

# Raise Your Glass! American Chestnut Leaves Can Reduce Tea Oxalate Content

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## BACKGROUND

- 1800s: American chestnut tree (ACT) teas widely used to treat coughs/colds
- Early 1900s: ACT → functionally extinct due to a fungus called “chestnut blight”
- Blight-tolerant ACT was developed 1980s with enhanced production of oxalate oxidase (OxOx), an enzyme that degrades soluble oxalate.
- Many stone formers avoid tea due to its high oxalate content
- **Hypothesis: the addition of enhanced OxOx ACT leaves to commercially available teas will reduce tea oxalate content**



## METHODS

- Free leaves of Yorkshire, Lipton, Tazo, PG Tips, Twinings, and Greenwise teas were brewed at manufacturer recommended serving size in 25 ml of boiling Ca+/Mg+ free phosphate buffered saline (PBS) x 5 minutes. Oxalate content was measured by colimetric assay (Trinity Biotech) in triplicate. This process was repeated for each tea combined with OxOx ACT leaves (250 mg).



- Free leaves from each tea (250 mg) were brewed individually or combined with OxOx ACT (250 mg) in PBS x 5 minutes, and oxalate content was measured in triplicate.
- Lipton tea (250 mg) was steeped (5') in 25 ml of distilled and spring water to assess the effect of solution on oxalate content.
- Mean milligrams of soluble Oxalate (mgOx)/sample of 0.25g tea leaves was calculated w/wo 0.25mg ACT to assess tea potency
- Mean mgOx/serving size (leaf amount varied by manufacturer) was then calculated w/wo the addition 0.25mg ACT leaves to assess typical oxalate consumption size

## RESULTS

Figure 1: Soluble Oxalate Per Gram of Tea

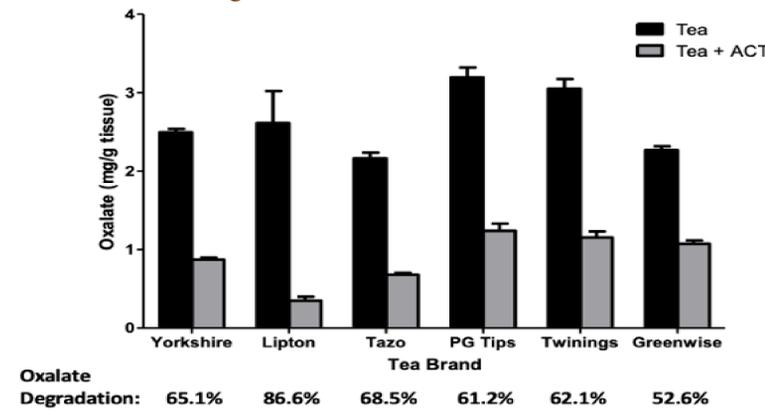


Figure 1: We consistently found that leaf “tissue” oxalate levels were considerably lower after adding OxOx ACT leaves. Before adding ACT leaves, soluble oxalate ranged from 2.16 to 3.19 mg Ox per g of tea leaves. When ACT leaves were steeped with tea, soluble oxalate was reduced, on average, of 66.02%, with the individual variations shown and largest variation observed in Lipton tea.

Figure 2: Soluble Oxalate Per Serving of Tea

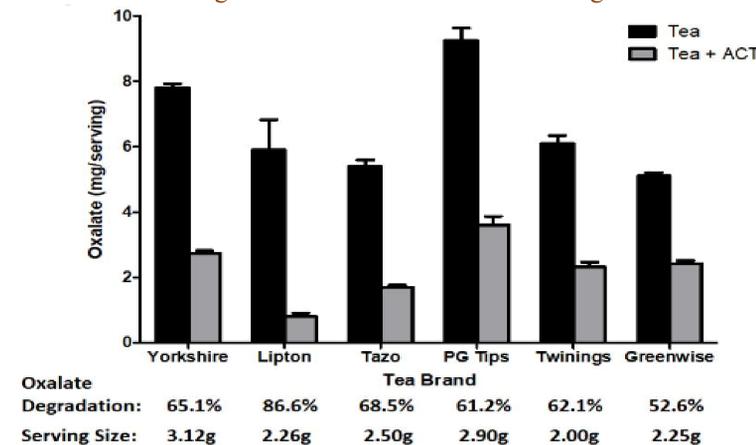


Figure 2: In terms of mg Ox per serving sizes of tea leaves, a similar trend as in Figure 1 is noted when ACT leaves are added. Prior to adding ACT leaves, soluble oxalate ranged from 5.1 to 9.3 mg Ox per serving size, with the individual variations shown.

Figure 3: Soluble Oxalate Content in Lipton Black Tea with Various Brewing Solutions

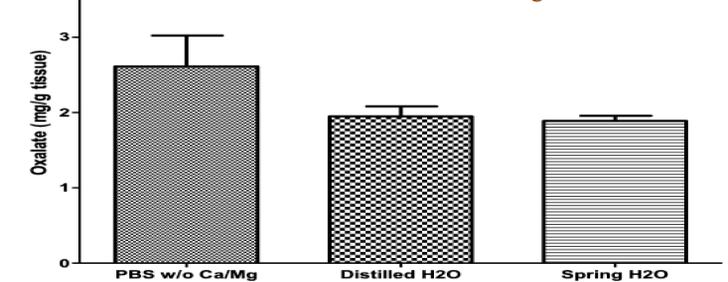


Figure 3: When Lipton black tea steep solution varied, we saw no statistically significant difference in soluble oxalate levels. PBS had slightly higher soluble oxalate compared to distilled (0.672 mg Ox/gm of tissue) or spring water (0.732 mg Ox/gm of tissue), indicating that brewing solution does not affect soluble oxalate content.

## CONCLUSIONS/FUTURE DIRECTION

- Dietary oxalate reduction is an essential strategy to reduce kidney stone recurrence in high-risk individuals.
- Since teas are known to be high in oxalate, we assessed the potential therapeutic role of OxOx American Chestnut Tree leaves in oxalate reduction using commercially available teas.
- Oxalate content was reduced by an average of ~70% by the addition of ACT leaves, demonstrating a possible therapeutic role.
- American Chestnut leaves alone, or in combination with other tea leaves, may mitigate the stone risk in stone formers who wish to enjoy the health benefits of freshly brewed tea.
- Future work will determine ACT OxOx enzyme kinetics and biochemical properties such as thermostability and pH optima.
- These data will be helpful to determine suitable conditions and tea/ACT leaf ratios for efficient oxalate degradation.

## REFERENCES

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- Taylor, E.N. and Curhan, G.C. 2007. Oxalate intake and the risk for nephrolithiasis. *Journal of the American Society of Nephrology* 18(7), pp. 2198–2204.