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## The surface water and soil quality by the year-long staying management in Jeseníky region

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**Key words:** wintering, surface water, soil

**Introduction** The common cattle keeping is with winter staying in the stable in Czech Republic, because there is not forage on the pastures. The new use of year-long cattle keeping on pastures has economic benefits, but elevates risk of increased concentrations of phosphorus, potassium and ammonia compounds percolating into the water table. The aim of paper is to appraise the influence of year-long cattle staying on pasture for soils and surface water quality.

**Materials and methods** Two localities were monitored during 2004-2007 period: 1-wintering with the shelter, 2-wintering without the shelter (where wintering place was moved every year). The water samples were taken from the upper (U) reaches of streams (above the pasture) and from the lower (L) ones in two-months interval (the water was sampled 20-times in total). The indicators: N-NO<sub>2</sub><sup>-</sup>, N-NO<sub>3</sub><sup>-</sup>, N-NH<sub>4</sub><sup>+</sup> and P. The soil is sandy-loam, subunit luvi-cambisols. It was sampled directly at the cattle wintering place (highest animal concentration) and from the adjacent pasture (check sampling) from depth of 0.02-0.30 m and 0.30-0.60 m in April and in October (the soil was sampled 7-times). The soil samples were analysed for content of inorganic nitrogen (N<sub>in</sub>) and available nutrients (P, K, Ca) by Mehlich III method. The results were evaluated by statistical software SPSS for Windows v.13.0.

**Results and discussion** The streams were not contaminated by nitrate and nitrite. The limit of ammonia nitrogen for surface water is 0.5 mg l<sup>-1</sup>, it exceeded acceptable pollution limits during the 2004-2005 period, also in the upper reaches of streams. The highest concentration was in August (1U 0.89, 1L 1.23, 2U 0.91, 2L 1.02 mg l<sup>-1</sup>) and October 2004 (1U 0.69, 1L 0.91, 2U 0.75, 2L 0.85 mg l<sup>-1</sup>). From December 2005 to August 2007 N-NH<sub>4</sub><sup>+</sup> content was under the pollution limit. Pollution by phosphorus (0.15 mg l<sup>-1</sup>) exceeded limits five times on locality 1 under the wintering place and twice on locality 2 (at the both samplings places). The pollution on locality 1 was proved from September 2006,

**Table 1** The nutrient content in soil (mean of year 2004-2007).

Locality	Utilization	Depth [m]	N <sub>in</sub> [mg .kg <sup>-1</sup> ]	P [mg .kg <sup>-1</sup> ]	K [mg .kg <sup>-1</sup> ]	Ca [mg .kg <sup>-1</sup> ]
1	pasture	0.02-0.30	7.80	37	218	2163
		0.30-0.60	5.20	18	126	1733
	wintering place	0.02-0.30	24.48	164	1191	1543
		0.30-0.60	15.16	132	395	959
2	pasture	0.02-0.30	14.24	50	181	2177
		0.30-0.60	9.97	29	141	1822
	wintering place	0.02-0.30	26.54	57	533	1752
		0.30-0.60	14.03	29	262	1095
	Locality		0.26	2.49	6.63 <sup>+</sup>	0.09
	Utilization	0.02-0.30	2.14	4.34 <sup>+</sup>	22.46 <sup>++</sup>	3.87
ANOVA	Season		3.70	1.85	0.23	0.10
(F-ratio)	Locality		0.01	0.96	1.25	0.45
	Utilization	0.30-0.60	3.20	1.29	8.29 <sup>++</sup>	13.45 <sup>++</sup>
	Season		6.16 <sup>+</sup>	1.79	1.64	0.27

<sup>+</sup> P > 95 <sup>++</sup> P > 99

which could be caused by the high phosphorus concentration in soil (Rzonca *et al.*, 2006) and its transport. From this point of view non-shelter wintering that is moved every year is better for surface water quality. The values of nutrient content in soils are in Table 1. In wintering place was tendency to increase of nitrogen content in 0.30-0.60m layer against the pasture (control). The cattle staying on wintering place had significant influence on increase of phosphorus content in 0.02-0.30m layer and of potassium in the both layers. The content of potassium was significantly higher on locality 1 than on 2 in 0.02-0.30m layer. The content of calcium showed a tendency to decrease in 0.02-0.30m layer and it was significantly lower in 0.30-0.60m layer in wintering place against the pasture.

**Conclusions** The year-long cattle keeping could contaminate surface water by phosphorus and ammonia nitrogen, but changing the wintering place every year and following the proper farming routines (high bedding, regeneration of grass turf in the spring) can eliminate the risk. The year-long cattle keeping has proved an impact on the increase of potassium and phosphorus content and the decrease of calcium content in the soil of winter place.

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