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Availability of phosphorus in soil after six years of fertilization with poultry litter and swine manure under crop-livestock integration system

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Introduction

Organic fertilizers derived from poultry litter and swine manure are alternatives which can increase of availability of phosphorus in soil in crop-livestock integration (CLI) systems. This study aimed to determine the availability of phosphorus in soil after six years of fertilization with different doses of poultry litter, swine manure and mineral fertilizers based in crops present on CLI system.

Material and Methods

Experimental design was a randomized complete block, in the 4x3+1 factorial, with four replications. The treatments consisted of four increasing doses (0, 100, 200 and 300 kg ha⁻¹ N) in interaction with four types of fertilizers, two of them were organic (poultry litter and swine slurry) and two balanced minerals with the same amounts of N, P and K as the organic ones, M1 related to swine manure and M2 with poultry litter.

Results and Conclusions

Table 1. Availability of phosphorus in soil (g dm⁻³) by reason increase doses organic and mineral fertilizers under crop-livestock integration (CLI) systems.

Doses (kg ha ⁻¹)	0	100	200	300	Regression
P 0-5 cm					
Fertilizer					
Poultry Litter	64,3	101,0 a	124,0 a	140,0 a	70,33 + 0,25** xR ² = 0,97
Swine Manure	64,3	59,4 b	72,5 b	85,1 b	$\bar{m} = 70,3$
M1	64,3	52,3 b	60,8 b	63,4 b	$\bar{m} = 60,2$
M2	64,3	69,8 b	85,6 b	133,0 a	54,99 + 0,22** xR ² = 0,84
P 5-10 cm					
Poultry Litter	61,3	76,9 a	108,0	111,0 a	62,33 + 0,18** xR ² = 0,92
Swine Manure	61,3	58,6 ab	89,4	79,4 b	59,39 + 0,08* xR ² = 0,56
M1	61,3	44,6 b	99,4	49,4 c	$\bar{m} = 63,7$
M2	61,3	45,0 b	85,0	112,0 a	57,78 - 0,13* + 0,001* x ² R ² = 0,91
P 10-20 cm					
Poultry Litter	48,1	55,0	54,4 b	49,1 b	$\bar{m} = 51,6$
Swine Manure	48,1	61,9	72,5 a	50,9 b	46,67 + 0,28** - 0,0009** x ² R ² = 0,89
M1	48,1	41,3	51,1 b	56,0 b	$\bar{m} = 49,1$
M2	48,1	52,0	32,9 c	108,0 a	54,01 - 0,38* + 0,002** x ² R ² = 0,79
P 20-40 cm					
Poultry Litter	31,6	42,7 b	53,0 a	44,6	30,65 + 0,19** - 0,0005** x ² R ² = 0,93
Swine Manure	31,6	41,0 b	53,6 a	43,8	30,27 + 0,19** - 0,0005** x ² R ² = 0,87
M1	31,6	38,7 b	39,1 b	43,1	32,83 + 0,03** x R ² = 0,89
M2	31,6	60,6 a	35,0 b	39,4	35,78 + 0,18* - 0,00062* x ² R ² = 0,30




Means followed by different letters in the same column are different (P<0.05) by Student's t-test.

After five years with organic and mineral fertilizer under CLI system observed increase in availability of P in the soil, where the poultry litter and M2 were better on top layers of 0-5 and 5-10 cm, while swine manure had contribution on the 5-10 cm layer, and all fertilizers allow the P leaching until 20-40 cm layer (Table 1).

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