

Development of a new method to measure the degree of texturization in extruded meat analogues

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Introduction:

High moisture extrusion (HMEs) process transforms plant-proteins into fibrous structure. The quality of extrudates is measured using several physical properties including the degree of texturization. Anisotropic index (AI) based on cutting force measures the differences between the longitudinal and transverse. The Anisotropy Index (AI) is a physical property of anisotropic structures and represent the formation of fibrous structure in extruded plant-proteins. We propose a new method to measure the degree of texturization of meat analogues based on their swelling behavior. Swelling behavior measures the expansion of the fibers in the longitudinal over transverse direction.

Method:

Pea protein isolate (PPI) was extruded at 50% water content and the extrusion conditions were set at 100 RPM for screw speed and barrel temperature at zone 1: 20 °C, zone 2: 40 °C, zone 3: 80 °C, zone 4: 100 °C, zone 5: 100 °C. We define an anisotropy index AI_{swelling} based on the differential swelling of meat analogues in the direction of longitudinal and transversal to the fiber direction. Extruded samples were submerged in sterile water for 24 hours and the dimensions were measured using electronic caliper.

Results:

Our swelling index showed an anisotropic manner when submerged in water, with the longitudinal swelling strain being significantly larger than the transversal swelling strain.

Significance:

This study introduces for the first-time a swelling-based anisotropy index as novel parameter to characterize the degree of texturization (fiber formation) in meat analogue matrices. We interpret

this swelling in terms of the molecular conformation of the protein chain that can be influenced by the processing conditions such as screw speed, temperature and water content. We demonstrate the usefulness of the novel index that may be of significant practical importance in characterizing plant protein matrices that mimic the anisotropic properties of meat.