UNIVERSITÄT HOHENHEIM
DEPARTMENT OF CROP SCIENCE

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 NO_x, HCl, PCDD/F
  - high ash → fine particulate matter emissions
  - high Cl, K → boiler corrosion
  - high K, low Ca → ash melting → furnace slagging
- Pecipitation 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

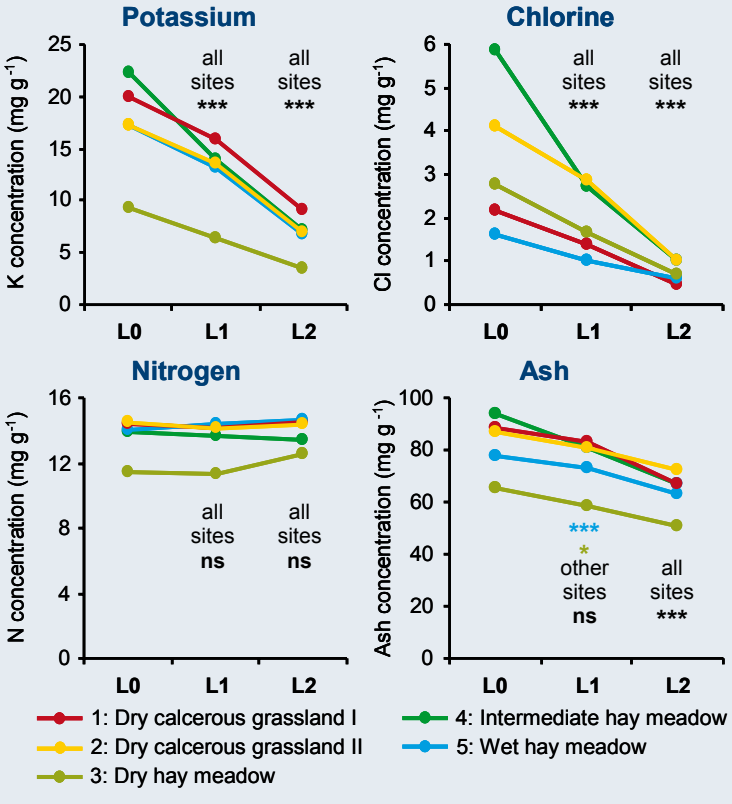
Treatments

- **L0** unleached control
- **L1** 10 min of leaching (≈ 30-40 mm precipitation)
- **L2** 120 min of leaching (> 70 mm precipitation)

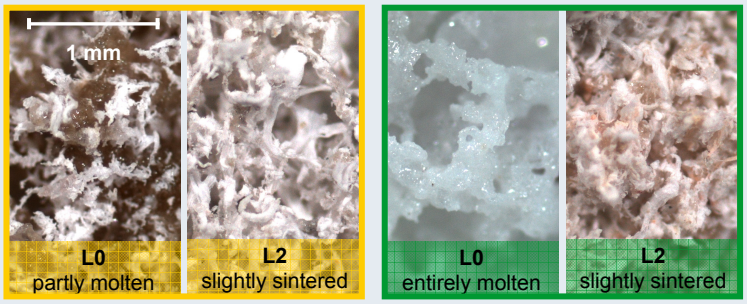
Ash melting behaviour

- 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. Signifikant differences from the unleached control marked by asterisks.



Ash structure after heating to 1000 °C for unleached (L0) and leached (L2) grassland biomass of site 2 and site 4.

- **K, Cl**: leaching as effective as for other herbaceous biofuels
- **Ash**: moderate reduction by leaching
- **N**: no reduction by leaching
- **Ash melting behaviour**: improved by leaching

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 likelyhood of suitable weather conditions

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