Determination and analysis of failure stresses in egg shells

J. KHAZAEI, N. EKRAMI, M. H. KIANMEHR - University Of Tehran, Iran

The ability of shells to withstand mechanical loading is dependent upon shell shape, shell thickness and the mechanical properties of the material comprising the shell. A complete stress analysis of an eggshell should lead to a better understanding of eggshell fracture which, in turn, influences the design of egg-processing equipment and research in strengthening the shell in order to reduce mechanical damages. The objective of this study was to apply the thin shell theory of mechanics as a method for determining the failure stress of egg shell material, irrespective of shape, size or thickness as a criterion for evaluating egg shell strength. For conducting the test, an apparatus was designed and constructed which was able to create an internal air pressure into the eggshell. The air pressure to rupture the egg shell was related to mechanical strength of the product using the thin shell theory of mechanics. The fact that no variation in failure stress was found for eggs from two birds placed side by side and fed the same ration, gives further support to the selection of failure stress as a criterion for evaluating eggshell strength.