

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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