A MODIFICATION OF A RUMEN SIMULATOR FOR USE IN THE STUDY OF THE EFFECT OF CONCENTRATE SUPPLEMENTATION ON ROUGHAGE DIGESTION

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A rumen simulation technique has been developed for studies of compartmentation in the rumen (Czerkawski and Breckenridge 1977 ; Czerkawski 1979). This technique has potential advantages for use in investigating the effect of supplements on digestion of poor quality roughages (Radcliffe & Ridgway 1984). This paper describes the construction of an eight vessel rumen simulator incorporating design modifications and using materials readily available in Australia.

Each vessel consisted of a 300 mm section of 'Excelon' clear PVC food grade tubing (77 mm inside diameter, 89 mm outside diameter) with a clear perspex base 14 mm thick glued into place with silicon sealant. A removable lid of clear 25 mm perspex 100 mm in diameter was recessed and threaded to fit threads in the top of the vessel, and an 0 ring used to ensure sealing. Three holes were bored in the lid: a central hole threaded to take an air-tight gland for passage of the stirring mechanisms, and two holes to allow passage of an outlet tube and of a three-way valve for flushing of head-space with nitrogen. A 6 mm stainless steel plunger rod, threaded for 25 mm at each end, passed through the air-tight gland. A friction plate consisting of a 3 mm thick piece of plastic and fabric belting material fixed to a PVC disc (50 mm x 10 mm) was attached to the top of the plunger. A stirrer and feed support was attached to the bottom of the plunger; it consisted of a plastic disc (75 mm in diameter x 4.5 mm thick) with four 10 rnm holes to allow fluid circulation. Four PVC rods (170 mm long; diameters, upper 40 mm:19.5 mm, lower 130 mm:12.5 mm) were fixed to the lower side with stainless steel screws. The rods supported diets contained in nylon bags held in place by an 'Elastrator' ring which fitted into a groove 25 mm from the top of the support rod. Four feed supports allow daily feeding with separate bags of roughage and concentrate which remain in the vessel for 48 h. The vessels were stirred with a vertical stroke 12 mm amplitude and by a 360° rotation of the feed assembly at a rate of 10/minute. The stirring action was imparted to the friction plates by ball bearing cams on 76 mm wheels. A 70 mm stainless steel spring made from 1 mm wire fitted to the plunger rod provided the return action after depression by the cam. During operation the vessels were kept at constant temperature (30°C) in a 300 x 760 x 390 mm glass water bath. The driving mechanism was constructed on a wooden frame which supported two drive shafts each with four cam wheels. Each shaft was driven by a 60 watt 240 volt motor with 140/1 reduction drive through a 22 tooth sprocket which drove a matching sprocket on the cam shaft with a roller chain. The wooden frame also provided placement notches for each vessel. It was supported on the top of the glass tank by steel rods fixed to the bench. The effluent was collected in a 1 1 flask with a tube leading from the collection flask to a rubber football bladder which acted as a gas collector.

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