

Relationship between Chalkiness and the Structural and Physicochemical Properties of Rice Starch at Different Nighttime Temperatures during the Early Grain-Filling Stage

Authors : Yongjun Zeng, Shan Huang, Guanjun Huang, Changzhi Long

Abstract : The chalkiness, starch fine structure, and physicochemical properties of rice starch were analyzed, and their correlations were investigated under different nighttime temperatures during the early grain-filling stage. Compared to MT, medium temperature (MT) and low (LNT) and high (HNT) nighttime temperatures resulted in an increased chalky grain rate (CGR) and chalkiness degree (CD). LNT mainly affected the chalkiness by increasing peak1 (short branch chains of amylopectin), the branching degree, and the proportion of small starch granules but decreasing peak2 (long branch chains of amylopectin) and peak 3 (amylose branches). This altered the pasting properties, such as by increasing the peak viscosity and final viscosity. However, HNT mainly affected the chalkiness by increasing peak 2 and the crystalline degree but decreasing peak 1 and peak 3. Regarding the thermal properties, HNT also elevated peak and conclusion temperatures. The CGR and CD were significantly and positively correlated with the proportions of small and medium starch granules, peak1, branching degree, gelatinization enthalpy, setback viscosity, and pasting time but markedly and negatively correlated with the proportion of large starch granules, amylose content, peak 3, peak viscosity, and breakdown viscosity. These findings suggest that LNT and HNT disrupted the starch structure, resulting in increased chalkiness. However, their mechanisms of action differ.

Keywords : chalkiness, starch fine structure, different nighttime temperatures, early grain-filling stage

Conference Title : ICRRD 2025 : International Conference on Rice Research and Development

Conference Location : Tokyo, Japan

Conference Dates : June 05-06, 2025