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**Probiotic and Paraprobiotic Fermented Milk Enriched with Jujube and Pumpkin Fruits****Elif Sezer<sup>1</sup>, Goncagül Balcı<sup>1</sup>, İleyda Demirbaş<sup>1</sup>, Şevval Dülger<sup>1</sup>, Ayşen Can<sup>2</sup>**<sup>1</sup>Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Türkiye<sup>2</sup> Department of R&D Center, AK Gıda San. Tic. A.Ş., Group Lactalis, Sakarya, Türkiye**Abstract**

This study evaluated the effects of jujube and pumpkin supplementation on the microbiological, physicochemical, textural, and sensory properties of probiotic and paraprobiotic fermented milk. *Lactocaseibacillus rhamnosus* and yogurt cultures were used for fermentation, and paraprobiotic samples were obtained post-fermentation heat treatment (85 °C, 20 min). Viable counts of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* + *L. rhamnosus* declined during storage in probiotic samples, while low but detectable levels persisted in paraprobiotic ones, indicating incomplete inactivation. Jujube supplementation showed a relatively stabilizing effect on *S. thermophilus* counts by Day 24. Paraprobiotic samples exhibited higher pH and lower acidification due to reduced microbial activity. Viscosity was consistently lower in paraprobiotic samples compared to probiotic ones, and fruit addition slightly reduced viscosity in probiotic formulations. Both hardness and adhesive force were lower in paraprobiotic samples at the beginning and end of storage, although both increased over time. It was determined that brightness and whiteness values were lower in samples containing paraprobiotics and fruit, and decreased in all samples during storage. Fruit-enriched paraprobiotic samples exhibited the lowest serum separation, suggesting improved phase stability. In sensory analyses, especially for taste, control and jujube-supplemented probiotic samples scored particularly high. Although fruit addition enhanced sweetness perception across all samples, it did not improve overall taste acceptance. Paraprobiotic samples, especially those with pumpkin, received the lowest sensory scores. In summary, fruit supplementation and thermal treatment jointly affected the structural and sensory characteristics of fermented milk. While some physical parameters improved in paraprobiotic formulations, sensory attributes remained higher in probiotic samples. These findings provide insight into the challenges of balancing functionality and consumer appeal and may guide future work on optimizing fruit incorporation and processing methods in fermented dairy systems.

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