

Supplementary Material

Title: Review of feeding conserved forage to horses: recent advances and recommendations

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Supplementary Material S1

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S 1 – Example of the range in chemical composition of forages produced and fed to horses in some European regions

European Region	Forage type	Botanical composition	DM (%)	CP (%DM)	Fibre		
					CF (%DM)	NDF (%DM)	ADF (%DM)
Nordic and Baltic countries (a)	Hay	Grasses	85 - 88	6.3 - 18	31 - 36	61 - 63	
	Haylage	Grasses	43* - 85	6.1 - 20	26 - 35	50 - 64	27 - 41
	Silage	Grasses	25 - 55*	10 - 16	26 - 37	54 - 63	29 - 34
	Straw	Cereal	85	3.0	45		
Central Europe countries (b)	Hay	Grasses	84 - 86	4.8 - 19	24 - 38	54 - 72	27 - 40
		Mixed ^{i,iii}	85 - 94	6.3 - 20	25 - 46	53 - 75	28 - 53
	Haylage	Grasses	55 - 82	6.1 - 16	24 - 35	55 - 74	31 - 48
		Mixed ⁱ	55	9.6 - 21	27 - 35	53 - 60	30 - 37
	Silage	Grasses	34 - 44	9.1 - 19	24 - 33	48 - 63	28 - 35
		Mixed ⁱ	34	12 - 21	25 - 33	51 - 59	28 - 35
	Straw	Maize	30 - 35	6.9 - 7.7	20 - 21	44 - 47	22 - 23
		Cereal	84 - 90	3.2 - 4.9	40 - 45	76 - 80	47 - 50
Southern countries (c)	Hay	Grasses ⁱⁱ	84 - 95	5.2 - 8.9	26 - 37	59 - 68	32 - 43
		Mixed ⁱⁱⁱ	83 - 90	6.2 - 8.9	32 - 38	61 - 66	38 - 45
	Haylage	Grasses	59 - 65	8.3 - 16	27 - 31		
		Mixed ⁱ	59	9.4		61	38
	Silage	Maize	31 - 36	6.5 - 8.9	19 - 28	39 - 53	21 - 32
	Straw	Cereal	85 - 91	2.7 - 5.5	36 - 44	75 - 77	46 - 53

* NB from our consensus definition the forages included here as haylages with a DM <50% would be considered silages and DM >50% haylages.

ⁱMeadow or permanent pasture; ⁱⁱ Oats hay included; ⁱⁱⁱ Meadow hay and consociations of grass x legume hay.

DM : Dry matter; CP : Crude Protein; CF : Crude Fibre; NDF : Neutral detergent fibre; ADF : Acid Detergent Fibre

Adapted from

(a) Finland, Sweden, Iceland, Denmark, Estonia

References: Särkijärvi *et al.*, 2008; MTT, 2010; Saastamoinen and Hellämäki, 2012; Müller and Udén, 2007; Jansson and Lindberg, 2012; Ragnarsson and Lindberg, 2008; 2010; Luthersson, personal data; Kaldmäe *et al.*, 2012a; 2012b.

(b) Netherlands, Germany, UK, France.

References: CVB, 2010; LUFA Nordwest, personal data; HorseHage, 2014; Tinsley *et al.*, 2014; Dulphy *et al.*, 1997a; Julliand, personal data; INRA, 2011.

(c) Italy, Spain, Portugal. References: Peiretti *et al.*, 2001; Bergero *et al.*, 2002; Bergero *et al.*, 2005; Bergero and Peiretti, 2011; Clotet, personal data; Casamiglia *et al.*, 2004; Dentinho *et al.*, 2014; Fradinho *et al.*, 2013; INIAV, not published

S2 . Summary of voluntary intake behaviour of horses fed various diets ad libitum with feed intake time over 24 hours (ADF – Acid detergent fibre; Wet Matter – WM; Dry Matter-DM; \pm s.d. *STB – Standardbred, TB - Thoroughbred*)

Reference	Horses/ Ponies	Feed (24 hr observations unless stated otherwise)	WM intake 500 kg horse	Average DM Intake in %BW	Intake* Rate (min/kg)	Mean Feed Intake Time (hrs/24h rs)
Vulink (2001)	Wild Konik	Nature Reserve, NL,				13 \pm 2.0
Van Dierendonck <i>et al.</i> (1996)	Przewalsky	Mongolia steppe grass (18 hrs)				12 \pm 3.6
Magnusson <i>et al.</i> (1994)	Icelandic	Iceland Grass Plains				14 \pm 2.5
Berger <i>et al.</i> (1999)	Przewalsky	Nature Reserve, D				11 \pm 4.4
Ferreira <i>et al.</i> (2013)		Western Asturias, June Heathland		5.3 2.7	22 11	12 \pm 0,8
Osoro <i>et al.</i> (2015)	Galiciano	Sep				
Mean Free-ranging, semi-feral horses on grass						12.4 \pm 2.7
Houbiers and Smolders (1990)	12 TB Trotters	Fresh cut summer grass (long, DM 16%)	80	2.1	10	13.37
		Fresh cut spring grass (short DM 14%)	84	2.3	8	11.16
	12 Warmblood	Fresh cut summer grass (long, DM 16%)	85	2.1	10	14.15
		Fresh cut spring grass (short DM 14%)	90	2.4	8	11.95
Chenost and Martin-Rosset (1985)	TB	Fresh cut hybrid ryegrass (DM 20%)	52	2.6	12	10.36
Dulphy <i>et al.</i> (1997a)	Light horses	Fresh forages (n=16)	63	2	10	10.57
Mean Barn/Stabled horses with cut Fresh Forages/Grass (DM 14 – 20%)			75.6	2.3	9.67	12 \pm 1.5
Bergero <i>et al.</i> (2002)	Ponies Maintenance	Early cut (DM 56%)	19	2.7	30	9.36
Haylages (but wetter than most UK haylages)	Light Work	Late cut (DM 63%)	17	2.8	30	8.52
	Med. Work	Late cut (DM 65%)	19	3.1	30	9.3
Mean Stabled, Haylages /Dry Silage (DM 56-65%)			23.2	2.8	30	9 \pm 0.5
Martin-Rosset and Dulphy (1987)	Heavy horse Yearlings	Hay medium quality	12	2	40	7.75
Vermorel <i>et al.</i> (1997)	Standardbred STB	Hay late cut	10	1.7	40	6.42

		Hay medium	11	1.9	40	7.05
Dulphy <i>et al.</i> (1997b) from various authors	Light horses	Lucerne hay (n=12)	13	2.2	45	9.55
		Grass hay (n=38)	13	2.2	35	7.42
		Straws (n=6)**	7	1.3	50	5.88
Pearson <i>et al.</i> (2001)	Ponies	Oat straw	12	2.2	45	9
Staniar <i>et al.</i> (2014)	Quarter Horses	Teff Hay (40% ADF)**	9.1	1.7	45	7
		Stabled: Mean Hays (DM 85%)	12 ± 1.4	2.0 ±0.2	40 ± 5	8 ±1.3
		Stabled: Mean Straws/High ADF** (DM 88% +)	10 ± 3.5	1.7 ±0.6	48 ±2.2	7.3 ± 4.1
Argo <i>et al.</i> (2002)	Welsh Ponies	Total Chaff-Pellet Mix	21	3.2	25	8.61
		As above – pelleted	25	4.4	18	7.43
		Day 26 Max intake pelleted	28	4.9	18	8.4
Dugdale <i>et al.</i> (2011)	Obese Ponies	Complete Chaff Diet	12	2.3	60	11.6
		Mean Concentrate: minimum 50% Chaff Diets	16.5	2.75	25-60	10 ± 1.8
		Mean Concentrate: Pellets	26.39	4.64	18	8 ± 0.7

#*Feed Intake Time as per author or estimated according to Ellis, 2010

** High ADF content: only volume limiting forage, which if overruled by intake behaviour can lead to compaction colics

References for Table S1 and S2

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