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Ammoniation of straw by urea: extent of ureolysis and improvement of nutritive value with moderate water addition

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Introduction — Our purpose was to compare different urea treatments of straw, using an urease source or not, with a moderate addition of water.

Materials and Methods — In August, we added per 100 kg of wheat straw (85% DM): 8 kg of urea (U), 8 kg + 1.6 kg of enzyme active soybean flour (as urease source, Soyasol) (US), or 4.5 kg of ammonia (A). U, US and water (to reach a treated straw moisture of 30%) were added by spraying on windrow (WU and WUS) or on cubic bales (BU and BUS) of 15 kg. The stacks (500 kg) were covered with plastic sheets. After 17 wk, we determined nitrogen (N), urea, organic matter digestibility (OMD) (*in vivo*, feed restricted at 30 g/kg $W^{0.75}$, or by densitometry for A, Besle *et al*, 1989) and volontary intake (sheep).

Results and Discussion — Within urea (table I) treatments: 1) without soya, ureolysis was poor for BU, which had a correlatively low intake. The moderate result for WU was probably due to a good mixture with straw and to the long duration of the treatment; 2) with US, ureolysis was total for both techniques. When ureolysis was moderate: 1) N level was higher after urea than after A treatment; 2) OMD improvement was the same for all ammonia sources; it was better when US was added to urea; 3) US improved intake.

In conclusion, urea treatment of straw can be achieved saving water, by spraying bales. Results were close to those obtained with A provided a urease source was added.

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Table I. Characteristics of untreated (UT) and treated (see text) straw.

	Treatments					
	UT	*WU*	*WUS*	*BU*	*BUS*	*A*
Ureolysis (%)	–	81.2^{a}	98.7^{b}	17.3^{c}	83.2^{a}	–
Total N (g/kg DM)	5.3^{a}	22.6^{b}	16.0^{c}	39.2^{d}	18.4^{c}	14.8^{e}
OMD (%)	37.8^{a}	47.4^{b}	57.5^{c}	52.3^{d}	56.9^{c}	54.2^{c}
Intake (g/kg $W^{0.75}$)	34.6^{a}	32.1^{a}	47.7^{b}	29.7^{c}	65.2^{d}	ND

Same superscripts are not significantly different ($P < 0.05$). ND = not determined.