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Evaluation of Analytical Methods to Determine Regulatory Compliance of Coffee Leaf Tea †

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Abstract: The leaves of the coffee plant *Coffea* are traditionally used in several countries worldwide to prepare tea-like beverages using aqueous infusion in hot water. There are currently no tested methods available to check the regulatory compliance of coffee leaf tea according to the European Union (EU) novel food authorization. This study shows that standard ISO methods for tea analysis could be transferred without modifications to coffee leaf tea analysis. The only difference found was a much lower content of some catechins in coffee leaf tea compared to *Camellia sinensis* tea, but the methods were clearly applicable to be used to control the EU's maximum limits for coffee leaf tea.

Keywords: coffee by-products; coffee leaves; tea; analysis; HPLC; food control; novel food

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1. Introduction

The leaves of the coffee plant (genus *Coffea*) are traditionally used in several countries worldwide to prepare tea-like beverages using aqueous infusion in hot water. Since 1 July 2020, the placing on the market of coffee leaf tea was authorized in the European Union (EU) under the framework of the novel food regulation [1]. The implementing regulation for coffee leaf tea established several conditions of use, including maximum amount of dried leaves per liter of water, a necessary pasteurization step and several chemical requirements including maximum levels for chlorogenic acid, caffeine and epigallocatechin gallate. To date, there are no standard methods available to control these parameters to check the regulatory compliance of coffee leaf tea. In this presentation, we have for the first time evaluated standard methods for *Camellia sinensis* tea analysis for transferability to coffee leaf tea.

2. Methods

The coffee leaf samples contained two *Coffea arabica* and two *C. canephora* varieties, which were dried and processed using various methods. An example of coffee leaf tea sample is shown in Figure 1.

Figure 1. Example of coffee leaf tea (dried leaves, lower left; brewed beverage, top; spent leaves, lower right).

In order to assure the homogeneity of the samples, each one of them was granulated to a size at which they could pass a sieve with a pore size of 500 μm. The following methods were applied:

ISO 14502-1:2005-03 [2], which is generally applied to determine the total polyphenols in green and black tea, based on a colorimetric method using Folin-Ciocalteu reagent

ISO 14502-2:2007-12 [3], which is used to ascertain the content of catechins and other characteristic substances including caffeine in green tea, utilizing high-performance liquid chromatography. Both methods contain an extraction method, using 70% methanol, preheated to a temperature of 70 °C.

Regarding pasteurization, an experiment was conducted in which the temperature of brewed coffee leaf tea was constantly recorded, after being poured into a cup as well as a tea pot [4].

Finally, nuclear magnetic resonance (NMR) spectroscopic methods developed for coffee analysis were assessed to be used for coffee leaf tea analysis [5].

3. Results and Discussion

The results showed that the methods for polyphenol and catechin analysis could be transferred without modifications to coffee leaf tea. Figure 2 shows an exemplary chromatogram of the tea catechin separation.

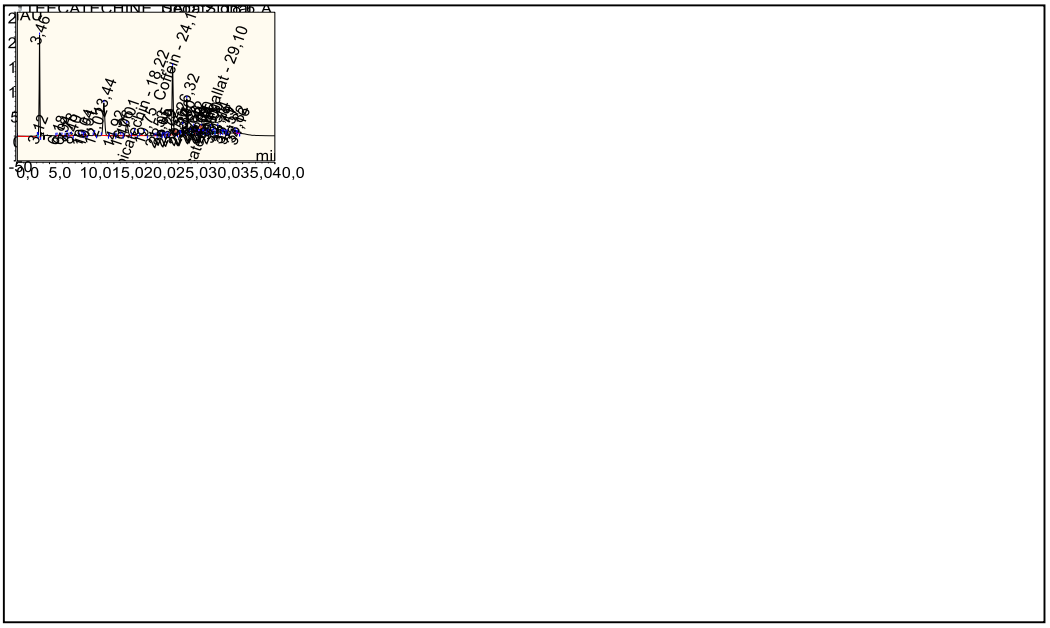

Figure 2. Representative chromatogram of a coffee leaf tea analyzed using HPLC method ISO 14502-2:2007-12.

The only difference found was a much lower content of some catechins in coffee leaf tea compared to *Camellia sinensis* tea, but the methods were clearly applicable to be used to control the EU's maximum limits for coffee leaf tea. Furthermore, standard European tea brewing methods using 90–95 °C hot water will ensure the EU's necessary pasteurization conditions (at least 71 °C for 15 s) (Figure 3). The NMR methods allowed for the determination of chlorogenic acid, which is also a compound with maximum limit in the EU's novel food approval.

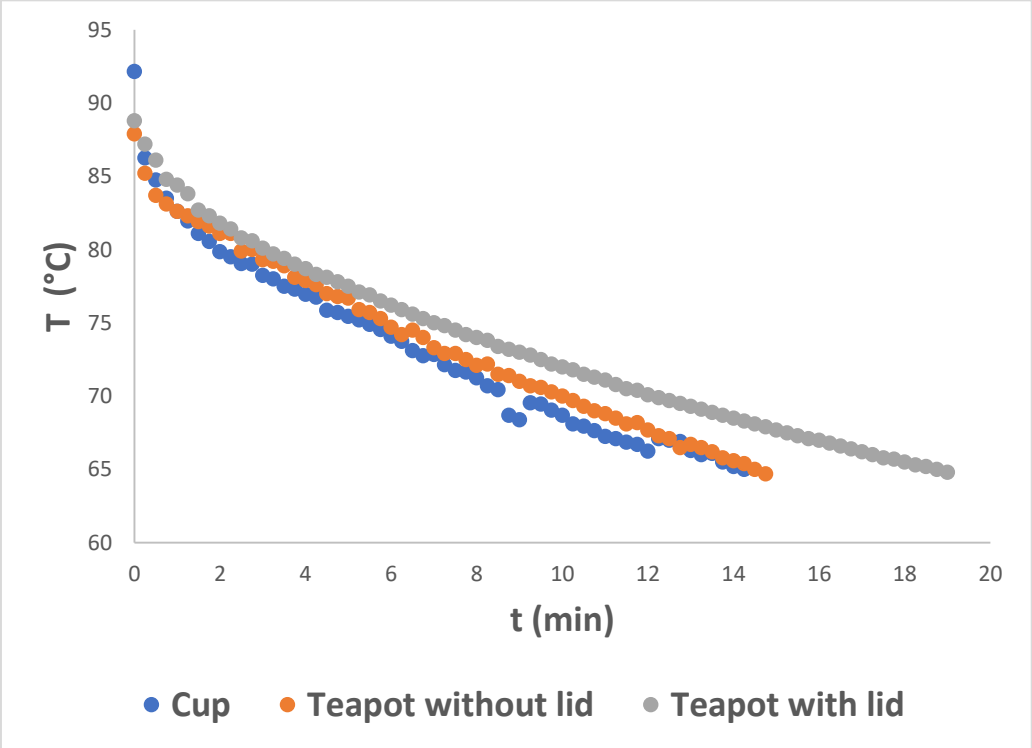

Figure 3. Cooling behavior of coffee leaf tea filled in a tea cup as well as a teapot with and without lid.

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Conflicts of Interest: S.S. is owner of Coffee Consulate, Mannheim, Germany. Coffee Consulate is an independent training and research center. Coffee Consulate is currently researching the potential of coffee by-products. However, S.S. reports no conflict of interest related to the work under consideration. The other authors declare no conflict of interest.

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