

Chemical Markers of Association of Raw Coffee and Cup Quality: Evaluating Arabica Coffee Varieties Across São Paulo Farms

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Introduction

Understanding the physical and chemical traits of raw Arabica coffee beans (RACB) is essential for improving cup quality and guiding optimal cultivation practices. This study evaluated the chemical parameters of RACB from 4 varieties harvested in 2022, cultivated in 3 experimental farms in São Paulo State, Brazil—Bela Época (BE - Ribeirão Corrente city), Limeira (LF – Altinópolis city), and Terra Preta (TP – Pedregulho city). The goal was to identify the most suitable variety for each region to optimize cup quality in specialty coffee production.

Materials/Methods

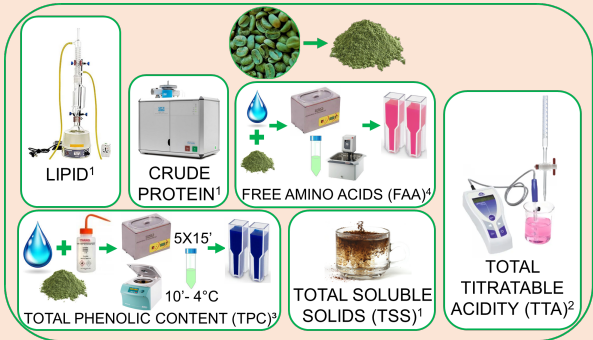


Table 1. Lipid, Protein, SS, and AT content of samples among farms.

Variety	Farm	Lipid (%)	Protein (%)	SS (%)	AT (mL NaOH/100 g)
1	BE	10.32 ± 0.23 b	14.68 ± 0.07 b	29.61 ± 0.42	124.13 ± 5.66 b
	FL	9.65 ± 0.08 c	16.07 ± 0.05 a	29.50 ± 0.87	130.67 ± 5.66 a
	TP	11.75 ± 0.09 a	14.56 ± 0.65 b	30.87 ± 0.87	137.20 ± 0.01 a
2	BE	10.3 ± 0.22 b	13.77 ± 0.07 b	28.87 ± 0.30	133.93 ± 5.66 b
	FL	8.29 ± 0.11 c	16.07 ± 0.32 a	30.27 ± 1.24	124.13 ± 5.66 c
	TP	13.45 ± 0.04 a	13.76 ± 0.23 b	30.41 ± 1.10	140.47 ± 5.66 a
3	BE	10.05 ± 0.21 b	13.88 ± 0.10 b	31.15 ± 2.13	198.47 ± 5.66 a
	FL	9.55 ± 0.08 c	14.79 ± 0.19 a	32.27 ± 0.89	127.40 ± 5.66 b
	TP	13.25 ± 0.22 a	14.22 ± 0.11 b	29.95 ± 0.45	130.67 ± 5.66 b
4	BE	10.10 ± 0.25 b	15.18 ± 0.28 b	32.53 ± 1.71	150.27 ± 5.66 a
	FL	8.45 ± 0.16 c	17.30 ± 0.55 a	31.24 ± 1.34	137.20 ± 9.80 c
	TP	11.73 ± 0.16 a	14.72 ± 0.14 b	31.05 ± 0.33	143.73 ± 5.66 b

Results are expressed as mean ± standard deviation. Letters in the same column indicate a significant statistical difference (P < 0.05) among the samples of the same variety analyzed in three experimental farms.

Conclusion/Perspectives

All varieties exhibited an optimal combination of chemical parameters when cultivated on LF. The cultivation of variety 1 is also recommended at BE due to its low acidity, a parameter that is highly important for cup quality. Chemical parameters allowed a preliminary prediction of the best variety for each farm to achieve high cup quality. However, further research with advanced statistical tools, detailed sensory analysis, and compound profiling are needed to strengthen these correlations, given the limited literature on raw coffee chemistry linked to beverage quality.

References:

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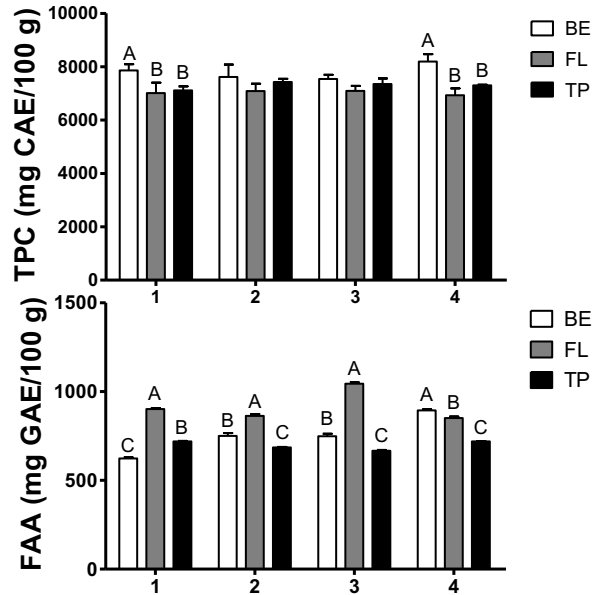


Figure 1. TPC and FAA content of samples among farms.

Results are expressed as mean ± standard deviation. Letters in the columns indicate a significant statistical difference (P < 0.05) among the samples of the same variety analyzed in three experimental farms.

Results/Discussion

Lipid and protein were location-dependent for all varieties. All varieties showed the highest lipid content at TP and the lowest at LF. In contrast, protein levels were highest at LF, with no significant differences between BE and TP. No variation in TSS was observed across farms, whereas TTA varied in all varieties. TP showed the highest TTA values for varieties 1 and 2, while BE had the highest values for varieties 3 and 4. In TPC, variation was observed across all farms in varieties 1 and 4, where BE exhibited the highest values. In FAA, variation was observed across all farms in all varieties. LF showed the highest values for varieties 1, 2, and 3, while BE had the highest value for variety 4.