I Got C: A Study of Epigallocatechin Gallate on the Stability of Vitamin C and Quality Parameters in Deaerated and Sonicated Fresh Orange Juice using Titration

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A novel study was designed to investigate the effect of epigallocatechin gallate (EGCG), a natural inhibitor of pectin methylesterase, at various concentrations on Vitamin C retention and quality parameters (pH, brix) in deaerated and 30 minute sonicated fresh orange juice (OJ) stored at 3.3°C and 21°C. The purpose was to study the kinetics of Ascorbic Acid (AA) degradation in OJ stored under test conditions using titration for 10 days. AA levels were studied using classic starch-iodine method and results were tabulated. AA deterioration ranged from 14.43% (OJ without EGCG at 21°C) to a remarkable 0.2273% (OJ with 4mg/mL EGCG at 3.3°C) over 10 days. The ANOVA test ($p=0.026 < 0.05$) indicated that there is a concentration-dependent relationship between the increase of EGCG and Vitamin C retention in OJ stored under test conditions. Various concentrations of EGCG do not have a significant effect on the pH ($p=0.968$) and brix ($p=0.982$) supported by ANOVA tests. The t-test shows that while there is no significant difference in pH values, there is a difference in brix values between containers at 3.3°C and 21°C. OJ without EGCG follows 1st order rate law; OJ with EGCG at both 3.3°C and 21°C follow zero and 1st order rate laws; 4mg/mL EGCG 3.3°C follows 1st order rate law after day 6. A direct relationship was found between activation energy and the concentration of EGCG. Storage temperature and EGCG appear to have an additive effect on Vitamin C retention in deaerated and sonicated OJ. The study has processing and packaging applications for preservative-free OJ fortified with EGCG; introduction of a first generational juicer with a sonicator and deaerator to store fresh OJ at home for health-conscious society; and food science applications for medical and space industry.

Awards Won: