

Cover crops affect the mineral nutrition of cocoa trees in full-sun cultivation system

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Supplementary data I. Related to 2 and Table 1. Analysis of variance of dry mass and soil chemical attributes cultivated with cocoa trees in full sun system and intercropped with cover crops and uncovered soil, in the 0-20 cm layer, after two years of cultivation.

Variation factor	P	K	S	Ca	Mg	Al	H+Al	pH	OM	SB	t	T	V	m
Treatments (T)	ns	**	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Year	ns	ns	ns	ns	**	ns	ns	***	ns	ns	ns	ns	ns	ns
T x Year	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
CV (%)	27	46	17	10	7	0	10	2	10	8	8	6	4	0

Variation factor	Fe	Zn	Cu	Mn	B	DM1	DM2
Treatments (T)	ns	ns	ns	ns	ns	**	ns
Year	**	ns	ns	ns	**		
T x Year	ns	ns	ns	ns	ns		
CV (%)	18	15	22	12	19	11	61

P: phosphorus; K: potassium; S: sulfur; Ca: calcium; Mg: magnesium; Al: aluminum; H+Al: potential acidity; pH: hydrogen potential; OM: organic matter; SB: sum of bases; t: effective CEC; T: pH 7 CEC; V: base saturation; m: aluminum saturation; Fe: iron; Zn: zinc; Cu: copper; Mn: manganese; B: boron; DM1: dry mass in 2020; DM2: dry mass in 2021. Significance levels: ns not significant, ** p < 0.01 and *** p < 0.001 by F test.

Supplementary data II. Chemical attributes in the 0-20cm layer of soil cultivated with cocoa trees in full-sun intercropped with cover crops and uncovered soil. Average values of the two years of cultivation (2020 and 2021).

Variation factor	pH	P	S	Ca	Mg	Al	H+Al	OM	Fe	Zn	Cu	Mn	B	SB	CEC	T	V
		mg dm ⁻³		-----cmolc dm ⁻³ -----					-----mg dm ⁻³ -----					-----cmolc dm ⁻³ -----		%	
Treatments		mg dm ⁻³	--	dag kg ⁻¹				--					--				
Fabaceas	6.2	43	7.4	7.9	2.3	0	3.7	3.1	100.6	11.9	3.0	417.9	0.5	10.5	10.6	14.2	74
Brachiaria	6.2	42	7.0	7.2	2.2	0	3.8	3.1	123.3	13.4	3.2	454.1	0.4	10.1	10.1	13.9	73
Uncovered soil	6.1	44	7.0	7.8	2.2	0	4.0	2.9	99.3	12.6	3.5	409.4	0.4	10.4	10.4	14.3	72
Esponaneous vegetation	6.2	31	7.8	7.4	2.2	0	3.9	3.0	116.9	13.5	2.8	409.6	0.4	9.9	10.0	13.8	72

pH: hydrogen potential; P: phosphorus; S: sulfur; Ca: calcium; Mg: magnesium; Al: aluminum; H+Al: potential acidity; OM: organic matter; Fe: iron; Zn: zinc; Cu: copper; Mn: manganese; B: boron; SB: sum of bases; CEC: cation exchange capacity; T: pH 7 CEC; V: base saturation.

Supplementary data III: Related to Table 2, Figure 3 and Table 3. Analysis of variance of the foliar nutritional composition of cocoa trees grown in full sun intercropped with cover crops and uncovered soil.

Variation factor	N	P	K	Ca	Mg	S	Fe	Zn	Cu	Mn	B
Treatments (T)	*	*	ns	ns	ns	ns	ns	**	ns	ns	ns
Year	***	***	***	**	*	*	***	***	*	**	**
T x Year	*	ns	*	ns	ns	ns	ns	*	ns	ns	ns
CV (%)	7	7	11	11	10	7	16	9	16	18	10

N: nitrogen; P: phosphorus; K: potassium; Ca: calcium; Mg: magnesium; S: sulfur; Fe: iron; Zn: zinc; Cu: copper; Mn: manganese; B: boron. Levels of significance: ns not significant; * p < 0.05; ** p < 0.01 and *** p < 0.001 by the F test.