



Optimising eating quality and shelf life of enhanced and marinated pork chops using three-gas MAP

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INTRODUCTION

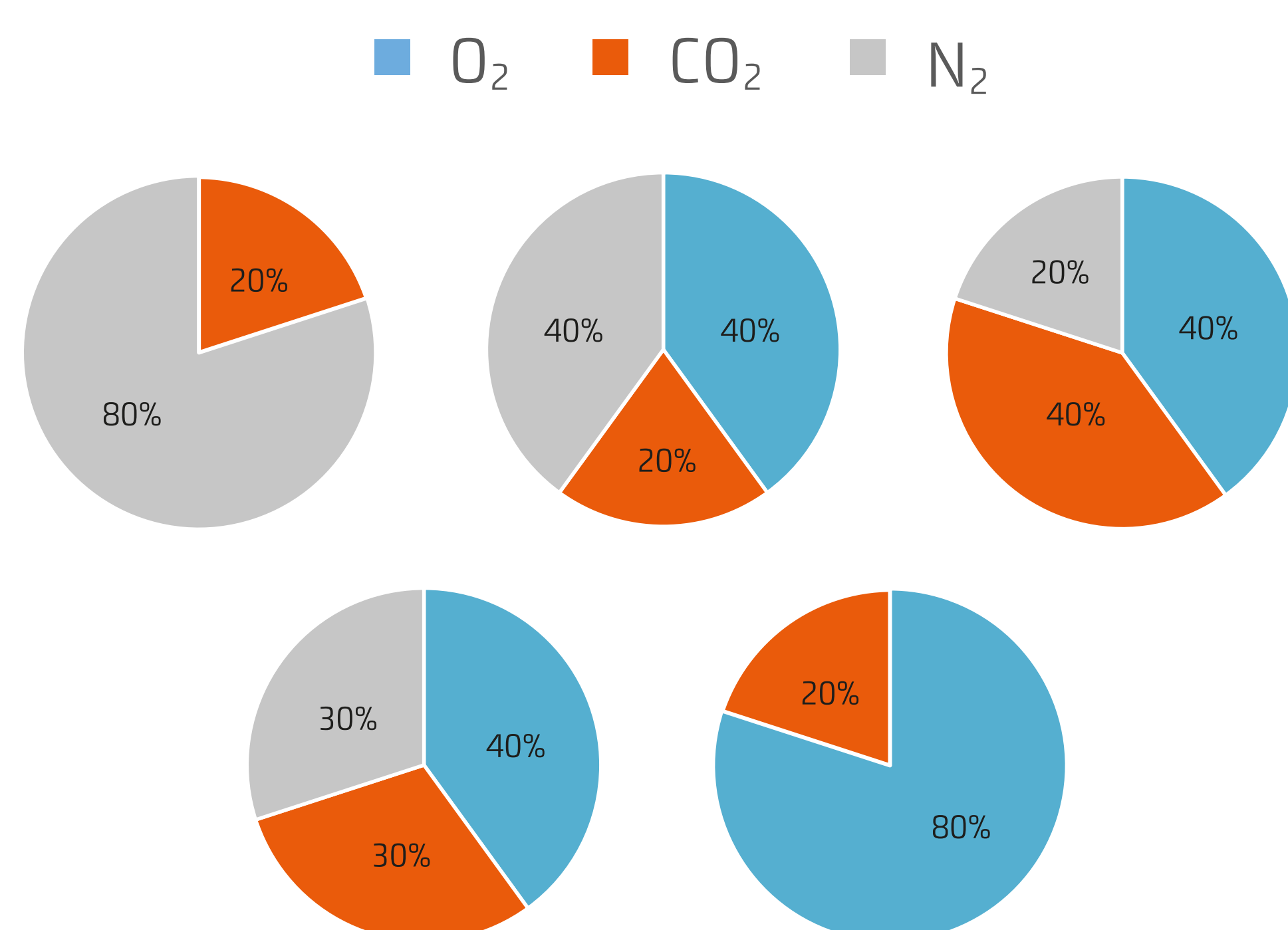
Traditionally, red meat is packed in 70-80% oxygen (O₂) to obtain an attractive bloom colour and in 20-30% carbon dioxide (CO₂) to extend shelf life. Unfortunately, high oxygen MAP results in less tender and less juicy meat with a more rancid flavour and premature browning (PMB) of the meat.

The objective of this study was to investigate the effect of low oxygen three-gas MAP on shelf life and eating quality of enhanced and marinated pork chops.

MATERIALS AND METHODS

Two retail meat products were packed in five different gas compositions:

1. Enhanced (brine-injected) loin chops
2. Enhanced (brine-injected) + marinated (surface) loin chops



The same slaughter process was used for both cuts: slaughtering on Monday, pH₂₄ cutting, deboning and injection (10% weight gain) on Tuesday, and slicing and MA-packing on Wednesday (day 0). All samples were stored on display at 5°C and 1200 lux and analysed during storage for up to 13 days.



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RESULTS

Table 1. Quality changes of enhanced pork chops when using no-oxygen MAP or low-oxygen three-gas MAP

Gas	- 20% CO ₂ 80% N ₂	40% O ₂ 20% CO ₂ 40% N ₂	40% O ₂ 30% CO ₂ 30% N ₂	40% O ₂ 40% CO ₂ 20% N ₂
Appearance	PMB ↓	PMB ↓	PMB ↓ Small holes ↑	Small holes ↑
Flavour	Rancid ↓ Sour ↓	(Rancid ↓) Sour ↓	Rancid ↓ Sour ↓	Rancid ↓ Sour ↓
Texture	Hardness ↓	Hardness ↓	-	-
Juciness	-	-	-	-
Shelf life - Odour	↓ 2-3 days	↓ 2 days	↓ 1 day	↓ 1 day

Table 2. Quality changes of enhanced + marinated pork chops when using no-oxygen MAP or low-oxygen three-gas MAP

Gas	- 20% CO ₂ 80% N ₂	40% O ₂ 20% CO ₂ 40% N ₂	40% O ₂ 30% CO ₂ 30% N ₂	40% O ₂ 40% CO ₂ 20% N ₂
Appearance	PMB ↓	(PMB ↓)	-	Small holes ↑
Flavour	Meat ↑ Stale ↓	-	-	-
Texture	-	-	-	-
Juciness	-	-	-	-
Shelf life - Odour	> 1 day ↑	↓ 2 days	-	↓ 4 days

CONCLUSION

- Enhanced pork should be MA-packed in a two-gas anoxic atmosphere (20% CO₂ + 80% N₂) to optimise the appearance, flavour and texture of the meat. Unfortunately, it will shorten the shelf life by approx. two days at 5°C (Table 1).
- To maintain a shelf life comparable to high oxygen MAP, it is recommended to pack enhanced pork chops in a three-gas MAP (40% O₂ + 40% CO₂ + 20% N₂), although this gas mixture will optimise only appearance and flavour (Table 1).
- It is recommended to MA-pack enhanced + marinated pork chops in an anoxic atmosphere (20% CO₂ + 80% N₂), as shelf life remains uncompromised, and appearance and flavour are optimised (Table 2).

	Accept limit	O ₂	CO ₂	N ₂	Why?
	Odour 8-9 days Colour 11 days	40%	30-40%	20-30%	✓ Uncompromised shelf life ✓ Less PMB – rancid flavour – sour taste ✓ More small holes
	Odour 6 days Colour 8 days	-	20%	80%	✓ Shorter shelf life ✓ Less PMB – rancid flavour – sour flavour – hardness
	Accept limit	O ₂	CO ₂	N ₂	Why?
	Odour >13 days Colour >13 days	-	20%	80%	✓ Longer shelf life ✓ Less PMB – stale flavour ✓ Enhanced meat flavour