

Effect of CMC on the physico-chemical properties of masa-water mixture

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ABSTRACT

CMC is a commonly added to corn tortillas to delay staling. CMC increases the viscosity of a masa/water mixture during thermal processing, and is hypothesized to compete with the masa constituents for the water. During cooling, the gum may inhibit retrogradation of gelatinized starch granules, influencing the flexibility of tortilla. Little is known about the interaction of the different components in the masa system at the super-structural level.

In this work, two different types of CMC (PE31FGS and PE32FGS) and guar gum were added at 10% level to a 55% moisture masa mixture. The enthalpy of the peak around 60°C attributed to amylopectin melting was the same among all samples with the same mc. The CMC with the higher viscosity lead to increased "freezable" water in the heated masa/water mixture. In addition, TGA results show that CMC has an impact on the distribution of water in the mixture.

INTRODUCTION

Carboxymethylcellulose (CMC) is an anionic water-soluble polymer derived from cellulose, which is widely used as food gum. For food use, the average degree of substitution 0.7.

In corn tortillas CMC helps maintain softness, thus increasing the shelf life of the product.

CMC is hypothesized to compete for water with other components in the dough and increase the viscosity of the mixtures, thus maintain the softness of tortilla.

The behavior of CMC and the distribution of water in the food system have not been studied at a superstructural level.

Thermal and thermomechanical analysis techniques have been shown to be particularly well suited for such characterization.

OBJECTIVE

The objective of this study was to characterize the impact of different types of CMC and guar gum on the superstructural characteristics of masa mixtures with 55% moisture content.

MATERIALS & METHODS

Masa-water mixture
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Adjusted to 55% moisture content
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Add PE31FGS CMC, PE32FGS CMC and guar gum at 10% level.

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Scanned by DSC from -50°C to 165°C @ 5°C/min and hold at 165°C for 3 minutes.

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Stored for 0-14 days @ 4°C.

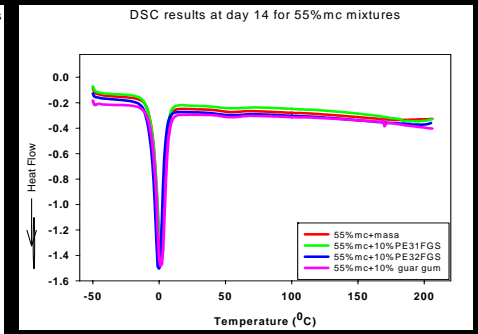
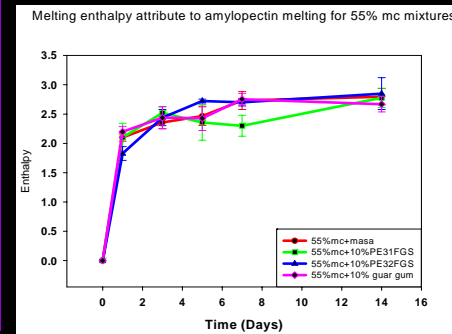
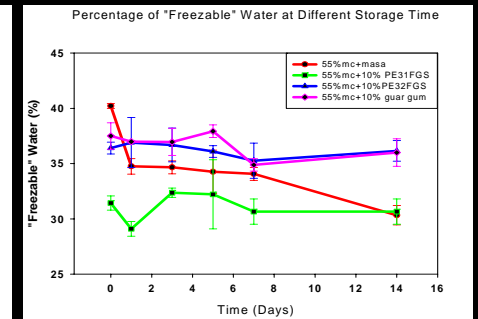
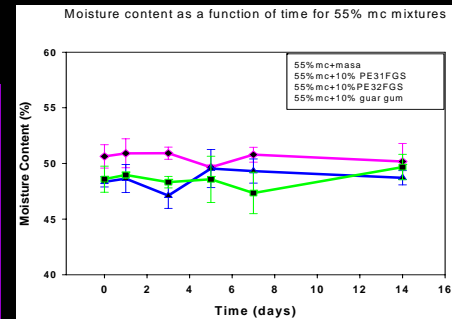
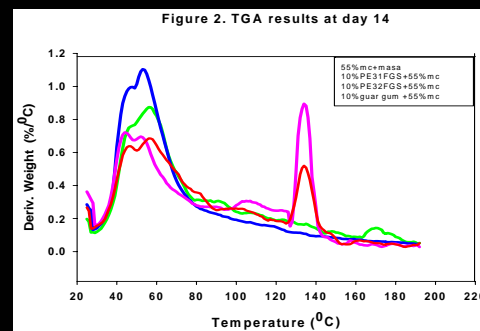
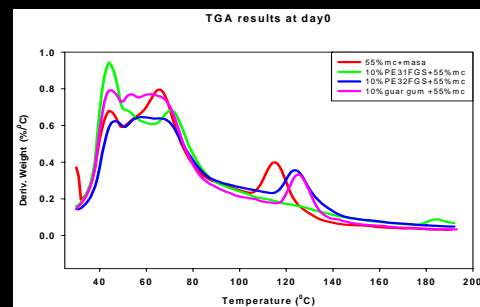
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Analyzed by High-Res TGA 2950 – TA Instrument (Thermogravimetric Analysis).

25°C to 200°C @ 20°C/min with sensitivity 3.0 and resolution 3°C

Analyzed by DSC 2920 – TA Instrument (Differential scanning Calorimeter)

-50°C to 210°C @ 5°C/min

RESULTS



Conclusion & Discussion

- There are no differences in moisture loss within samples with 55% mc with and without CMC.
- TGA results show that CMC does have an impact on the distribution of water in the mixture. Water was not homogeneously partitioned within the masa/water/CMC mixture. There is intermediate water in the system.
- The transition in DSC around 0°C is attributed to "freezable" water. The transition around 40°C is attributed to amylopectin melting. The sample with PE32FGS CMC and guar gum had a higher percentage "freezable" water than the samples with PE31FGS CMC and without CMC. This may be due to the higher viscosity of PE32FGS CMC and guar gum than PE31FGS CMC. CMC with different viscosity does have an impact on the amount of "freezable" water. The addition of gum has no impact on the enthalpy of amylopectin melting.
- Tortilla with CMC has a softer and more flexible texture than tortilla with guar gum.
- These results show that CMC not only had impact on the water distribution, but also its viscosity affect the percentage of "freezable" water in the tortilla.

REFERECES

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- Lindberg, J., Sirvio, H and Martinmaa, J. Rheological Studies On CMC. Cellulose Chemistry and Technology, 21: 379.