Influence of organic chicken dejections on the soils of two contrasting outdoor-runs of AlterAviBio experimental facility: Ex-ante assessment of variations in C, N, P, Cu and Zn soil stocks

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Influence of organic broiler droppings on the soil of 2 contrasting outdoor-runs: Assessment of nutrients soil stocks variations

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Introduction

Organic broilers must have **access to an outdoor-run:**

- **sustainability ?** ⇒ **AlterAviBio** program
- broilers **droppings** on outdoor-runs ⇒ **impact on soils ?**

Objectives

⇒ **measurements of initial stocks of C, N, P, Cu and Zn in the soils of two contrasting outdoor-runs types :**
grassland (G) vs. oak canopy (T)

⇒ **prediction of final nutrients stocks and comparison to estimated detection thresholds**

Material and Methods

Outdoor-runs characteristics

INRA domain
"Le Magneraud"

2 outdoor-runs of 2500 m²:
seeded grassland (G) vs. oak canopy (T)

- **5 batches x 750 organic broilers** (Mar. 2009 to Nov. 2010)
- **first outdoor access** at **28 days** of age

Soil sampling and analysis

- **2 horizons**: 0 – 5 cm and 5 – 15 cm
- soil **bulk density** (g cm^{-3}): cylinder method
- **soil contents** (g kg^{-1}), ISO and AFNOR norms: organic C, total N, Olsen P_2O_5, Zn and Cu

nutrient stock
=
horizon thickness x bulk density x soil content

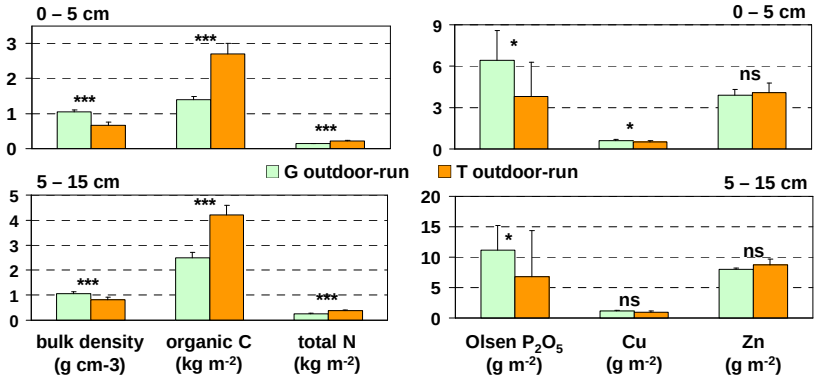
Excretion assessment

- **Outdoor-run excretion** for 5 batches of 750 broilers:
  CORPEN [1] ⇒ N, P_2O_5, Cu and Zn
  C/N ratio in fresh droppings [2] [3] ⇒ organic C
- **2 hypotheses of droppings distribution**:
  uniform distribution (**hyp. 100%**) **VS.**
  excretion on the first half of the outdoor-run (**hyp. 50%**)

⇒ **comparison to detection thresholds**

Results

Soil characteristics



Figures 1a & 1b: Nutrients stocks for G and T outdoor-runs for 0 – 5 and 5 – 15 cm horizons

Broilers excretion

Table 2: Outdoor nutrients broilers excretion according to two droppings distribution hypotheses (prediction for 5 batches x 750 broilers)

	organic C (kg m-2)	total N (kg m-2)	Olsen P_2O_5 (kg m-2)	Cu (g m-2)	Zn (g m-2)
hyp. 50%	0.450	0.020	0.027	0.056	0.297
hyp. 100%	0.900	0.039	0.054	0.111	0.594

Soils stocks variations VS. detection thresholds

G outdoor-run	T outdoor-run
organic C, total N, Olsen P_2O_5 DETECTABLE	
total Cu, total Zn NOT DETECTABLE	

Conclusions

After 5 batches of 750 broilers:
⇒ **variations in soil stocks will be detectable ONLY for C, N and P**
⇒ **final spatial variability of stocks will depend on droppings distribution (broilers behavior)**
⇒ **final stocks will be measured and compared to results of this study**

References
[1] CORPEN, 2006. Estimations des rejets d'azote, phosphore, potassium, calcium, cuivre, zinc par les élevages avicoles. p. 55.
[2] Amanullah, M., 2007. Nutrient Release Pattern during Composting Poultry Manure. Research Journal of Agriculture and Biological Sciences, 3(4): 306-308.
[3] Rynk et al., 1992. On-Farm Composting Handbook. Natural Resource, Agriculture, and Engineering Service. Ithaca, New York, USA.

This work was carried out with the financial support of the research program "Pour et Sur le Développement Régional dans le Grand Ouest"