Role of Roast on Chemical Characteristics of Cold Brew Coffee

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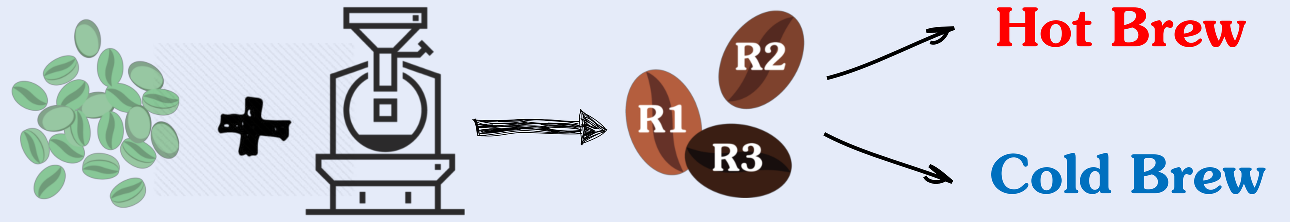
Introduction

Compared to traditional hot brewing, cold brewing coffee has recently become a popular coffee production method. A significant body of literature on coffee bean roasting and hot brew coffee chemistry exists, but there is little understanding of how cold brew coffee chemistry is affected by the roasting temperature of the beans, which results in physical and chemical changes to the solid matrix. Roasting green coffee beans produces bioactive compounds necessary for a flavorful and aromatic cup of coffee, involving important chemical syntheses and degradation occurring within the solid bean matrix.

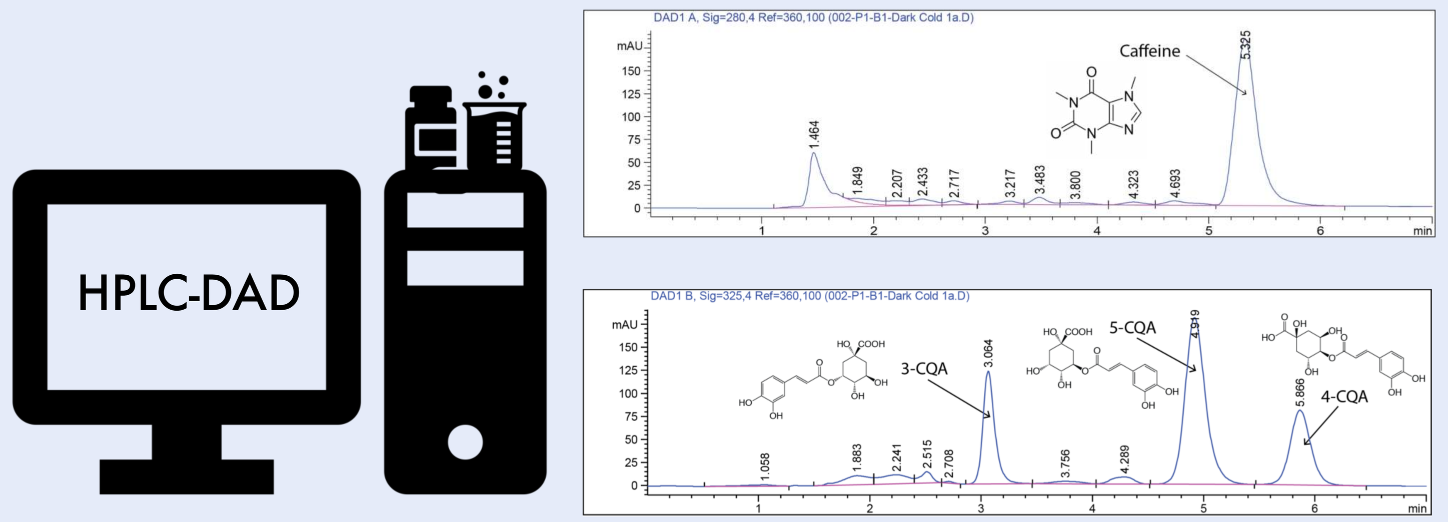
A previous study by Fuller & Rao[1], found that grind size and roast effect the bioactive compounds found in cold brew coffee, as does brewing method[2]. It is known that degree of roast significantly affects the chemistry of hot brew coffee[3,4,5], but little is known about the effect of roasting temperature on cold brew coffee chemistry. This work investigates differential extraction yields of hot and cold brewing methods for three roast temperatures, R1, R2, R3 with R1 being the lightest roast and R3 being the darkest, to better understand what role water temperature plays in facilitating the solubility of soluble solids.

Methodology

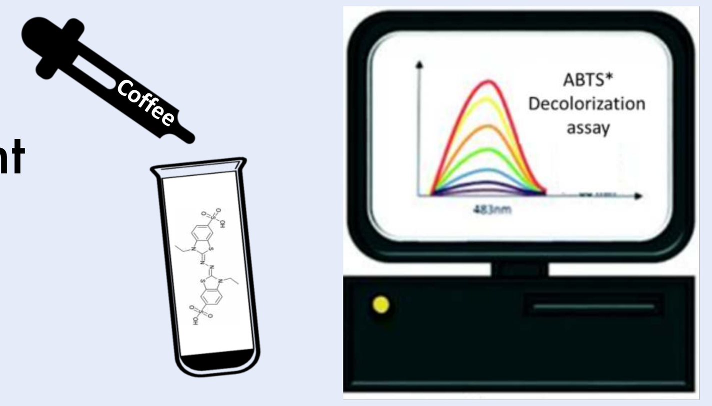
A — Roast, grind, sieve, and brew



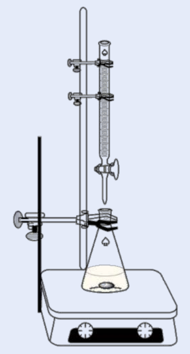
B — Quantification of Caffeine and CQAs



C — Antioxidant Activities



D — pH and Total Titratable Acids



Results

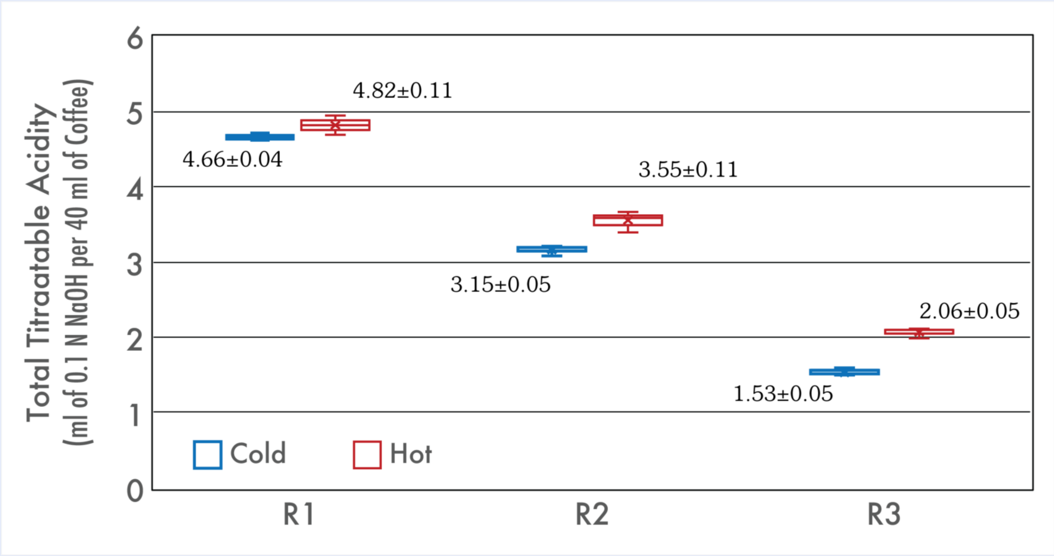


Figure 1. Total titratable acidity (TA) of cold brew and hot brew coffee at 3 roast levels, reported as mean±SD. (*n* = 3)

Acidity

Cold brew coffees across all three roast temperatures were slightly less acidic than their hot brew counterparts (Figure 1). As roasting temperature increased, the total titratable acidity (TA) of all coffees decreased. With an increase in roasting temperature, an increase in the TA differences between cold and hot brew coffees was also observed to increase slightly, indicating that roasting influences extraction processes.

Table 1. pH of cold brew and hot brew coffee at 3 different level of roast, reported as mean±SD. (*n* = 3)

Roast	Cold Brew	Hot Brew
R1	5.00 ± 0.06	4.80 ± 0.01
R2	5.30 ± 0.01	5.04 ± 0.01
R3	5.75 ± 0.02	5.39 ± 0.02

The deviations in pH between hot and cold brew coffee increased as a function of roasting temperature (Table 1), indicating hot water extraction yields increased availability/solubility of certain acidic compounds. The pH differences due to roast temperature were larger than differences in pH due to water extraction temperature.

CQA and Antioxidant Activity

As roasting temperature increased, the total caffeoylquinic acid (CQA) concentrations in both cold and hot brew coffees decreased (Figure 2). The water temperature during distraction did not affect the extraction of CQA, nor did it cause a differential extraction of CQA isomers.

Across the hot brew coffees, there was little relation between degree of roast and antioxidant activity as determined via the ABTS·+ decolorization assay; the extraction yield of antioxidant compounds decreased as degree of roast increased. For all roasts, the hot brew coffee showed higher levels of antioxidant capacity. The difference in antioxidant activities between hot and cold brew coffee was nearly 30% for the darkest roast (R3).

Caffeine

All coffees analyzed had comparable caffeine concentrations regardless of roast temperature or extraction temperature (Figure 4).

The extraction of caffeine is depended of grind size distribution. The particle size for coffee ground used in this study was between 500 μm to 2000 μm.

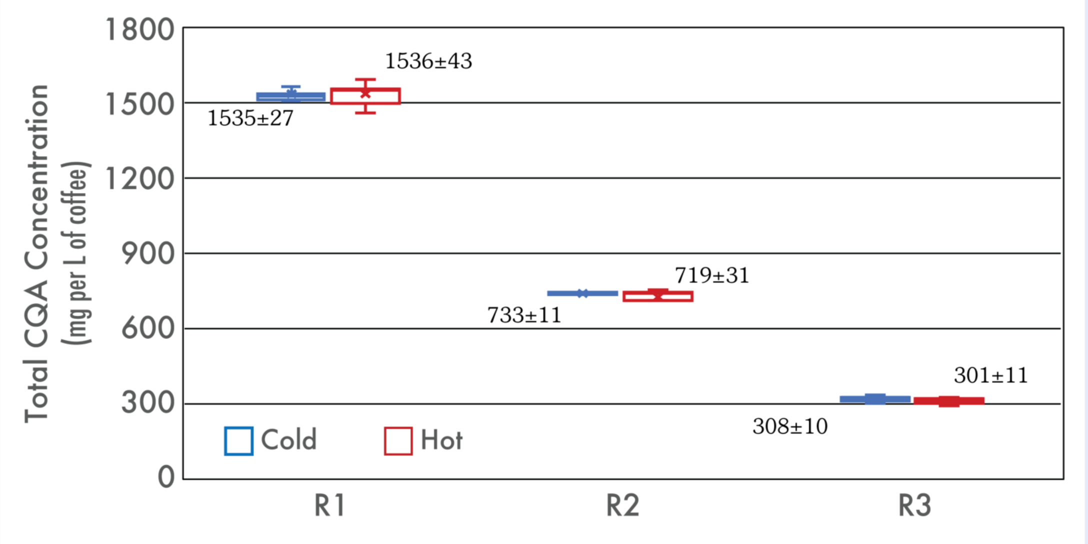


Figure 2. Total CQA concentration of cold brew and hot brew coffee at 3 roast levels, reported as mean±SD. (*n* = 9)

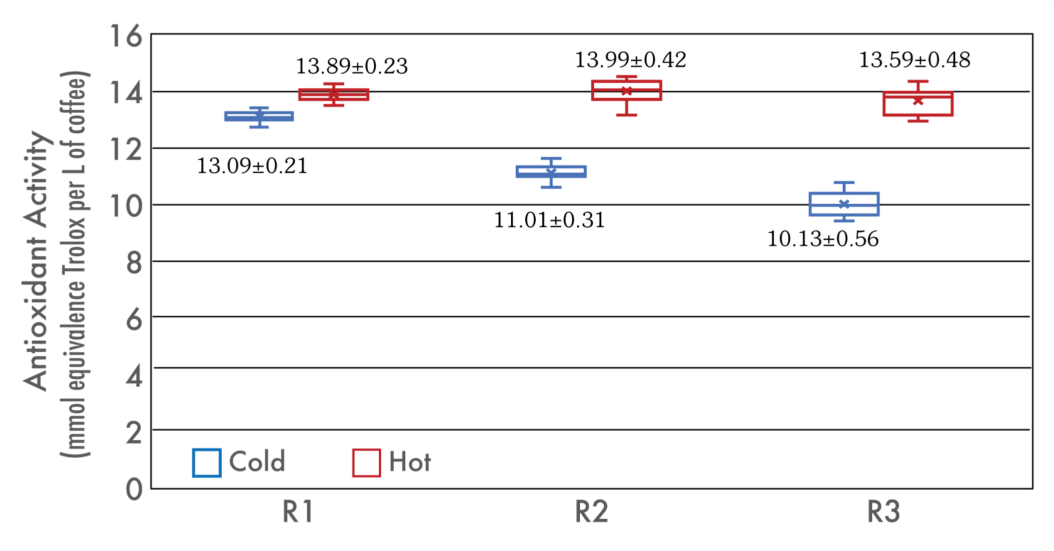


Figure 3. Antioxidant activity of cold brew and hot brew coffee at 3 roast levels, reported as mean±SD. (*n* = 9)

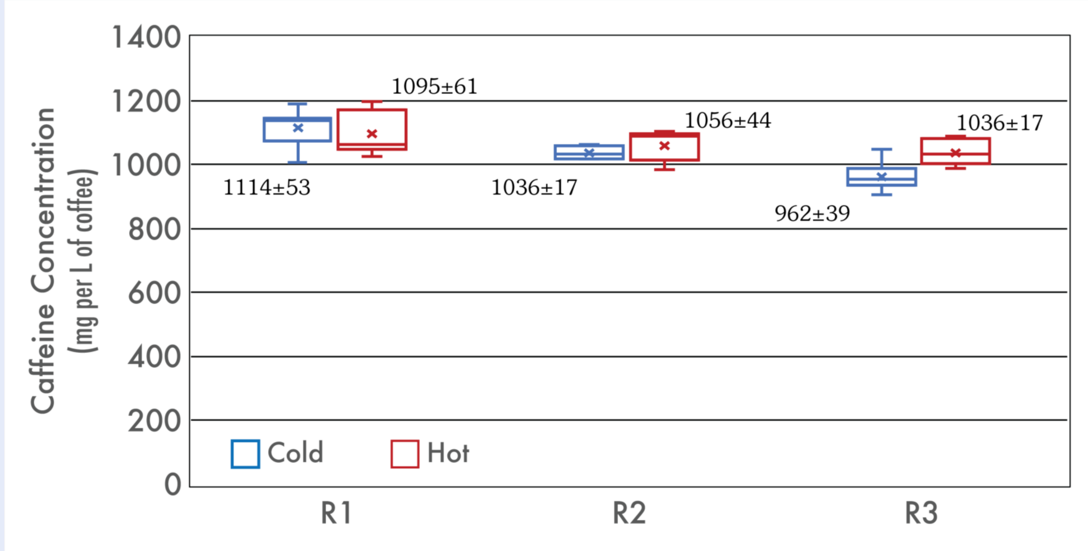


Figure 4. Caffeine concentration of cold brew and hot brew coffee at 3 roast levels, reported as mean±SD. (*n* = 9)

Acknowledgements

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