

A summary of an investigation into the nutrient content of hay steamed for 50 minutes in the Haygain steamer

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Nutrient content of 30 different samples of dry hay and hay steamed for 50 minutes in the Haygain steamer.

Method: 30 samples of hay from all over the UK were taken from 5 areas of each bale. The same bales were then steamed for 50 minutes in a Haygain steamer and another 30 samples taken, using the same procedure. Samples were immediately stored in a freezer before being dried in a force-draught oven at approx 60°C where upon they were analysed for total nitrogen by use of the Leco FP428 nitrogen determinator; sodium, potassium, calcium and magnesium by ICP-AES; phosphorous by colorimetry, water soluble carbohydrates by an automated anthrone method and trace elements by ICP-AES.

Results

Table 2. Nutrient content of 30 different samples of hay before and after steaming for 50 minutes in the Haygain steamer.

Analyte (units)	Dry (mean)	Steamed (mean)	Standard error of mean	Significance (P)
N (%)	1.121	1.186	0.02498	0.014
Ca (%)	0.3913	0.4126	0.02660	0.428
K (%)	1.364	1.509	0.06798	0.041
Mg (%)	0.1190	0.1252	0.007315	0.407
Na (%)	0.1298	0.1482	0.02486	0.465
P (%)	0.1460	0.1553	0.008400	0.276
WSC (%)	12.58	10.28	0.8274	0.009
Cu (mg/kg)	46.47	61.31	15.32	0.341
Mn (mg/kg)	108.1	123.9	18.03	0.390
Fe (mg/kg)	288.5	121.1	120.3	0.174
Zn (mg/kg)	17.54	23.46	1.535	0.001

Conclusions: Steaming for 50 minutes in the Haygain had no effect on Ca, Mg, Na, P, Cu, Mn or Fe, while N, K and Zn levels actually increased. The only nutrient to be lost as a result of steaming was WSC which showed a 2.3% loss. Alterations in nutrient content are most likely due to partial heat-induced break down of the cellular structure of the hay, making these nutrients more available to the horse. Steaming therefore conserved or increased the nitrogen and mineral content of hay. The small but significant reduction in WSC may also make this hay a useful fodder when fed to ponies predisposed to laminitis. In addition the feedback from the field trials suggest as the hay is so palatable after it has been steamed then a lower nutritional grade of hay can be fed to laminitics which otherwise may be tasteless.

It is difficult to compare the results with the standard nutrient composition of hay in the NRC (2007) as this study looked at a range of hays from all over the UK. The hays varied in quality and stage of maturity with has an impact on the nutritional content of the dry hay. This is demonstrated by the large standard error of mean for all of the nutrients. However, the results clearly demonstrate the variability throughout the UK which supports the need to steam hay as it is difficult to source good quality hay so conserving what nutrients are in it becomes a priority.

The increases in N, K and Zn seen are likely to be due to the heat opening up the fibre matrix and making them more detectable to the analysis tests and potentially more available to the horse. Another area for future research would be more in depth *in vitro* gas production trial and total collection trial to assess if these increases result in an increased availability to the horse.