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Influence of Balance Nutrition on quality of *Coffee Arabica* L.

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Introduction

The cup coffee quality is primarily driven by the physical and chemical characteristics of the green bean, which is determined by the combinations of three main factors: Environment x Genetics x Agricultural practices (Lambot at al. 2017). Coffee is grown mostly on weathered, acid soils around the coffee belt. Nutritional practices of coffee growers are often poor, without any balance between nutrients, and too much emphasis on nitrogen. The objective of this research was to compare the impact of three different nutritional practices on coffee quality.

Materials/Methods

During five years, two trials on Arabica coffee varieties Caturra and Castillo® were carried out in El Pital-Huila region of Colombia. Three nutritional programs (**NP**) were tested: **NP1** represents farmer practices with the application of N, P ,K , S and Mg; **NP2** represents a balanced program providing all essential nutrients for coffee (N, P, K, S, Mg, Ca, Zn and B), but with a 50% reduction in the application of K, and **NP3** finally represents a fully balanced program providing all essential nutrients at optimum rates. The descriptive sensory analysis of coffee bean samples from the trials was made in the lab of Coffee Mind® in Denmark. Roasting was stopped at the #87 color on the Agtron Gourmet scale, and the brewing preparation followed the standards of the Specialty Coffee Association of Europe (SCAE).

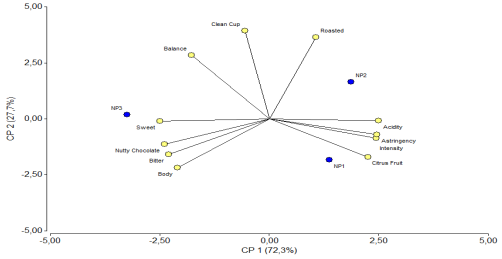

Figure 1: Principal components analysis for the cup profile for two coffee varieties.

Category	Variety	Variable	Unit	NP1	NP2	NP3
Cup quality	Castillo	Sweet	Score	8,0	8,2	8,6
		Balance		7,2	7,2	7,7
		Astringency		7,8	7,9	7,3
	Caturra	Sweet		7,4	7,1	8,1
		Balance		6,8	7,7	7,6
		Astringency		8,8	8,6	8,3
Bean quality	Castillo	Green beans	% in mesh 16-17-18	82,5a	87,4b	86,8b
Biochemical Composition of the green coffee beans	Castillo	Lipids	%	19,4ab	17,13b	21,7a
	Caturra			20,3ab	21,2b	20,5a

= **NP1** call as farmer practices; **NP2** call as balance program with reduction in K; **NP3** call as balance program.*Different letters indicate statistically significant differences according with Fisher LSD test.

Table 1: Quality and biochemical composition for 3 nutritional programs and two coffee varieties.

Results/Discussion

The results show clear interaction between varieties and years, but also statistical differences were observed in the cup quality, and the cuppers could discriminate cup quality attributes between treatments over the years. The principal component analysis (Figure 1) discriminates important cup attributes between the treatments as follows: the sweetness, balance and body were closely correlated with the fully balanced **NP3**, and the astringency close to the unbalanced **NP1** and the balanced **NP2** with 50% less K. Statistical differences were observed in the green bean size, **NP3** improves the green coffee beans size with 86,8% of the beans over the mesh 16+17+18 compared with only 82,5% in **NP1.** Not statistical difference in the beans size were found between **NP3** and **NP2** (Table 1). In the Castillo variety a reduction of 50% of K (**NP2**) and the omission of Ca, B and Zn (**NP1**) resulted in a significant decline of lipids content on green beans, while in Caturra such a decline was not visible most likely due to higher soil K content.

Conclusion/Perspectives

An unbalanced nutrition without soluble Ca^{+2} and micronutrients or a reduction in K^{+} application rates can negatively affect coffee bean size, biochemical composition of the green coffee bean and the coffee cup profile. Hence it can be concluded that it is necessary to provide more advise to coffee growers aiming to improve their nutritional practices. Balanced nutritional practices, applying all nutrients in the right rate and form and at the right time, will ensure higher farmer profits through increased bean yields and optimized coffee quality.

References:

Lambot, C.; Herrera, J.; Bertrand, B.; Sadeghian, S.; Benavides, P.; Gaitan, A. 2017.Cultivating coffee quality-Terrior and Agro-Ecosystem. The Craft and Science of Coffee. Edited By: Britta Folmer- Academic Press/Elsevier: 17-49.