EFFECTS OF REDUCING THE AMOUNT OF NITRITE IN ORGANIC MEAT PRODUCTS

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Introduction

Organic meat, especially pork, and products thereof is a small but steadily growing segment in the Netherlands and the EU. With the growing demands for organic production of meat, there is also more interest in organic meat products. The organic production chain of pork is well controlled and only a small list of additives (mentioned in EU Directive 2092/91) may be used. For years profound discussion is going on in the EU on the use of nitrite (E250) as an additive in meat products. Nitrite is used in meat products for formation and stabilising the red, cured meat color. Nitrite does also have antimicrobial and anti-oxidative properties. Colour and colour stability of cured meat products is of great importance also for consumers of organic products. Therefore NGO's and producers of organic products, organised by Biologica, decided to work out to which extent nitrite could be avoided or produced while still obtaining a stable and safe product. The objective of the study was to determine the amount of nitrite salt sufficient to obtain colour stable and safe organic meat products.

Materials and Methods

- Recent literature survey about sodium nitrite and alternatives in meat products.
- Practical experiments with organic meat products including shelf life monitoring.
- Visual and instrumental (CIElab) colour comparison.
- Challenge testing with *Clostridium botulinum*.

Results and Discussion

Based on literature information, organic cured ham and luncheon meat with three levels (0, ca 50 and ca 85 mg/kg) ingoing sodium nitrite were prepared. A generally applied product flow of 5 weeks at 4°C before slicing, MAP packaging of sliced product, and retail storage for 5 weeks at 7°C with light source of 880 lux (12 hours on a day) only the last week was simulated. At several stages, analyses were performed.

Table 1: Analyses of nitrite content in organic luncheon meat and cured ham during storage.

Nitrite content [mg/kg]	Luncheon meat			Cured ham		
Ingoing nitrite	0	41	82	0	59	94
After 1 week storage 4°C	0	6.1	6.4	0	16.7	24.7
At slicing, after 5 weeks storage at 4°C	0	4.3	3.5	0	12.1	16.3
4 Weeks after slicing and MAP packaging 7°C	0	2	2.3	0	4.9	7.1
5th Week after slicing, last week at 880 lux	0	2.5	5.6	0	5.7	4

The residual nitrite analysis showed that nitrite concentrations declined sharply after production for both type of products to about 15–25% of the ingoing level and steadily declined further during storage time to a final amount of 2.5–6ppm. The visual evaluations of the colour of both products with nitrite were still acceptable compared to the one without nitrite. Colour measurements during bulk storage, slicing and presentation in a chilled cabinet were performed by using the CIElab method.

The a* value of both products without nitrite was significantly lower (Figure 1 and 2). During storage, slicing and presentation in the cabinet, the a* value of products without nitrite decreased further.

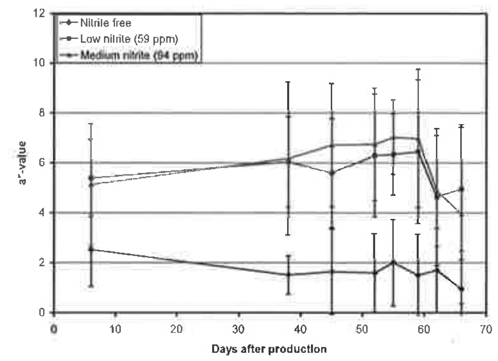


Figure 1: Red colour change of luncheon meat during storage.

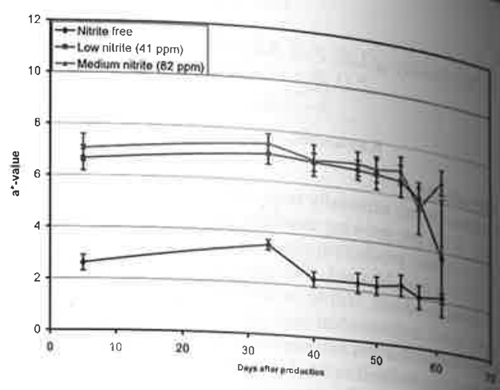
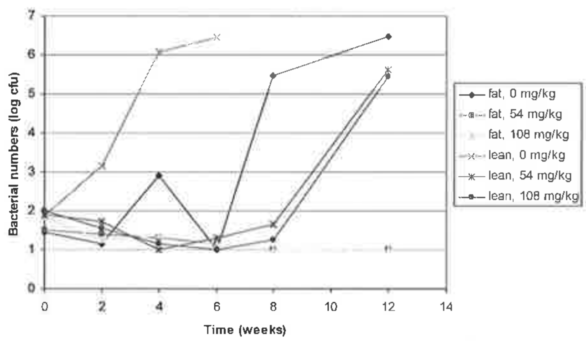


Figure 2: Red colour change of cured ham during storage.

Challenge tests with C.*botulinum* (100 spores/g) were performed with a lean (10% fat) and fat (30% fat) pasteurized (P_{70} = 55 min) luncheon meat type product with 0, 54 and 108 mg/kg ingoing nitrite respectively. The a_w-values of the end products varied between 0,968 and 0.975. The products were stored at 7°C, 10°C and 15 °C over 12 weeks.



In products with or without nitrite growth of C. *botulinum* was not detected during the whole storage period at 7°C and 10°C. Botuline toxin was not determined.

At 15°C growth of C. *botulinum* was detected earlier in products without nitrite (Figure 3). Botuline toxin was detected in lean luncheon meat without nitrite after 6 weeks, in fat luncheon meat without nitrite after 8 to 12 weeks and in lean luncheon meat with 54 mg/kg nitrite after 12 weeks.

Figure 3: Growth of *Clostridium botulinum* in luncheon meat, stored at 15°C.

Conclusion

Complete abandoning of nitrite in the processing of organic meat products is not advisable. It would result in serious colour deficiency of the product compared to conventional products and from this point of view the product would not look as consumers expect. Furthermore, the risk of botulin toxin formation will increase at higher storage temperatures. By a reduction of the amount of nitrite to approximately 80 mg/kg ingoing, the colour forming and stability will be sufficient to reach a shelf life of 65 days. During production, heating, cooling and storage, the level of residual nitrite will be far less than the 50 mg/kg specified in the EU Directive 2092/91.