

Effects of Vegetable Juice Powder and Incubation Time on Cured Meat Properties of Frankfurter-Style Cooked Sausages and Ready-to-Eat Hams

A.S. Leaflet R2259

Jeffrey J. Sindelar, graduate research assistant;
Joseph C. Cordray, professor of animal science;
Joseph G. Sebranek, university professor of animal science,
and of food science and human nutrition

Summary and Implications

Utilizing celery juice powder (with high natural nitrate content) and a nitrate-reducing culture (*Staphylococcus carnosus*) was found to be an effective replacement for sodium nitrite in the manufacturing of frankfurter-style sausages and ready-to-eat hams. Products manufactured with this process demonstrated typical cured meat properties. If the process is conducted appropriately, the quality of products produced in this fashion can be comparable to conventionally cured products, however, questions remain concerning the long-term microbiological properties of these products.

Introduction

Traditional cured meat products are manufactured with nitrite and/or nitrate but these preservatives are not permitted in natural and organic cured meats. An alternative process that utilizes ingredients such as vegetable juice powder to provide a natural source of nitrate has been developed for natural and organic cured meats. Adding a nitrate-reducing bacterial culture to the mixture provides for conversion of the nitrate to nitrite which is followed by typical meat curing reactions. However, many questions concerning the most effective way to utilize this process remain. To address some of these questions, this study was designed to assess varying concentrations of vegetable juice powder and different culture incubation times on cured meat properties of frankfurter-style cooked sausages and ready-to-eat hams.

Materials and Methods

Frankfurter-style sausages were manufactured with 0.2% or 0.4% vegetable juice powder and held at 37.8° C (internal) for 30 minutes or 120 minutes to determine the necessary time for nitrate conversion. Hams were prepared with 0.2% or 0.35% vegetable juice powder and held at 37.8°C (internal) for 0 or 120 minutes. The slow warm-up time of the large diameter hams in a typical heating process was considered a potentially significant incubation time for the culture thus the 0 additional incubation time was chosen as one treatment. Conventional nitrite-cured batches of both frankfurters and hams were prepared as controls. All

products were evaluated for cured color, lipid oxidation, residual nitrite and nitrate and sensory panel assessments during 90 days of refrigerated storage.

Results and Discussion

The results for the frankfurter-style sausages showed that no differences in lipid oxidation were observed for any of the treatments. However, products with the 120 minute-incubation time and the control were redder than those incubated for 30 minutes, regardless of the level of vegetable juice powder used. Sensory panelists detected differences only in the low vegetable juice (0.2%) treatments incubated for a short time (30 minutes). Consequently, with adequate time of 120 minutes for the culture to convert nitrate to nitrite, frankfurter-style sausages were found to be comparable in quality to conventionally cured products during storage for 90 days.

For the hams, no color differences were observed for any of the treatments. Lipid oxidation was somewhat less in the conventionally-cured control than in hams held for 120 minutes of incubation at 37.8° C. Sensory panels, however, reported a detectable and undesirable vegetable-like aroma and flavor in the hams with 0.35% added vegetable juice powder. The low concentration (0.2%) of vegetable juice powder, on the other hand, resulted in sensory attributes that were comparable to those of the conventionally cured control.

Consequently, cured sausage and hams can be manufactured with a natural source of nitrate and a nitrate reducing bacterial culture to achieve comparable quality attributes of conventionally nitrite-cured products. However, adequate time and temperature must be included in the process to allow sufficient conversion of nitrate to nitrite by the culture, and the amount of vegetable juice powder must be carefully controlled to avoid negative flavor impacts on the finished products. This means that the process utilizing a natural nitrate source and the nitrate-reducing culture to produce cured meat characteristics will be very product-specific and will need to be carefully designed to accommodate different product diameters and heating treatments.