

THREE-GAS MAP IS OPTIMIZING EATING QUALITY AND SHELF LIFE OF RETAIL PACKED BEEF STEAKS

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RAW MATERIALS

12 Dairy cows, Holstein Frisian, 46-81 months, 263-326 kg
Longissimus dorsi (LD) aged for 20 days at 3°C in vacuum
20 mm steaks retail packed and stored at 5°C and 1200 lux for 7 days

Skinpack

VSP

MAP

30% O₂ + 30% CO₂ + 40% N₂

MAP

40% O₂ + 30% CO₂ + 30% N₂

MAP

50% O₂ + 30% CO₂ + 20% N₂

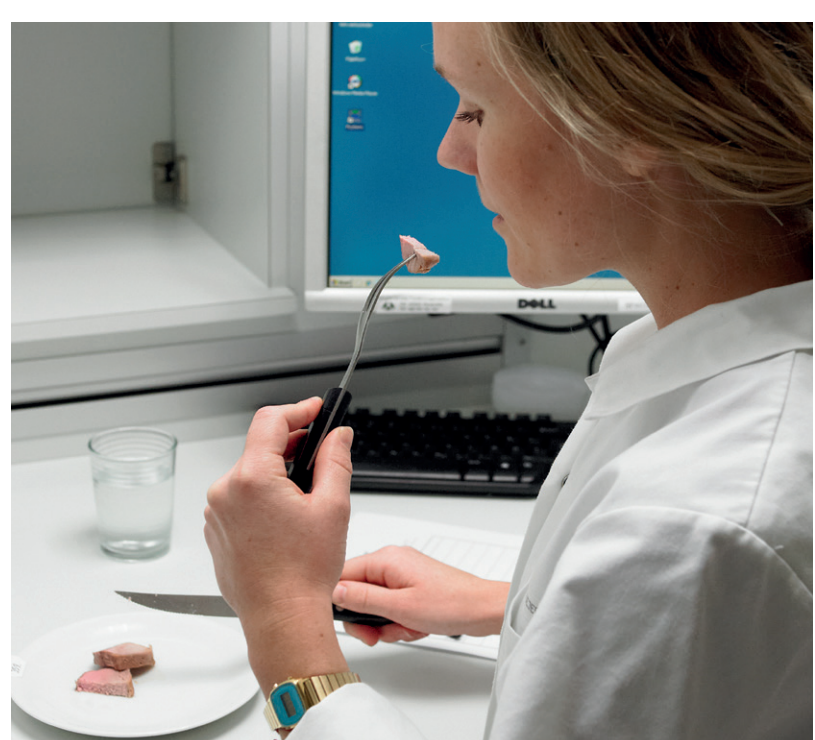
MAP

70% O₂ + 30% CO₂

ANALYSIS

Left loin

Right loin



Eating quality

Tempering to 10-15°C, pan-frying at 170-180°C to 62-63°C in the centre

Appearance – Flavour – Texture

Shelf life

Degassing & blooming for 30 min

Initial counts – Odour – Appearance



RESULTS

Table 1. LSMEANS and levels of significance for sensory attributes of retail packed beef steaks packed in VSP and MAP (O₂/CO₂/N₂). Evaluated on a unstructured line scale (0-15).

	VSP	MAP 30/30/40	MAP 40/30/30	MAP 50/30/20	MAP 70/30	Significance
Doneness (PMB)	4.4 ^a	5.5 ^b	8.0 ^c	9.9 ^d	10.9 ^e	0.0476 *
Tenderness	6.5 ^b	5.8 ^{ab}	5.1 ^a	5.3 ^a	5.5 ^a	0.0108 *
Juiciness	9.0 ^b	8.8 ^b	7.4 ^a	6.7 ^a	7.4 ^a	<0.0001 ***
Hardness (First bite)	6.4 ^a	6.6 ^a	7.6 ^b	7.4 ^b	7.4 ^b	0.0046 **
Beef flavour	6.8 ^b	5.2 ^a	4.9 ^a	4.4 ^a	4.5 ^a	0.0002 ***
WOF	2.7 ^a	4.7 ^b	4.6 ^b	6.3 ^c	5.9 ^c	< 0.0001 ***

- PMB decreases stepwise when the oxygen level is lowered.
- To optimize tenderness and juiciness of MA-packed beef, the oxygen level has to be reduced to 30% or less.
- Non-oxygen packaging is needed in order to minimize WOF and rancid flavour, but 30-40% O₂ can lower WOF to some extent.

Table 2. Shelf life (storage time in days before acceptance limit is reached) of retail packed beef steaks packed in VSP and MAP (O₂/CO₂/N₂)

	VSP	MAP 30/30/40	MAP 40/30/30	MAP 50/30/20	MAP 70/30
Odour limit	7	6	6	6.5	7
Appearance limit	15-19	7	7	6.5	9

- Shelf life of steaks from aged strip loin is approximately 6-7 days at 5°C regardless of the packaging method.
- The colour stability was twice as long when packaging in a non-oxygen VSP as if packaging in MAP.
- Initial counts for steaks before packaging were 3.3 log cfu/cm².

CONCLUSION

To optimize eating quality and decrease PMB of beef steaks, these results suggest that low oxygen three-gas MAP with 30% O₂ + 30% CO₂ + 40% N₂ is a useful alternative to high oxygen MAP with 70% O₂ + 30% CO₂



CONTACT

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