

# Dynamics and mineralisation of nitrogen in soil fertilised with brown coal-urea blends

Biplob K. Saha<sup>1</sup>, Michael T. Rose<sup>2</sup>, Vanessa Wong<sup>3</sup>, Timothy R. Cavagnaro<sup>4</sup> and Antonio F. Patti<sup>1</sup>

<sup>1</sup>School of Chemistry, Monash University, Clayton, Victoria, 3800, Australia

<sup>2</sup>NSW Department of Primary Industries, Wollongbar Primary Industries Institute, Wollongbar, NSW 2477, Australia

<sup>3</sup>School of Earth, Atmosphere & Environment, Monash University, Clayton, Victoria, 3800, Australia

<sup>4</sup>School of Agriculture, Food and Wine, The University of Adelaide, Waite Campus, South Australia, 5064, Australia

## Introduction

- The nitrogen efficiency of nitrogenous fertiliser is very poor and the transfer to plants seldom exceeds 50% of added N<sup>1</sup>.
- The low use efficiency of N is consequence of its losses by leaching, denitrification and volatilisation<sup>2</sup>
- This lost N represents both an economic inefficiency and an environmental burden<sup>3</sup>
- This study aims to increase N-use efficiency by blending brown coal with N fertilisers

## Materials and Methods

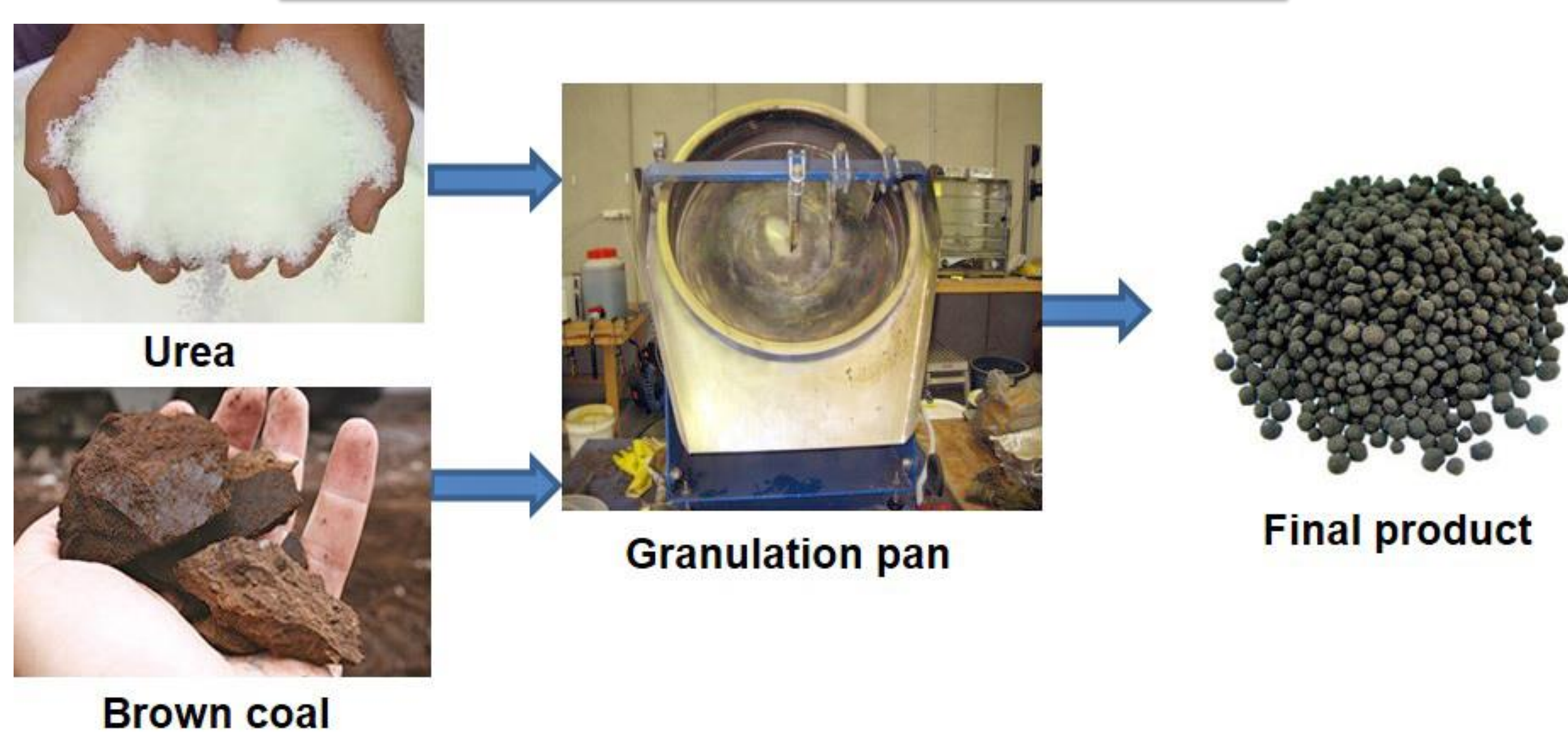


Figure 1: Preparation of brown coal-urea blends

The soil was treated with N @ 250 mg kg<sup>-1</sup> soil. Equal amount of N was added from different BCU granules including urea.

Table 1: CN ratio and C and N contents of BCU blends

Granules	C:N	C content (%)	N content (%)
Brown coal-urea 1 (BCU 1)	1.0	40	22
Brown coal-urea 2 (BCU 2)	1.5	46	17
Brown coal-urea 3 (BCU 3)	3.0	49	9
Brown coal-urea 4 (BCU 4)	10.0	54	5



The BCU blends were tested for N emissions under controlled conditions according to the experimental set-up shown in Figure 2

## References

(1) Raun, W. R. et al. *Agron. J.* 2002, 94, 815-820. (2) Dong, L. et al. *Biol. Biochem.* 2009, 41, 612-621. (3) Wang, Q. et al. *Plant. Soil.* 2010, 337, 325-339.

## Acknowledgements

Grateful to Monash University for PhD scholarships and Brown Coal Innovation Australia (BCIA) for funding the research.

## Results and Discussion

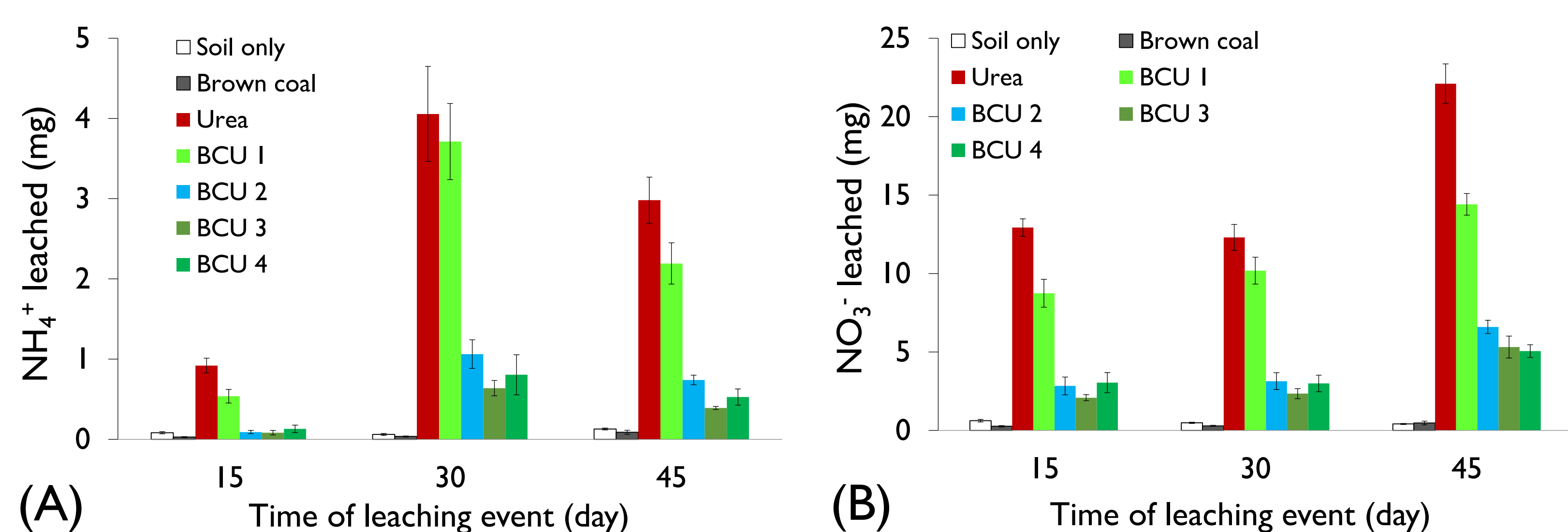


Figure 3: Ammonium (A) and nitrate (B) leached out from soil at three different leaching events (Bars indicate standard error, n=5).

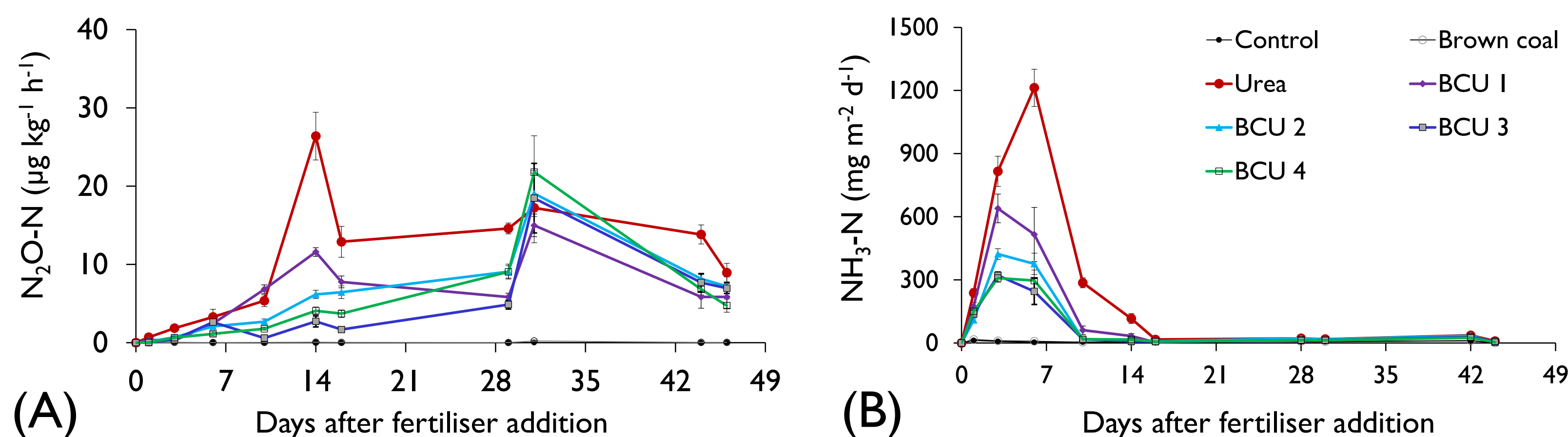


Figure 4: Daily N<sub>2</sub>O-N emission (A) and NH<sub>3</sub> emission (B) from soil

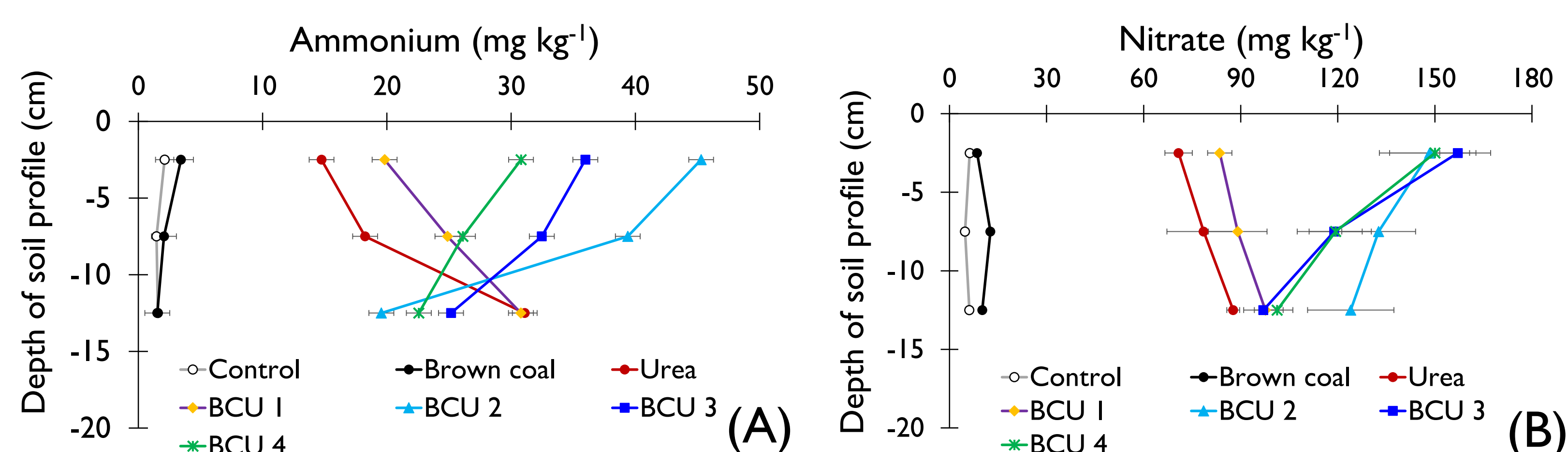


Figure 5: Ammonium (A) and nitrate (B) content of soil at harvest

## Conclusions

- Blending of BC with urea significantly reduced leaching and gaseous loss of N.
- BCU blends maintained significantly higher amount of N in the soil profile.
- Greater amount of N will be available for plants over a longer period of time.

