

Laboratory, *in sacco* and *in vivo* assessment of various treatment conditions affecting the sulphurizing of wheat straw

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The objective of this study was to examine the effects of treatment time, SO₂ levels, moisture levels and temperature on laboratory assessments, *in sacco* degradabilities and *in vivo* digestibilities of untreated and ammonia (NH₃) treated wheat straw.

Wheat straw and gas ammoniated (3 % w/w) wheat straw were treated with SO₂ at 1, 2 or 3 % dry matter (DM) for 10, 20, 30 or 40 days at 20, 40 or 60°C and 10, 35 or 60 % moisture according to a factorial experimental design. Treated straw was analyzed for acid detergent fibre (ADF) and neutral detergent fibre (NDF). Means were compared according to least significant differences (LSD). The six treatments with lowest ADF and NDF contents were also compared *in sacco* with NH₃-treated and untreated wheat straw for effective degradability of dry matter (DM), ADF and NDF according to the method described by Orskov and McDonald (1979, J Agric Sci, 92, 499-503). The two SO₂ treatments with highest *in sacco* effective degradabilities, untreated and NH₃ treated wheat straw were then included in total mixed diets (40 % DM) and compared in an *in vivo* digestibility trial with 5 sheep per treatment.

Lowest NDF values for ammoniated straw were recorded with the 2 % SO₂ treatment (P<0.05) at all moisture and temperature levels.

Untreated straw responded most effectively to 3 % SO₂ treatment (P<0.05) at the highest temperature (60°C) and highest moisture level (60 %). Although some treatments decreased ADF values (P<0.05), the effects were small and no clear trend was observed.

In sacco effective degradability of DM was higher (P<0.05) for SO₂ and NH₃ treated straw compared with untreated straw. Best results were achieved with 3 % SO₂ treatment at 60 % moisture and 40°C for 30 days (41.24 vs 30.62 % for untreated straw at a rumen outflow rate of 0.05/h). NDF and ADF degradabilities did not follow the same trend found with DM degradabilities.

The DM digestibilities of total diets containing 40 % untreated straw, NH₃ treated straw and two SO₂ treated straws (a : 3 % SO₂, 60 % moisture, 40°C, 30 days ; b : 3 % SO₂, 60 % moisture, 60°C, 10 days) did not differ (71.61, 71.09, 72.76 and 72.92 %). Organic matter (OM), NDF and ADF digestibilities also did not differ amongst treatments.

Promising results regarding the SO₂ treatment of wheat straw were found with laboratory analysis and *in sacco* evaluations. The same trend was not found when 40 % treated straw was included in total diets in an *in vivo* digestibility trial.