10. Other topics of meat science and technology **《P10-008》**

An instrumental protocol for measuring water dynamics in meat and plant-based burgers

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Objectives: Sensory juiciness is a crucial parameter in increasing the palatability of a food, even more so in burgers. Juiciness is also dependent on the water content, so it is important to understand how it evolves in the fresh product to the consumer's mouth. This communication describes an instrumental protocol for measuring water dynamics and other parameters in meat and plant-based burgers which reduces the cost and time of analysis.

Materials and Methods: Two commercial (CB, CE) and seven self-produced plant-based (P1 to P7) and one meat (MT) types of burgers, for a total of 100 samples were used. The plant-based burgers were based on pea protein. The protocol consists of an adaptation of the methods applied to the meat to consider the structural characteristics and composition of meat and vegan burgers [1,2,3].

Results and Discussion: The protocol is organized to reduce analysis time and quantity of sample; to increase measured parameters and to improve their correlations by standardizing the operating conditions. The variable and often structurally coarse texture of burgers makes even simple measurement such as pH inaccurate as well as greatly reduces the correlation between measured parameters. To improve the reliability of the results, it was chosen to analyze the homogenized product as well.

The first analysis consisted of taking a portion (8-9g) to determine total moisture content (TMC) after drying in an oven at 120°C for at least 4h and then the ash.

The remaining portion of the burger, if frozen, was weighed and subjected to slow thawing for 7-10h in a ventilated cold room at 2-4°C in a closed container to detect thawing losses, otherwise was subjected directly to analysis.

Then a fresh/thawed sample was prepared according to the MCS method to obtain the fluid fractions that occur after cooking: cooking loss, meat cooking shrinkage, fluid and fat losses.

Meanwhile, by the WHCtrend method [2], on the raw remaining homogenized (600rpm, 20s) product, were measured: initial and final area, halo, and free fluid (as parameters to describe the water holding capacity); pH and temperature.

Then, the raw homogenized sample was placed into a plastic container of 18 mL and using a texture profile analyzer (Instron 5543) with a cylinder probe of 11.2mm diameter, was performed a double compression cycle test. The parameters retained were: gumminess, chewiness, adhesiveness, springiness, cohesion force resilience and cohesion energy resilience.

After the MCS method, the cooked sample was divided. A small portion (4-5g) was dried to determine residual water or water to the mouth (FTM). The remaining portion was homogenized, measured pH, and subjected to TPA as the raw ones.

The 18mL raw and cooked homogenized were freeze-dried and fat, protein, fatty acid and NIR spectrum were measured. NIR spectrum are obtained by a portable instrument.

All the fluid fractions are expressed as percentage referred to raw sample weight.

Other parameters were estimated.

The raw/cooked specific fluid content (SFC) was obtained as the amount of water (TMC or FTM) divided by the volume of raw/cooked product and expressed as mg/mm3. The volume was estimated by multiplying the raw/cooked surface area, measured by the MCS method, by the 10mm raw height or the cooked height.

The latter is obtained by the raw height reduced by the MCS. SFC expresses the amount of water/fluid (mg) per unit of volume (mm3) of cooked product thus considering how cooking can concentrate fluid in relation to different shrinkage.

Conclusions: An instrumental protocol for measuring water dynamics and other parameters in meat and plant-based burgers has been developed, not only to reduce the cost and time of analysis, but even more to increase the correlation between different parameters by reducing the variability due to the use of multiple samples. Among parameters, the specific fluid content, and the TPA, seem to give interesting indications about the behavior of the fluid content. NIR was added with the intent of creating a large calibration database, to replace many of the current parameters with a simple NIR measurement, reducing even more cost and time for analysis.

References:

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