

NatureWorks® PLA: Marketing Opportunities and Flavor Preservation in a Bottle—Naturally!

Beverage packaging made from nature—it's just that simple.

NatureWorks® PLA is a clear, nature-based innovation made 100 percent from corn, making the bottles a natural fit for fresh, wholesome beverages and food products.

- Market research on the brand concept in North America, Europe and Japan has identified a clear segment of consumers who are attracted to the idea of packaging from nature—and are even willing to pay more for fresh foods and beverages in “natural containers.”
- In-store retail commercialization confirms that NatureWorks PLA packaging is a strong point-of-purchase differentiation for fresh foods.

The combination of performance and environmental attributes creates a strong point-of-purchase appeal for NatureWorks PLA. It creates an additional marketing advantage by extending the natural appeal of the beverage to the entire product offering. Testing of several foodstuffs (water, milk, salad oil, orange juice) stored in NatureWorks PLA bottles show the corn-based material offers comparable properties to PET—confirming the suitability of NatureWorks PLA for a wide variety of food and beverage bottling applications.

Water

NatureWorks PLA, PET and glass bottles were filled with reverse osmotic filtered water and stored at 37.8°C for 3 and 6 weeks. A modified triangle test was used to compare the flavor of water from the PLA and PET bottles compared to the glass bottles. A panel of experienced researchers was used to detect potential off-flavor in the NatureWorks PLA, PET and glass bottles. Panelists could not differentiate any off-flavor coming from the water bottled in the NatureWorks PLA, PET and glass bottles under the conditions of the test.

NatureWorks PLA and PET bottles containing spring water were stored for a period of 6 weeks at 37.8°C. Sensory panel evaluations were performed at 0, 3 and 6 weeks. Sensory studies were carried out with consumer panelists. Results indicated that when comparing the spring water from NatureWorks PLA and PET bottles, the consumer did not detect stronger off-flavor coming from the NatureWorks PLA compared to the PET bottle and vice versa.

Sample	Number of consumer responses indicated off-flavor/aftertaste		
	Week 0	Week 3	Week 6
PLA	49	48	51
PET	51	52	49
Total	100	100	100

Source: Michigan State University – School of Packaging

Milk

Iowa State University evaluated milk in NatureWorks PLA and PET bottles for off-flavor elucidation caused by microbial spoilage and light degradation.

Microbiological Quality

Milk was packaged in NatureWorks PLA and PET bottles and held for up to three weeks at 4°C and 10°C to determine the effect of the packaging on the microbial quality of milk.

As shown in Figure 1, there was no difference in the total aerobic plate counts for the milk stored in NatureWorks PLA or PET bottles. Because of the temperature abuse, milk stored at 10°C had a higher rate of microbial growth during storage.

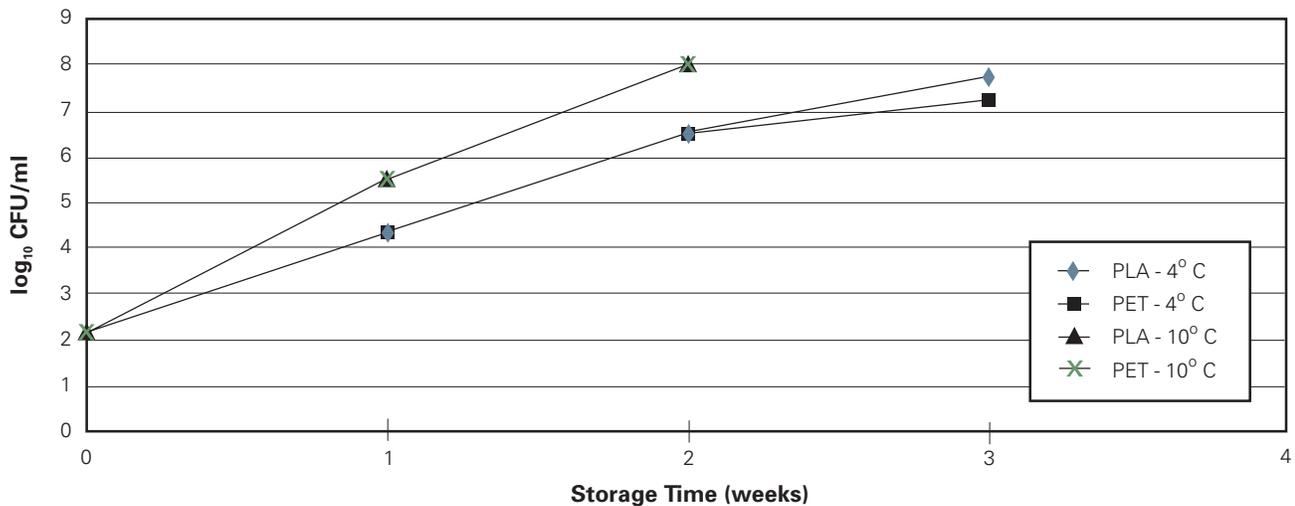


Figure 1. Effect of packaging material and storage temperature on total aerobic plate count

Source: Iowa State University, Department of Food Science & Human Nutrition

Light Exposure

Exposing milk to light results in light-oxidized flavor development and loss of light-sensitive vitamins. To compare the effects of packaging material on light oxidation, milk was packaged in NatureWorks PLA and and PET bottles and exposed to light or dark for four hours during refrigerator storage. Sensory paneling was conducted the following day to detect any off-flavor issues.

Panelists were unable to detect differences between milk samples packaged in NatureWorks PLA bottles and exposed to either light or dark. No differences were detected between milk stored in the light and packaged either in NatureWorks PLA or PET bottles

Table 1. Effect of packaging material and light exposure on sensory quality of milk		
Constant Factor	Treatment Variable	Differences detected by panelists (<i>a</i> < 0.05)
PET Bottles	Light vs Dark	Yes
PLA Bottles	Light vs Dark	No
Light Exposure	PLA vs PET	No
Dark	PLA vs PET	No

Source: Iowa State University, Department of Food Science & Human Nutrition

Light exposure equally affected the riboflavin content of milk samples in both bottle types.

Table 2. Effect of packaging material and light exposure on riboflavin content^a of milk

Packaging Material	Exposure		Average
	Light	Dark	
PLA	0.15	0.20	0.175
PET	0.16	0.18	0.170
Average	0.155	0.190	

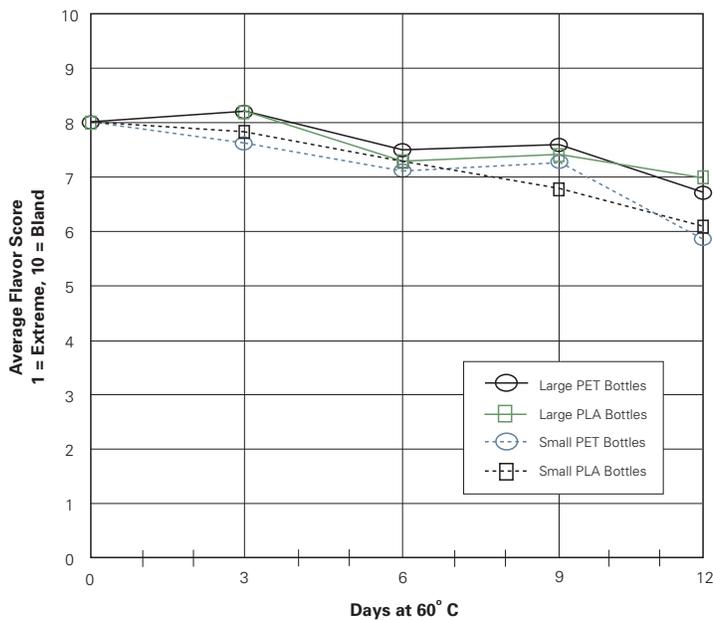
^a mg/100 mL milk; Source: Iowa State University, Department of Food Science & Human Nutrition

Commercial trials of milk in NatureWorks PLA versus glass bottles corroborate Iowa State’s findings. In a study completed for CSI in Italy, eight panelists compared fresh milk in glass bottles and NatureWorks PLA, held at 23°C for 24-hour and 48-hour intervals. No difference in taste was found between glass and NatureWorks PLA bottles in both samples.

Salad Oil

Sensory evaluation was completed to test for off-flavor issues with soybean salad oil stored in NatureWorks PLA versus PET bottles during accelerated aging and room temperature (light and dark) conditions. Observations were made at regular intervals by a panel of trained sensory judges using the official method of the American Oil Chemists’ Society (AOCS). The AOCS method included an overall flavor intensity rating using a 10-point scale (1 = extreme and 10 = bland) and a description of off-flavors.

Average flavor intensity score of soybean salad oil stored in PLA versus PET packaging under accelerated aging conditions



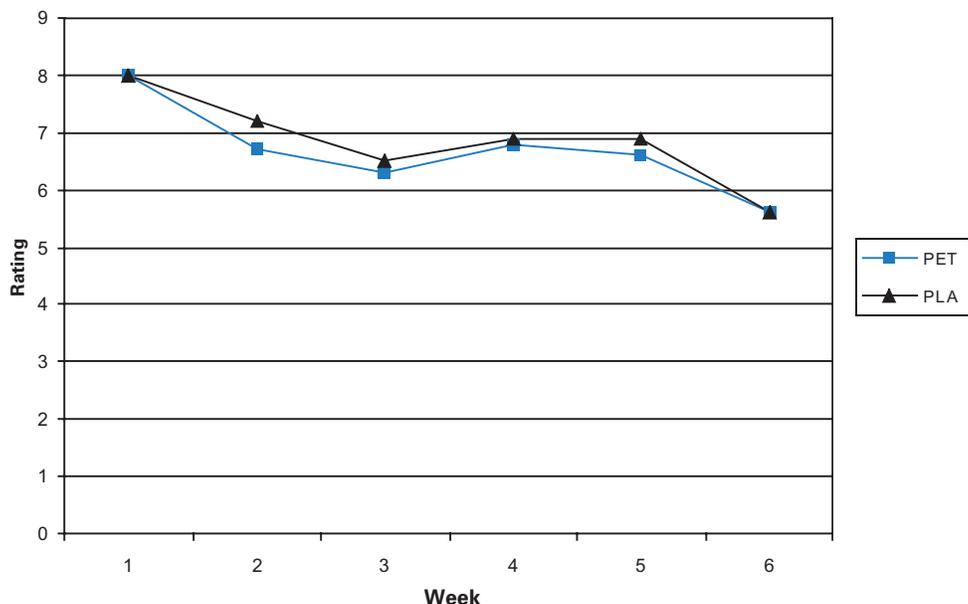
Source: Cargill Foods, Research & Development

From the testing data it was concluded by the panelists that there is no difference in the flavor intensity or flavor character of soy salad oil stored in either NatureWorks PLA or PET bottles.

Orange Juice

Orange juice samples were refrigerated at 40°C and evaluated weekly for 4 weeks by a panel of 15 sensory judges. At each observation time, a test was conducted to determine if there was a significant difference between the juice stored in NatureWorks PLA versus PET using triangle test methodology. The judges were asked to describe any differences between the samples and to rate the overall fresh flavor of the juice using a 9-point scale.

Flavor difference test results and freshness ratings of orange juice stored in NatureWorks PLA and PET bottles



Brand Advantage

Made from 100 percent field corn, NatureWorks PLA is a nature-based alternative to traditional plastic derived from fossil fuels. Because of its sustainable source, NatureWorks PLA has a natural appeal that resonates with today's consumers, creating an opportunity to use packaging as a value-added feature of a product brand.

For more information, please visit www.natureworkspla.com



*Visit www.natureworkspla.com for composting information.