Abstract

Processed bean quality is affected by intrinsic (genetic) preharvest factors (agronomic), postharvest storage environment and processing conditions. The effect of genetic background on processing quality has been demonstrated in genetic and genetic-environmental interaction studies. Food processors are interested in identifying models to predict processed bean culinary quality using dry bean physico-chemical and rheological characteristics.

Different groups of beans of diverse or specific origin and genetic backgrounds were selected to measure quality characteristics. Processing studies included evaluation of initial moisture, dry bean color, soaked weight, hydration coefficient, water content, washed drained weight, texture, dry weight, clumps and splits. Moisture and alcohol insoluble solids of bean flour and rheological characteristics of hot (95 °C) and cool (50 °C) pasting torques of bean flour slurries (6%, db) were also evaluated. The interrelationships among bean culinary quality, physico-chemical and rheological characteristics were determined by production-location matrices, factor analyses, and principal component analyses.

Results showed that particle size as well as chemical compositions of starch granules and protein matrices influenced bean flour rheological behaviors which were related to canned bean culinary quality.

Results showed year, location, cultivar and their interactions affected bean culinary quality, physico-chemical and rheological characteristics. Factor analysis categorized quality traits into groups designated as "soaking", "dry color", "thermal", and "general quality" factors. Similar results were found in both correlation and principal component analyses. High associations were exhibited among traits as followed: (1) soaked weight, hydration coefficient, and water content; (2) dry bean color characteristics L, a and b; (3) washed drained weight, texture, and dry weight; and (4) hot pasting torque, and cool pasting torque.

Regression analyses demonstrated limited correlations among dry bean physico-chemical and rheological characteristics, and processed bean culinary quality for the diverse bean cultivars/strains. High correlations obtained for several varieties of navy beans showed processed bean quality could be adequately predicted from raw product characteristics for selected beans within a common commercial class. However, bean culinary quality could not be predicted by using models from different commercial classes of beans or from bean groups of different origins.

Ranking tests for specific bean cultivars showed potential value for breeding improvement programs to select bean cultivars for improved processing utility.