

SUGAR-FREE QATAYEF- A REFORMULATION STUDY FOR DIABETIC CONSUMERS



Miriam Chalhoub | Clea el Naddaf | Sara Maria Saliba | Nadira el Hayek
School of Engineering – Department of Agriculture and Food Engineering, USEK

1.CONTEXT OF THE STUDY

Diabetes & the Lebanese sweet tradition

Type 2 diabetes affects an estimated 14% of Lebanese adults. Traditional sweets such as qatayef are prepared with refined wheat flour and saturated in sugar syrup, a combination that drives sharp glucose spikes and effectively excludes diabetic consumers from a culturally central food.

Sugar is hard to remove

Sugar is difficult to remove because it plays several key roles: it provides bulk and texture by binding water and softening the crumb, supports browning through the Maillard reaction for the golden crust and aroma, feeds yeast to create the characteristic qatayef surface bubbles, and helps preservation by lowering water activity, which extends shelf life and limits microbial growth.

Objective

Develop a sugar-free qatayef whose sensory profile — appearance, aroma, texture, sweetness — is statistically comparable to the traditional product, while delivering a glycemic load suitable for diabetic consumers.



2. R&D METHODOLOGY

Sweetener system

Three types of sweeteners were selected to mimic sucrose multifunctionality while keeping the glycemic index near zero:

- Erythritol (GI=0): bulking agent, ~70% sweetness of sucrose, mild cooling effect.
- Stevia (GI=0): high-intensity sweetener (~250× sucrose), heat-stable.
- Xylitol (GI 7–13): sugar alcohol with 1:1 sweetness vs. sucrose; provides bulk, humectancy and soft crumb; non-fermentable by yeast.

Flour reformulation

Refined wheat flour (GI ≈ 71) was partially replaced with two lower-GI flours:

- Whole wheat flour (GI=45): fibre, B vitamins, slower digestion.
- Oat flour (GI=25): β-glucan content shown to lower postprandial glucose response.



3.ENSURE THE QUALITY

Analytical methods

- **Benedict's test:** qualitative confirmation that no reducing sugars remain in the reformulated product.
- **Water activity (a_w):** measured with a calibrated hygrometer; target $a_w < 0.85$ to prevent microbial growth.
- **Moisture content:** oven-drying method (105 °C, AOAC 925.10); benchmark = traditional qatayef.

Sensory evaluation

Triangle test (n=30) to detect differences vs. traditional control, followed by a 9-point hedonic scale evaluating:

- Appearance & colour, aroma, sweetness, texture, overall acceptability.
- Statistical analysis.



4.CONVIVIAL MEAL

Restoring qatayef to the Diabetes table

Qatayef is a staple shared with family and neighbours. The reformulated product is designed to fit the same ritual without isolating diabetic relatives or forcing a separate menu.

Suggested fillings & pairings

- Walnut – cinnamon filling: low GI, healthy fats, naturally low sugar.
- Reduced-sugar ashta with stevia and rose water replacing the classic syrup soak.
- Light orange-blossom syrup made with erythritol – stevia in place of sucrose.

5.CONCLUSIONS & PERSPECTIVES

- **Sucrose-free formulation achieved** using an erythritol – stevia – xylitol either alone or as a blend with whole wheat / oat flour, giving a low estimated glycemic load.
- **Quality benchmarks met:** negative Benedict's test, $a_w < 0.85$, moisture and texture comparable to traditional qatayef.
- **Sensory acceptance:** no significant difference detected by panellists for overall liking ($p > 0.05$).
- **Next steps:** in-vivo glycemic index measurement, shelf-life trial, scale-up to a Lebanese pastry partner, clinical pilot with type 2 diabetic volunteers.