



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

XXI International Grassland Congress / VIII  
International Rangeland Congress

---

## Voluntary Intake and Digestibility in Horses: Individual Variability in the Effect of Forage Quality

N. Edouard  
*INRA, France*

G. Fleurance  
*Les Haras nationaux, France*

W. Martin-Rosset  
*INRA, France*

P. Duncan  
*CEBC-CNRS, France*

J. P. Dulphy  
*INRA, France*

*See next page for additional authors*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/15-1/8>

The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

---

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

---

**Presenter Information**

N. Edouard, G. Fleurance, W. Martin-Rosset, P. Duncan, J. P. Dulphy, S. Grange, R. Baumont, H. Dubroeuq,  
F. J. Pérez-Barbería, and I. J. Gordon

## Voluntary intake and digestibility in horses : individual variability in the effect of forage quality

N. Edouard<sup>1,2</sup>, G. Fleurance<sup>3,1</sup>, W. Martin-Rosset<sup>1</sup>, P. Duncan<sup>2</sup>, J.P. Dulphy<sup>1</sup>, S. Grange<sup>2</sup>, R. Baumont<sup>1</sup>, H. Dubroeuq<sup>1</sup>, F.J. Pérez-Barbería<sup>4</sup> and I.J. Gordon<sup>5</sup>

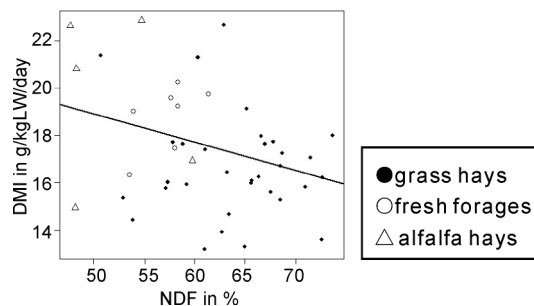
<sup>1</sup>INRA, Unité de Recherches sur les Herbivores, 63122 St-Genès-Champagnelle, France, E-mail : nedouard@clermont.inra.fr, <sup>2</sup>CEBC-CNRS, 79360 Beauvoir-sur-Niort, France, <sup>3</sup>Les Haras Nationaux, Direction des connaissances, 19230 Arnac-Pompadour, France, <sup>4</sup>The Macaulay Institute, Craigiebuckler, Aberdeen, UK, AB15 8QH, <sup>5</sup>CSIRO—Davies Laboratory, PMB PO Aitkenvale, Qld 4814, Australia

**Key words :** horses, intake, digestibility, forage quality, individual variability

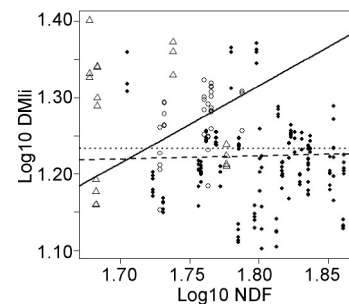
**Introduction** In herbivores, the abundance, structure and quality of plant resources, which vary in time and space, are known to influence intake strongly. In ruminants, as quality of forages declines, digestibility and total intake decline. Equids are hind-gut fermenters grazing herbivores, adapted to consume low quality forages. For many years it has been believed that the response of equids to a reduction in food quality is to increase intake to maintain rates of nutrient absorption (Janis, 1976). All reviews of horse nutrition show that digestibility declines with forage quality; for intake, however, most studies have found no significant relationship with forage quality, and more recently it has been suggested that horses may eat less in response to declining forage quality (Dulphy et al., 1997). The aim of this meta-analysis is to clarify the relationship between forage quality, digestibility and intake, allowing for the first time the differences between individual animals and diets to be controlled for.

**Materials and methods** We analysed a set of 45 trials where dry matter intake (DMI) and digestibility (DMD) were measured in 21 saddle horses fed three diets : 7 fresh forages, 33 grass hays and 5 legume hays. Forage quality was characterized by Neutral Detergent Fibre (NDF) and Crude Protein (CP) contents. The data set was analysed first at the group level (mean values of the group of individuals tested on each forage) to allow comparisons with the literature, and then at the individual level (for the 17 horses tested at least 6 times) using mixed models controlling for individual variability. The diet was incorporated as a fixed effect in the models.

**Results and discussion** As expected DMD declined with forage quality in both analyses. Intake declined slightly with increasing NDF content at the group level (Figure 1), and there were no effects of CP or DMD on intake. On the contrary, intake of individual horses increased as DMD and CP declined, and increased with increasing NDF, for fresh forages and grass hays (Figure 2). Moreover, the horses showed different responses to a decline in forage quality : most of them tended to eat more as DMD declined (12/17, two of which were significant,  $0.23 < R^2 < 0.45$ ) whereas one animal significantly increased DMI as DMD increased ( $R^2 = 0.48$ ) and four others tended to do so. These increases in DMI when DMD declined allowed the individuals' intake of energy and protein not to fall below their expected requirements.



**Figure 1** The average DMI of forages by the groups of horses in relation to their fibre content, —: for the three diets together ( $DMI = 24.91 - 0.12 \times NDF$ ,  $R^2 = 0.10$ ,  $P < 0.05$ ).



**Figure 2** The individual DMI in relation to fibre content, — fresh forages ( $\log_{10} DMI_i = -0.52 + 1.02 \times \log_{10} NDF$ )  $P < 0.05$ ; ... alfalfa hays ( $\log_{10} DMI_i = 1.23 + 0 \times \log_{10} NDF$ ); ... grass hays ( $\log_{10} DMI_i = 1.146 + 0.04 \times \log_{10} NDF$ )  $P < 0.05$ .

**Conclusions** As predicted by the Janis model, these horses increased their intake as the quality of the forages declined, apparently to maintain their intake of energy and/or nutrients. For the first time, using mixed models, we show that individual horses differ in their response to declining quality in forages. The strong individual variability may be a general characteristic of saddle horses, perhaps a by-product of artificial selection for athletic performance.

### References

- Dulphy, J.P., Martin-Rosset, W., Dubroeuq, H., Ballet, J.M., Detour, A., Jailler, M., 1997. Compared feeding patterns in *ad libitum* intake of dry forages by horses and sheep. *Livestock Production Science* 52, 49-56.  
Janis, C., 1976. The evolutionary strategy of the equidae and the origins of rumen and cecal digestion. *Evolution* 30, 757-774.