Supelco®
Analytical Products

Application Instruction

pH Measurement in Meat Using Special pH Indicator Test Strips

Introduction

The measurement of the pH in meat plays a central role in the processing of meat products and the assessment of their quality. The slaughtering procedure triggers a series of biochemical processes that result in a shift of the initial value (pH 7.0) into the acidic range (pH 5.4–6.7).

The temporal course of the drop in pH depends on a variety of factors, such as the body temperature of the animals being slaughtered or the degree of stress to which the animals are subjected prior to slaughtering. A substantial percentage of the muscles of pigs, but also of those of cattle, exhibit an abnormal pattern e.g. in the rapidly glycolyzing muscle tissue—which because of the external appearance of pork is referred to as PSE (pale, soft, exudative) meat—the pH drops to values lower than 5.8 within the first hour postmortem (p.m.). This is the reason why the measurement of a pH_1 value (45–60 min p.m.) is recommended for the identification of PSE meat.

Since, however, the borderline between normal and PSE muscles is a flowing one, the pH_1 value yields secure positive results only for extreme PSE muscles. Notwithstanding this, there is no doubt that the measurement of the pH_1 value constitutes a valuable orientation tool for distinguishing PSE meat from normal meat.

Measuring the pH can, however, also serve to identify easily perishable DFD (dark, firm, dry) meat. Due to the fact that only relatively little glycogen is present in this type of muscle at the time of slaughtering, the pH drops only slightly, reaching a final pH of above 6.0 in 24 hours (p.m.) The DFD meat of pigs is equivalent in its properties to the so-called “dark cutting” meat (dark, gluey cut surface) of beef. Here, too, similar to the DFD muscle of pigs, virtually the entire reserves of glycogen are depleted very early on in the slaughter process, although in beef the final pH is, in very many cases, achieved after as long as 48 hours later. This means that the final pH can be measured and the discovery of “dark cutting” meat can only be definitively decided 48 hours after slaughtering.

Methods for determining pH in meat

The identification of these two abnormal meat-quality properties is of major relevance in the meat-processing sector to enable suitable measures to be taken to avoid defective products and spoilage. The pH can only be measured swiftly and accurately using conventional glass or puncture electrodes under the provision that specific conditions are observed. Inadequate training in the proper use of the pH-meter frequently results in errors and false measurement results. What’s more, glass electrodes are highly fragile and relatively expensive.

The pH can also be measured using color indicators, based on the principle that their color changes when a certain pH is reached. An appropriate combination of such mixed indicators can be used to achieve a good degree of accuracy. We have used this combined approach to develop a special indicator test strip for the measurement of pH levels in meat. Furthermore, the dye that is used is bound in such a way that it is made insoluble and cannot “bleed”, meaning that the meat under investigation is not contaminated by the indicator dyes.[1]

Experimental

Method

A special non-bleeding combination strip (**1.09632**) has been created for the pH range of 5.2–7.2 to enable the pH to be measured directly in meat with an accuracy that compares favorably with the electrometric method.

Measuring Range

pH 5.2–7.2

Applicable Sample

Meat (e.g. beef, pork)

Reagents, Instruments and Materials

Test/Reagents Kit

MQuant® pH indicator strips pH 5.2–7.2 for pH measurements in meat (**1.09632**)

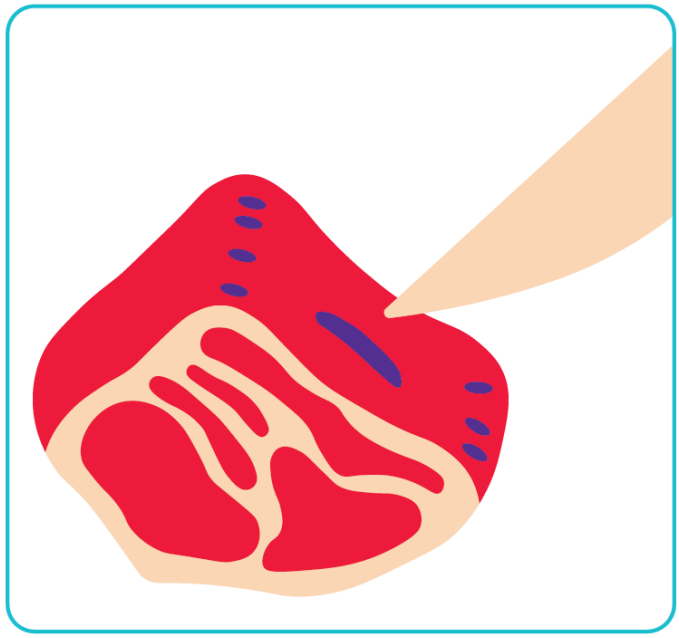
Analytical Procedure

Sample Preparation

pH values can vary considerably from one region of muscles in the slaughtered animal to the next.

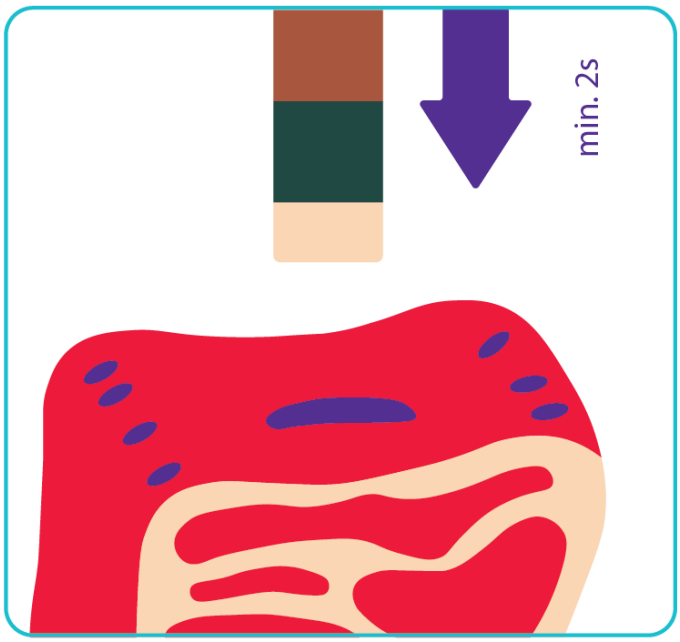
For this reason, it is advisable to first define a specific site in the body of the animal suitable for serial measurements, e.g. in the topside. The pH can be measured not only in the carcass, but also in boned cuts, using the special indicator test strip to determine the quality of the meat. Here it is particularly suited for identifying all DFD or “dark cutting” muscles. To ensure that a secure and reproducible reaction is achieved here, the following procedure is advisable:

- The chosen site must be undamaged (free from blood, lacerations etc.).
- Using a sharp-tipped knife, make an incision across the direction of the muscle fibers (about one inch deep).

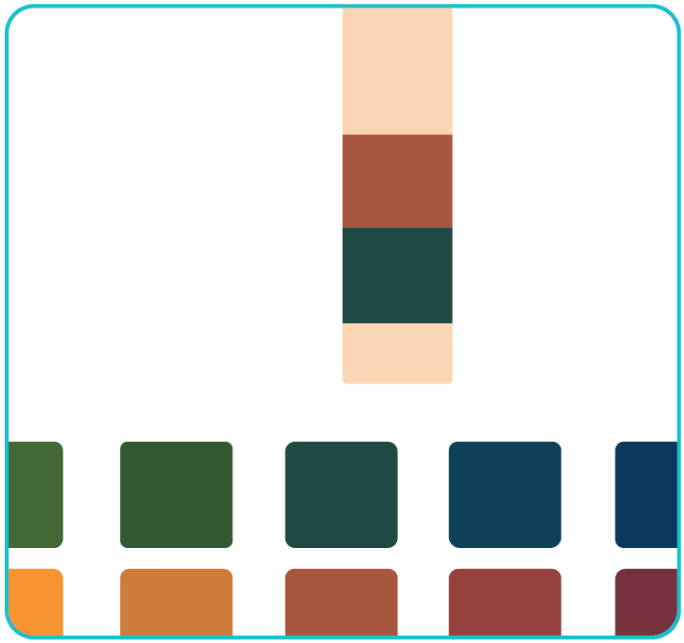


Measurement of pH in meat

When carrying out this procedure, it must be borne in mind that the indicator zones are relatively sensitive to moisture and should not be touched with the bare fingers.



Sample preparation



Color comparison

The color comparison scale has the following color graduations:
5.2 - 5.6 - 6.0 - 6.4 - 6.8 - 7.2

Measurement

Carefully insert the special-indicator test strip into the incision to a depth of about ¾ inch, or 20 mm, and press the muscle together above and below the measurement site for 2–5 seconds. This is to ensure good contact of the muscle with the indicator zones and that they are thoroughly wetted with the meat juices.

Remove the test strip from the incision and, under adequate lighting conditions, compare the two reaction zones with the color scale printed on the pack until the best possible color match is achieved. Read off the corresponding pH value.

Conclusion

Five advantages of the special indicator for measuring pH in meat

The advantages of this special indicator test strip (**1.09632**) for pH measurement in meat at a glance:

- No “contamination” of the measurement site thanks to the covalent binding of the indicator dyes.
- The test-strip principle enables the measurement to be made directly in the meat (the plastic material is physiologically safe).
- No protein error.
- No impact of the inherent color of the meat or meat juices.
- Improved color graduation makes it easy to read off the pH results visually.

Featured Products

Description	Cat. No.
MQuant® pH indicator strips	
pH indicator strips pH 5.2–7.2 for pH measurements in meat, MQuant®	**1.09632**

References

1. G. Feiner, *Meat products handbook*, Woodhead Publishing Ltd. And CRC press, **2006**.

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