Pre-packaged fresh fish – Searching for quality descriptive criteria

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32 samples of pre-packaged fresh fish fillets, 16 saithe and 16 redfish samples were bought in German supermarkets and investigated with physical, chemical, microbiological and sensory methods to find out, which criteria is the most suitable for quality description. It was shown that sensory assessment besides determination of TVB-N value is the best criteria to evaluate quality of these products.

Introduction

On the German market the share of fresh fish in total fish consumption amounts only to about 15 %. To sell this fish in packages for self-service is a goal for most sellers. Expensive trained personnel for fish selling is no longer needed, and customers are able to choose the product they want without any loss of time. In a lot of European countries it is common to find pre-packaged fresh fish in supermarkets. In Germany only a few manufacturers of such products can be found. These products are therefore rarely available on the market.

Fish fillet packaged under modified atmosphere, under vacuum or wrapped in foil is offered. The last type of product is only to be used to carry the fish home, unpack it there and eat it soon. For packages under vacuum and modified atmosphere a shelf-life of up to six days in retail were pretended, if the package is stored under +2 °C. But this temperature is not often reached in German households, because the refrigerators have usually temperatures about +7 to 10 °C. At these temperatures the fish will spoil soon.

In cooperation with the Federal Federation of the German Fish Industry several products were looked at to find out what kind of parameters and criteria describe freshness or quality of these products and whether there was a difference between the several kinds of packaging.

Materials and methods

Samples

32 products were investigated, 16 samples of redfish, 16 saithe samples. Six products were vacuumpacked, ten wrapped in foil and sixteen were packaged under modified atmosphere. Every sample existed of ten packages. The products were bought on retail level in German supermarkets. Immediately after the purchase the temperature of the fillets was measured and then the samples were transported to the institute in a cooling box with a temperature of +1 to 4 °C. In the institute the products were kept cool in a cold-storage room at +2 °C. Temperatures of the packages were between -2,3 °C and +8,4 °C at time of buying, most of the samples were about +2 °C. The samples were investigated at the day they were bought or the day after on the assumption that the consumers would not store the fish more than one day. For physical, chemical and sensory investigations five packages were used, for microbiology three packages. This was not a representative examination, but a first attempt to find out what product quantity the German consumers get.

Methodologies

Physical

As physical determinations the **pH-value** and the **Fishtester-value were measured**, determined by the German Intelectron Fishtester VI.

Chemical

The chemical determinations were first to find out the content of the total volatile bases nitrogen, the **TVB-N**, with two methods. The first method is a steam destillation of an acidified perchloric acid-extract (Anon.L.10.00 3). The second method is a steam distillation of the minced fillet according to Antona (Antonacopoulus, 1960), which is often used by the German fish industry.

The value of tri- and dimethylamine and trimethylamine oxide, **TMA-N, DMA-N**, and **TMAO-N** were determined by gaschromatography after extraction with perchloric acid (Anon.). **Chloride** was investigated titrimetrically, **ethanol**, **D-** and **L-lactic acid** and proof

Frischfisch in Selbstbedienungspackungen – auf der Suche nach Untersuchungsmethoden zur Qualitätsbeschreibung
32 Proben verpackten Frischfischs in Selbstbedienungspackungen, 16 Seelachs- und 16 Rotbarschproben aus deutschen Supermärkten wurden mit physikalischen, chemischen, mikrobiellen und sensorischen Methoden untersucht. Ziel der Untersuchung war die Wertung von Untersuchungsmethoden zur Qualitätsbestimmung. Es zeigte sich, daß neben der sensorischen Beurteilung die Bestimmung des TVB-N geeignet ist, die Qualität dieser Produkte zu beurteilen.

for **frozen/unfrozen fillets** were determined enzymatically (Rehbein 1979). **Biogenic amines** were investigated by HPLC, formaldehyde photometrically.

Microbiological

Each package was divided into nine samples. Subsamples were homogenizied and diluted. Determined were the **total viable counts** on plate count agar, **Shewanella**, **Enteriobacteria**, **Lactobacilli**, **Clostridia** and **Photobacteria** on selective media.

Sensory

For sensory investigations the fillets were cooked by microwave without any additives. For comparison with unpackaged fish fresh fish from the fishmarket in Hamburg was bought at the day the investigations were done and filleted in the institute. The members of the panel were first asked for their preference for one of the samples. Both samples, the pre-packed and unpackaged, were not marked. In the second the members of the panel were asked to judge the fish samples with a sensory assessment with scale. The evaluation follows a scale with 9 points, where 9 to 7 points characterize the best sensory quality, 6 to 4 points medium quality and if getting 3 points or less the fish is unfit for human consumption (Paulus et al. 1969). Consideration was given to appearance, smell, consistence and taste were looked at.

Results

Sensory

The sensory preference test showed that nearly in all cases the fish from the fishmarket was prefered (figures 1 and 2). The panellists were able to choose more than one of the samples. Also, the panellists were able to find out which the pre-packed sample was.

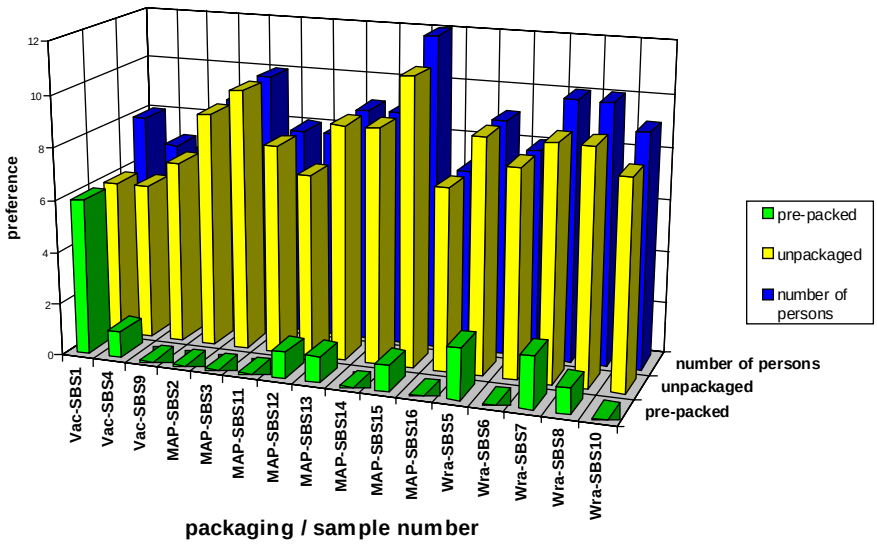

Fig. 1: Sensory preference for saith

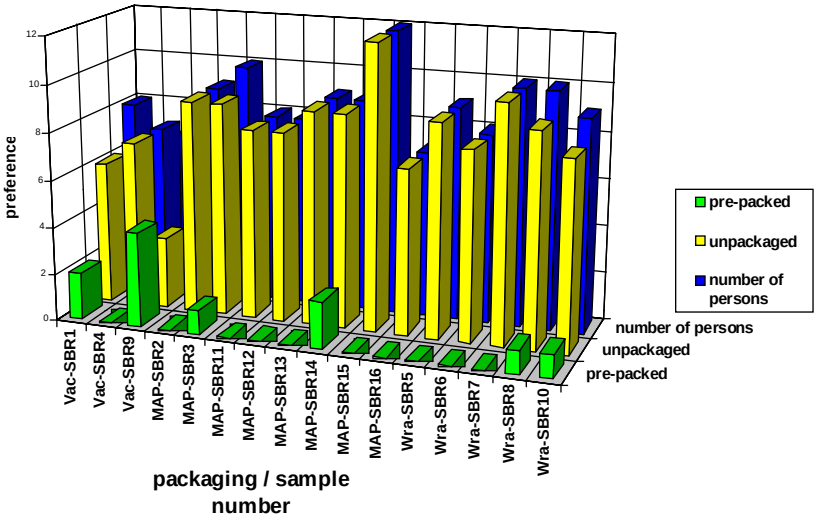

Fig. 2: Sensory preference for redfish

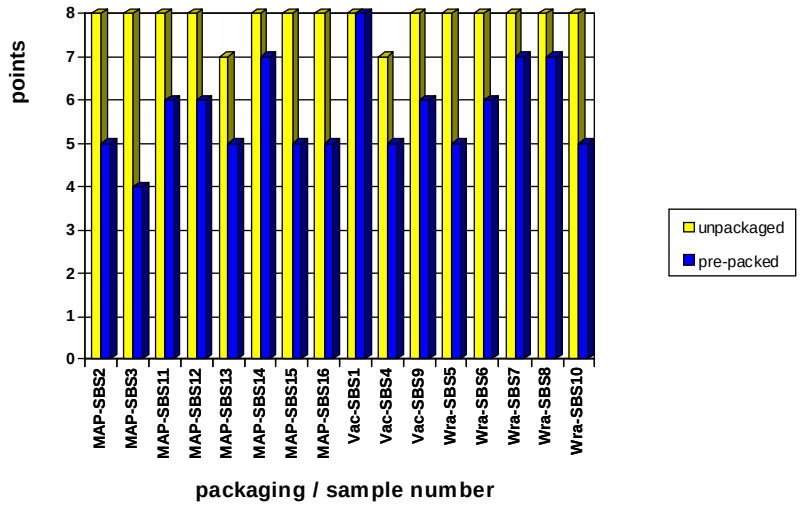

Fig. 3: Sensory valuation of saithe

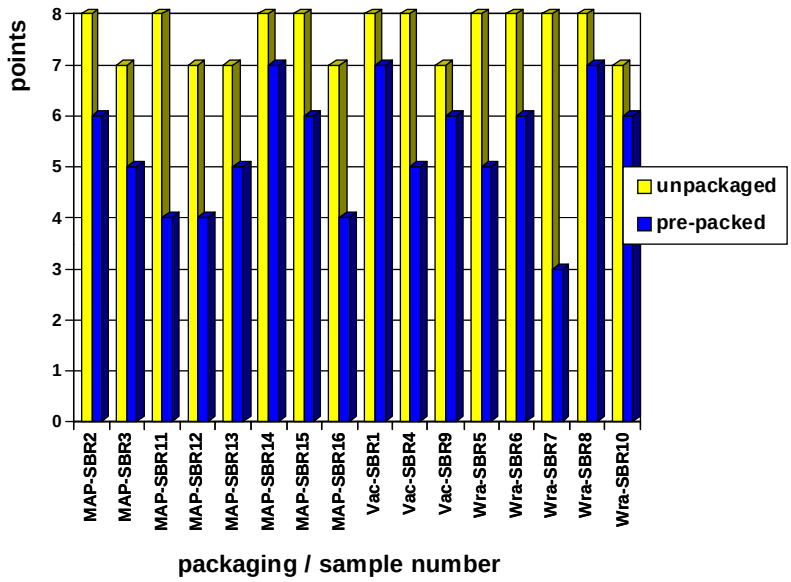

Fig. 4: Sensory valuation of redfish

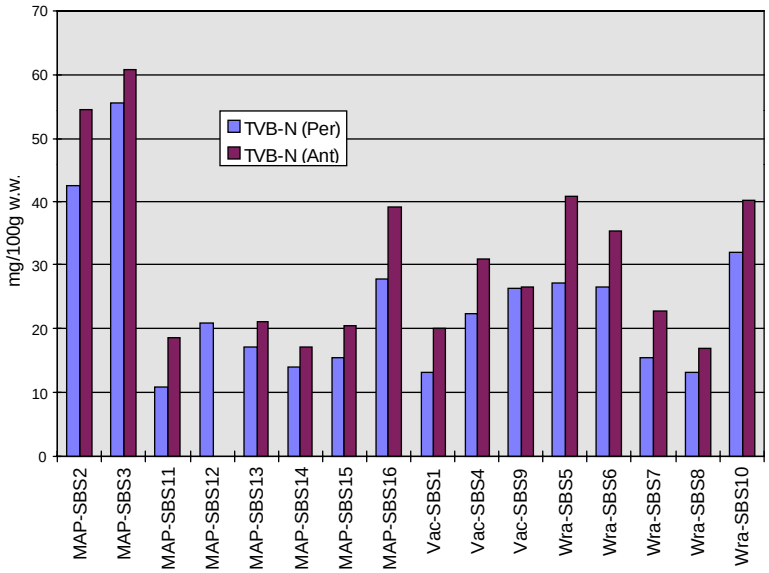

Fig. 5: Content of TVB-N of saithe (mg/100g w.w.)

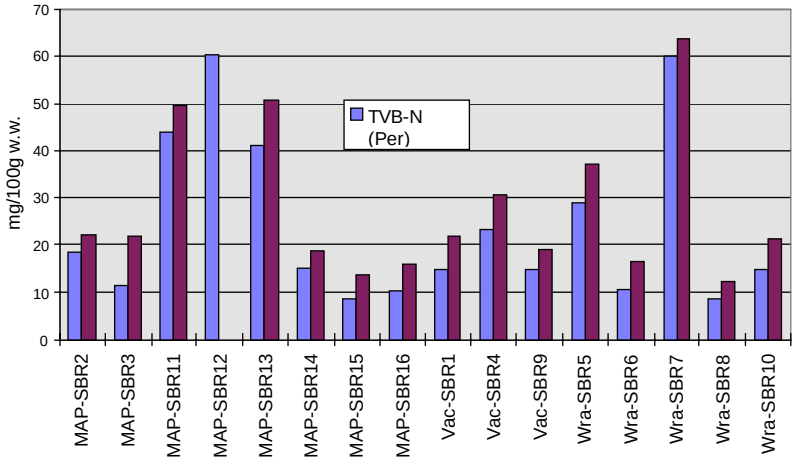

Fig. 6: Content of TVB-N for redfish (mg/100 g w.w.)

The sensory valuation for saithe is shown in figure 3. The values are the average of the four investigated attributes appearance, smell, texture and taste. The samples are sorted for the different kinds of packaging. The first eight are packaged under modified atmosphere (MAP), the next three vacuum-packaged (Vac) and the last five wrapped in foil (Wra). The majority of the pre-packed fish samples were of medium quality, getting 4 to 6 points. Four samples were in the area above at 7 to 9 points, which indicates good qualities.

The results for redfish are worse than for saithe (figure 4). Three samples are between 7 and 9 points. One sample received only 3 points, that means that this sample was unfit for human consumption. The other samples were in the middle. The samples were also sorted for the kind of packaging. Neither for redfish nor for saithe a relationsship with the kind of packaging is obvious. Considering the shelf-life given by the producers, up to five days after purchase, it is obvious that a lot of products wouldn‘t be eatable any more at that point of time. Two samples, packed under modified atmosphere, were stored up to the end of shelf-life and then opened. The appearance and smell indicated total spoilage, so that the samples were not analysed.

Microbiology

The data for microbiological investigations show that there was no significant correlation between analysed total viable count and specific spoilage organisms and other determined criteria. Lactobacilli and Clostridia were not important for pre-packed fish. Here also no difference between the different kinds of packaging was observed.

Chemistry

For TVB-N only a few samples exceeded the regulated limiting content of 35 mg/100g wet weight

(w.w.) for saithe and 25 mg/100g w.w. for redfish, if the §35 method is used (Anon. 1995) (figures 5 and 6). Samples with high TVB-N content also had high content of DMA-N and TMA-N.

The content of TVB-N determined with the second, the direct ditillation, was always higher than with the § 35 method. Therefore the § 35 method should be preferred because of getting more precise values. Here also no dependence of packaging to the content of TVB-N, DMA-N and TMA-N was seen. If the TVB-N content is compared to the sensory notes it is obvious that samples with high content of TVB-N were scored of being of low quality. It is obvious that high TVB-N content correspond to low sensory notes. For example redfish sample number seven had a very high TVB-N content. The sensory note was very low and the fish was found not to be edible, this sample reached only three points in the sensory investigation. Not the kind of packaging but the quality of the raw material is decisive for quality.

The other chemical parameters like content of ethanol or lactic acid are also suitable for describing quality. The physical parameters are not suitable because of getting no distinct results. Sensory analysis and determination of TVB-N are most suitable for the description of quality of pre-packaged fish fillet.

Conclusions

Suitable criteria to evaluate quality of pr-packaged fish fillets are sensory investigations and the determination of the value of TVB-N. Most of the other determined criteria confirmed the results got by these investigations, but are on their own not sufficent to describe the quality of pre-packaged fish.

Sensory investigations showed that pre-packaged fish has a different taste to unpackaged fish. All of the panellists find out the pre-packaged fish. No difference between the several kinds of packaging was seen. To sell these products with good quality on the German market it is necessary to inform retailers and costumers about correct handling of these products. If the raw material is of excellent quality, the cooling chain is not interrupted, the retailers and the consumers do know how to handle such a product, then these product could get a higher market share in German supermarkets.

References

Antonacopoulus, N.: Verbesserte Apparatur zur quantitativen Destillation wasserdampfflüchtiger Stoffe, Z. Lebensm. Unters. Forsch., 113: 113-116; 1960

Rehbein, H.: Verfahren zur Unterscheidung gefrosterter/aufgetauter Filets von Naßfischfilets, Inf. Fischw., 26: 113-119; 1979

Paulus, K.; Gutschmidt, J.; Fricker, A.: Karlsruher Bewertungsschema - Entwicklung, Anwendbarkeit, Modifikationen, Lebensm. Wiss. u. Technol., 3: 132-139; 1969

Anon. L 10.00 3: Amtliche Sammlung von Untersuchungsverfahren nach § 35 LMBG; Bestimmung des Gehaltes von flüchtigen stickstoffhaltigen Basen (TVB-N) in Fischen und Fischerzeugnissen

Anon.L.10.00 4: Amtliche Sammlung von Untersuchungsverfahren nach § 35 LMBG; Bestimmung des Gehaltes von Trimethylamin-Stickstoff (TMA-N) in Fischen und Fischerzeugnissen

Anon.: Entscheidung der Kommission vom 8.März 1995 über TVB-N-Grenzwerte für bestimmte Kategorien von Fischereierzeugnissen und die angewendeten Analysenmethoden, 95/362