

SUPPLEMENTARY MATERIAL

Quantification of nitrates leaching from grassland soils in winter using the Burns model

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Table S1. Descriptive statistics of average content of nitrate nitrogen (N-NO₃), and its stocks in 0–30 cm layer of grassland soils in the autumn period of 2018–2020

NO ₃ -N content					NO ₃ -N stocks				
A measure of statistics	2018	2019	2020	3 periods	a measure of statistics	2018	2019	2020	3 periods
Very light soils									
<i>n</i>	6			18	<i>n</i>	6			18
\bar{x} (mg N·kg ⁻¹)	5.3	3.4	6.7	5.1	\bar{x} (kg N·ha ⁻¹)	24.4	15.7	30.6	23.5
<i>CV</i> (%)	109.4	88.2	46.3	82.4	<i>CV</i> (%)	109.4	87.3	47.1	81.3
max. (mg N·kg ⁻¹)	16.2	6.9	10.5	16.2	max. (kg N·ha ⁻¹)	74.5	31.9	48.2	74.5
min. (mg N·kg ⁻¹)	0.3	0.7	2.9	0.3	min. (kg N·ha ⁻¹)	1.3	3.4	13.2	1.3
Light soils									
<i>n</i>	12			36	<i>n</i>	12			36
\bar{x} (mg N·kg ⁻¹)	3.9	8.8	7.1	6.6	\bar{x} (kg N·ha ⁻¹)	17.7	39.6	32.1	29.8
<i>CV</i> (%)	66.7	70.5	132.4	103.0	<i>CV</i> (%)	65.5	70.5	131.2	102.3
max. (mg N·kg ⁻¹)	8.9	19.1	34.8	34.8	max. (kg N·ha ⁻¹)	39.9	86.0	156.4	156.4
min, mg N·kg ⁻¹	0.3	0.9	0.01	0.01	min, kg N·ha ⁻¹)	1.3	3.9	0.05	0.05
Medium soils									
<i>n</i>	8			24	<i>n</i>	8			24
\bar{x} (mg N·kg ⁻¹)	10.7	1.9	13.8	8.8	\bar{x} (kg N·ha ⁻¹)	45.4	8.1	58.6	37.3
<i>CV</i> (%)	77.6	94.7	61.6	95.5	<i>CV</i> (%)	78.0	91.4	61.9	95.7
max. (mg N·kg ⁻¹)	24.9	5.9	28.7	28.7	max. (kg N·ha ⁻¹)	105.8	25.1	122.1	122.1
min, mg N·kg ⁻¹	2.0	0.8	6	0.8	min (kg N·ha ⁻¹)	8.7	3.2	25.6	3.2
Heavy soils									
<i>n</i>	4			12	<i>n</i>	4			12
\bar{x} (mg N·kg ⁻¹)	5.0	3.7	14.8	7.8	\bar{x} (kg N·ha ⁻¹)	19.5	14.5	57.8	30.6
<i>CV</i> (%)	48.0	70.3	48.0	84.6	<i>CV</i> (%)	48.7	70.3	47.8	84.6
max. (mg N·kg ⁻¹)	7.8	7.0	24.8	24.8	max. (kg N·ha ⁻¹)	30.5	27.2	96.6	96.6
min. (mg N·kg ⁻¹)	2.9	1.2	8.1	1.2	min. (kg N·ha ⁻¹)	11.2	4.5	31.4	4.5
Mineral soils total									
<i>n</i>	30			90	<i>n</i>	30			90
\bar{x} (mg N·kg ⁻¹)	6.2	5.2	9.8	7.1	\bar{x} (kg N·ha ⁻¹)	26.7	23.1	42.3	30.7
<i>CV</i> (%)	93.5	100	85.7	95.8	<i>CV</i> (%)	93.6	101.3	84.6	96.1
max. (mg N·kg ⁻¹)	24.9	19.1	34.8	34.8	max. (kg N·ha ⁻¹)	105.8	86.0	156.4	156.4
min. (mg N·kg ⁻¹)	0.3	0.7	0.01	0.01	min. (kg N·ha ⁻¹)	1.3	3.2	0.05	0.05
Organic origin soils									
<i>n</i>	9			27	<i>n</i>	9			27
\bar{x} (mg N·kg ⁻¹)	13.6	32.4	19.9	22.0	\bar{x} (kg N·ha ⁻¹)	16.0	33.8	21.4	23.7
<i>CV</i> (%)	120.6	81.5	128.6	107.7	<i>CV</i> (%)	83.1	71.6	93.5	86.1
max. (mg N·kg ⁻¹)	53.9	80.2	67.8	80.2	max. (kg N·ha ⁻¹)	38.0	72.0	53.2	72.0
min. (mg N·kg ⁻¹)	2.3	0.9	0.5	0.5	min. (kg N·ha ⁻¹)	2.9	3.3	0.5	0.5

Explanations: as under Table 2.

Source: own study.

Table S2. Descriptive statistics of nitrate nitrogen (N-NO₃) leaching status from grassland soils in the 0–30 cm layer in three winter periods

Level of N-NO ₃ leaching					Leaching coefficient N-NO ₃ ¹⁾				
A measure of statistics	2018/2019	2019/2020	2020/2021	3 periods	a measure of statistics	2018/2019	2019/2020	2020/2021	3 periods
Very light soils									
<i>n</i>	6			18	<i>n</i>	6			18
\bar{x} (mg N·kg ⁻¹)	18.0	10.8	17.9	15.6	\bar{x} (%)	74.9	66.4	57.4	66.3
<i>CV</i> (%)	107.5	89.4	52.8	85.2	<i>CV</i> (%)	3.7	5.9	8.2	12.4
max. (mg N·kg ⁻¹)	54.2	22.0	32.1	54.2	max. (%)	80.0	72.1	66.5	80.0
min. (mg N·kg ⁻¹)	1.0	2.1	7.4	1.0	min. (%)	72.6	62.2	53.2	53.2
Light soils									
<i>n</i>	12			36	<i>n</i>	12			36
\bar{x} (mg N·kg ⁻¹)	11.7	24.8	15.3	17.2	\bar{x} (%)	65.1	63.1	52.5	60.2
<i>CV</i>	64.3	73.1	116.5	92.0	<i>CV</i> (%)	13.1	14.3	20.4	17.9
max. (mg N·kg ⁻¹)	23.9	50.2	65.8	65.8	max. (%)	76.7	78.3	75.1	78.3
min. (mg N·kg ⁻¹)	0.8	2.7	0.0	0.0	min. (%)	51.3	49.3	36.4	36.4
Medium soils									
<i>n</i>	8			24	<i>n</i>	8			24
\bar{x} (mg N·kg ⁻¹)	21.8	4.6	25.9	17.4	\bar{x} (%)	46.2	52.8	43.4	47.5
<i>CV</i>	100.1	106.3	65.5	104.1	<i>CV</i> (%)	30.3	14.9	20.2	22.9
max. (mg N·kg ⁻¹)	68.5	15.9	55.9	68.5	max. (%)	64.8	63.5	58.3	64.8
min. (mg N·kg ⁻¹)	5.1	1.3	10.3	1.3	min. (%)	29.0	41.1	34.1	29.0
Heavy soils									
<i>n</i>	4			12	<i>n</i>	4			12
\bar{x} (mg N·kg ⁻¹)	7.9	5.9	20.6	11.5	\bar{x} (%)	40.6	41.4	36.2	39.4
<i>CV</i>	54.1	78.6	40.8	76.2	<i>CV</i> (%)	37.0	24.6	8.4	25.1
max. (mg N·kg ⁻¹)	13.0	12.5	31.6	31.6	max. (%)	59.7	51.7	40.1	59.7
min. (mg N·kg ⁻¹)	2.6	1.8	11.2	1.8	min. (%)	23.6	28.0	32.7	23.6
Mineral soils total									
<i>n</i>	30			90	<i>n</i>	30			90
\bar{x} (mg N·kg ⁻¹)	15.2	14.1	19.3	16.2	\bar{x} (%)	58.8	58.1	48.9	55.3
<i>CV</i>	99.9	108.3	78.7	93.9	<i>CV</i> (%)	27.4	19.6	22.2	24.7
max. (mg N·kg ⁻¹)	68.5	50.2	65.8	68.5	max. (%)	80.0	78.3	75.1	80.0
min. (mg N·kg ⁻¹)	0.8	1.3	0.0	0.0	min. (%)	23.6	28.0	32.7	23.6
Organic soils									
<i>n</i>	9			27	<i>n</i>	9			27
\bar{x} (mg N·kg ⁻¹)	7.0	4.6	3.9	5.1	\bar{x} (%)	40.5	21.5	19.9	27.3
<i>CV</i>	103.1	78.7	106.8	101.0	<i>CV</i> (%)	35.6	91.8	65.5	66.2
max. (mg N·kg ⁻¹)	23.6	12.2	13.5	23.6	max. (%)	67.8	62.1	46.6	67.8
min. (mg N·kg ⁻¹)	1.0	1.1	0.1	0.1	min. (%)	26.6	7.2	9.2	7.2

¹⁾ Leaching coefficient N-NO₃ means the ratio – expressed as a percentage, of N-NO₃ leached from the soil to its autumn N-NO₃ stocks ($W_{N-NO_3}/Z_{N-NO_3} \cdot 100$).

Explanations: as under Table 2.

Source: own study.