WHITE PAPER

FEBRUARY 2024

FOSLIFE

The Sweet Soluble Prebiotic Fiber

FOSLIFE® SHORT- CHAIN FRUCTOOLIGOSACCHARIDES

A prebiotics symphony in yogurt formulation

Introduction

Yogurt is a popular dairy product known for its beneficial microorganisms that combat harmful bacteria. Its global popularity has grown due to its health benefits, versatility, and various flavors. Fruit-stirred yogurt, combining fruit with yogurt, is a hit for those seeking a nutritious and tasty snack. Sweetened yogurt, with added sugar, is also popular, but it raises health concerns like diabetes and obesity.

Reducing sugar in sweetened yogurt is challenging because sugar affects texture and color. Common sugar substitutes may not replicate sugar's properties, leading to consumer hesitance. Short-chain fructo-oligosaccharides (scFOS) are proposed as a sugar substitute in yogurt, offering prebiotic benefits and addressing sugar-related health risks. These have characteristics similar to sugar, making them useful for reducing sugar in food and drinks. Key starter strains used for yogurt preparation are Lactobacillus bulgaricus and Streptococcus thermophilus.

FOSLIFE® is a short-chain fructooligosaccharides (scFOS) produced by Revelations Biotech Pvt Ltd using a patented process that is a sweet-tasting, soluble dietary fiber. It is comprised of Kestose (GF2), Nystose (GF3), and fructofuranosyl nystose (GF4) (Fig. 1) . The present study aims to create a healthy set yogurt using FOSLIFE® (L65) as a sugar replacer and evaluate its impact on milk acidification and quality parameters of yogurt.

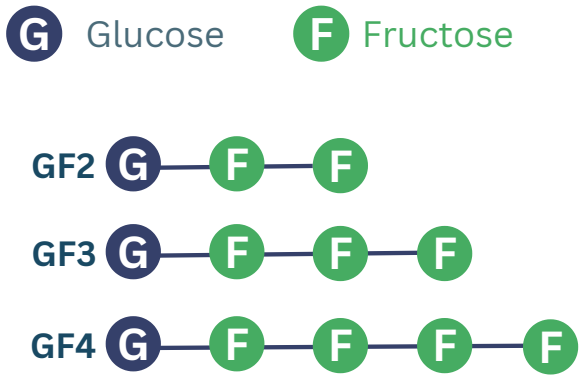

Fig 1 : Short-chain fructooligosaccharides (scFOS)

Study Design

The control sample, labelled "S_0" was made from standardized milk with 3.5% fat and 8.5% SNF (Solid-Not-Fat). To this milk, a dry blend of 2% skim milk powder and 0.3% stabilizer was added followed by heating to 95°C. Subsequently, sugar (5%) was added, followed by a 10-minute holding period. The sample was rapidly cooled to 45°C, and a 0.1% YoFlex® Express 1.0 starter culture was introduced and incubated at 43±1°C until the pH reached 4.6. Similarly, sample "S_1" was made by complete substitution of sugar with FOSLIFE® L-65 solids keeping all the other ingredients constant. The prebiotic effect of FOSLIFE® in terms of acidification profile (pH change per hour and curdling time), lactic acid bacterial count, and metabolism of scFOS were observed during incubation. Once curdling occurred, the samples were cooled to 20-25°C for further processing.

Study Outcome

Prebiotic effect of FOSLIFE®

Acidification of Milk

The time needed for coagulation to reach a pH of 4.6 varied between 210±5 to 270±5 minutes. Sample S_0, which contained 100% sugar, had the longest curdling time (270±5 min) while sample S_1 with 100% FOSLIFE®, had the shortest curdling time (210±5 min). The presence of FOSLIFE® reduces the average time to complete fermentation approximately by 21% shorter than the control.

This suggests that the fermentation process was influenced by the culture used and the addition of prebiotic FOSLIFE®. The presence of FOSLIFE® appeared to stimulate the growth of probiotic microorganisms, specifically, *S. thermophilus and L. bulgaricus*, which were part of the starter culture. This likely contributed to the faster curdling time in the sample.

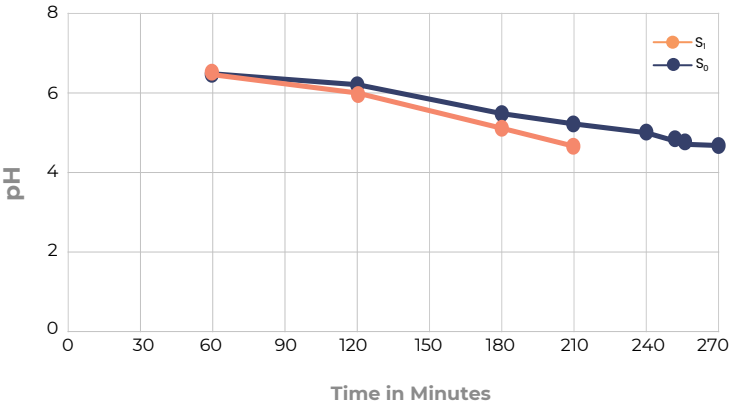

Fig 2 : Effect of FOSLIFE on incubation time of Milk

LAB Count

During milk incubation, bacterial counts in both samples *(S. thermophilus and L. delbruekii ssp. Bulgaricus)* increased. Sample 100% FOSLIFE® (S_1) exhibited a faster growth rate than S_0 with 100% sucrose. In 210 minutes, the culture population in milk sample S_1 rose from 12×10^5 to 20.2×10^8 cfu/ml, while the control treatment increased from 8×10^5 to 28×10^7 in 270 minutes, reaching the desired pH. Notably, the sample with FOSLIFE® demonstrated a 2.5-fold rise at 120 minutes and a substantial 6.8-fold increase at 180 minutes compared to sample S_0.

This underscores FOSLIFE®'s promising prebiotic effect in fostering lactic acid bacterial growth and showcasing its potential as a valuable additive in promoting beneficial microbial activity in dairy products.

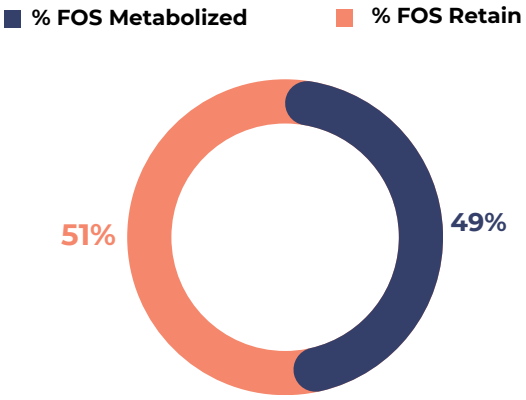

Fig. 3: Metabolism of scFOS during incubation at 43°C

Table 1 : Prebiotic effect of FOSLIFE® on LAB culture counts (cfu/ml)

Time (minutes)	S_0	S_1
0	8×10^5	12×10^5
60	31×10^5	47×10^5
120	15.2×10^6	39×10^6
180	51×10^6	35×10^7
210	-	20.2×10^8
240	23×10^7	-
250	-	-
255	-	-
270	28×10^7	-

*** S_0: Set yogurt with sugar S_1: Set yogurt with FOSLIFE®**

Metabolism of FOSLIFE® scFOS during incubation of milk

The starter culture employed for yogurt production metabolized the FOSLIFE® short-chain fructooligosaccharides leading to an increased rate of acidification and reduced fermentation time necessary to achieve a pH of 4.6. The decreased level of scFOS during fermentation and reduction in fermentation time in the present investigation demonstrates that scFOS stimulated the metabolic activity of binary co-cultures. Lactic acid bacteria metabolized 51% of the added scFOS, leaving 49% retained in the sample .

Sensory Evaluation

In evaluation of set yogurt, a panel of semi-trained members evaluated the sensory parameters, including consistency, taste, flavor, texture, mouthfeel, and overall acceptability. The results, presented in Fig 4, revealed that the taste, texture, mouthfeel, and flavor of yogurt with FOSLIFE® (S_1) were most liked by the panelists while consistency received less score as compared to yogurt with sugar (S_0) .There was no significant difference observed in consistency, taste, and mouthfeel among both treatments. Overall, the yogurt with FOSLIFE® (S_1) was most liked by the sensory panel. It means that the FOSLIFE® as a sugar replacer had a positive impact on the sensory attributes of the set yogurt.

These results align with previous research, emphasizing FOSLIFE® scFOS potential to offer similar functional benefits to sucrose with fewer calories and a low glycemic index

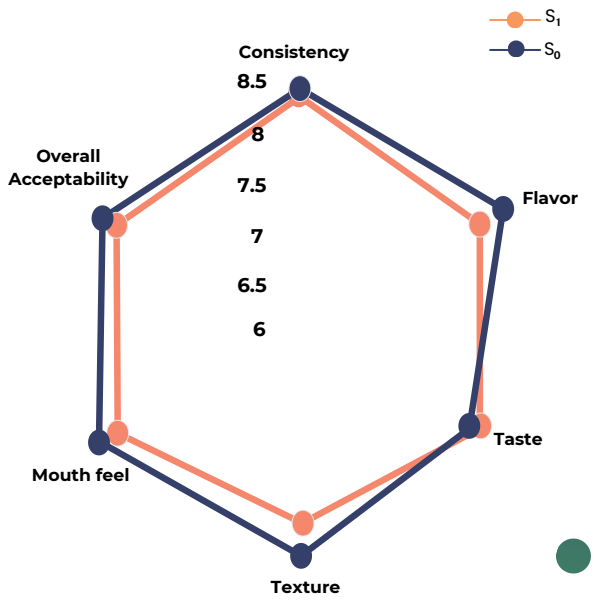

Fig 4: Sensory Evaluation of set yogurt

Conclusion

The study's findings suggest that FOSLIFE® is a valuable functional ingredient for enhancing the qualities of yogurt. FOSLIFE® not only expedited milk acidification, reducing fermentation time but also showcased its prebiotic potential by enhancing the metabolic activity of co-cultures and LAB count , ultimately improving the efficiency of yogurt production. This shortened fermentation time aligns with industrial preferences for higher productivity and lower microbial contamination risks. Replacing sucrose with FOSLIFE® boosts the sensory appeal of set yogurt . These results highlight FOSLIFE® 's potential to create a range of healthy, low-calorie, low glycemic index yogurt-like dairy products with no added sugars, offering promising possibilities for innovative, health-conscious dairy products .

References

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