

Dalhousie University, Faculty of Agriculture

AGRI5710 and AGRI5705: Graduate Module Course

Module Title: **Biopolymers and their Applications in Food Packaging**

Instructor: Dr. Avik Khan

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Dates module will be offered: September-November 2019.

Frequency of formal classes/meetings: The module will comprise of 4 classes (2 hr each) and 1 lab work of 4 hrs. The classes will be held remotely via video conference and the lab work will be held at the Dalhousie Agricultural Campus (Truro, NS).

Module Content and Learning Objectives

The purpose of food packaging is to preserve the quality and safety of the food it contains from the time of manufacture to the time it is used by the consumer. An equally important function of packaging is to protect the product from physical, chemical, or biological damages. The packaging also has a secondary function, i.e., reduction of loss, damage and waste for distributor and customer, and facilitate in storage, handling and other commercial operations (Khan, Khan, et al., 2012; Khan, Huq, Khan, Riedl, & Lacroix, 2012). The most well-known packaging materials that meet these criteria are petroleum-based materials (synthetic polymers), which have been in use by the food industry for over 50 years. These materials are not only safe, inexpensive, versatile, but also flexible. However, one of the limitations with plastic food packaging materials is that it is meant to be discarded, with very little being recycled (Van Den Broek, Knoop, Kappen, & Boeriu, 2015). One-third of household waste consist of food packaging materials. About 80% of it are single-use plastics, of which <11% get recycled in Canada. Most of them end up in landfills and water bodies, polluting the ecosystem.

In addition to the above environmental issues, food packaging has been impacted by notable changes in food distribution, including globalization of the food supply, consumer trends for more fresh and convenient foods, as well a desire for safer and better-quality foods. Given these and previously mentioned issues, consumers are demanding that food packaging materials be more natural, disposable, potentially biodegradable, as well as recyclable. These sentiments are well reflected in the recently launched (October 2018), "Plastic Challenge-Food Packaging" competition by the Innovation, Science and Economic Development Canada. The challenge is designed to target innovative and sustainable food packaging materials to reduce the generation and disposal of plastic/ waste.

This module is intended for graduate students in the Faculty of Agriculture and others who are interested in learning about recent trends in the utilization of biopolymers for sustainable food packaging applications. The module will include discussions on commonly used food packaging materials; introduction to biopolymers, their properties, and bio-based food packaging, potential benefits and possible limitations, and discussions on bio-based film fabrication techniques. Students will be encouraged to actively take part in discussions and give presentations on current issues surrounding plastic waste problem and food packaging. There will also be a training (lab work) on the preparation of biopolymeric films via solution casting and extrusion method.

Method of Evaluation:

Students will be given a food packaging related problem to research and make presentations of their findings (30%), 1000-word final assignment (50%), participation/contribution to discussions (20%).

Any restrictions on enrollment: N/A

Reference:

- Khan, A., Huq, T., Khan, R. A., Riedl, B., & Lacroix, M. (2012). Nanocellulose Based Composites and Bioactive Agents for Food Packaging. *Critical Reviews in Food Science and Nutrition*, 120904065059008. <http://doi.org/10.1080/10408398.2011.578765>
- Khan, A., Khan, R. A., Salmieri, S., Le Tien, C., Riedl, B., Bouchard, J., ... Lacroix, M. (2012). Mechanical and barrier properties of nanocrystalline cellulose reinforced chitosan based nanocomposite films. *Carbohydrate Polymers*, 90(4), 1601–1608.
- Van Den Broek, L. A. M., Knoop, R. J. I., Kappen, F. H. J., & Boeriu, C. G. (2015). Chitosan films and blends for packaging material. *Carbohydrate Polymers*, 116, 237–242. <http://doi.org/10.1016/j.carbpol.2014.07.039>