Potential of leaching to optimise fuel quality of semi-natural grassland biomass

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Introduction

- Combustion for energy production an alternative use for species-rich semi-natural grasslands no longer needed for forage production
- Fuel composition limits suitability for combustion:
  - high N, Cl: emissions of NOx, HCl, PCDD/F
  - high ash: fine particulate matter emissions
  - high Cl, K: boiler corrosion
  - high K, low Ca: ash melting → furnace slagging
- Precipitation during the field period leaches harmful compounds (K, Cl, N, ash) from rice and cereal straw

Semi-natural grassland:
- Harvest of living, not dead biomass: Same leaching efficiency?
- Field period limited by regrowth of sward: Sufficient leaching possible?

Material and methods

Grassland biomass samples
- Five semi-natural grassland sites in southwest Germany
- Harvested at 2 and 3 July (at seed maturity of grasses)

Leaching method
- Standardised laboratory method; compared to the leaching effect of artificial precipitation events in previous studies
- Grass samples of 30 g DM each weighed into 1 l wide-neck PE bottles, filled with tap water and placed on laboratory shaker; four replication per treatment

Treatments
- L0: unleached control
- L1: 10 min of leaching (= 30-40 mm precipitation)
- L2: 120 min of leaching (> 70 mm precipitation)

Ash melting behaviour
- Ash samples heated to 1000 °C for four hours

Results

Effect of leaching on the composition of grassland biomass from five sites. L0: unleached control; L1: leached for 10 min; L2: leached for 120 min. Significant differences from the unleached control marked by asterisks.

Conclusions

- Leaching reduces K and Cl concentrations and improves ash-melting behaviour of grassland biomass
- To leach K and Cl sufficiently, high amounts of precipitation are necessary
- Leaching as a strategy for fuel quality optimisation is strongly tied to the likelihood of suitable weather conditions

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