



# Bioplastics from chicken feathers

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## Summary

Chicken feathers, a by product of the poultry industry, were thermally transformed by extrusion into a plastic material. The obtained material showed suitable mechanical properties for future application developments.

## Problem

Chicken feathers are a waste or low value by-product of the poultry industry. It is estimated that around 80,000 tons of chicken feathers are generated annually in Canada. Most of the feathers generated are treated as a waste ending in landfills or being burned. Although some efforts have been made to process parts of feather or extracted keratin protein into plastic, the use of full fat whole feather for making plastics has not been studied. The aim of this study was to investigate the suitability of whole chicken feathers to be transformed in plastic materials through thermal processes.

Specific objectives:

- To determine optimal processing temperature and moisture content for processing feather bioplastics
- To determine the effect of nanoclay incorporation on mechanical properties of feather bioplastics

## Our Approach

White chicken feathers obtained from the Poultry Research Centre were cleaned, washed, ground and mixed with additives to help their processing. After the determination of optimal extrusion temperature and moisture content, the effect of natural nanoclay (montmorillonite) incorporation was studied according to the scheme presented below.

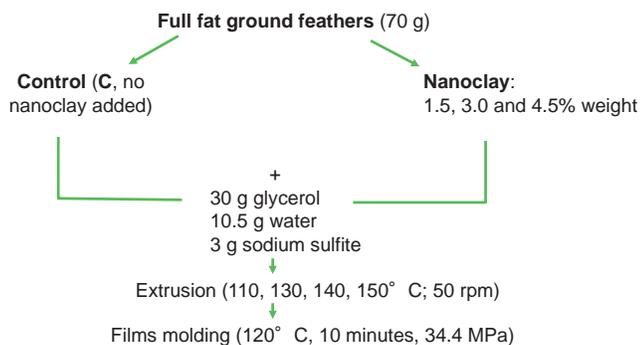


Figure 1. Scheme of chicken feather processing into bioplastics.

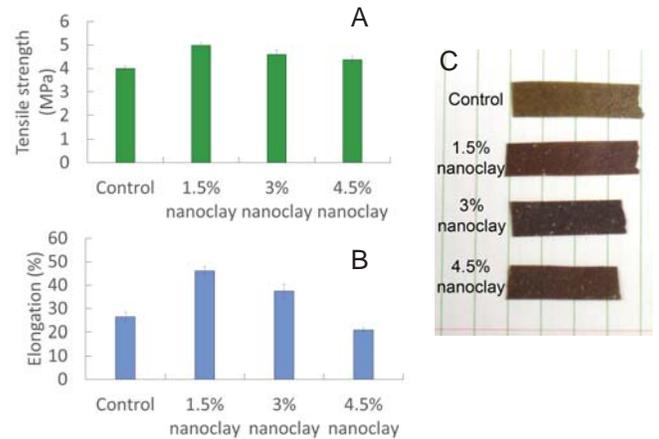


Figure 2. Tensile strength at break (figure A), elongation at break (figure B) and digital photography (figure C) of feather bioplastics.

## Our Observations

Improvements of tensile strength (25% increment) and elongation (74% increment) of feather bioplastics were achieved by incorporating 1.5% nanoclay.

Although mechanical properties of feather bioplastics are lower than those of non-degradable petroleum based materials, they are similar to the properties of several commercial petroleum-based biodegradable plastics.

Chicken feathers without any further treatment other than grinding can be processed into bioplastics using conventional plastic processing machinery. In addition, synthetic and harmful additives are not required in the process.

## What Does this mean?

Current efforts are being focused to further improve the mechanical properties and to test the biodegradability of feather bioplastics.

It is expected that the developed bioplastics can be used for several applications, such as agricultural mulches and pots, composting bags, or as structural materials in the fabrication of household items or interior parts for cars, filling in part the increasing demand for environmentally-friendly plastics.

## Acknowledgements



## Contact Information

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