Title Effect of soluble solid content on thermal conductivity of tomato fruit at different stages of ripeness

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Abstract

Introduction: Thermal conductivity is one of the most commonly used thermo-physical properties of food to predict heating or cooling rates or times. Over the years both the measured values and the mathematical models of thermo-physical properties of food had been published. However little published information is available on the thermo-physical properties of tomato fruit at different stage of ripeness. The objective of this work was to elaborate a specifically designed apparatus for the determination of thermal conductivity of tomato fruits at different stages of ripeness. And then the correlation of thermal conductivity and other physical characteristic including soluble solid content, water content and density was analyzed. **Materials and Methods:** The samples tomato with the same variety were obtained fresh from the same plot in China, which were non-diseases and no insect pests, no machinery damaging, no hollow, and the diameter about 60 mm. Physical characteristic relevant to heat transfer phenomena. I.e. water content, soluble content and density was determined according to standard methods. The thermal conductivities of tomato fruits were measured by means of a specifically designed apparatus using line-heat source principle. **Results and Discussion:** The experimental results showed that significant difference was observed in measured thermal conductivity, the soluble solid content and water content of tomato fruit at different stages of ripeness. Thermal conductivity had a better correlation with soluble content rather than with water content or density for the same kind of tomato fruit. Thermal conductivity decreases with the increase of soluble solid content in sample. And then thermal conductivity was modeled through a linear regression equation as a function of soluble solid was obtained. That is $\lambda = -0.067s + 0.79$, which λ is thermal conductivity of tomato fruit, is soluble solid content of tomato fruit. The errors for predicting the thermal conductivity from experimental data is below 7.8%, and this is acceptable for general engineering practice.