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Abstract

Short-Term Effects of a Snack Including Fruit Juice Enriched with Vitamin D3, n-3 Fatty Acids, and Probiotics on Energy Intake and Satiety in Normal-Weight and Overweight Individuals †

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Abstract: Introduction: The purpose of this study was to test the hypothesis that a preload including orange fruit juice (FJ) enriched with 50 µg of vitamin D3, 8.33 g of n-3 PUFA, and 108 cfu/mL of *Lacticaseibacillus casei* Shirota and *Lacticaseibacillus rhamnosus* GG probiotics, consumed as a snack before a meal, would (a) have greater short-term effects on satiety, as measured by the subsequent *ad libitum* meal intake, and (b) induce greater satiety, as assessed using visual analogue scales (VAS), in normal-weight and overweight healthy individuals compared to the same orange FJ without any fortification. Methods: Forty-six healthy individuals (normal weight: n = 24, 25 ± 1 years, BMI: 21 ± 1 kg/m^2; overweight: n = 22, 28 ± 2 years, BMI: 27 ± 1 kg/m^2) participated in this randomized, double-blind, within-subject crossover study. The participants consumed a standardized breakfast after 12 h of fasting. Two hours later, they were given 50 g of available carbohydrates from the two preloads (enriched orange FJ or control FJ) in random order, with a one-week washout period, and three hours later, they were offered an *ad libitum* lunch. The participants rated their hunger, desire to eat, perceived fullness, thirst, preoccupation with food, and pleasure of eating on visual analogue scales (VAS) at the baseline and at 15–30 min intervals up to 7 h of the intervention. Results: A statistical analysis of the results showed that when the individuals consumed the preload that included the FJ enriched with biofunctional ingredients, they had lower feeling of hunger, desire to eat, and preoccupation with food, and a higher perceived fullness at all time points between the preload and the meal. Additionally, the overweight individuals had a lower total energy intake at the meal and a lower energy intake 24 h post intervention day, as well as lower protein and fat intakes, compared to the normal-weight individuals. Discussion: Since the macronutrient contents of both preloads were similar, the satiating power of the enriched FJ indicates that the added ingredients (vitamin D3, n-3, and probiotics) have biofunctional properties that induce fullness and reduce the total energy intake, particularly in overweight individuals. The addition of enriched FJ to a snack seems to promote satiety besides providing valuable nutrients, and it may be an effective strategy for body weight control.

Keywords: fruit juice; vitamin D3; n-3 fatty acids; probiotics; satiety

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Author Contributions: E.P. conceptualized and designed the study, and drafted the manuscript. N.Z. conducted nutritional and statistical analyses, and drafted the manuscript. N.Z., C.A., S.T., D.-L.B. collected the data. S.V.-A. and O.S.P. created the fruit juices with the added biofunctional ingredients. All authors have read and agreed to the published version of the manuscript.

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