APPLICATION NOTE

F&F-O-001-2015/A1

Oxidation Stability of Meat

Reference: **International Standard Procedure AOCS Cd 12c-16**

Tested with **VELP Scientifica OXITEST Oxidation Stability Reactor** (Code F30900248)

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OXIDATION STABILITY OF MEAT

Introduction

Meat is one of the most ancient food in human diet, since prehistoric times, when first men hunted wild animals for eating them. Over the centuries, thanks to the civilization, the domestication of animals was allowed (such as chickens, sheep, fish, seafood, pigs and cattle) and nowadays, the meat production is on an industrial scale.
Meat is very high in protein and low in carbohydrates, but fat content can vary widely depending on the species and breed of animal, the anatomical part of the body and its cooking.
Thanks to the bacteria that find a nutrient rich substrate, meat is a highly perishable product. Among the alterations, the lipid oxidation results in “off flavor”. To preserve meat, in order to be stored and consumed, tenderness, juiciness, flavor or color are protect using additives.

Oxidation Stability in Food

One of the most important quality alteration of food is due to oxygen absorption by the unsaturated fatty acids, free or esterified. The auto-oxidation of fats is a chemical reaction promoted by oxygen, light, high temperatures, metal traces and, sometimes, enzymes.
OXITEST can determine the oxidation stability of various sample types, without the need for preliminary fat separation.

OXITEST Principle

OXITEST speeds up the oxidation process because of the two accelerating factors, temperature and oxygen pressure, according to the most common applications.
The instrument measures the absolute pressure change inside the two chambers, monitoring the oxygen uptake by reactive components in the sample and automatically generates an IP value.

IP Definition: IP stands for Induction Period and it is the time required to reach the starting point of oxidation, corresponding to either a level of detectable rancidity or a sudden change in the rate of oxidation. The longer the Induction Period, the higher the stability against oxidation over time.

Sample

Meat with natural antioxidant Type 1 (Formula F1)
Fat labeled value: 30g / 100g of meat

Meat with natural antioxidant Type 2 (Formula F2)

Equipment and Chemicals

- Analytical balance, 3 decimals
- Grinder
- Silicone grease
- Oxygen, purity grade 5.0

Sample Preparation

Store the samples at room temperature.
Grind meat to a suitable finesse and put 10 grams of homogeneous sample directly on the surface of the titanium sample holder, by using a spatula.
In each reaction chamber (A and B), place 2 spacer and 1 sample holders containing the sample for a total of 10 g of meat in each oxidation chamber.

Analysis Procedure

Grease the O-rings with silicon grease and set them in their position. Close the chambers with the titanium covers and turn the discharge valves in open position. Set the following conditions on the OXISoft™ software:
Temperature: 80 °C
Oxygen Pressure: 6 bars

When the temperature set is reached inside the chambers, close the discharge valves and start loading oxygen.
Data acquisition is automatically started by the software.

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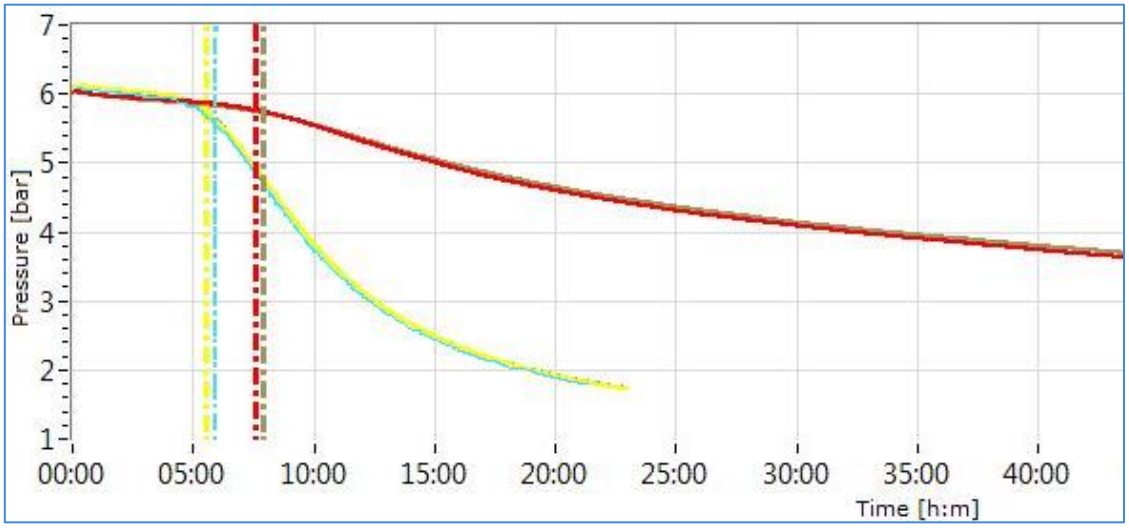
Typical Results on Meat

Each meat sample has been monitored two times. At the end of the oxidation tests, the IP of every run is calculated by the software OXISoft™.

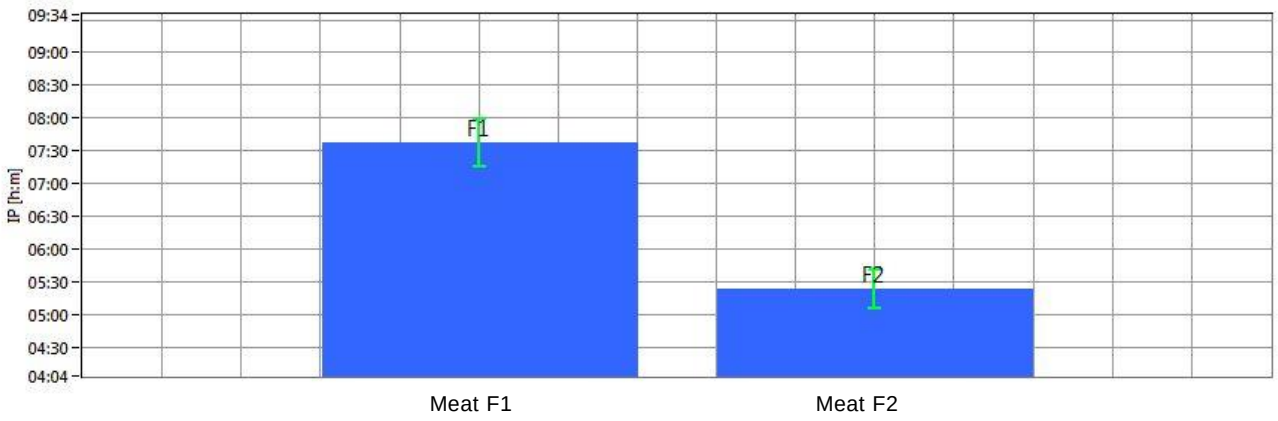
It is possible to elaborate the oxidation curves obtained for each kind of meat.

Sample	Weight (g)	Set Point (bars)	Set Point (°C)	IP (hh:mm)	Line
Meat F1	10.000	6.00	80.0	7:32	
Meat F1	10.000	6.00	80.0	7:53	
Meat F2	10.000	6.00	80.0	5:29	
Meat F2	10.000	6.00	80.0	5:33	



Formula Comparison

With OXISoft™, it is also possible to easily compare the obtained IP values, of different formulations but tested at the same condition, and identify the most stable one.



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Conclusion

The results obtained by OXISoft™ and the formula comparison function clearly discriminate the meat's resistance to oxidation, although the total fats percentage of their formulations is very similar.
Meat F1 have a longer IP value, hence a higher oxidation stability. Meat F2 results significantly less stable against oxidation. This is related to the different effect of different natural antioxidants added

Benefits of OXITEST are:

- Test is made directly on the whole sample
- No need for preliminary fat separation of the sample
- Resistant titanium chamber
- Time saving analysis, if compared to the traditional methods
- Especially designed for R&D, Product Development and Quality Control labs
- Many investigations available through the software OXISoft™:
  1. Repeatability test: a series of tests run on the same sample or standard to verify its IP period, to calculate accuracy and repeatability of the data
  2. Freshness test: to verify the quality of different lots, for example of the same raw material, and compare them
  3. Formula comparison: to identify the most stable formula of a finished product, under the same conditions
  4. Packaging comparison: for testing which packaging maintains the product in the freshest condition
  5. IP during ageing: to obtain a graph of the decrease of the product IP during the shelf-life period
  6. Estimated shelf life: to have a prediction of oxidation stability during the shelf life.

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