Nitrogen Phytoavailability of Composted Biosolids

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BACKGROUND

- Composting biosolids with woodchips can increase its stability, minimize odors, and maximize acceptability for land-application
- However, the amount of phytoavailable N in composted biosolids is needed to determine appropriate application rates.

OBJECTIVE

To evaluate the relative N phytoavailability (RNP) of composted biosolids

MATERIALS AND METHODS

Biosolids composting

- 2 types of biosolids (lagoon aged and un-aged) were composted with wood chips at 1:1 dry wt ratio

The greenhouse study

- 2 biosolids types and their compost applied to soil at 400 mg N kg^{-1}
- chemical fertilizer applied at 4 rates (equiv. to 0, 75, 150, and 300 kg N ha^{-1}
- Treatments:
  - ✓ Aged biosolids (AB)
  - ✓ Composted aged biosolids (CAB)
  - ✓ Un-aged biosolids (UB)
  - ✓ Composted un-aged biosolids (CUB)
  - ✓ Fertilizer at 0 kg N ha^{-1} (F0)
  - ✓ Fertilizer at 75 kg N ha^{-1}(F1)
  - ✓ Fertilizer at 150 kg N ha^{-1}(F2)
  - ✓ Fertilizer at 300 kg N ha^{-1}(F3)
- Test plants were corn and ryegrass grown in greenhouse for 6 months in 2013
- Study repeated in 2014

CALCULATIONS

$$\text{RNP (\%)} = \frac{\text{[N uptake per unit N applied (PCi)]} \times 100}{\text{Mean N uptake per unit fertilizer N applied}}$$

Where:

Mean N uptake per unit fertilizer N applied

= [(Plant N uptake in F1 - Plant Total N uptake in F0)/75 +
(Plant N uptake in F2 - Plant Total N uptake in F0)/150 +
(Plant N uptake in F3 - Plant Total N uptake in F0)/300]/3.

N uptake per unit N applied (PCi)

$$= \frac{\text{(Plant N uptake of treatment - Plant N uptake of control)}}{\text{Total N applied}}$$

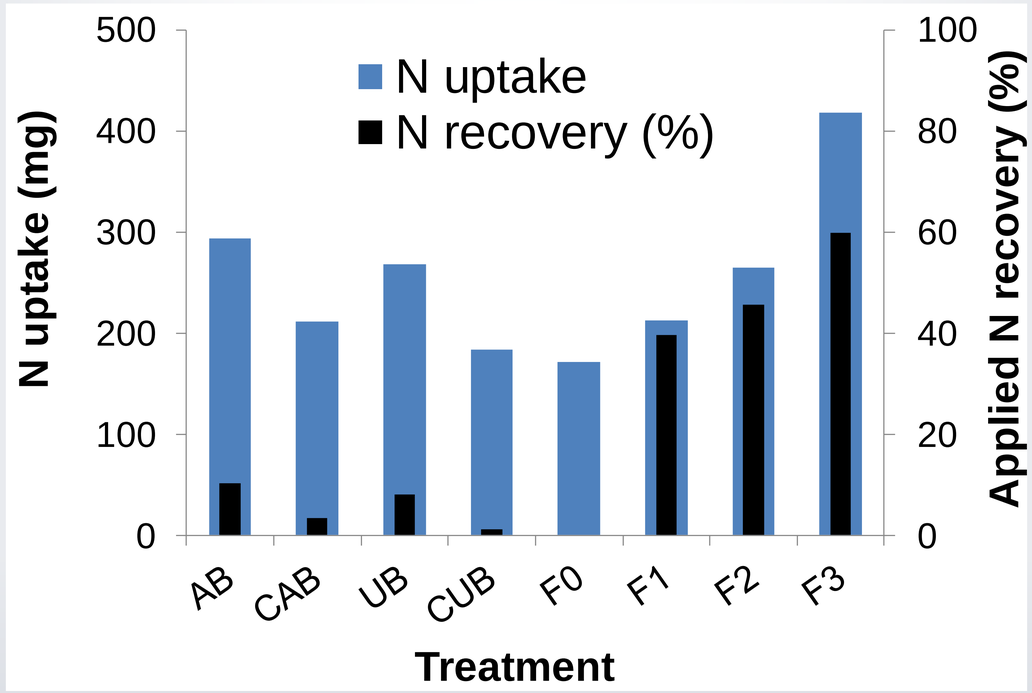

Figure 1: Total N uptake and percentage of nitrogen applied that was taken up by corn during the study in 2013

Table 1: Relative N phytoavailability (%) to corn and ryegrass from biosolids and their compost during the study in 2013

Treatment	Corn	Ryegrass	Average ± SE
AB	21.2	21.8	21.5 ± 1.0
CAB	7.0	8.7	7.9 ± 1.7
UB	16.7	20.5	18.6 ± 1.9
CUB	2.3	12.6	7.5 ± 5.2

RESULTS AND DISCUSSIONS

- Plant's dry-matter yields were identical for treatments with composted and un-composted biosolids.
- N uptake by plants was lower in treatments with composted than with un-composted biosolids.
- RNP was lower in composted (<10%) than in un-composted biosolids

CONCLUSIONS

- Uptake of N by plants is lower from composted biosolids than from biosolids and commercial fertilizers, but dry matter yield may not be affected.
- The RNP in composted biosolids was <10 percent of the total N, and about 20 percent observed in un-composted biosolids.

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