

Executive Summary

Bean flours can be used in the baking industry to enhance the nutritional properties of bread. Although they function well in bread applications, inconsistency can occur from lot to lot. Furthermore, the use of bean flours can contribute to undesirable flavours in the end-product. It was the objective of this research to examine the effects of genotype (G), environment (E), year (Y) and their interactions on the flour and baking properties of beans from four market classes (navy, pinto, black, cranberry). For each market class, two or three genotypes (varieties) grown at two or three environments (locations) in Manitoba over two growing years were examined. Beans were milled into flour and analyzed for flour properties (protein and starch contents, pasting properties, water absorption capacity, and particle size properties). Pulse flours were blended with wheat flour (20:80 / pulse flour:wheat flour) and baked into bread. Bread quality parameters (crumb cell structure, volume, colour) were measured. The breads were also analyzed for their sensory characteristics (appearance, aroma, pulse flavour, sweetness, bitterness, aftertaste and overall acceptability) using a trained panel.

The data revealed that there were both main effects and two and three way interactions. Significant main effects indicated that the variable (G, E and/or Y) affected the results. Two way interactions (G x E, E x Y, and/or G x Y) indicated that two variables interacted with each other to affect the results. A three way interaction (G x E x Y) indicated that there was a two-way interaction that varied across levels of a third variable which affected the results. Significant three way interactions (G x E x Y) were observed for most flour properties regardless of market class. Significant two way interactions, G x Y and/or E x Y were found for crumb cell structure (cell contrast, cell diameter), bread volume, and crumb colour depending on the market class. A significant three way interaction, G x E x Y, was found for crumb colour of bread made with pinto bean flour. Depending on market class, significant main effects, G or Y, and two way interactions, G x Y and/or E x Y, were found for all sensory parameters except bitterness. A significant three way interaction (G x E x Y) was found for appearance and aftertaste of bread made with black bean flour and for overall acceptability of bread made with navy bean flour. These results are of practical importance to flour millers and bakers who require consistent flour quality with little to no variation from lot to lot. It is also valuable in selecting specific bean varieties with the desired quality traits for use in bakery applications.