

## EFFECT OF THE USE OF ANDEAN PURPLE MAIZE ON TECHNOLOGICAL PROPERTIES OF BREAKFAST CEREAL

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### Abstract

Andean purple maize (PM) contains fibers and natural pigments, which could improve the quality of extruded products. In this project, we evaluated the technological properties of a breakfast cereal formulated with substitution of commercial yellow corn by PM whole-flour in 25% (PM25), 50% (PM50), 75% (PM75) and 100% (PM100). The results show that as the concentration of PM increases in breakfast cereal, it presents a greater intensity of the purple color and water absorption index, at the same time that decrease its instrumental hardness and expansion index.

### Key words:

Sustainability, anthocyanins, thermoplastic extrusion.

### Introduction

Excessive amounts of sugar, low fiber content and the use of artificial colorants, have been the biggest problems of commercial breakfast cereal. Compositionally, Andean purple maize (PM) is similar to the commercial yellow corn, is rich in starch (~60%), proteins (~6%) and lipids (~3%). However, it is the presence of natural pigments, as anthocyanins and other phenolic compounds, what differentiates PM from other conventional corn varieties, and makes it stand out as a health-promoting food. In this sense, the aim of this study was to produced and evaluated the technological properties of a breakfast cereal formulated with PM whole-flour.

### Results and Discussion

From the four formulations subjected to thermoplastic extrusion process, were obtained extruded products type breakfast cereal (Figure 1). The extrusion cooking was conducted in triplicate using a twin screw extruder, with constant parameters: die diameter (4.8 mm), screw speed (210 rpm), moisture (18%) and temperatures of four zones (70°C, 110°C, 130°C and 150°C).

Results of technological characterization are presented in the Table 1.



**Figure 1.** Formulations and extruded products, type breakfast cereal, obtained using four concentrations of Andean purple maize: 25% (PM25), 50% (PM50), 75% (PM75) and 100% (PM), with commercial yellow corn.

**Table 1.** Technological properties of breakfast cereal elaborated with Andean purple maize (PM)<sup>1</sup>

Properties	PM25	PM50	PM75	PM100
M (%)	3.69±0.06 <sup>ns</sup>	3.72±0.04 <sup>ns</sup>	3.70±0.06 <sup>ns</sup>	3.69±0.03 <sup>ns</sup>
a <sub>w</sub>	0.22±0.03 <sup>ns</sup>	0.24±0.01 <sup>ns</sup>	0.22±0.02 <sup>ns</sup>	0.23±0.03 <sup>ns</sup>
H (N)	38.59±3.62 <sup>c</sup>	40.72±3.86 <sup>d</sup>	36.37±3.36 <sup>b</sup>	34.18±2.57 <sup>a</sup>
EI	2.20±0.10 <sup>a</sup>	2.01±0.09 <sup>b</sup>	1.93±0.09 <sup>c</sup>	1.83±0.09 <sup>d</sup>
D (g/cm <sup>3</sup> )	0.25±0.03 <sup>a</sup>	0.28±0.05 <sup>b</sup>	0.31±0.04 <sup>c</sup>	0.33±0.05 <sup>d</sup>
WSI (%)	69.96±2.73 <sup>d</sup>	65.41±2.15 <sup>c</sup>	62.31±2.49 <sup>b</sup>	51.38±1.88 <sup>a</sup>
WAI (%)	476.1±14.4 <sup>d</sup>	517.7±9.7 <sup>c</sup>	559.4±11.7 <sup>b</sup>	610.8±10.1 <sup>a</sup>
<b>Color parameters</b>				
L*	26.89±0.51 <sup>d</sup>	20.31±0.40 <sup>c</sup>	17.29±0.32 <sup>b</sup>	15.39±0.27 <sup>a</sup>
a*	7.60±0.29 <sup>c</sup>	7.21±0.14 <sup>b</sup>	7.20±0.15 <sup>b</sup>	0.65±0.38 <sup>a</sup>
b*	6.06±0.08 <sup>d</sup>	1.72±0.12 <sup>c</sup>	5.72±0.02 <sup>b</sup>	-0.35±0.02 <sup>a</sup>

<sup>1</sup>Different lowercase letters on the same row differ from each other by Scott-Knott test (p<0.05). ns= non-significant  
M= moisture; a<sub>w</sub>= water activity; H= hardness; EI= expansion index; D= density; WSI= water solution index; WAI= water absorption index; L\*=brightness; a\*= redness or greenness; b\*= yellowness or blueness.

The breakfast cereal elaborated with 100% PM whole-flour (PM100), presented the best technological characteristics in terms of an intense purple color and less hardness; however, in order to the use of a whole flour (high amount of fiber) PM100 presented a less expansion index and low density compared with the products that included commercial yellow corn.

### Conclusions

Andean purple maize has potential as ingredient that confers color and improve the texture of breakfast cereal, at the same time that increase the added value and demand of this grain.

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<sup>1</sup> AACC. Approved Methods of Analysis-American Association of Cereal Chemists. St. Paul, 2010.