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ABSTRACT

This study demonstrates the effect of milling and extrusion processing on the functional properties such as antioxidant capacity, total phenolic compound and resistant starch content of extruded snack foods developed based on cereal and legume along with non-use food part of vegetable and herbs. Result showed that Japanese green tea and egoma leaf possessed the highest antioxidant capacity. Red kidney bean and corn grit presented the highest resistant starch content. Effect of milling process such as screw crushing, hammer milling and jet milling on green bean, broad bean, and black soy bean, were also studied. The result found that hammer mill was more suitable for blending with respect to antioxidant capacity, phenolic and resistant starch content compared to the other processes ($p<0.05$). Extrusion process slightly decreased the antioxidant capacity and phenolic content in all the extruded products but their resistant starch content was make highly decrease. The optimization conditions for Japanese green tea and egoma leaf snack production were investigated using response surface methodology. A central composite design with four independent variables: screw speed (116, 150, 200, 250 and 284 rpm); feed rate (28.8, 32.0, 38.3, 44.7 and 47.9); moisture content (13.0, 14.0, 16.0, 18.0 and 19.0 %) and vegetables or herbs content (0.0, 1.0, 3.0, 5.0 and 6.4) was use to study the response variables such as expansion ratio, bulk density, hardness, crispness, antioxidant activity, total phenolic and resistant starch content. A second-degree equation for independent and response variables was computed and used to create the contour and surface plot graphs. The screw speed at 196 rpm, feed rate of 44.7 g/min, moisture content at 15.4 % and vegetables or herbs content of 3.4 % were suitable to make Japanese green tea snack with the responses as 2.215 ± 0.097 (expansion ratio); 0.463 ± 0.002 g/ml (bulk density); 3241 ± 337 g (hardness); 9.800 ± 4.494 (crispness); 0.904 ± 0.033 mmol Trolox/g (antioxidant activity); 5.098 ± 0.502 mg GAE/g (total phenolic content) and 0.305 ± 0.010 % w/w (resistant starch content). The optimum condition for egoma leaf snack processing was 215 rpm, 43.1 g/min, 14.1 % and 3.0% for screw speed, feed rate, moisture content and vegetables or herbs content, respectively. Under the same condition of Japanese green tea snack production, expansion ratio of 2.203 ± 0.084, bulk density at 0.480 ± 0.006 g/ml, hardness of 3451 ± 207 g, crispness at 9.800 ± 3.899, antioxidant activity of 0.253 ± 0.022 mmol Trolox/g, total phenolic content at 3.022 ± 0.253 mg GAE/g and resistant starch content of 0.218 ± 0.010 % w/w were also presented for egoma leaf snack. However, as for the sensory evaluation of the score and acceptation from Japanese green tea and egoma snack were still low in the level of neither like nor dislike. Further improvement in developing these products need to be taken into consideration.