

TEXTURE LOSSES OF GREEN BEANS ALONG FROZEN STORAGE

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Abstract

The texture loss of frozen green beans (*Phaseolus vulgaris*, L., variety Bencanta) was macroscopically evaluated by a puncture test, using the INSTRON (Universal Testing Machine, model 4500) with a 4,85 mm diameter plunger, along 250 days of isothermal storage at -7, -15 and -30°C. The force deformation curves were recorded for data analysis of: i) Energy - the area below the force deformation curve, as a measurement of the resistance to compression by the plunger, ii) Stress at the failure point - pressure at the failure point, as an index of firmness and iii) Stiffness -Stress / Strain, both at the failure point.

The force deformation curves exhibit a decrease in the resistance to compression, with storage time at all studied temperatures. For longer periods of storage, the well-defined failure point, that is a characteristic of fresh green beans, decreases in Stress magnitude and increases in Strain, corresponding to the softening of green beans initial texture. The softening of the green beans tissues was assessed by the decrease in Energy, Stress and Stiffness along storage time and at the three studied temperatures. This texture loss has an exponential behaviour, with a residual value of texture that is maintained for a long period of storage. Thus, the softening process was modelled with a first reversible order kinetics. The kinetic parameters were estimated by non-linear regression to all data, maximising the likelihood function and solving the normal equations by the Gauss-Newton algorithm. Although the high biological variability observed in the texture of green beans influence the precision of the estimated kinetic parameters, the temperature effect was well described by an Arrhenius behaviour.

This research work led to the conclusion that the softening of frozen stored green beans, is an irreversible degradation of texture, and is an important quality attribute, that can be macroscopically described.