



Mango peel increased the growth rates of microorganisms and antioxidant properties of products during kefir fermentation.

Gabriela Mourad Vicenssuto*, Ruann Janser Soares de Castro

Abstract

This work evaluated the effect of the fermentation process using kefir as microbial agent and milk supplemented with mango peels as substrate aiming to obtain a product with better antioxidant properties. The characterization of the microorganism's profile (lactic and acid lactic bacteria and yeast) during the fermentation kinetics was performed. The results showed that the use of mango peels in the growth medium (UHT whole milk) had a positive effect on the antioxidant properties of the fermented products and also in microorganism's growth.

Key words: Kefir; mango peel; bioactive compounds.

Introduction

Fermentation using kefir grains results in production of several bioactive compounds that are associated with a healthier maintenance of human body. The antioxidants are an important group in this category, being the phenolics and biopeptides the main compounds responsible by this activity. Kefir may contribute to human health as probiotic, assisting in the colonization of the intestine and avoiding the attack of pathogenic microorganisms. Mango is a fruit that is also known by its antioxidant properties, that are mainly found on its peel. In the food industry, mango peels are considered as waste of juice production, representing a very cheap substrate for fermentation. In this context, the present work evaluated the effect of the fermentation process using kefir as microbial agent and milk supplemented with mango peels as substrate aiming to obtain a product with better antioxidant properties.

Results and Discussion

The kefir grains were incubated at 30°C/24h using UHT whole milk supplemented with freeze-dried mango peels (10% w/v) as growth medium. Control assays were performed using only UHT whole milk. A fermentation kinetic of 12 hours was carried out, in which the microbial growth and antioxidant properties of the fermented products were determined every 2 hours. Table 1 shows the growth profile for the major groups of microorganisms found in kefir culture. It was possible to observe that the growth rates in the presence of mango peels were higher than the control assays. This behavior can be related to the presence of antioxidant compounds in mango peel that resulted in a favorable anaerobic condition for probiotic bacteria growth, such as the acid lactic bacteria. The antioxidant properties of control and tested samples were evaluated using the following methods: DPPH, FRAP, ABTS and Total Reduction Capacity (TRC). The results were expressed as μmol trolox equivalent per gram of sample ($\mu\text{mol TE/g}$). Two main phenomena deserve to be highlighted: 1) the fermentation process significantly increased the antioxidant properties of the milk and 2) the supplementation of the growth medium with mango peels also resulted in fermented products with better antioxidant properties compared to the control (Table 2). This fact can be associated with the production of bioactive compounds by the fermentation and solubilization of the phenolic compounds with antioxidant properties from mango peel.

Table 1. Microbial growth of control and samples during kefir fermentation.

Fermentation time (h)	Microbial growth (UFC/mL)			
	Yeast	Acetic Acid Bacteria	Lactic Acid Bacteria	
Sample	0	5.73E+03	2.57E+06	1.88E+06
	4	1.17E+04	2.58E+06	3.66E+06
	8	6.23E+04	9.57E+06	2.63E+07
	12	3.70E+05	4.20E+07	2.11E+08
Control	0	3.93E+03	2.50E+06	1.12E+06
	4	9.77E+03	2.69E+06	2.73E+06
	8	4.23E+04	1.48E+07	2.73E+07
	12	3.13E+05	4.40E+07	6.90E+07

Table 2. Antioxidant properties of the fermented products by kefir.

Fermentation time (h)	FRAP ($\mu\text{mol TE/g}$)		ABTS ($\mu\text{mol TE/g}$)	
	Control	Sample	Control	Sample
0	15.87	18.55	142.07	136.09
2	30.09	29.07	137.42	148.51
4	59.48	35.10	133.31	155.36
6	51.87	64.61	126.31	152.78
8	21.34	54.08	135.42	138.40
10	35.20	52.88	132.42	145.44
12	30.82	42.66	140.98	147.80

Fermentation time (h)	DPPH ($\mu\text{mol TE/g}$)		TRC (mg GAE /g)	
	Control	Sample	Control	Sample
0	5.34	6.48	7.62	7.12
2	4.39	5.79	7.97	6.44
4	6.23	9.32	7.14	6.55
6	6.49	12.96	7.12	7.00
8	7.11	12.24	4.88	7.00
10	6.48	13.81	7.84	9.13
12	6.21	8.40	7.85	5.82

Conclusions

As an overall result, the supplementation of the medium with mango peels showed a significant and positive impact in the increase of the microbial growth rates and also in the antioxidant activity of the fermented products, an indicative of the potential use of this waste in kefir products and co-products.

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