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### **Solution to the pink tea challenge** D'Ulivo, Lucia

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## Solution to the pink tea challenge

Lucia D'Ulivo

### 1 Solution to the challenge

Pink tea, also known as *Noon Chai*, is a traditional Kashmiri beverage prepared with special tea leaves, as Kashmiri *Chai* and green tea, water, salt, baking soda and milk.

Tea leaves contain hundreds different types of polyphenols [1,2], which are protonated at acidic pH and ionized in alkaline conditions [3]. Therefore, polyphenols and, consequently, tea act as natural acid-base indicators [3]. Specifically, polyphenols in green or Kashmiri *Chai* act as phenolsulfonphthalein, a common pH indicator better known as Phenol Red, which is yellow at acidic pH and turns red in alkaline conditions (Figure 1).

During the preparation of *Noon Chai*, tea leaves are boiled for a long time (about 1h) to maximize the extraction of polyphenols [4]. Using tea bags is not recommended since it can decrease the extraction efficiency [4]. By adding baking soda, the tea extract assumes a red color, which turns pink with the final addition of milk. In the case of Kashmiri *Chai* blend or green tea, the extract turns from a yellow-pale brown to a red-dark brown color as the pH becomes alkaline. This is why adding baking soda is essential for obtaining the characteristic pink coloration.

For the preparation of pink tea, Kashmiri *Chai* blend or green tea works the best since their content in polyphenols is higher compared to other teas [4]. On

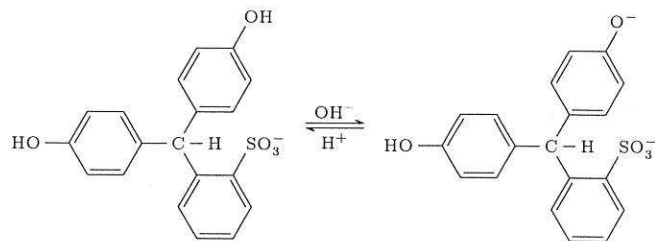


Figure 1: Acid-base equilibrium of phenolsulfonphthalein (Phenol Red). Phenolsulfonphthalein is yellow in acidic conditions and turns red in alkali.

the other hand, white tea has a relative low content of polyphenols [4]. Indeed, a white tea infusion looks pale-yellows and turns light brown by adding baking soda. Although a change in coloration is observable, it is not quite enough to obtain the fancy pink tea.

Many herbal teas, as hibiscus flowers, contain anthocyanins a class of polyphenolic compounds that act as well as pH indicators. In the case of hibiscus flowers, the acid and base colors are red and green, respectively [3]. A similar phenomenon occurs with other herbal teas as Red Zinzer or Mandarin Orange [3]. In this case, the addition of baking soda would yield a "green tea" extract, instead of the pink one.

### References

1. N. Kuhnert, "Unraveling the structure of the black tea thearubigins," *Archives of Biochemistry and Biophysics*, vol. 501, pp. 37–51, sep 2010.
2. M.-C. Menet, S. Sang, C. S. Yang, C.-T. Ho, and R. T. Rosen, "Analysis of theaflavins and thearubigins from black tea extract by MALDI-TOF mass spectrometry," *Journal of Agricultural and Food Chemistry*, vol. 52, pp. 2455–2461, may 2004.
3. D. N. Epp, "Teas as natural indicators," *Journal of Chemical Education*, vol. 70, p. 326, apr 1993.

Lucia D'Ulivo  
National Research Council of Canada  
1200 Montreal Road  
ON K1A0R6 Ottawa, Canada  
Tel.: +1(613)998-8380  
Fax: +1(613)993-2451  
E-mail: Lucia.D'Ulivo@nrc-cnrc.gc.ca and  
lucia.dulivo@gmail.com

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4. G. Rusak, D. Komes, S. Likić, D. Horžić, and M. Kovač, "Phenolic content and antioxidative capacity of green and white tea extracts depending on extraction conditions and the solvent used," *Food Chemistry*, vol. 110, pp. 852–858, oct 2008.