



PARTNERSHIP
Oklahoma State University

Protein Color Stability Study



KEY FINDINGS

Tri Gas Master Bag packaging with FreshPax® CR provided superior retail display performance and overall acceptability compared to Hi Oxygen packaging.

Objective:

A study was done in collaboration with Oklahoma State University to **evaluate the impact of different master bag packaging methods on retail color stability and overall acceptability** of sirloin steaks during refrigerated storage and retail display conditions.

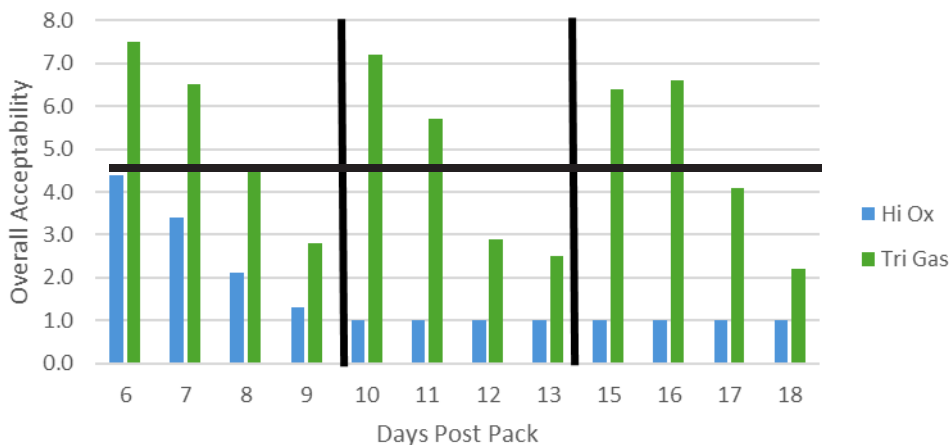
Study Design:

- Compared High Oxygen (Hi Ox) vs Tri Gas master bag with FreshPax CR packaging
- Four foam trays packaged per master bag
- Products stored at 3°C ±1°C for up to 15 days
- Products displayed at 0°C under retail lighting conditions
- Headspace analysis verified package integrity and gas composition
- Six-member trained color panel evaluated overall acceptability daily

Key Findings:

- High Oxygen master bag packaging never consistently met retail acceptability thresholds.
- By Day 10, High Oxygen packaged steaks were considered extremely undesirable.
- Tri Gas master bag packaging maintained acceptable appearance longer during display.
- Tri Gas packaging demonstrated improved color stability and reduced discoloration.
- Results showed a clear retail display advantage for Tri Gas master bag systems.

Overall Acceptability - Sirloin



“... as expected, when combining color and discoloration as assessed in the overall acceptability score, tri gas with FreshPax CR has an advantage in retail display over high oxygen in master bags.”



Sirloin Steaks

Packaging treatments of sirloin steaks consisted of high oxygen (Hi Ox) master bag packaging and tri gas master bag packaging containing FreshPax CR oxygen scavenger. The FreshPax CR was used in the tri gas master bag packaging to eliminate oxygen and maintain oxygen free in the master bag. All products packaged in master bags had 4 foam trays per master bag; product was stored in dark storage ($3^{\circ}\text{C} \pm 1^{\circ}\text{C}$) up to 15 days and then exposed to light in a display case (set to 0°C) at specific pull times (6-10-15 days).

All master bags were analyzed using a headspace analyzer to determine the percent of oxygen and carbon dioxide present at each pull day, to verify that no leaks were present.

Overall acceptability was evaluated on a scale of 1 to 8, with 8 being extremely desirable and 1 being extremely undesirable by a six-member trained color panel once daily. Typically, more emphasis is put on the overall acceptability scores, when determining pricing or pulling considerations at retail, which has a "threshold" of 4.5. This prominence is elevated because this score takes into consideration muscle color, fat color and total discoloration. For example, a package of stew meat with bright cherry red lean color, but an area of browning the size of a dime (i.e. fingertip) could certainly cause a potential customer to discriminate from purchasing a particular item.

The product from high oxygen master bags never met the acceptability line, although it was close on day 6. From day 10 to the end, the high oxygen product was considered extremely undesirable. The product from tri gas master bags stayed above the acceptability line for the first two days of the pulls, but by the third it would drop below the acceptability line.

As expected, when combining color and discoloration as assessed in the overall acceptability score, tri gas with FreshPax CR has an advantage in retail display over high oxygen in master bags.

Days on Display	Removed from Master Bag: Day 6		Removed from Master Bag: Day 10		Removed from Master Bag: Day 15	
	Hi Ox	Tri Gas	Hi Ox	Tri Gas	Hi Ox	Tri Gas
1						
2						
3						
4						