DEVELOPMENT OF AN INSTRUMENTAL METHOD FOR ASSESSING THE ADHESIVENESS ON DRY-CURED HAM SLICES

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Abstract – Texture Profile Analysis is a common double compression test for determining the textural properties of dry-cured meat products. A method for assessing the adhesiveness characteristics of dry cured ham slices packaged under vacuum conditions was tested. For this work, a TA.XT Plus texture analyzer equipped with a probe connected to a special device was used. To develop this method, different speeds (0.5-10 mm/s), distances (80 and 100 mm), load cell (5 and 50 N) and slice thicknesses (1-4 mm) were assessed. Optimal conditions to measure adhesiveness between dry-cured ham slices were a speed of 0.5 mm/s, 100 mm of distance, 5 N load cell and 1 mm thick slices. When using these optimal conditions the adhesiveness mean value of dry-cured ham slices was 0.81±0.10 N.

Key Words – load cell, probe, texture analyzer

I. INTRODUCTION

There are different methods to objectively determine food quality and characteristics. Tenderness can be evaluated using objective techniques, instrumental or sensorial measurements with trained panels, or subjective methods with a consumer panel [1]. The instrumental texture profile analysis (TPA) is often used to estimate the adhesiveness of dry-cured meat products. Different levels of adhesiveness are appropriate for different type of products or target specific consumers [2]. Adhesiveness is a common parameter obtained from TPA test. The TPA sequence involves contacting a product, compressing that product, withdrawing to the original contact point, and then repeating the entire cycle a second time. However, TPA test procedure is not an useful method for quantifying the adhesiveness of dry-cured ham slices, since a specific adhesiveness method should be develop for this meat product. Nowadays, consumer's demand for low salt consumption has increased. This implies increasing of the incidence of some textural problems in dried meat products [3]. Excessive softness and pastiness are two of the main texture problems which have been associated to high proteolysis [4]. In this regard, an excessively high adhesiveness would cause problems in the package slices sticking. Therefore, the aim of this work was to develop a new method to analyze the adhesiveness in sliced dry-cured ham with a texture analyzer.

II. MATERIALS AND METHODS

A. Experimental design and sampling

For this study, samples of commercial sliced dry-cured ham packaged under vacuum conditions were used. Different load cell (50 and 5 N), speeds (0.5, 4, 6 and 10 mm/s), distances (80, 100 and 130 mm) and slice thicknesses (0.5, 1, 1.5, 2, 3 and 4 mm) were tested.

B. Textural analysis

Textural analysis was performed using a texture analyzer (Stable Micro Systems, TA-XT Plus, London, U.K.) by carrying out a separation test using different load cells with a specific probe. The texturometer was equipped with a probe connected to a special device that enables horizontal probe displacement (Figure 1). After the separation of the slices, the probe returned to the initial position. From the obtained graph force vs. distance, the adhesiveness was calculated. All the measurements were made in triplicate, at room temperature.

III. RESULTS AND DISCUSSION

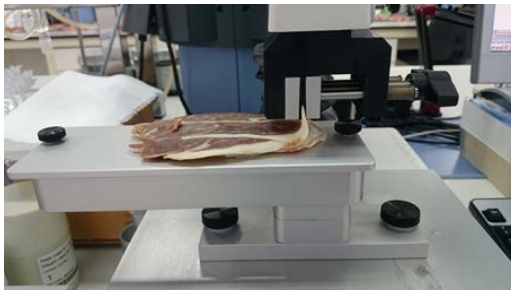

Figure 1. Specific probe for adhesiveness measurement.

The area under the curve shown in the Figure 2 during the upstroke corresponds to the resistance of the material to the plunger being lifted. It reflects the sample adhesion [5] or the difficulty of pulling away the plunger from the food. In this test (load cell: 50 N; speed: 2-10 mm/s; distance: 80 mm and slice thickness: 2 mm), a jagged signal was obtained due to a mechanical error or a weak probe signal probably due to use a heavy load cell (50 N) was obtained. Thus, the results obtained were inaccurate.

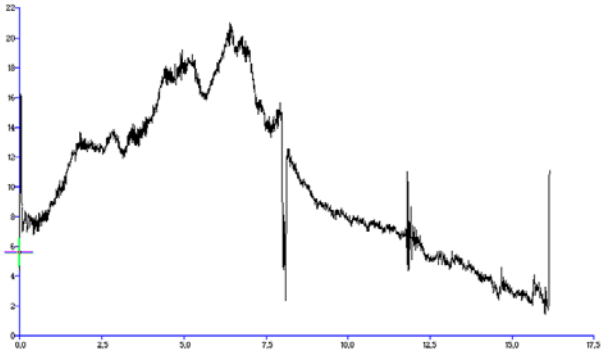

Figure 2. Graph force vs. distance (load cell: 50 N; speed: 2 mm/s; distance: 80 mm and slice thickness: 2 mm)

After numerous tests, the conditions for the measurement of adhesiveness of dry cured ham slices (load cell: 5 N; speed: 0.5 mm/s; distance: 100 mm and slice thickness: 1 mm) were optimized and the results were improved (Figure 3). Using these measurement conditions, an adhesiveness mean value of 0.81±0.10 N was obtained.

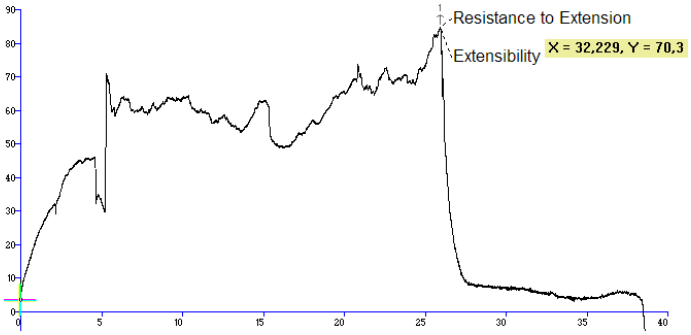

Figure 3. Graph force vs. distance (load cell: 5 N; speed: 0.5 mm/s; distance: 100 mm and slice thickness: 1 mm)

CONCLUSION

The obtained results showed that instrumental adhesiveness of dry cured ham slices can be measured using the following conditions: load cell: 5 N; speed: 0.5 mm/s; distance: 100 mm and slice thickness: 1 mm.

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