, then stored at 20 °C.

2.3.2 Investigation of Inulin Concentration

Using the optimal LMP level, skim milk (500 mL, 1.5 % fat) was heated to 45 °C and supplemented with pectin LMP at a fixed concentration and inulin at inulin–skim milk ratios of 0.5, 1.0, 2.0, or 3.0 % w/v.

2.3.3 Investigation of Fermentation Time

Skim milk formulations containing the optimal concentrations of inulin and LMP (as determined in the above investigation) were prepared as described and incubated at 40 °C for 9, 11, 13, or 15 h.

All experimental conditions were conducted in triplicate. Two control yogurts were prepared in parallel: one with low-fat milk and no inulin or pectin and the other with full-fat milk.

2.4 Evaluation of Quality Attributes

2.4.1 Sensory Analysis

Sensory evaluation was performed in accordance with TCVN 3215-79 by a panel of six trained assessors. Each assessor rated the flavor and visual appearance of coded 60 mL samples served at 20 °C on a five-point scale (0–5), and mean scores were calculated for each formulation.

2.4.2 Texture Measurement

A Zwick/Roell Z 1.0–TestXpert 3.0 instrument equipped with a 20 mm diameter flat cylindrical probe was used to penetrate each yogurt sample (60 mL in a glass jar) at a constant speed of 1 mm/s to a depth of 9 mm at 14 ± 1 °C. The maximum force recorded (in Newtons) was taken as the sample's firmness.

2.4.3 Syneresis (Whey Separation)

A 10 g aliquot of each yogurt was centrifuged at 2,000 rpm and 20 °C for 15 min. Expelled whey was decanted and weighed. Syneresis was expressed as the percentage of whey weight relative to the initial sample weight, as shown in Eq(1).

$$Syneresis(\%) = \frac{Mass\ of\ whey\ (g)}{Mass\ of\ yogurt\ (g)} \times 100 \quad (1)$$

2.4.4 Physicochemical Analyses

Physicochemical properties were determined as follows: total soluble solids (°Brix) were measured using an RBX0080 refractometer; pH was recorded with a BP3001 pH/mV/ORP meter; and titratable acidity was assessed by titrating a 10 g sample with 0.1 M NaOH to the phenolphthalein endpoint, with results expressed as percent lactic acid.

2.5 Statistical analysis

Data are reported as mean ± SD (n = 3), analyzed by One-way ANOVA (Excel 365, Analysis ToolPak); differing superscript letters indicate values that are statistically distinct ($p < 0.05$).

3. Results and discussion

3.1 Pectin Extraction

The pectin extracted from durian rind in this study was categorized as low-methoxyl pectin (LMP) (6.03 %) due to its DE being lower than 50 % (44.92 %). Its anhydrouronic acid (AUA) content reached 76.26 %, confirming a highly purified backbone. FTIR in Figure 1 displayed the characteristic pectic signature. The peak observed at 3,334 cm^{-1} corresponds to the –OH stretching vibration due to hydrogen bonding of the polygalacturonic acid polymer. The absorption band at 1,717 cm^{-1} indicates the presence of the carbonyl (C=O) group in the methyl-esterified group ($COOCH_3$). The strong band at 1,646 cm^{-1} and the weaker band near 1,400 cm^{-1} are due to the stretching vibration of the carboxylate anion (COO^-). The bands around 1,327 cm^{-1} and the spectral region between 1221 and 900 cm^{-1} are related to the "fingerprint" of homogalacturonan region chains.

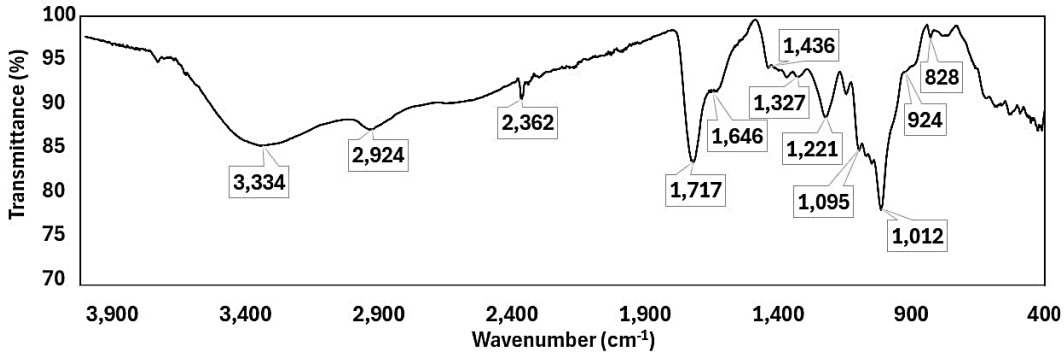

Figure 1: FTIR spectra of durian-rind pectin

3.2 Effect of Low-Methoxyl Pectin (LMP) Concentration

3.2.1 Effect of LMP concentration on the sensory attributes of low-fat yogurt

LMP, which gels in the presence of Ca^{2+} rather than high sugar, is suitable for low-sugar, low-fat yogurts. Table 1 shows that 0.05–0.20 % LMP maintains high texture scores (4.2–4.5) with acceptable flavor; 0.40 % yields an over-firm gel (score 3.7) while 0.60 % produces a brittle, non-elastic network (score 1.8) and was not flavor-scored because the sensory panel deemed its texture unacceptable. Up to 0.2 % LMP forms Ca^{2+}-mediated links between its $–COO^-$ groups and casein, enhancing network density without introducing stiffness (Wijaya et al., 2017). Above 0.4 %, excessive cross-linking densifies the matrix, reduces elasticity, and negatively impacts sensory acceptance (Demirci et al., 2020). A 0.1–0.2 % LMP is a suitable range for low-fat yogurt.

Table 1: Effect of LMP concentration on the sensory attributes of low-fat yogurt with 2 % inulin in 15 h fermentation

Sample code	Pectin (%)	Texture	Flavor
M0.05	0.05	4.2±0.4^{a}	4.3±0.3^{a}
M0.1	0.1	4.5±0.5^{a}	4.5±0.3^{a}
M0.2	0.2	4.5±0.5^{a}	4.4±0.7^{a}
M0.4	0.4	3.6±0.5^{b}	4.5±0.3^{a}
M0.6	0.6	1.8±0.4^{c}	not evaluated

3.2.2 Effect of LMP concentration on the physicochemical and texture properties of low-fat yogurt

Table 2 illustrates how increasing concentrations of low-methoxyl pectin (LMP) affect key quality parameters of low-fat yogurt. All LMP-fortified samples (0.05–0.40 %) maintain a pH and °Brix level indistinguishable from those of both controls, indicating that pectin does not alter the fermentation endpoint acidity or total soluble solids content. The low-fat control (Control L) exhibits a low firmness of 0.35 N, roughly half that of full-fat yogurt (0.65 N). At 0.10 % LMP (M0.1), firmness rises to 0.62 N (statistically equivalent to Control F), demonstrating LMP's capacity to reinforce the protein network and mimic fat's textural role. Ca^{2+}-"egg-box" bridges tighten the casein network—G′ rises while the critical strain (γc) stays high—so the gel is firmly elastic. Above 0.10 %, firmness declines, suggesting an overly dense pectin network that loses elasticity (0.48 N at 0.20 %; back to 0.35 N at 0.40 %). At ≥ 0.40 % LMP, system's surplus pectin over-crosslinks the same Ca^{2+}/COO^{-} sites, forming an ultra-dense matrix with higher G′ but sharply lower γc; the brittle network contracts, expels serum and shows greater syneresis (Figure 2). Similar firmness-versus-brittleness trade-offs were reported for citrus LMP in skim-milk yogurt (Khubber et al., 2021) and for okra polysaccharide gels (Xu et al., 2019).

Control L exhibits severe whey separation (38.1 %), and M0.1 reduces syneresis to 28.5 %, a substantial improvement but still double that of Control F (14.3 %). The minimum syneresis at 0.10 % LMP confirms an optimal balance between gel strength and water retention. Higher pectin levels (> 0.20%) actually increase syneresis (also shown in Figure 2), likely due to network over-crosslinking, which creates larger pores that expel whey more readily. LMP interacts with casein micelles through calcium bridges to form a cohesive gel network, improving firmness and enhancing binding to serum (Wijaya et al., 2017). However, beyond an optimal concentration (0.10 %), excessive cross-linking reduces network flexibility and water-holding capacity, leading to increased syneresis (Pimentel et al., 2013).

Table 2: Effect of LMP concentration on the physicochemical and texture properties of low-fat yogurt with 0.2 % inulin in 15 h fermentation

Sample code	Pectin (%)	pH	°Brix	Firmness (N)	Syneresis (%)
Control F	-	3.82±0.02^{a}	9.8±0.4^{a}	0.65±0.01^{d}	14.3±0.21^{f}
Control L	-	3.82±0.01^{a}	9.5±0.7^{a}	0.35±0.03^{a}	38.1±0.21^{a}
M0.05	0.05	3.79±0.02^{a}	10.3±0.4^{a}	0.55±0.02^{b}	32.0±0.14^{b}
M0.1	0.1	3.82±0.01^{a}	10.1±0.1^{a}	0.62±0.02^{bd}	28.5±0.21^{c}
M0.2	0.2	3.81±0.01^{a}	10.3±0.4^{a}	0.48±0.001^{c}	34.4±0.28^{d}
M0.4	0.4	3.80+0.03^{a}	10.5±0.7^{a}	0.35±0.01^{a}	40.7±0.21^{e}

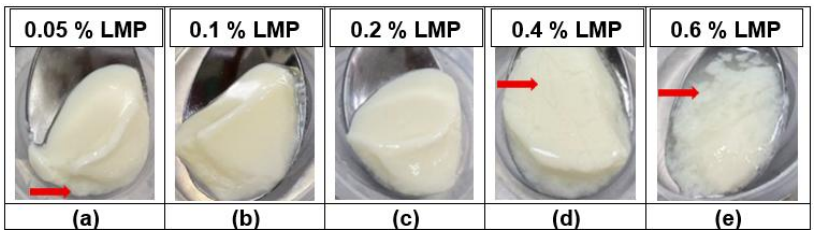

Figure 2: Yogurt with 2 % inulin + 0.05–0.60 % LMP (a–e). Arrows mark cracking and syneresis at higher doses

All key metrics (firmness, syneresis, pH, and °Brix) were statistically compared with both low-fat and full-fat controls using ANOVA ($p < 0.05$), ensuring consistent benchmarking. Distinct superscripts confirm concentration-dependent effects on firmness and syneresis, with 0.10 % yielding optimal values, while pH and °Brix remain statistically unchanged. Sensory tests were limited to treated samples, as the controls served as established references. The close agreement among instrumental data, sensory scores, and visual inspection supports the reliability of the results.

3.3 Effect of Inulin Concentration

Although 0.10 % LMP restores texture, further stabilizers, such as inulin, may be needed to replicate fat's function fully. Table 3 demonstrates that increasing levels of inulin (0.5–3.0 % w/v) in low-fat yogurt significantly improves texture and reduces whey separation without altering fermentation acidity or soluble solids. All inulin-fortified yogurts exhibit pH and °Brix values statistically identical to those of Control L, indicating that inulin does not interfere with lactic acid production or soluble solids content. Adding 0.5–2.0 % inulin increases firmness from 0.35 N to around 0.61–0.62 N, closely approaching the firmness of the full-fat control (0.65 N). This aligns with Crispín-Isidro et al. (2015), who found that long-chain inulin increases serum viscosity, fills casein-network voids, and via hydrogen bonds reinforces the gel. Whey separation drops from 38.1 % in Control L to as low as 29.1 % at 2.0 % inulin, indicating an enhanced water-holding capacity. At 3.0 % inulin, syneresis slightly increases to 31.9 %, suggesting that excessively high inulin can over-thicken the serum, impair network cohesion, and paradoxically promote whey expulsion (Oliveira et al., 2011). Superscript letters also show only 2 % inulin matches full-fat firmness and minimizes syneresis (still higher than full-fat), with 3 % giving no extra benefit, and unchanged pH and °Brix confirm its texturizing and water-retention effects.

Table 3: Effect of Inulin on the physicochemical and texture properties of low-fat yogurt with 0.1 % LMP in 15 h fermentation

Sample code	Inulin (%)	pH	°Brix	Firmness (N)	Syneresis (%)
Control F	-	3.82±0.02^{a}	9.8±0.4^{a}	0.65±0.01^{c}	14.3±0.21^{d}
Control L	-	3.82±0.01^{a}	9.5±0.7^{a}	0.35±0.03^{a}	38.1±0.21^{a}
M0.5	0.5	3.83±0.01^{a}	9.8±0.4^{a}	0.61±0.01^{b}	30.1±0.57^{bc}
M1	1	3.83±0.01^{a}	9.8±0.4^{a}	0.62±0.001^{b}	30.2±0.71^{bc}
M2	2	3.84±0.01^{a}	10.0±0.7^{a}	0.622±0.02^{bc}	29.1±0.21^{b}
M3	3	3.84±0.01^{a}	10.3±0.4^{a}	0.58±0.01^{b}	31.9±0.28^{c}

3.4 Effect of Fermentation Time

Yogurt with 2.0 % inulin + 0.10 % LMP is optimal for balancing firmness and minimizing whey separation without altering acidity or solids. Table 4 tracks how extending fermentation time from 9 to 15 h affects the acidification, solids content, texture and stability of this low-fat yogurt. Extending fermentation from 9 to 15 h raises titratable acidity (1.17 to 1.57 %) and lowers pH (4.17 to 3.84), approaching the casein isoelectric point and enhancing gel formation, while °Brix drops early (10.9 to 10.1) due to lactose consumption then stabilizes. These patterns align with Tamime and Robinson (2007). Firmness increases to 0.62 N at 15 h and syneresis falls from 35.6 % to 29.1 %, reflecting a more cohesive network at lower pH that traps serum more effectively. Gains become most pronounced beyond 13 h, indicating 13–15 h as the ideal fermentation window. Figure 3 shows pronounced whey separation at 9 h (arrow), while the 11, 13, and 15 h samples exhibit progressively smoother surfaces and less whey, mirroring the syneresis decline.

Table 4: Effect of fermentation time on the physicochemical and texture properties of low-fat yogurt

Sample code	Fermentation Time (h)	Acidity (% lactic)	pH	°Brix	Firmness (N)	Syneresis (%)
M9	9	1.17±0.01^{a}	4.17±0.07^{a}	10.9±0.1^{a}	0.27±0.01^{a}	35.6±0.21^{a}
M11	11	1.33±0.01^{b}	4.03±0.01^{a}	10.1±0.1^{b}	0.35±0.001^{b}	32.4±0.35^{b}
M13	13	1.45±0.01^{c}	3.91±0.02^{b}	10.1±0.1^{b}	0.42±0.03^{b}	31.3±0.14^{b}
M15	15	1.57±0.01^{d}	3.84±0.01^{c}	10.1±0.1^{b}	0.62±0.02^{c}	29.1±0.21^{c}

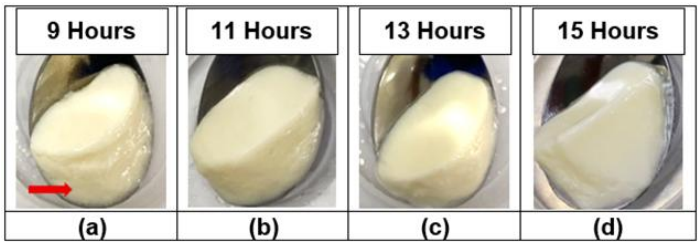

Figure 3: Yogurt gel with 2 % inulin + 0.10 % LMP after 9, 11, 13, and 15 h fermentation (a–d). Arrow in (a) marks whey release; later panels show reduced syneresis

A syneresis level of 29 % marks a notable improvement over the 38 % in the unmodified low-fat control, though still higher than the 14 % in full-fat yogurt. Khubber et al. (2021) reported 39–44 % whey loss using 0.4–1.0 % LMP alone after 6 h fermentation. In contrast, our combination of 2 % inulin and 0.10 % LMP, with extended 15 h fermentation, achieved a significantly lower syneresis of 29 %. Inulin might bind free water and fill voids, while LMP cross-links with casein via Ca^{2+} bridges; prolonged incubation consolidates the network. Thus, combining the two biopolymers for a longer fermentation time yields a tighter gel without resorting to high pectin levels, which can compromise flavor or increase cost.

4. Conclusions

This study confirms that low-methoxyl pectin isolated from durian peel, when used at 0.10 % w/v in combination with 2.0 % inulin, effectively restores the firmness and reduces the syneresis of low-fat yogurt to levels approaching those of full-fat counterparts. Neither additive adversely affected the fermentation endpoint acidity or soluble solids content, and sensory evaluation indicated high acceptability in terms of texture and flavor. Extending fermentation to 13-15 h further improved gel cohesion and minimized whey separation. Beyond delivering a clean-label strategy for lower-fat, prebiotic-enriched dairy, this work demonstrates a high-value outlet for durian-processing waste—helping Southeast Asian fruit industries close the loop, reduce disposal burdens, and advance regional goals for healthier diets and circular bio-economy growth. Future work will optimize inoculum dose and culture selection in scale-up fermenters for 6–10 h production batches. It will also undertake refrigerated shelf-life studies, with periodic assessments of texture, syneresis, pH, sensory, microstructural, and rheological properties, to confirm the seamless integration and long-term stability of the LMP-inulin blend.

References

Crispín-Isidro G., Lobato-Calleros C., Espinosa-Andrews H., Álvarez-Ramírez J., Vernon-Carter E.J., 2015, Effect of inulin and agave fructans addition on the rheological, micro-structural and sensory properties of reduced-fat stirred yogurt, LWT – Food Science and Technology, 62(1), 438–444.

Demirci T., Sert D., Aktaş K., Atik D.S., Öztürk Negiş H.İ., Akın N., 2020, Influence of hot- and cold-break tomato powders on survival of probiotic Lactobacillus paracasei subsp. paracasei F19, texture profile and antioxidative activity in set-type yoghurts, Lebensmittel-Wissenschaft and Technologie, 118, 108855.

Huynh U.D.H., Nguyen C.D.H., Le N.L.B., Le K.T.K., Nguyen T.T.T., Mang T.X.T, Tran U.P.N., 2024, Recovery of beneficial compounds from fruit waste for application to potential skincare products, Chemical Engineering Transactions, 113, 325–330.

Jong S.H., Abdullah N., Muhammad N., 2023, Optimisation of low-methoxyl pectin extraction from durian rinds and its physicochemical characterisation, Carbohydrate Polymer Technologies and Applications, 5, 100263.

Khubber S., Chaturvedi K., Thakur N., Sharma N., Yadav S. K., 2021, Low-methoxyl pectin stabilises low-fat set yoghurt and improves its physicochemical properties, rheology, micro-structure and sensory liking, Food Hydrocolloids, 111, 106240.

Oliveira R.P.D.S., Perego P., Oliveira M.N.D., Converti A., 2011, Effect of inulin as prebiotic and synbiotic interactions between probiotics to improve fermented milk firmness, Journal of Food Engineering, 107(1), 36–40.

Pagán J., Muñoz J., Cho H., 2001, Structure and functional properties of pectins extracted from durian rind, Journal of Agricultural and Food Chemistry, 49(8), 3798–3804.

Qin Y.Q., Wang L.Y., Yang X.Y., Xu Y.J., Fan G., Fan Y.G., Ren J.N., An Q., Li X., 2023, Inulin: properties and health benefits, Food and Function, 14(7), 2948–2968.

Tam A., 2024, Vietnamese innovation: Biochar and wood vinegar production from durian shells, VietNamNet Global, Vietnam <vietnamnet.vn/en/vietnamese-innovation-biochar-and-wood-vinegar-production-from-durian-shells-2315633.html> accessed 27.05.2025.

Tamime A.Y., Robinson R.K., 2007, Yoghurt: Science and Technology, 3rd ed., Woodhead Publishing, Cambridge, United Kingdom.

Tran U.P.N., Dang-Bao T., Le P.T.K., Huynh U.D.H., Nguyen T.T.H., Le T.M., 2022, Encapsulation of betalains extracted from red dragon fruit peels by freeze-drying using microcrystalline cellulose and dragon-fruit-peel pectin as wall materials, Chemical Engineering Transactions, 97, 31–36.

Wijaya W., Van der Meeren P., Patel A. R., 2017, Cold-set gelation of whey protein isolate and low-methoxyl pectin at low pH, Food Hydrocolloids, 65, 35–45.

Xu K., Guo M., Du J., Zhang Z., 2019, Okra polysaccharide: effect on the texture and micro-structure of set yoghurt as a new natural stabiliser, International Journal of Biological Macromolecules, 133, 117–126.

Żbikowska A., Szymańska I., Kowalska M., 2020, Impact of inulin addition on properties of natural yogurt, Applied Sciences, 10(12), 4317.