EFFECTS OF THERMAL TREATMENT ON LOW-FAT SAUSAGE CONTAINING SURIMI FROM SARDINE

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SUMMARY

The object of this research was to asses how a variety of thermal treatments (24h 4°C and cooked to an internal temperature of 70°C ; 30 mn 40°C and cooked to an internal temperature of 70°C) affect the binding properties and texture of bologna sausage made with different levels of fat (4.9% and 10.7%) and surimi (0%, 6.5% and 13%) content. When fat content was reduced (10.7% to 4.9%), there was a significant decline both in the binding properties and in the shear force of the products. Only the 13% surimi level affected ($P<0.05$) cooking loss and shear force values. Where meat batters were kept for 24 h at 4°C, cooking loss and shear force increased, but nevertheless this effect does not appear to be due to setting of the fish proteins.

Introduction

The development of low-fat products is acquiring ever-increasing importance. A variety of technological procedures or addition of non-meat ingredients have been used to palliate the effect of reduced fat content and try to produce an acceptable low-fat product (Claus, 1991; Keeton, 1992).

It has been suggested that given the functional potential of fish proteins, the addition of surimi may enhance the fat and water binding properties and the rheological characteristics of meat protein (Lanier, 1985). Surimi from different species has been used in varying proportions in the preparation of meat products (Cavestany et al., 1994). Although the effect of surimi on the binding properties and texture of products depends upon the proportion added, this effect cannot generally be said to be very marked.

The thermal treatment to which the products are subjected in the course of processing affects the rheological properties of gels formed from myosystems (Foegeding et al., 1986; Camou et al., 1989). On the other hand, surimi presents gelling properties not found in proteins from warm-blooded animals and poultry, such as setting into elastic gels at very low temperatures (Lanier, 1985). These factors may influence the characteristics of low-fat products formulated as suggested by Cavestany et al. (1994).

The aim of this research was to study the effect of different thermal treatments on binding properties and texture of low-fat bologna sausage containing different proportions of sardine surimi.

Materials and Methods

Various combinations of meat, fat and surimi were prepared to the formulae shown in table 1, which were made up according to the conditions described by Cavestany et al. (1994).

The meat batters was packed into Fibrous® casing (Viscora, Beauvais, France) (11 cm diameter) and divided into two batches: the first was heated for 30 min at 40°C then cooked at 90°C until an internal temperature of 70°C was reached (treatment A). The second batch was kept at 4°C for 24 h then cooked at 90°C until an internal temperature of 70°C was reached (treatment B). Cooking loss was estimated as (%) weight loss occurring during the cooking process. The composition and the textural parameters and expressible fluid of the various samples were assessed as described by Cavestany et al. (1994). Two-way analysis of variance was performed according to thermal treatment, fat and surimi levels using an F test. The difference in means between pairs was resolved by running a least-squares difference range test to obtain the confidence intervals.

Results and Discussion

The proximate composition of the samples was as shown in table 1. The variation in fat content occurred basically at the expense of moisture, since the level of protein present was essentially similar.

The thermal treatment process significantly affected the binding properties of bologna sausage (table 2). While cooking loss (CL) was more marked in the treatment B samples, total expressible fluid (TEF) and expressible moisture (EM) were highest in samples directly cooked at 90°C, treatment C (these data are take from Cavestany et al. 1994). The various thermal treatments tested presented significant differences in product texture (table 3), the highest shear force (SF), penetration force (PF) and work of penetration (WP) values occurring in the treatment B samples. In the case of treatment B, these results may be ascribed to the refrigeration of the meat emulsion for a period prior to heating; this effect would not appear to be caused by the percentage of fat or the occurrence of setting in the fish proteins given that there were no significant interactions between fat or surimi content and thermal treatment. The lower SF, PF and WP values found for the samples directly cooked at 90°C (treatment C) may be related to their higher heating rate. At slow heating rates, protein-protein interactions have time to occur in a more orderly fashion, making for the formation of stronger structures (Foegeding et al., 1986; Camou et al., 1989).

Differences in fat levels produced significant changes ($P<0.05$) in CL such that the greater the fat content (and the lower the moisture content) the smaller was the weight loss (table 2). The greater the fat content the lower was EM and the greater was the amount of fat released (table 2). The effect of the fat on binding properties was scarcely affected by the presence of surimi, and rather more so by the thermal treatment ($P<0.05$). A direct relationship was found between fat content and the values of SF (table 3), while elasticity (D) declined when fat content was increased (table 3). Similar results have been described by Cavestany et al. (1994) and are ascribed basically to the fact that the fat level is altered essentially by modifying the percentage of moisture (table 1).

The presence of surimi significantly affected binding properties ($P<0.05$), although only at high concentrations (13%), causing a significant decrease in CL, TEF and EM (table 2). The presence of surimi was found to have a similar effect on SF (table 3). These results concur with those reported by Cavestany et al. (1994). Fish protein was not found to have any effect at all on the other textural parameters assayed (table 3).

References

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