

Rungtip Jutamongkon 2010: Factors Affecting the Stability of Fruit Bromelain in Smooth Cayenne Pineapple (*Ananas Comosus*). Doctor of Philosophy (Food Science), Major Field: Food Science, Department of Food Science and Technology. Thesis Advisor: Associate Professor Sanguansri Charoenrein, Ph.D. 121 pages.

Bromelain is the collective name for closely related proteolytic enzymes found in stem and fruit tissue of the plant family Bromeliaceae, of which pineapple, *Ananas comosus*, is the best known. The medicinal properties of pineapple bromelain have been primarily associated with the proteolytic activity of bromelain. This research had objectives to study the relationship of bromelain activity and total soluble solids, total acidity in Smooth Cayenne type pineapple. Moreover, optimal pH, the effect of temperature on stability of bromelain, kinetics of bromelain and the effect of sugars and polyol on the thermal stability of fruit bromelain were studied. An inverse relationship appeared to exist between the bromelain activity and total soluble solids in pineapples, especially ($R^2 = 0.597$) for 14.1–16.0 °Brix. In other words, within this °Brix range, more mature pineapple exhibited low bromelain activity. There was no relationship between total acidity and bromelain activity. Thermal inactivation of bromelain in temperature range of 40-80 °C, the calculated activation energy (E_a) for bromelain was 313.18 ± 57.44 kJ/ mol. Pineapple juice exhibited high bromelain activity (higher than 2,000 CDU/g) in a broad pH range (6–10), with two maximum at pH 8.0 and 10.0. For kinetic studies, we found that V_{\max} 65.78 ± 7.79 CDU/min/mg protein and K_m $4.00 \pm 0.07 \times 10^{-5}$ mol/l. Heating at 60 °C was selected in the study of effect of sugars and polyol on the thermal stability of bromelain. Denaturation temperature of bromelain with and without solutes using differential scanning calorimetry (DSC) were determined and used to elucidate the results. The % residual activity indicated the increased thermal stability of the enzyme in all the solutes. The thermal stability of bromelain increased with incremented concentrations of sucrose. Trehalose was the best stabilizer of bromelain, followed by sorbitol and sucrose, respectively. Therefore, if we want to preserve bromelain activity in pineapple juice from heat treatment. Trehalose should be added to pineapple juice before heat treatment.

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