

ID: 1977

RELEVANCE OF NON-INVASIVE AND NON-DESTRUCTIVE IMAGING TOOLS TO ASSESS INTERNAL QUALITY OF TABLE EGGS

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Egg quality (shell strength, freshness and maintenance of physicochemical, technological and organoleptic properties, etc.) is essential to the economic viability of the table egg sector. Certain alterations, linked to external factors such as the hens age or the storage conditions for example, can in particular, have negative impacts from a health and economic point of view. Some internal egg quality indicators (characteristics of the yolk and white) are visible and are mostly measured after breaking the egg. Others, like the volume of the air chamber or the displacement of the yolk, are less easily measurable. The objective of this work is to evaluate the use of tomographic imaging tools (magnetic resonance imaging (MRI) for soft tissues, and computed tomography (CT)-scan for hard tissues) as non-invasive methods and non-destructive to characterize the quality of eggs. Consumption eggs from Lohmann Tradition hens were collected on the day of laying, and then stored for 7, 14 and 28 days at two temperatures (4 and 20°C). They were analyzed by MRI and CT-scan, and afterwards characterized with the standard measurement tools of egg quality after breaking. In total, 37 trays containing 10 to 15 eggs were imaged i) by CT-scan for assessment of the air chamber volumetry, and ii) by MRI for the characterization of the white and yellow volumes and for the mapping of T2 relaxation times. The images were processed with different software (ITK-snap, ImageJ, TableCurve2D, Matlab). Comparisons and correlations were made between the standard and the imaging methods. The volume measurements determined under the different storage conditions were thus studied using a comparison of groups, while the T2 relaxation times were studied i) by principal component analyzes (PCA) and ii) by correlations with certain standard parameters of the egg quality. The results obtained show that imagery can be used as a non-invasive tool for measuring internal egg quality while providing new possibilities for measuring criteria that are difficult to assess once the egg has been broken. The results of this study may ultimately allow the creation of a new egg quality referential.