Advancing Biofortified Sweet Corn: Evaluating High Beta Carotene Parental Inbreds for Hybrid Development

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Addressing global malnutrition through the biofortification of staple crops is essential for improving public health and nutritional security. Sweet corn (Zea mays), a widely consumed vegetable, offers a unique opportunity to enhance dietary intake of essential nutrients, particularly beta carotene, a precursor to vitamin A. This study focuses on evaluating sweet corn inbreds with elevated beta carotene content to identify optimal parental lines for developing superior hybrids. The sweet corn lines developed in Tamil Nadu Agricultural University were utilized. Four sweet corn inbred lines, DBT 15, DBT 18, DBT 23, and DBT 25, were selected for their high beta carotene and sugar content during Summer 2024. The total sugar content and beta carotene levels were quantified in the 24th day after flowering, using the anthrone method and High-Performance Liquid Chromatography (HPLC), respectively. Additionally, marker analysis was performed to confirm the presence of the crtRB1 gene, which is crucial for beta carotene biosynthesis. The evaluations revealed the following results for total sugar content (%): DBT 15 with 15.26%, DBT 18 with 14.19%, DBT 23 with 14.9%, and DBT 25 with 15.2%. The beta carotene concentrations (µg/g) were: DBT 15 with 8.369, DBT 18 with 8.381, DBT 23 with 8.389, and DBT 25 with 7.894. Among these lines, DBT 15 and DBT 25 exhibited the highest sugar content, while DBT 18 and DBT 23 had the highest beta carotene levels. This research highlights the potential of these inbred lines as valuable parents for breeding nutritionally enhanced sweet corn hybrids. By identifying and utilizing superior parental lines, future hybrids can be developed to combine high beta carotene and sugar content, addressing both nutritional deficiencies and consumer preferences. Our findings contribute to the broader effort of food biofortification, promoting better health through enriched diets.

Keywords: Biofortification, Sweet Corn, Beta Carotene, crtRB1 Gene, Parental Inbreds