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Characterization and prediction of organic nitrogen biodegradability during anaerobic digestion: a bioaccessibility approach

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1 **Characterization and prediction of organic nitrogen**  
2 **biodegradability during anaerobic digestion: a bioaccessibility**  
3 **approach.**

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12

13 **Abstract**

14 Prediction of organic nitrogen mineralization into ammonium during anaerobic digestion is required  
15 for optimizing substitution of mineral fertilizer by digestates. The aim of this study was to understand  
16 organic nitrogen biodegradability and to investigate how it can be predicted from carbon  
17 biodegradability, and nitrogen bioaccessibility, respectively. Bioaccessibility was assessed using  
18 fractionation methods based on sequential extractions. Results showed that organic nitrogen was  
19 present in fractions whose bioaccessibility levels differed. Organic nitrogen and carbon  
20 biodegradability were also determined and compared. Results highlighted two groups of substrates:  
21 the first with an initial  $\text{NH}_4^+/\text{TKN}<30\%$ , whose carbon and nitrogen biodegradability are similar; the  
22 second with an initial  $\text{NH}_4^+/\text{TKN}>30\%$ , whose carbon and nitrogen biodegradability differ  
23 significantly. To enable prediction on all substrates, partial least square (PLS) regressions were carried  
24 out to link organic nitrogen bioaccessibility indicators to biodegradability. The models successfully  
25 predicted organic nitrogen biodegradability with a maximum prediction error of 10%.

26  
27 **Keywords** : anaerobic digestion, nitrogen, ammonium, biodegradability, bioaccessibility

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