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Genetic variability in carbohydrate profile of maize

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Maize is the most widely distributed crop of the world, cultivated in tropics, sub-tropics and temperate regions in almost all the conditions of irrigated to semi-arid. It is, after wheat and rice, the most important cereal grain, providing nutrients for humans. In India, 52% of maize produced is used as poultry feed, about 24% as food, 11% as livestock feed, 11% in the wet milling industry and the rest for breweries and seed with 1% each. With the increasing production and productivity of maize, in some manner or another, every Indian's life is touched by one of our most abundant renewable resources, corn starch. From the clothing we wear to the food on our table, corn starch is a component of tens of thousands of manufactured products that define our modern lifestyle. The starch is made of two components: the linear polymer of glucose chain, amylose and amylopectin, the branched polymer of glucose units. In normal maize, the proportion of amylose to amylopectin is approximately in the ratio 25:75. However, maize having higher amylopectin content is termed as waxy maize, whereas, germplasm with more than 30% of amylose is called amylose extender (a.e.) lines. Both waxy as well as a.e. lines have different industrial applications. Waxy maize is highly regarded for making jellies, whereas, a.e. maize is mainly used for making starch threads. Keeping this in view the present study was planned to evaluate the carbohydrate profile of 28 elite maize germplasms. The seeds were ground to powder and analyzed for total starch, amylose in starch and amylopectin in starch. A significant variation was observed in the total starch content. It varied from 53.84 (WOSC) to 75.06 (Hybrid-9471). Amylose in starch showed a wide variability ranging from 2.81 (EC6200071) to 55.82 (African Tall), whereas amylopectin content also exhibited vast variation ranging from 44.18 (African Tall) to 97.19 (EC6200071). The results showed that the germplasm is highly important in terms of genetic variability of the carbohydrate profile and could effectively be exploited for the development of waxy as well as a.e. maize to meet the ever increasing demand of the maize industry in the changing scenario.

Keywords
maize; starch; waxy maize; amylose; amylopectin.

GRAIN STORAGE

Optimization of drying process for PB1121 variety of paddy

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Rough rice is typically harvested at moisture contents ranging from 20% to 24%, and subsequently dried to approximately 12% for safe long-term storage and milling. Harvesting paddy at high moisture content normally results in high yields and less damage and prevents field losses due to dropping and shattering. Drying of grains creates moisture and temperature gradient within the kernel resulting in the development of tensile stresses at the surface and compressive stress at the interior of the rice kernel. These stresses may result in kernel fissuring and subsequent breakage during milling. Thus, drying is considered to be one of the most critical operations in post-harvest processing of paddy which has great influence on milling yield. Basmati rice possesses unique cooking, eating and digestive qualities. India accounts for more than 70% of the world basmati rice production. Among basmati, PB1121 is widely grown in India and contributes a major share of rice exports from the country. Therefore drying of PB1121 was carried out with the objective to optimize the drying variables for minimum drying time and maximum head yield. Drying was carried out in 2-passes using a cross-flow dryer. The drying experiment in thin layer was conducted as per a central composite rotatable design in response surface methodology with 3 factors (drying air temperature, tempering time and moisture reduction in first drying pass) at 5 levels. The variables chosen for the experiment were drying air temperature (40–70 °C), tempering time (60–240 min) and moisture reduction percentage (3–10%) in the first pass of drying. Optimization of drying variables was done through the use of a desirability function by combining all responses into one measurement. The desirability functions were minimum drying time, maximum brown rice yield and head rice yield. Total drying time ranged from 35 to 132 min in two stages of drying, while in continuous drying it varied from 41 to 204 min. Head rice yield ranged from 39.77 to 71.56%. Optimum conditions for drying of paddy grains were found to be temperature of 58.3 °C, 7.13% moisture reduction and 148 min tempering time. At optimized conditions, total drying time and head rice yield were calculated at 53.1 min and 54.53%, respectively.

Keywords
Paddy (PB1121); two stage drying; optimization.

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