

DETERMINATION OF THE CONSISTENCY OF MEAT PRODUCTS WITH THE WOLODKEWITSCH APPARATUS D 10

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Introduction.

For two years we have striven to develop objective methods in order to express properties like colour and consistency of meat and meat products.

As for as consistency is concerned there exists for meat a number of more or less reliable methods, while for meat products methods probably exist, but in that case they are little known.

Therefore we have invented a way by which we are able to measure the consistency of products such as sausages and liver pastes outgoing from a Wolodkewitsch food tester. The method is described in this paper together with the results obtained when the method was applied to 6 different products.

Description of the test method.

There are a number of accessory devices belonging to the Wolodkewitsch apparatus, by which one is able to determine different mechanical properties such as consistency according to the slit method, compressive strength, shearing strength and bending strength.

We have systematically examined the usefulness of these devices to express the consistency of different kinds of meat products and found the slit method consistently to be the best. Figure 1 illustrates the principle of the slit method, which can be characterized as a way to determine the compressive strength of the sample when it has to pass through a narrow slit.

The device consists of a metal container with a polished cylindrical inside wall. The sample to be tested is cut out with a tool similar to a cork-bore and with the same diameter as the cylinder mentioned above.

Centrally above the sample container a solid test punch is located connected to an exchangeable spring. The spring regulates the driving force which comes from an electric motor.

During the procedure the test punch is pressed with a certain force P (kg) and an even, adjustable velocity v (mm/sec.) down into the sample parallel to the longitudinal axis of the cylinder. By this treatment the sample will be pressed out through the slit between the cylinder wall and the puncher. The resistance which effects the test punch is registered on a recording device.

A typical force-distance-diagram for a sausage is shown in figure 2.

The consistency (F) of the sample can be expressed either as the average (represented by h_1) or the maximum force (h_2), which is needed to press the sample out of the container. In both cases the following is valid:

$$F_i = \frac{h_i \cdot P_{\max}}{50} \quad i=1 \text{ or } 2, \text{ where } h_i \text{ is measured in mm and } P_{\max} \text{ is the maximum force}$$

that the spring can develop. F_i may be given the dimensions kg (relative scale) or kg/cm.² (absolute scale).

The following conditions were valid at the consistency testings. The meat products were kept at room-temperature (about 22°C).

Sample size: 18 (diameter) x 20 (height) mm.

The diameter of the test punch: 17 mm

Slit width: 0,5 mm

Maximum spring force ($P_{\max}$) used: 5-25 kg

The velocity of the test punch (v): 1,0 mm/sec.

The consistency was calculated as the maximum required force (F_2).

The average of three measurements per product was taken as the true consistency value.

Results and discussion.

The consistency of 6 Swedish meat products was determined according to the slit method. The products are described briefly below:

"Falukorv" is a hot smoked, cooked sausage, containing particles of sinews and rinds of varying sizes.

"Medisterkorv" is like "falukorv" a hot smoked and cooked sausage.

"Blodkorv" is a cooked sausage made of blood and flour. It contains relatively large lard cubes and sometimes raisins.

"Kökt medvurst" is a hot smoked, cooked sausage containing small lard particles.

"Rökt medvurst" is a cold smoked sausage which is also slightly dried. It is very firm and contains small lard particles.

Liver paste is a well-known product, which does not need further description. It can be found in Sweden both in an easy to spread form as well as in a firmer form.

The consistency of these meat products is given in the table below.

Meat product	number of samples	mean value kg	S.d. kg
Falukorv	57	7,8	1,80
Medisterkorv	16	5,5	1.03
Blodkorv	24	7,0	1,30
Kökt medvurst	33	8,0	1,41
Rökt medvurst	35	18	4,2
Liver paste, firm	15	4,6	1,48
Liver paste, easy to spread	23	1,8	0,52

Falukorv, medisterkorv and kokt medvurst belong to the same type of sausage, hot smoked and cooked. But medisterkorv differs to some extent from the others by being more tender and by having a smoother texture. Consequently it also showed a significant lower consistency value.

Rökt medvurst is a type of dried product and therefore it is considerably firmer than the other analysed products with a consistency value of 18 kg.

The difference in firmness and consistency between the two types of liver paste was considerable, as the value of the firmer paste was about three times that of the easy to spread one, 4.8 kg respectively 1.8 kg.

The standard deviations of the consistency values were rather low and lower than could be expected as the analysed products come from different producers in different parts of the country. It shows that the producers use the same production methods.

Applications.

Research work

The consistence testing method described above may be used to investigate the effect of new additions and processes on the product quality. We have used it to evaluate the effect of using glucono-delta-lactone in the production of cold smoked sausages. It was found that an acceptable firmness (about 14 kg) was obtained already after 4 days with an addition of 0.4-0.6% Gdl compared with 6 days and no addition (figure 3). It is obvious that if no other factors have to be considered it is possible to shorten the smoking time considerably by using Gdl.

We have also used the Wolodkewitsch apparatus to follow the effect of the cooking temperature on the firmness and consistency of hot smoked products. Numerous other applications in research work may be found.

Control of meat products

Apart from research work there are numerous applications for the described method in the control work of meat products. It may be sufficient to mention a few examples from our own work.

One obvious application is to determine acceptable limits for the consistency of different products to be used in product specifications. When such limits are set and confirmed by sensoric methods it is possible to use the objective method to determine the consistency in quality tests instead of using a test panel. An excellent example of this kind of application is illustrated by the two types of liver pastes. As shown in table 1 there is a definite limit between the firmer and the easy to spread type and it is very easy to distinguish between them by measuring the consistency value.

The slit method may also be used to indicate the presence of particles of rind or sinews in a product as shown by figure 4. The irregular force-distance-diagram to the left shows that the product was very inhomogenous probably depending on the presence of rather large particles. The diagram to the right represents a product with a uniform consistency.

Litterature.

1. Th. Grünewald : Ein Festigkeitprüfgerät für Lebensmittel nach N. Wolodkewitsch. Zeitschrift für Lebensmittel-Untersuchung und Forschung 105. Band. 1. Heft, 1957, 1-12.
2. N. Wolodkewitsch : Zur Methodik der Festigkeitsmessungen an Lebensmitteln. Zeitschrift für Lebensmittel-Untersuchung- und Forschung 103. Band, 4. Heft, 1956, 261-272.

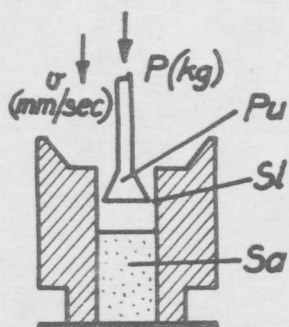


Figure 1. Principle of the slit method

Pu test punch

Sa sample

Sl slit

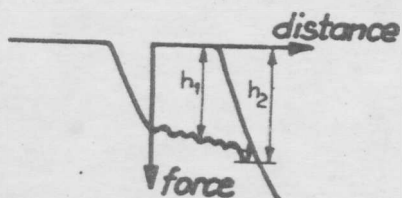


Figure 2. A typical forcedistance - diagram

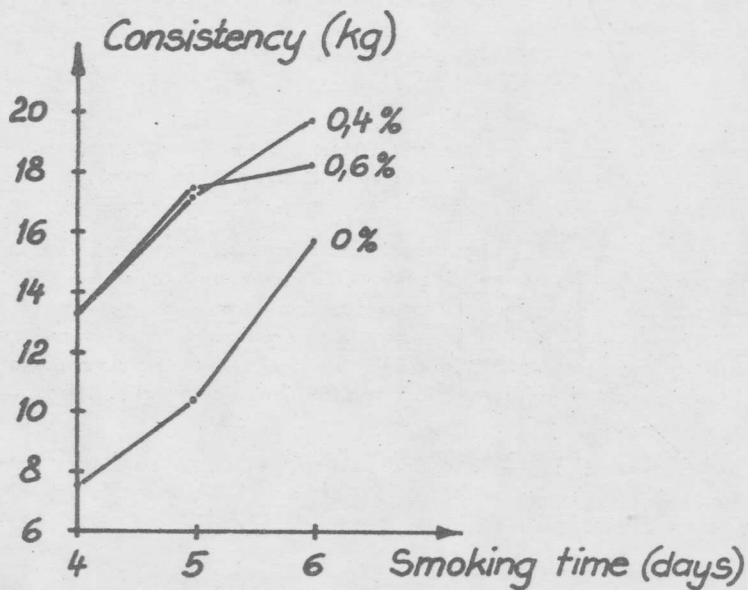


Figure 3. Influence of GdL on the consistency of cold smoked sausage.



Figure 4. The relative homogeneity of two sausage of the same kind.