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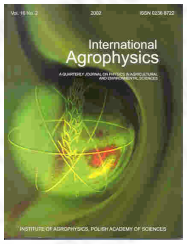

International Agrophysics
publisher: Institute of Agrophysics
Polish Academy of Sciences
Lublin, Poland
ISSN: 0236-8722

vol. 22, nr. 3 (2008)

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Regression equation for describing gluten thermal expansion

(get PDF)

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vol. 21 (2007), nr. 4, pp. 377-383

abstract Testing of gluten ability of thermal expansion consisted in heating a small sample of freshly washed out gluten at temperatures causing the boiling of water within it. Gluten membranes extend around forming bubbles of water vapour under increase of pressure and are simultaneously being modified thermally. At certain volume of the bubbles, the membranes achieve maximum extensibility and further increasing of water vapour pressure causes their perforation. The dynamics of the expansion process was recorded by use of a digital camera. The proposed regression equation describes the dependence of the volume increment of gluten on heating time and allows to split the thermal expansion process into hyperbolic and linear components. The hyperbolic one is determined by a three-parameter function of hyperbolic tangent. The parameters a, c and b characterize the half of extent and duration of the hyperbolic expansion and its rate, respectively. The linear component can be meant as viscous flow of gluten, therefore it is determined by a one-parameter linear function. The parameter d means the rate of linear expansion. The volume increase of strong gluten at lowest temperature (110°C) was very slow and its character was only linear (d). Higher heating temperatures (above 140°C) caused considerably larger and faster hyperbolic expansion (a and b) of strong gluten than of the weak one. However, the weak gluten in whole range of used temperatures was distinguished by almost twice faster linear expansion (d). It may suggest the existence of significant differences between wheat cultivars in terms of extensibility of thermally modified gluten membranes.

keywords wheat, wet gluten, heating temperature, gluten membranes, thermal expansion