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Determining the Shelf Life of Five Raw Cookie Dough Formulations

Shelf-Life Study

Final Report

Study Oversight

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Purpose

The purpose of this study was to determine the shelf life of raw cookie dough. The real time shelf life was conducted at ambient temperature.

Methods

Five types of raw cookie dough (Table 1) were provided by Custom Foods in packaging and stored at ambient temperature for 21 days. Twelve individually packaged samples of raw cookie dough weighing a minimum of 200g were needed to complete the study. Samples were tested for chemical, microbial, and sensory properties upon receipt (day 0) and after 2, 4, 6, 8, 10, 14, 18, and 21 days of storage.

Table 1: Cookie Dough Types

Oatmeal Raisin (8 provided)
Snickerdoodle (8 provided)
Peanut Butter
Carmel Apple
White Chocolate Macadamia Nut

Chemistry

Chemical testing included an evaluation of pH and water activity. One replicate was tested at the beginning and end of the study.

Water Activity

Water activity was measured using an Aqua Lab water activity meter.

pH

pH was measured using an Accumet pH meter.

Microbiology

Aerobic Plate Count (APC)

Samples were evaluated in duplicate at every testing interval for aerobic organisms using 3M Petrifilm™ Plate Count. The sample (1ml) was set on the Petrifilm™ and incubated at 35 ±1 °C for 24 – 48 hours. Results were reported as CFU/gram of sample.

Coliforms and E. coli

Samples were evaluated in duplicate at the beginning and end of the study for coliform and E. coli organisms using 3M Petrifilm™. The sample (1ml) was set on the Petrifilm™ and incubated at 35 ±1 °C for 24 – 48 hours. Results are reported as CFU/gram of sample.

Yeast and Mold (Y&M)

Samples were evaluated in duplicate at the beginning, middle, and end of the study for individual yeast and mold counts using the FDA BAM method. The sample (1ml) was set on

Rose Bengal Agar and incubated at 25 ± 1 °C for 5 days. Results are reported as CFU/gram of sample.

Sensory

The product odor, color, and general appearance were evaluated upon receipt and at each testing interval. Samples were evaluated as follows:

Odor – odor similar to baseline or off odor development (rancidity)

Color – similar to baseline (good/fair/poor)

General Appearance – similar to baseline

Packaging integrity was noted at each testing point.

Results

Upon arrival the water activity of each cookie dough was below 0.7700. Snickerdoodle had the highest water activity at 0.7631, followed by white chocolate at 0.7530, peanut butter at 0.7499, oatmeal raisin at 0.7298, and caramel apple at 0.7220. Over the course of the shelf life the water activity marginally decreased for all formulations (Appendix A).

The pH of the samples ranged between 7.20-8.14. Upon arrival, caramel apple had the highest pH of 8.14, and white chocolate had the lowest pH of 7.34. The pH for all types slightly decreased over time.

The microbial results over the course of the shelf life were consistently low for each cookie dough type. Upon arrival the highest result was with the peanut butter cookie dough, which had an APC of 490 CFU/g. Over time all microbial results eventually decreased after a peak result that was either demonstrated at the beginning or middle of the study.

Discussion

The microbial results of this study indicate that each cookie dough is shelf stable for 21 days at room temperature (Appendix B). This can be contributed to a loss of moisture in the cookie dough. Final packaging was not utilized therefore an “open” shelf life was conducted in which the samples were retrieved from the same packaging. This exposure to air contributed to the drying out of the cookie dough. By day 6 the caramel apple cookie dough was breaking apart and the inclusions were falling out. On day 5, the peanut butter cookie dough was purging oil (Appendix C). The general appearance deviated significantly from the initial evaluation. Therefore, the sensor evaluation for quality of the cookie dough does not support a 21-day shelf life. The sensory of each type of cookie dough was unacceptable by day 6.

Conclusion

Based on the microbial, chemical, and sensory results a 4-day ambient shelf life is recommended for each of the cookie dough types. This recommendation is for the best quality of the product since they degraded significantly in provided packaging after day 4 and visually would not be appealing to customers.

Appendix
A. Beginning, middle, and end testing. Microbial results are reported as CFU/g

		Replicate	Yeast	Mold	CC	EC	Water Activity	pH
Peanut Butter	Day 0	1	10	30	40	<10	0.7499	7.80
		2	<10	100	20	<10		
		Average	8	65	30	<10		
	Day 12	1	70	210	NA	NA	NA	NA
		2	90	190				
		Average	80	200				
	Day 21	1	<10	<10	<10	<10	0.7174	7.46
		2	<10	<10	<10	<10		
		Average	<10	<10	<10	<10		
White Chocolate	Day 0	1	<10	30	20	<10	0.7530	7.34
		2	<10	40	30	<10		
		Average	<10	35	25	<10		
	Day 12	1	70	210	NA	NA	NA	NA
		2	90	190				
		Average	80	200				
	Day 21	1	<10	<10	<10	<10	0.7213	7.20
		2	<10	<10	<10	<10		
		Average	<10	<10	<10	<10		
Caramel Apple	Day 0	1	<10	70	<10	<10	0.7220	8.14
		2	<10	80	10	<10		
		Average	<10	75	8	<10		
	Day 12	1	<10	10	NA	NA	NA	NA
		2	<10	30				
		Average	<10	20				
	Day 21	1	<10	<10	<10	<10	0.7189	8.01
		2	<10	<10	<10	<10		
		Average	<10	<10	<10	<10		
Oatmeal Raisin	Day 0	1	<10	50	<10	<10	0.7298	8.01
		2	<10	20	10	<10		
		Average	<10	35	8	<10		
	Day 12	1	<10	30	NA	NA	NA	NA
		2	<10	30				
		Average	<10	30				
	Day 21	1	<10	<10	<10	<10	0.7110	7.99
		2	<10	<10	<10	<10		
		Average	<10	<10	<10	<10		
Snickerdoodle	Day 0	1	<10	30	<10	<10	0.7631	7.67
		2	<10	50	30	<10		
		Average	<10	40	17.5	<10		
	Day 12	1	<10	<10	NA	NA	NA	NA
		2	<10	<10				
		Average	<10	<10				
	Day 21	1	<10	<10	<10	<10	0.7431	7.61
		2	<10	<10	<10	<10		
		Average	<10	<10	<10	<10		

B. Aerobic plate count (APC) over time
Results are reported as CFU/g

		Peanut Butter	White Chocolate	Caramel Apple	Oatmeal Raisin	Snickerdoodle
	Replicate	APC	APC	APC	APC	APC
Day 0	1	470	300	120	380	210
	2	510	240	230	390	360
	Average	490	270	175	385	285
Day 2	1	250	90	170	130	140
	2	220	120	300	230	90
	Average	235	105	235	180	115
Day 4	1	480	120	180	150	250
	2	480	130	240	160	350
	Average	480	125	210	155	300
Day 5	1	2,700	320	100	150	140
	2	25,000	330	110	140	120
	Average	13,850	325	105	145	130
Day 8	1	260	110	150	130	120
	2	210	200	150	250	100
	Average	235	155	150	190	110
Day 10	1	170	260	10	230	90
	2	130	200	10	270	50
	Average	150	230	10	250	70
Day 14	1	380	310	120	200	250
	2	430	270	110	290	270
	Average	405	290	115	245	260
Day 18	1	90	210	80	10	200
	2	80	200	30	40	210
	Average	85	205	55	25	205
Day 21	1	20	70	70	10	30
	2	30	80	20	40	90
	Average	25	75	45	25	60

C. Liquid purge from peanut butter cookie dough day 5

