

Effect of glyphosate residues in animal feed on rumen pH-value, short chain fatty acids and rumination time of dairy cows

Einfluss von Glyphosatrückständen in Futtermitteln auf den Pansen pH-Wert, flüchtige Fettsäuren und die Wiederkauaktivität bei Milchkühen

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Glyphosate is currently one of the most controversially discussed herbicide. It inhibits the aromatic amino acid biosynthesis in plants and is suspected to influence the rumen microflora and consequently rumen fermentation. The aim of this study was to examine the effect of glyphosate residues in animal feed on rumen fermentation characteristics.

Methods: A total of ten cannulated German Holstein cows were divided into two different feeding groups with five cows each. The experiment lasted 16 weeks and was subdivided into three periods: period 1 (week 0, pre-treatment period), period 2 (week 5 to 8) and period 3 (week 14 to 15). In period 1 all cows received a total mixed ration (TMR) consisting of 30% maize silage, 30% grass silage, 40% concentrate (on a dry matter basis) for *ad libitum* consumption. During period 2 and 3 cows were divided into two groups fed *ad libitum*, either an uncontaminated control TMR (CON) or a glyphosate contaminated TMR (GLY). The TMRs were composed of 21% maize silage, 42% grass silage, 30% concentrate and 7% straw (on a dry matter basis). Straw and concentrate components originated from wheat and peas with or without glyphosate treatment were used. During the experimental periods pH-value in the ventral sac of the rumen was measured using a submersible continuous ruminal pH measurement system (1) (Dascor Inc., Escondido, CA, USA) and the rumination time (RT) was determined simultaneously in period 2 and 3 by a sensor-based automatic measurement system (Rumiwatch, Liestal, Switzerland). Samples of rumen fluid were taken once in period 1 and twice in period 2 and 3 for short chain fatty acids (SCFA) analysis. Data were acquired for pH in period 1, 2 and 3 and for RT in period 2 and 3. Data were analyzed by using the MIXED procedure of SAS 9.4. Data for variables obtained in period 1 served as a covariate. Values are represented as LS-Means \pm standard error (SE).

Results: Glyphosate contamination did not influence RT, the daily average pH value and the concentration of total SCFA as well as the molar proportions of SCFA in the rumen fluid (Table 1). No evidence for subacute ruminal acidosis (average daily pH < 6.2; pH < 5.8 more than 324 minutes per day (2)) was identified. Only the period showed an effect on the pH-value and the SCFA, but no influence on RT (Table 1).

Table 1: Effect of glyphosate residues on pH-value, short chain fatty acids (SCFA) and rumination time (RT) of dairy cows (LS-Means \pm SE).

	Treatment		p-value	period	group*period
	CON (n = 5)	GLY (n = 5)			
RT [min/d]	593 \pm 19	597 \pm 19	0.898	0.736	0.706
pH [daily average pH]	6.4 \pm 0.1	6.5 \pm 0.1	0.415	0.004	0.117
pH < 5.8 [min/d]	55 \pm 50	112 \pm 50	0.453	0.089	0.178
Total SCFA [mmol/L]	49.1 \pm 4.2	57.6 \pm 4.2	0.207	0.121	0.235
Acetate [mol%]	68.8 \pm 0.4	68.0 \pm 0.4	0.210		0.388
Propionate [mol%]	17.0 \pm 0.5	17.2 \pm 0.5	0.732	0.003	0.831
Butyrate [mol%]	11.4 \pm 0.3	11.2 \pm 0.3	0.674	0.022	0.793

Conclusion: Present results suggest that a glyphosate contamination of feedstuffs did not influence rumen fermentation characteristics. Rumen microbiome will be analyzed to investigate possible specific treatment-related effects on ruminal microbial diversity.

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(2) ZEBELI, O, DIJKSTRA, J, TAJAJ, M, STEINGASS, H, AMETAJ, BN and DROCHNER, W. (2008) : *J. Dairy Sci.* 91:2046-2066

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