

Correlation between CDR CoffeeLab® and HPLC method

Dr. Sara Banfi, Researcher at the CDR Chemical Lab "Francesco Bonicolini"

P2618

The **CDR CoffeeLab®** system utilizes advanced calibration curves developed through extensive analysis of both green and roasted coffee matrices. By integrating real-world samples into the development phase, the system inherently accounts for the complex chemical background of the coffee bean. This matrix-matched approach ensures that the photometric response remains highly representative, regardless of botanical origin, variety, or roast profile.

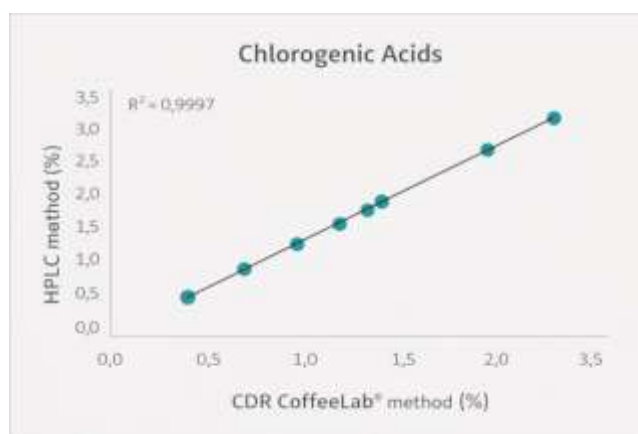
To ensure the robustness of these measurements, systematic **recovery tests** were conducted for every analytical parameter. These trials confirm that the extraction and reaction phases of the CDR CoffeeLab® method yield results consistent with the true concentration of the analytes, thereby validating the precision of the pre-set calibrations.

Furthermore, comparative studies were performed between the results obtained with CDR CoffeeLab®, the **University of Florence**, and independent external laboratories, further validating the accuracy of the calibrations.

Building upon this foundational accuracy, the objective of this study is to further validate the performance of the system by benchmarking its results against **High-Performance Liquid Chromatography (HPLC)**—the industry standard for quantitative chemical analysis. This comparison demonstrates the reliability of the CDR system as a rapid, on-site alternative to traditional, time-intensive chromatographic methods, offering laboratory-grade data with significantly increased efficiency.

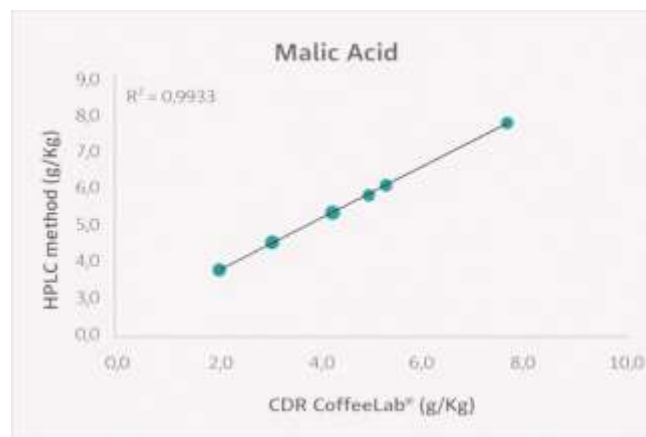
Chlorogenic Acids

Variety of coffee	Laboratory (g/Kg)	CDR CoffeeLab® (g/Kg)
Green Robusta coffee	7.5	7.5
Green Robusta coffee	7.6	7.6
Green Robusta coffee	6.2	6.2
Green Arabica coffee	4.4	4.4
Green Arabica coffee	3.3	3.2
Green Arabica coffee	4.0	4.0
Green Arabica coffee	3.9	3.8
Green Arabica coffee	3.0	3.0
Roasted coffee	1.8	1.8
Roasted coffee	0.8	0.7



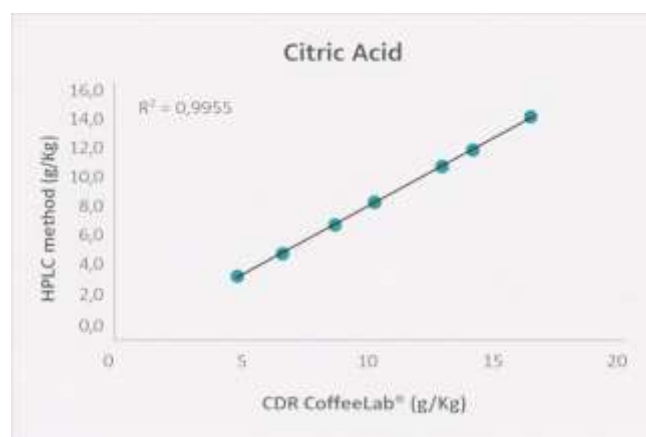
Malic Acid

Variety of coffee	Laboratory (g/Kg)	CDR CoffeeLab® (g/Kg)
Green Robusta coffee	2.6	2.8
Green Arabica coffee	4.4	4.7
Green Arabica coffee	5.3	5.4
Green Arabica coffee	8.2	7.9
Roasted coffee	3.5	3.5
Roasted coffee	5.3	5.2
Roasted coffee	4.5	4.5



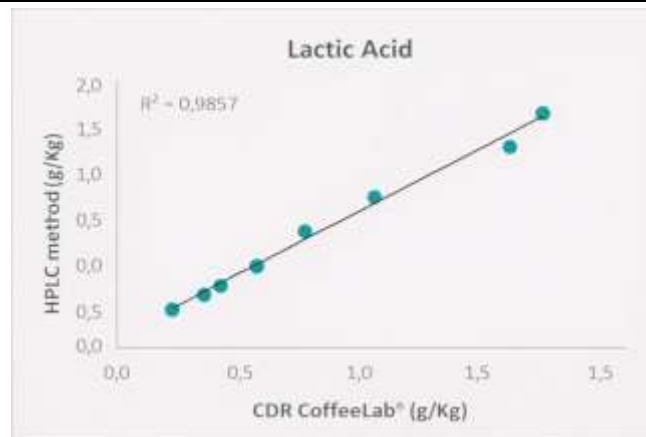
Citric Acid

Variety of coffee	Laboratory (g/Kg)	CDR CoffeeLab® (g/Kg)
Green Robusta coffee	8.8	8.5
Green Arabica coffee	12.5	12.3
Green Arabica coffee	10.1	10.2
Green Arabica coffee	15.6	15.9
Green Arabica coffee	10.0	9.6
Roasted coffee	6.0	6.0
Green Arabica coffee	13	12.9
Roasted coffee	7.6	7.2



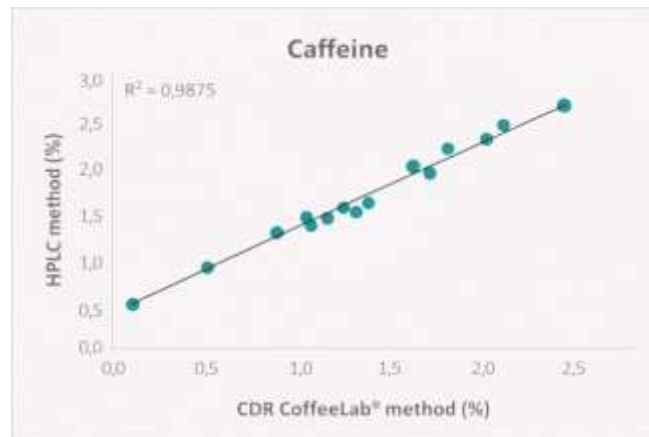
Lactic Acid

Variety of coffee	Laboratory (g/Kg)	CDR CoffeeLab® (g/Kg)
Green Robusta coffee	0.2	0.1
Green Arabica coffee	0.3	0.2
Green Arabica coffee	0.6	0.8
Green Arabica coffee	0.4	0.3
Roasted coffee	0.8	1.1
Roasted coffee	1.2	1.5
Roasted coffee	1.3	1.8



Caffeine

Variety of coffee	Laboratory (g/Kg)	CDR CoffeeLab® (g/Kg)
Green Arabica coffee	1.1	1.1
Green Arabica coffee	1.2	1.3
Green Robusta coffee	2.2	2.2
Green Arabica coffee	0.0	0.0
Green Robusta coffee	1.9	1.8
Green Arabica coffee	1.6	1.4
Green Arabica coffee	1.4	1.3
Roasted coffee	2.0	2.1
Roasted coffee	0.0	0.0
Roasted coffee	1.2	1.2
Roasted coffee	1.4	1.4
Roasted coffee	2.5	2.5
Roasted coffee	0.0	0.0
Roasted coffee	1.8	1.9
Roasted coffee	1.5	1.3
Roasted coffee	2.2	2.3
Roasted coffee	0.6	0.6



Conclusion

The comparative analysis across all key parameters, **Chlorogenic Acids, Malic Acid, Citric Acid, Lactic Acid,** and **Caffeine**, demonstrates a high degree of correlation between the **CDR CoffeeLab®** system and the HPLC reference method.

The experimental data, collected from a diverse range of samples including Green Robusta, Green Arabica, and various roasted profiles, consistently show a **high correlation coefficient (R²)**. The near-identity of the values obtained confirms that the CDR CoffeeLab® provides an analytical response perfectly aligned with traditional chromatography.

In conclusion, this study validates the **CDR CoffeeLab®** as a robust and reliable analytical tool. By delivering laboratory-grade accuracy through a simplified, user-friendly interface, it successfully bridges the gap between complex chemical analysis and the production floor. This makes high-level quality control **accessible to non-specialized operators**, allowing for rapid, informed decision-making throughout the coffee supply chain without the need for intensive training or sophisticated laboratory infrastructure.