

INFLUENCES OF FUNCTIONAL INGREDIENTS ON TECHNOLOGICAL AND SENSORY QUALITY OF COOKED SAUSAGES

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Introduction

Current studies show that the usual daily intakes for some components of food products are below the recommended norm. This results from a deficient consumption of fruits, vegetables and cereals, because of an undersupply with dietary fibres, some minerals and vitamins. Consequently, the risks for hypertension, diabetes mellitus, high cholesterol level or intestinal diseases are increased (DGE, 2004). In recent years there is a growing choice of functional food products with healthy components.

Soluble dietary fibres have positive influences on the development of the intestinal microflora and cause healthy effects (Pool-Zobel, 1997). The fibre structure has also an influence on sensory and technological properties of meat products. The addition of dietary fibres allows a reduction of fat up to 5% (Troeger et al., 2005). On the other hand, a fat reduction often causes an increasing percentage of water. But the higher portion of water has negative influences on the texture of sausages, the sensory value and yield (Cofrades et al., 2000). In conclusion, a reduction of fat effects technological and sensory problems (Backers and Noll, 1998).

The addition of algae is well known for different food products like chocolate, cereals or some other processed foods, in isolated cases also for sausages. Algae contain many highly valuable nutrients with a high level of bioavailability (Delarras, 1997).

The primary objective of this investigation is the addition of 3% dietary fibres and other health beneficial ingredients like minerals and algae to pork sausages. A negative influence on technological and sensory quality has to be avoided. Moreover, a considerable reduction of fat content is postulated. Influences on quality characteristics like texture, flavour and overall acceptability are investigated.

The development of a technology for adding algae as a stuffing in sausages is described.

Materials & Methods

Fat-reduced cooked sausages were produced basing on three different formulations (figure 1). The functional ingredients were mixed into the lean minced meat. Following ingredients were used: 1.5 and 3% dietary fibres (wheat fiber WF200 and oat fiber HF200 after rehydration, fibre/water - ratio = 1/4; obtained from JRS, Germany), 0.23% minerals (zinc-selenium-mixture, 50% of recommended daily intake per 100 g; purchased by Twardy, Germany) and 5% or 10% stuffing with 2% spirulina-algae.

The lean minced meat was produced in a cutting machine at 2500 knife rotation per minute (end of the cutting process at a batter temperature of 12°C). Each batch was filled into sausage casings (\varnothing 60 mm) and treated in a smoking-cooking procedure (equipment from Maurer, Germany). After cooling for 24 hours, the examination of the sausages was conducted. Following properties were analysed: content of fat (extraction with petroleum ether by the Soxhlett method), texture of the sausages (characterized by maximum shear force [N/cm²] -with texture analyzer TA.XT.plus, guillotine, Stable Microsystems, U.K.) and sensory quality (evaluation by the DLG-method (DLG, 2006), realized from a panel of 10 examiners).

Results & Discussion

Since fat is necessary for a good emulsifying, a reduction of fat content in the recipe is followed by a softer texture of the sausages (figure 2). The maximum shear force is increased in cases of addition of wheat and oat fibres or algae. This is caused by the firm texture of the algae stuffing and the specific structure of the dietary fibres. Fat-reduced sausages with 3% dietary fibres become not firmer than sausages with higher fat content and an addition of 1.5% fibres. This can be explained by an increasing water level through the rehydration of the fibres. Consequently, no specific differences can be ascertained in the texture of the sausages after a higher dietary fibre level and a parallel fat-reduction. A simultaneous addition of 10% algae stuffing and minerals does not have identifiable tendencies on texture, because minerals reduce the cohesion of fat and protein components and therefore the emulsifying properties in the lean minced meat.

Furthermore, there are no significant differences of sensory quality between sausages with dietary fibres, minerals and algae stuffing (figure 3) and sausages with simultaneous fat reduction. Algae stuffing led to a higher sensory value. These sausages are characterized by a pleasantly firm bite. They are juicy and have an aromatic and flavorful taste. The reduction of fat and the addition of 3% dietary fibres have some negative

effects on sensory quality. The products are pale, softer, have a short bite and partially a dry and/or fibrous taste. The meat flavour is decreased. Minerals can support these negative effects.

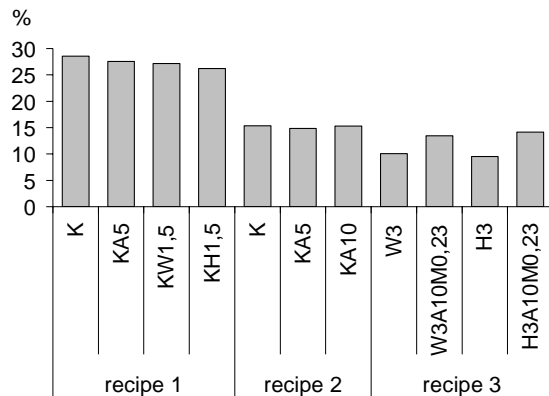


figure 1: total fat content (%)

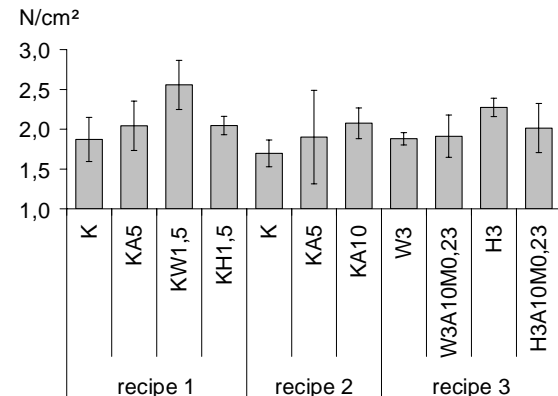
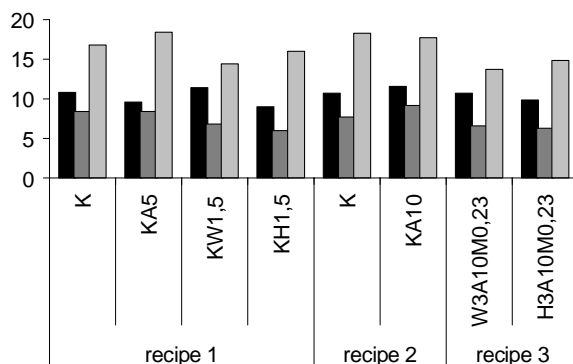


figure 2: maximum shear force (N/cm²)



■ colour (max. 15) ■ firmness (max. 10) ■ flavour (max. 20)

figure 3: sensory quality by DLG-method

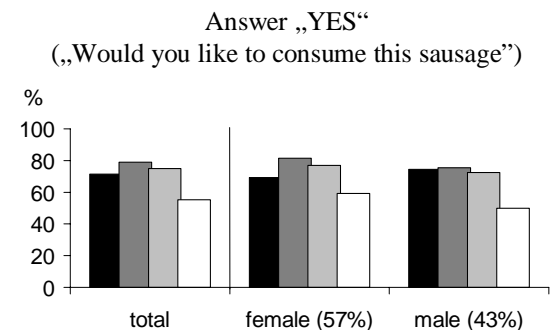


figure 4: consumer survey, n=228 (multiple choice)

Table of abbreviations in figures: K: control, KA5 or KA10: control with 5 or 10% algae stuffing, KW1,5: control with 1.5% wheat fibers, KH1,5: control with 1.5% oat fibers, W3: with 3% wheat fibers, W3A10M0,23: with 3% wheat fibers, 10% algae inlay and 0.23% minerals, H3: with 3% oat fibers, H3A10M0,23: with 3% oat fibers, 10% algae stuffing and 0.23% minerals

A consumer survey (figure 4) showed, that consumers prefer sausages with algae stuffing and wheat fibres more than conventional sausages and those with oat fibres.

Conclusions

An addition of 1.5% wheat or oat fibres in cooked sausages is possible without any negative effects on sensory value. An addition of 3% dietary fibres simultaneously with or without 0.23% minerals and a parallel fat reduction caused negative effects on sensory properties. The sausages are pale, softer and have a dryer and fibrous taste. The developed algae stuffing (figure 5) has positive influences on sensory properties. The texture is pleasantly firmer, the taste is aromatic and flavourous. A high consumer acceptance can be assumed.

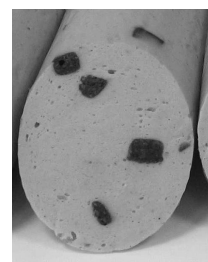


figure 5: sausage KA5 (recipe 1)

References

1. DGE - Deutsche Gesellschaft für Ernährung e.V. (2004). Ernährungsbericht 2004 der Bundesrepublik Deutschland, Frankfurt/M.
2. Pool-Zobel B. (1997). Quo vadis Ernährung?, Ernährungs-Umschau 44: 3, 106
3. Troeger K., Nitsch P., Müller W.-D., Münch S. (2005). 1. Bayreuth-Kulmbacher Fachgespräch, 13-15
4. Cofrades S., Hughes E., Troy D.J. (2000). European Food Research Technology 211,19-26
5. Backers T., Noll B., Fleischwirtschaft (1998). 78, 4, 316-318
6. Delarras C., Fleischwirtschaft (1997). 77: 10, 932-935
7. DLG - Deutsche Landwirtschafts-Gesellschaft e.V. (2006). DLG-Qualitätswettbewerb: Prüfbestimmungen für Fleischerzeugnisse (Schinken und Wurst), 49. Auflage