

Release and plant availability of sulfur from catch crops

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Introduction

Because of declining sulfur immisions during the last years (for Bavaria 1999: $\bar{\varnothing}$ 6 kg S ha⁻¹), sufficient sulfur supply is no longer guaranteed. This is also true for organic farming systems (Hagel, 2000). Leaching of sulfate is one of the most important factors for high loss of sulfur. Thus, similar to nitrogen, sulfur preserving farming systems may gain increasing significance in order to minimise sulfur loss. Model experiments were used to investigate to what extent the cultivation of catch crops can lead to a reduction of sulfur leaching and, consequently, increase S-utilisation by the following crop.

Material and Methods

Catch crops (Table 1) were cultivated (8-10 weeks) in a pot experiment in a silty loam (4.9 kg pot⁻¹, 0.92 mg SO₄-S 100g⁻¹). During winter, leaching was simulated by percolation. In February, catch crops, or mineral fertiliser were incorporated. In April, wheat was sown and cultivated until maturity (July). Available sulfur from catch crops was determined by incubation of soil without plants (S_{min}, CaCl₂ extract) and biomass production of wheat.

Results and Discussion

Catch crops reduced S leaching up to 78 % compared to the control (Table 1). However, this obvious preservation capacity for sulfur in green manure – in contrast to the application of mineral sulfur in the control – did not increase but reduced S_{min} content of soil at sowing time of wheat. Only some catch crops led to an increased soil S mineralisation from April to July. Compared to mineral S fertilisation, catch crops showed little, no, or negative effects on the yield of wheat. Among catch crops species, only *Brassica napus* and *Raphanus s. oleiformis* led to a small but positive S utilisation. With *Lolium perenne*, a marked reduction of yield and S uptake, as a consequence of S immobilisation, was observed.

Table 1. Availability of sulfur conserved by different catch crops species – pot experiment with wheat

	mg S pot ⁻¹				wheat biomass	S uptake
	loss by leaching	manure as catch crops (S fertiliser)	S _{min} in soil April (sowing time wheat)	S mineralisation without wheat April to July	total	total
					g dry m. pot ⁻¹	mg S pot ⁻¹
without leaching						
- catch crops	0	0	60	12	76.3	55 d
with leaching						
- catch crops	41	0	21	13	42.6	23 ab
- catch crops + min. S-fertilisat.	41	(20)	41	-	63.9	38 c
+ <i>Brassica napus</i>	10	26	20	15	44.8	29 b
+ <i>Sinapis alba</i>	9	35	16	17	38.7	24 ab
+ <i>Raphanus s. oleif.</i>	11	21	18	18	44.5	27 b
+ <i>Trifolium resupin.</i>	14	32	17	13	42.0	24 ab
+ <i>Pisum/Vicia s.</i>	18	20	15	16	39.1	23 ab
+ <i>Phacelia tan.</i>	13	25	14	14	35.1	24 ab
+ <i>Lolium perenne</i>	14	22	9	13	27.9	18 a

Conclusions

Comparable to other experiences with organic manure, it can be suggested that catch crops show, like nitrogen, no short-term but long-term S effects, increasing the S-pool in soil by continuous application (Gutser and v. Tucher, 2000).

References

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