

## FOOD CHEMISTRY &amp; NUTRITION

July 24-26, 2017 Vancouver, Canada

## The impacts of processing method and age on phytochemicals and bioactivities of coffee leaf

Xiu-Min Chen and David D Kitts  
University of British Columbia, Canada

**Statement of the Problem:** Coffee-leaf tea has been found to have potential health benefits due to its high polyphenol content and low caffeine content, compared with green tea. There is no information related to the effects of both processing methods and the age of leaf on the phytochemical profile and related bioactivities. The purpose of this study is to investigate the effects of different processing methods and age of coffee leaf, on the phytochemical profiles and associated antioxidant and anti-inflammatory activities.

**Methodology:** Coffee leaves collected as young or old leaves harvested on a Nicaragua coffee plantation, were processed to mimic the production of white, green, oolong, and black tea by varying the processing method. The dried leaves were ground into powder and infused in boiling water for 0.5, 10, and 20 min, respectively. Phytochemical profiles, total phenolic content (TPC), antioxidant activity and the effects on nitric oxide (NO), inducible nitric oxide (iNOS) and cyclooxygenase 2 (COX-2) and pro-inflammatory cytokines production in raw 264.7 cells, both with or without induction by lipopolysaccharide (LPS) and interferon gamma (IFN- $\gamma$ ) were investigated.

**Findings:** The contents of mangiferin, caffeine, 3-O-caffeoylquinic acid (3-CQA), 5-CQA, 3,4-O-dicaffeoylquinic acid (3,4-diCQA), 3,5-diCQA, and rutin in coffee leaves extracted using hot water within 0.5 min were not significantly different in the same samples extracted longer for 10 or 20 min. Young coffee leaves processed by electric drying after a flash boil (e.g. green-tea-treatment), contained the highest contents of mangiferin, rutin, chlorogenic acids, and TPC, which also corresponding to high antioxidant activity. Young leaves dried using a drum drier after 2 h oxidation (e.g. oolong-tea-treatment) had significantly lower content of phenolic compounds, TPC, and antioxidant and anti-inflammatory activity when compared with old leaves dried in the same way. However, when leaf was oxidized for 48h (e.g. black-tea-treatment), the old leaves had lower antioxidant and anti-inflammatory activities compared to young leaves. In contrast to antioxidant activities, the anti-inflammatory activity of coffee leaf infused with boiling water for 10 and 20 min was significantly higher compared to the 0.5 min of infusion ( $P < 0.05$ ). A most interesting observation was with old leaves processed with a black-tea-treatment, that showed capacity to induce NO production in Raw 264.7 cells, while also having NO inhibitory effects when the cells were challenged with LPS+IFN- $\gamma$ . All hot water extracts exhibited a dose-dependent inhibition of iNOS protein expression when cells were challenged with LPS+IFN- $\gamma$ , among which green-tea-treatment had greater inhibitory capacity compared to those processed using a black-tea-treatment. Moreover, old leaves processed with black-tea-treatment induced iNOS expression. Coffee leaf extracts could not significantly inhibit COX-2 expression, instead they induced COX-2 and the black-tea-treatment on the old leaf possessed the highest capacity to induce COX-2. Black-tea-treatment of the old leaf also significantly induced pro-inflammatory cytokines, including IL-1 $\alpha$ , IL-1 $\beta$ , IL-6, IL-10, G-CSF, GM-CSF and TNF- $\alpha$ . Green-tea-treatment of the young leaf significantly inhibited IL-1 $\alpha$ , IL-6, IL-10, and GM-CSF. All four types of coffee leaves induced IL-1 $\beta$ , inhibited IL-6 and IL-10, whereas, they could not inhibit G-CSF and TNF- $\alpha$ .

**Conclusion & Significance:** Our study shows that processing methods and the age of the coffee leaf at harvest will influence the phytochemical profile, antioxidant and anti-inflammatory activities. Although infusion time did not affect phenolic content, TPC and related antioxidant activities, there was an effect on the anti-inflammatory activity. Green-tea-treatment of young leaf possessed the highest anti-oxidant and anti-inflammatory activities.

## Biography

Xiu-Min Chen graduated from Beijing University of Chemical Technology with a major of biochemical engineering. She worked two years in a bioengineering company to develop PCR diagnostic kits before she continued her master's study at Chinese Academy of Sciences, Institute of Process Engineering, where she studied the anti-diabetic effects of *Amorphophallus konjac* oligosaccharide and chromium(III) complex. She obtained PhD degree in Food Science at University of British Columbia, where her research focus on the antioxidant and anti-inflammatory Maillard reaction products which are produced during heat processing of foods. She continued working as a postdoc and sessional lecturer at UBC. Currently, she is the research associate at UBC, Food, Nutrition and Health. Her research areas include chemical and functional changes of heat-processed food; antioxidant and anti-inflammatory bioactive components from food, plant, and herb; and bioavailability of functional components. She has extensive experience on isolation and characterization of bioactive components from various foods and plants, such as orange peel, blueberry, cranberry, and coffee leaf and study antioxidant and anti-inflammatory mechanisms, especially on intestinal inflammation.

xiumin.chen@alumni.ubc.ca