**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 |
| Maize | 30 - 35 | 6.9 - 7.7 | 20 - 21 | 44 - 47 | 22 - 23 |
| Straw | 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; ± 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 Intake Time** hrs/24hrs |
| Vulink (2001) | | Wild Konik | Nature Reserve, NL, | |  |  |  | 13 ± 2.0 |
| Van Dierendonck *et al.* (1996) | | Przewalsky | Mongolia steppe grass (18 hrs) | |  |  |  | 12 ± 3.6 |
| Magnusson *et al*.(1994) | | Icelandic | Iceland Grass Plains | |  |  |  | 14 ± 2.5 |
| Berger *et al.*(1999) | | Przewalsky | Nature Reserve, D | |  |  |  | 11 ± 4.4 |
| Ferreira *et al*. (2013)  Osoro *et al*. (2015) | | Galiciano | Western Asturias, June, Heathland,Sep | |  | 5.3  2.7 | 22  11 | 12 ± 0,8 |
| ***Mean Free-ranging, semi-feral horses on grass*** | | | | |  |  |  | **12.4 ±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 *et al*. (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 ± 1.5** |
| Bergero *et al*. (2002) Haylages (some  nearly silages) | Ponies Rest | | Early cut (DM 56%) | | 19 | 2.7 | 30 | 9.36 |
| 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 (DM 56-65%)** | | | | | **23.2** | **2.8** | **30** | **9 ± 0.5** |
| Martin-Rosset and Dulphy (1987) | Heavy H.  Yearlings | | Hay medium quality | | 12 | 2 | 40 | 7.75 |
| Vermorel *et al.* (1997) | STB | | Hay late cut | | 10 | 1.7 | 40 | 6.42 |
|  |  | | Hay medium | | 11 | 1.9 | 40 | 7.05 |
| Dulphy *et al.* (1997b) | Light horses | | Lucerne hay ( n=12) | | 13 | 2.2 | 45 | 9.55 |
| from various authors |  | | Grass hay (n=38) | | 13 | 2.2 | 35 | 7.42 |
|  |  | | Straws (n=6)# | | 7 | 1.3 | 50 | 5.88 |
| Pearson *et al.* (2001) | Ponies | | Oat straw | | 12 | 2.2 | 45 | 9 |
| Staniar *et al.* (2014) | Quarter H. | | 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 *et al.* (2002) | Welsh | | Total Chaff-Pellet Mix | | 21 | 3.2 | 25 | 8.61 |
|  | Ponies | | As above – pelleted | | 25 | 4.4 | 18 | 7.43 |
|  | Day 26 | | Max intake pelleted | | 28 | 4.9 | 18 | 8.4 |
| Dugdale *et al.* (2011) | Fat 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** | | | | | **26.4** | **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 - if overruled by intake behaviour can lead to compaction colics

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