Treatment and supplementation strategies for making efficient use of cereal straws for ruminant production

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Declaration

I certify that the substance of this thesis has not been submitted for any degree and is not currently being submitted for any other degree.

I certify that all help received in the preparation of this thesis, and all sources used, have been acknowledged.

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Summary

Two experiments have been conducted to test the effects on performances of sheep and cattle of various protein concentrates when given as supplements to straw-based diets. Comparative effects of urea treatment and protein supplementation have also been examined.

Experiment 1

An investigation was made of the effect of copra, palm kernel cake, cotton seed meal and sunflower meal supplements on wool growth and live weight gain of sheep. Twenty-five crossbred wethers, 5 months of age and weighing 30.8 kg, were randomly grouped into 5 treatments: control (Ctrl), copra (Cpr), palm kernel cake (Pkc), cotton seed meal (Csm) and sunflower meal (Sfm) supplements. Restricted feeding of oaten chaff plus 3% urea and 1% mix-minerals (Oc) as a basal diet was applied to all. The supplements were added into the diets of the treated groups in order to provide an intake of 19.5 gN/d. The animals were individually penned and fed once a day. The experiment lasted 5 weeks with a 10 week pre-experimental period. Feed intake, live weight change, greasy wool yield and fibre diameter were measured.

Live weight (LW) gains of wethers supplemented with Cpr, Csm, Sfm and Pkc were 11.4, -6.9, -1.7, and 11.4 g/d, respectively, which were significantly different ($P<0.05$) from wethers in the Ctrl group (13.3 g/d). This was probably due to restricted feeding of the basal diets bringing about a shortage of energy to support LW gain in supplemented sheep.

Both greasy and clean wool yields of the supplemented animals were significantly higher than yields of the Ctrl group ($P<0.05$). The sheep in the control group produced 0.23 g/d greasy wool, whereas the productions for Cpr, Csm, Sfm and Pkc were 0.29, 0.30, 0.26 and 0.30, respectively. The growth rates of greasy and clean wool of sheep in Cpr, Csm, Sfm and Pkc were respectively 16; 10; 14; 18% and 21; 17; 17; 21% higher than those of sheep in Ctrl. None of the supplements produced any effect on

fibre diameter (P>0.05). Even though restricted feeding caused a slight loss in live weight, supplements of Cpr, Csm Sfm and Pkc promoted wool production.

Experiment 2

Experiment 2 was conducted to determine the effects on feed intake and live weight gain of cattle of urea treatment of rice straw (TRS) and supplementation of untreated rice straw (URS) with copra or whole cotton seed. Sixteen F1 (Vietnam Local Yellow x Brahman) cattle (aged 30 months, mean 221 kg) were allocated to 4 treatment groups: (1) URS *ad libitum*, (2) TRS *ad libitum*, (3) URS *ad libitum* plus 1.3 kg copra (Cpr) and (4) URS *ad libitum* plus 1 kg whole cotton seed (WCS). Feed intakes, live weight gains, and rates of ammonia production *in vitro* from copra and cotton seed were measured .

Urea treatment of straw and supplementation of URS with Cpr and WCS brought about higher (P<0.01 and P<0.05) rice straw dry matter intakes (DMI) by cattle. DMI were 1.40, 2.41, 1.67 and 1.73 kg/100kg live weight (LW) for groups 1, 2, 3 and 4, whereas total digestible energy intakes were estimated to be 20, 35, 41 and 40 MJ/h/d, respectively. Live weight gains of supplemented animals (183 g/d for Cpr and 235g/d for WCS) and those fed on TRS (165g/d) were significantly higher (P<0.01 and P<0.05) than for cattle in the control group (-49.1 g/d).

Animals fed solely URS lost weight, while urea treatment of rice straw and supplementation with Cpr and WCS improved the growth rate of animals significantly. However, live weight gains of cattle in response to the two supplements did not reflect rates of protein degradation of these supplements *in vitro*.

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