

DEGRADABILITY OF PROTEIN CONCENTRATES AVAILABLE IN NORTHAUSTRALIA

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Forages provide the major source of dietary protein for dairy production, but additional protein can be required in concentrates and there may be nutritional advantages to more slowly degraded protein. Meat and bone meal (MBM) has been widely used, but is no longer permitted to be fed to ruminants. The *in sacco* technique (Orskov *et al.* 1980) was used with three rumen fistulated Holstein-Friesian steers fed lucerne hay (20% CP), to describe degradation of dry matter (DM) and protein (P) for concentrates available in northern Australia. Quickly degraded (QD), slowly (SD), effective rumen degradation (ERD) and undegraded P (UDP) (g/kg DM) fractions of DM and P were calculated using the equation $P = a + (b \cdot c) / (c + r)$ assuming a rumen outflow rate $r = 0.08 \text{ h}^{-1}$ for high production (AFRC 1993) (Table 1).

Table 1. Degradabilities of dry matter (DM) and protein (P) in protein rich concentrates

Feed	CP	a	b	c	QD	SD	ERD	UDP	ERDP
	(%)				(g/kg DM)				(% CP)
<i>Dry matter</i>									
Cottonseed meal (CSM)	21.2	59.1		0.056	212	243	455		
CSM (1% HCHO)		24.5	33.0	0.004	245	17	262		
Sunflower meal		3.8	59.0	0.158	38	392	430		
Rumentek® canola meal		8.9	67.5	0.101	89	376	465		
Whole cotton seed (WCS)		45.1	43.9	0.016	451	73	524		
Copra meal		24.2	73.1	0.034	242	220	462		
Palm kernel extract (PKE)		4.8	78.1	0.050	48	302	351		
Lucerne hay		25.7	45.7	0.065	257	205	462		
Meat and bone meal (Cattle)		13.4	33.2	0.077	134	163	297		
Fish meal (Sea Pep®)		20.0	87.3	0.002	200	22	222		
Feather meal		2.9	19.2	0.035	29	58	87		
<i>Protein</i>									
Cottonseed meal (CSM)	44.2	15.7	78.9	0.070	69	163	219	209	52.6
CSM (1% HCHO)	45.6	11.3	35.3	0.003	52	5	47	399	12.5
Sunflower meal	38.9	16.8	78.5	0.181	65	212	264	112	71.2
Rumentek® canola meal	42.3	3.5	94.2	0.120	15	239	251	169	60.1
Whole cotton seed (WCS)	23.1	83.3	10.4	0.033	193	7	161	31	86.4
Copra meal	24.8	10.4	65.8	0.013	26	49	44	199	19.9
Palm kernel extract (PKE)	17.4	10.8	92.0	0.037	19	51	66	104	40.0
Lucerne hay	20.0	28.1	54.6	0.087	56	57	102	87	56.6
Meat and bone meal (Cattle)	56.7	9.8	54.1	0.092	56	164	208	348	38.7
Fish meal (Sea Pep®)	54.2	21.4	35.7	0.016	116	32	125	394	27.3
Feather meal	92.4	4.8	19.3	0.027	44	44	80	836	9.6

Cottonseed meal ($\geq 40\%$ CP), with an effective rumen degradability (ERDP) of 53%, was more rapidly degraded than MBM but provided more UDP than sunflower or canola meal. In contrast, 86% of protein in unprocessed whole cotton seed (WCS) when cracked was degraded in the rumen. Entire WCS was not degraded. Copra meal and palm kernel extract (PKE) have similar ME and P to WCS and lower degradability than WCS or oil seed meals. Fish meal has a similar protein level and degradability to MBM but cost precludes its use in dairy rations. Hydrolysed feather meal (92% CP equivalent) had very low degradability (ERDP $< 10\%$) and would be unsuitable if rumen degradable protein is limiting. Oil seed meals are acceptable alternatives to MBM. Formaldehyde will reduce their degradability. Response to protein concentrates of different degradability may be small (Moss *et al.* 1996).

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