

24-Month Shelf Life Study

January 13, 2022

Objective: Evaluate the effect of time, temperature and relative humidity on the stability of Empyreal® 75 over 24 months.

Methodology: A sample of Empyreal 75 was split and placed into two 18-liter containers. Container one was stored under ambient conditions (25°C and 60% relative humidity) and container two was stored under tropical conditions (30°C and 75% relative humidity) for a period of 24 months. Conditions reflect the shipping conditions the product may encounter during transportation. Every three months, a sample from each container was analyzed for visual appearance, protein, peroxide value, moisture, water activity, yeast, mold and ammoniacal nitrogen (Table 1). Stability study protocol was completed by Eurofins Scientific Inc. Nutrition Analysis Center (Des Moines, IA, USA).

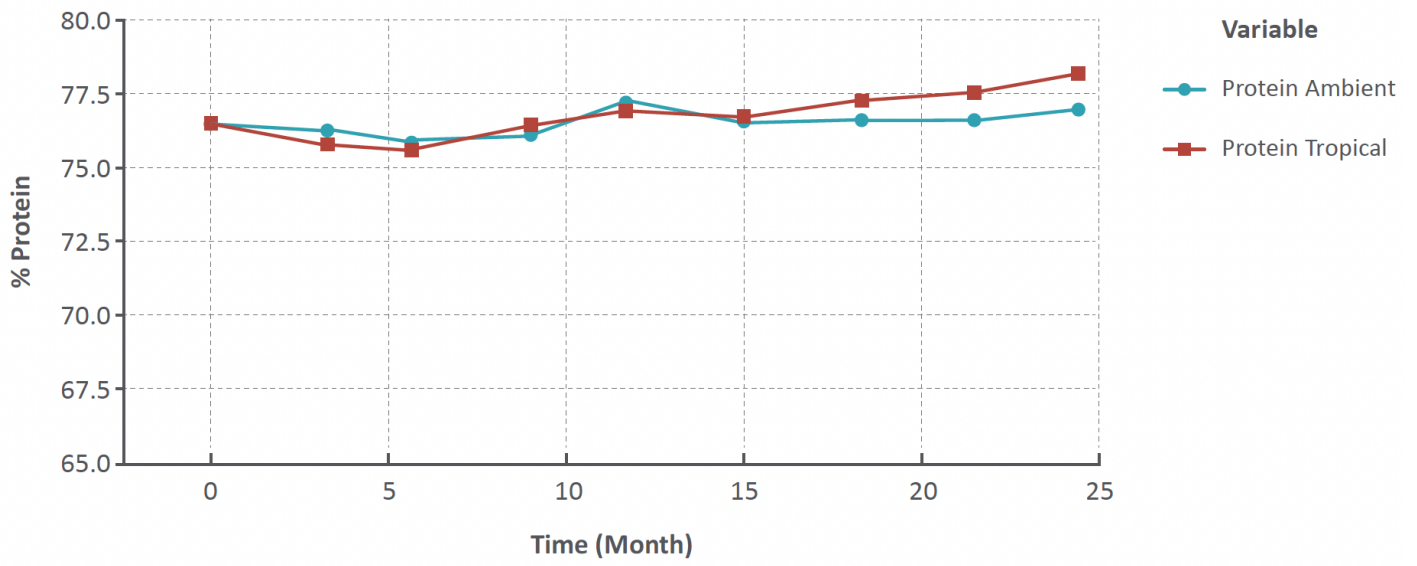
Results:

- Visual appearance of product was not impacted by time, temperature or relative humidity.
- Protein remained stable for 24 months (Figure 1).
- Mold and yeast cfu/gram did not increase above baseline analysis.
- No spoilage was observed and measured levels of ammoniacal nitrogen remained low for the duration of the study.

Table 1: Analytical results

Analyte	Method Reference	Reporting Units	Baseline Value	24-Month Ambient	24-Month Tropical
Visual Appearance	Visual Description	No Unit	Golden Yellow With Some Small Dark Golden Yellow Granules and Slightly Larger Light Golden Yellow Granules	No Change	No Change
Protein - Combustion	AOAC 992.15; AOAC 990.03	%	76.65	76.97	77.91
Mold	BAM Chapter 18	cfu/g	20	10	<10
Yeast	BAM Chapter 18	cfu/g	10	<10	<10
Ammoniacal Nitrogen	AOAC 941.04	%	<0.2	<0.2	<0.2

Figure 1: Scatterplot of protein ambient & protein tropical by time



Cargill Branded Feed creates proprietary feed ingredients to improve digestive health and performance for production animals in the beef, dairy, aquaculture and pet food markets. Branded Feed is a segment of Cargill Starches, Sweeteners & Texturizers (CSST).

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