Forage Analysis Report – Meadow 2023

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Find out about all of our supplements including our low iron Forage Focused Balancers at **www.forageplus.com**

Sample Details

Lab Reference:	29382320 / 3504889 – UKAS Accredited
Sample Type:	Wet Chemistry Nutritional & Mineral - Hay
Sample Received:	11/07/2023
Order Number:	95413

Dietary Mineral Report (values are based on 100% dry matter basis)

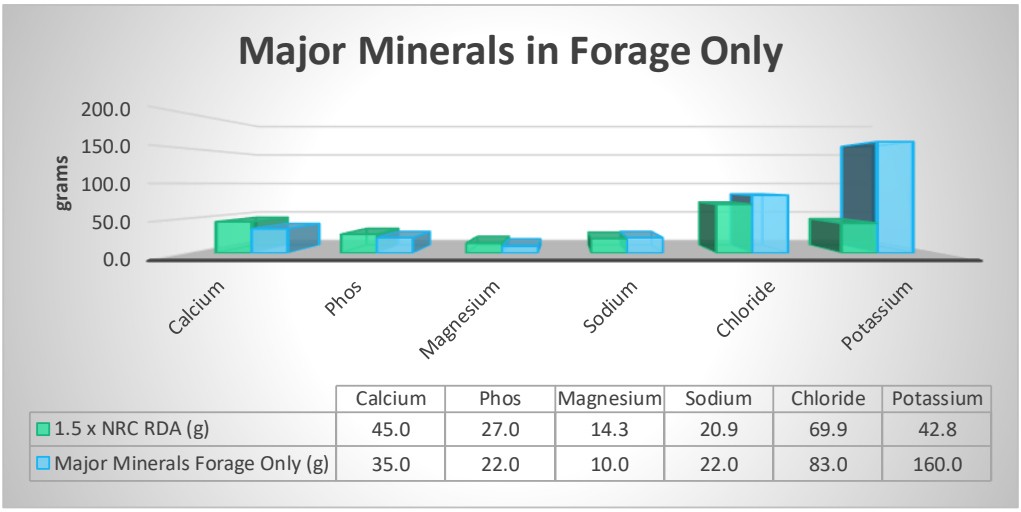
DIETARY MINERALS

Dry Matter (as sampled)	Analysis	Units
Dry Matter	87.7	%
Major Minerals	**Analysis**	**Units**
Phosphorus	0.22	%
Magnesium	0.10	%
Calcium	0.35	%
Sodium	0.22	%
Potassium	1.60	%
Chloride	0.83	%

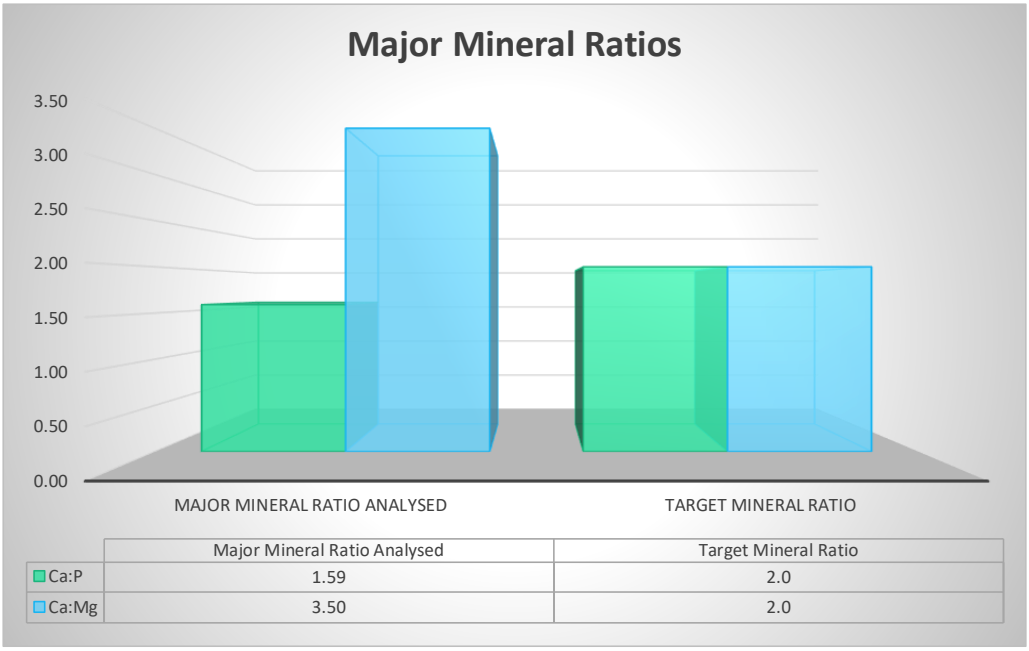
Trace Minerals	Analysis	Units
Manganese	139.20	mg/kg
Copper	4.20	mg/kg
Zinc	17.80	mg/kg
Selenium	0.04	mg/kg
Cobalt	0.04	mg/kg
Iodine	0.16	mg/kg
Antagonists	**Analysis**	**Units**
Lead	0.10	mg/kg
Iron	56.00	mg/kg
Aluminium	41.00	mg/kg
Molybdenum	0.58	mg/kg
Sulphur	0.14	%
Soil Contamination Index	**Analysis**	
SCI	3.00	

Please note we cannot give you high or low figures for each individual mineral. This is because a complicated relationship exists between certain minerals where an excess of one mineral will block another. Please refer to the graphs on page 2, 3 and 4 to understand the imbalances in your forage where figures will be based on 10kg of forage fed.

Major Mineral Charts (charts are based on 10kg of forage fed)



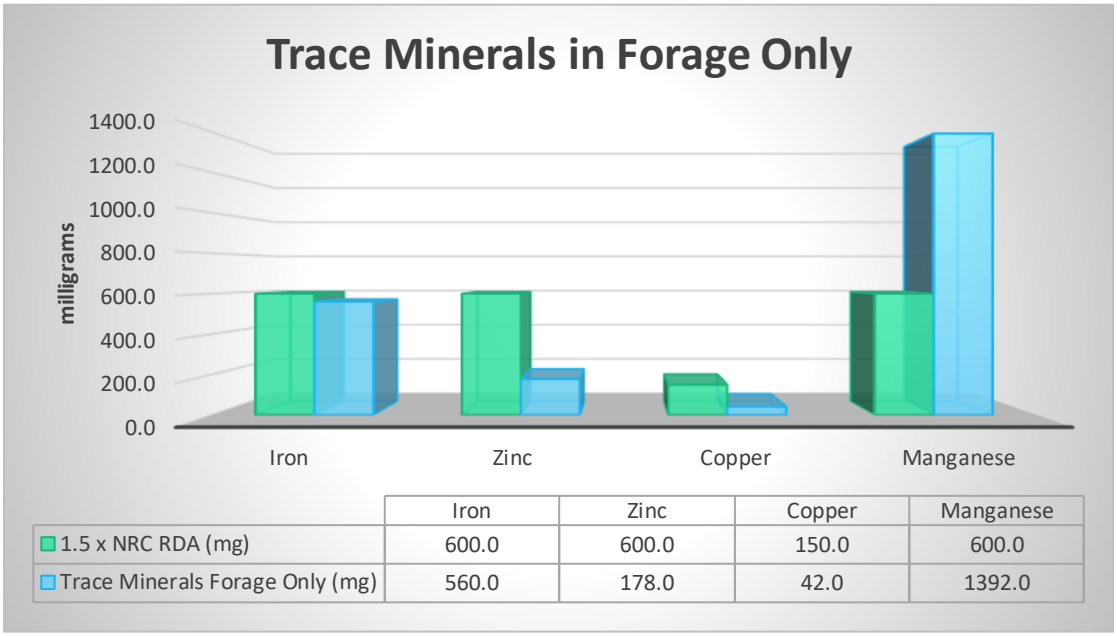
	Calcium	Phos	Magnesium	Sodium	Chloride	Potassium
1.5 x NRC RDA (g)	45.0	27.0	14.3	20.9	69.9	42.8
Major Minerals Forage Only (g)	35.0	22.0	10.0	22.0	83.0	160.0



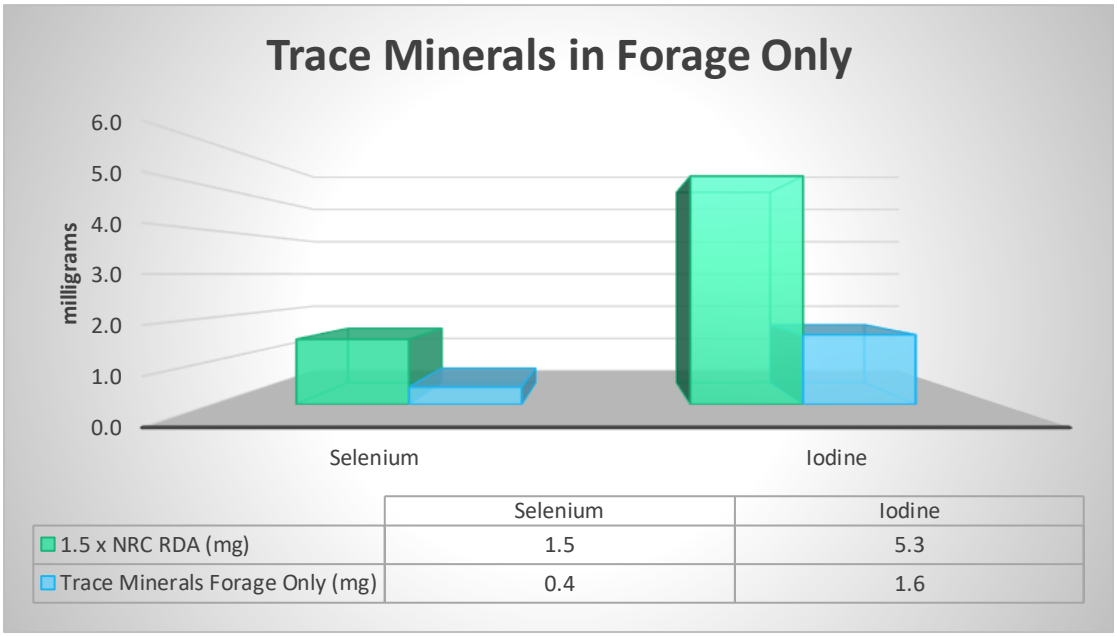
	Major Mineral Ratio Analysed	Target Mineral Ratio
Ca:P	1.59	2.0
Ca:Mg	3.50	2.0

Target mineral ratios for healthy adult horses are shown above. If you have a young horse, Laminitic horse, performance horse, pregnant or lactating mare, then ratios of calcium with magnesium and phosphorous would need to be lower. Target ratio for Ca:P is from 1.5 -2.0 parts Ca to 1-part P but horses can tolerate as high as 6:1 Ca:P. Target ratio for Ca:Mg is from 1.5 – 2.0 parts Ca to 1-part Mg. Na:K ratio target is 3 to 10-parts K and 1-part Na. The ratio between K:Na should be no higher than 10:1. Feeding the appropriate Forageplus Balancer or creating a bespoke Feed Plan would achieve improved ratios for maintenance and support of health.

Trace Mineral Charts



	Iron	Zinc	Copper	Manganese
1.5 x NRC RDA (mg)	600.0	600.0	150.0	600.0
Trace Minerals Forage Only (mg)	560.0	178.0	42.0	1392.0



	Selenium	Iodine
1.5 x NRC RDA (mg)	1.5	5.3
Trace Minerals Forage Only (mg)	0.4	1.6

Levels of selenium are commonly low in forage. The level in your forage is low and extra supplementation would be required.

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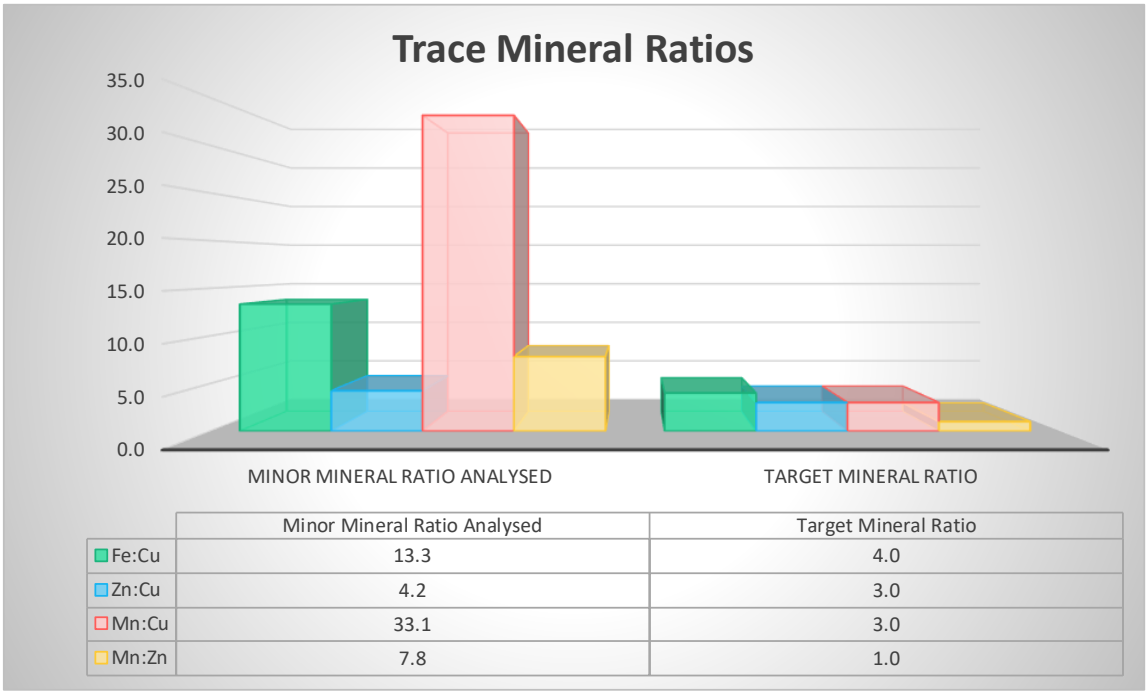

	Minor Mineral Ratio Analysed	Target Mineral Ratio
Fe:Cu	13.3	4.0
Zn:Cu	4.2	3.0
Mn:Cu	33.1	3.0
Mn:Zn	7.8	1.0

Target mineral ratios for healthy adult horses can range between 10:1 and 4:1 for iron : copper with the 4:1 ratio being the ideal. This is especially important in a young horse or a horse in heavy work. High ratios of iron and manganese are problematic because these *antagonist* minerals "block" the uptake of copper and zinc. The ideal ratio between manganese and zinc is 1:1. The antagonistic effect of iron and manganese will effectively lower the availability of copper and zinc and this is particularly important in forage already shown to have low levels of copper and zinc. The uptake of copper can be further compromised when the molybdenum level is more than 50% that of copper. It is extremely common to have iron : copper and manganese : zinc ratios above 20:1 this would indicate that feeding a Forage Focused Balancer or a bespoke feeding plan is necessary to correct relative deficiencies as matched to forage.

The soil contamination index refers to heavy metals. Heavy metals are natural constituents of soils and their concentration varies depending on parental materials. In the last fifty years or so the content of heavy metal in soils has increased due to human activities such as: distribution of fertilizers, pesticides, industries, waste disposal, roadside and general air pollution. The toxic heavy metals like cadmium, lead and mercury affect biological functions such as hormone systems and growth. Many heavy metals accumulate in one or more of the body organs in horses and other animals. These toxicants are accumulated in the vital organs including liver and kidney and exert adverse effects on all domestic animals, particularly those grazing on pasture or eating dried forage. For you however your report shows insignificant contamination. A soil contamination index of 3 is very low. The index covers a range up to 150 with the following being the concentration description:

10 Very Low | 25 Low | 50 Mean | 100 High | 150 Very High

Dietary Nutritional Report (values are based on 100% dry matter basis)

Nutritional Analysis

Dry Matter (as sampled)		Analysis	Units
Dry Matter		87.70	%
Digestible Energy		**Mcal/kg**	**MJ/kg**
Digestible Energy		2.18	9.13
Nutritional Analysis		**%**	**g/kg**
Crude Protein		8.80	88.0
Estimated Lysine		0.31	3.1
Acid Detergent Fibre (ADF)		34.6	346.0
Neutral Detergent Fibre (NDF)		60.7	607.0
Water Soluble carbohydrates (WSC)		17.7	177.0
Ethanol Soluble Carbohydrates (ESC)		10.00	100.0
Starch		0.40	4.0
Non-Fibre Carbohydrates (NFC)		21.3	213.0
Nitrate Analysis		**Units**	
%Nitrate (below)	< 0.03	%	
PPM Nitrate-Nitrogen (below)	< 70	ppm	
Nitrogen / Sulphur Ratio			
Nitrogen / Sulphur Ratio		10.06	

Dry Matter: equals (100% – Moisture) and represents everything in the sample other than water including protein, fibre, fat, minerals, etc. Animals consume feeds to meet their dry matter needs, because it is the dry matter that contains all the nutrients. Therefore, animals will have to consume more of a wetter feed to receive the same amount of dry matter as they would from a drier feed. For example, if an animal consumes 10 kg of hay at 90% dry matter, it consumes 9 kg of dry matter (10 x .90). If pasture at 20% dry matter is substituted for the hay, the animal would have to consume 45 kg. of pasture (9/.20) to receive the same amount of dry matter.

Hay has the highest dry matter content of the forage fed to horses and ponies. Haylage can have a dry matter content some 30% lower than hay so a greater weight of haylage often needs to be fed in comparison to hay because there is more water in haylage. Thus, it is very important to know the dry matter content of a feed to establish feeding rates and ensure that livestock receive the proper amount of feed to meet their daily needs.

As Sampled Basis: nutrient results for a sample in its natural state including the water. Also known as as fed or as received. This is equivalent to what your horse will receive in one mouthful of food and were the numbers reported on your analysis report. As fed figures will always report with a lower amount of nutrient than dry matter figures.

Digestible Energy This is a measure of the energy available in your forage. In the UK this is measured in MJ/kg. A digestible energy content of around 8MJ/kg is average in the UK. Lower than this level and you will have to feed more forage to maintain weight, higher than this level and you will need to feed less.

Crude Protein –This is a measure of the total protein in the sample including true protein and non-protein nitrogen. A protein level of around 8% is adequate; however, protein levels in the UK are usually much lower than this. Where your report shows a poor protein level, below 8%, you should check the amount of forage fed is covering the protein requirements of your horse. The report does not inform about the individual amino acids that make up the protein in your hay. We have included a nitrogen/sulphur ratio which is an indication of protein quality; however, this will only be calculated if you have also carried out a full mineral analysis of the forage as well as a nutritional analysis. When the ratio of nitrogen /sulphur is above 10 then this indicates poor protein quality, so supplementation with methionine and other essential amino acids is recommended along with feeding other high protein sources such as copra, linseed or alfalfa. Many forages in the UK report above this 10:1 figure so many horses need supplementing with extra individual amino acids.

Lysine – this is an estimated level and in the UK the average is usually lower than needed for maintenance of horses even on adlib forage. An average 500 kg horse needs around 25 grams of lysine for maintenance, if working this level will need to be higher. For this reason, we recommend 10 grams of supplementation per day for an adult horse. Performance horses will need at least 20 grams extra, pregnant, lactating mares and young horses 30 grams extra.

Acid Detergent Fibre and Neutral Detergent Fibre - These figures measure fibres (there are 5 types). The higher the ADF and NDF values are, the more lignin the hay contains and the more of this type of hay your horse will have to eat to maintain their weight. The ideal ADF value is less than 35% and the ideal NDF value is less than 45%. However, most hays have values that are 10% higher than these ideal levels. Levels 10% or more than the ideal level is not a problem but to compensate your horse will need to consume more of this type of hay.

Water-Soluble Carbohydrates (WSC) - This is a measure of the simple sugar *and* fructan levels in the forage. It has been thought in the past that fructan can contribute to laminitis; however, the amount of fructan contained in forage has not been shown to be a problem so it is now thought the levels of simple sugar and starch are the values to be aware of when trying to control laminitis in horses.

Ethanol-Soluble Carbohydrates (ESC) - This is a subset of WSC *without* the fructan fraction and includes primarily monosaccharides and disaccharides. These simple sugars are digested in the foregut and raise insulin levels. Too much can lead to laminitis because of elevated blood insulin. The ESC measure gives you a much better idea of the simple sugar level. This combined with the starch level is the figure that you should be interested in when controlling laminitis in horses.

Dr Kellon and the ECIR Crushing's Group have found the ideal level for managing Laminitic horses is an ESC and Starch combination of below 10%. Rinsing hay will reduce the sugar but you need to rinse in a specific way that is like washing detergent out of clothes.

Starch - This compound is normally digested in the foregut into individual glucose (blood sugar) molecules; therefore, it has a strong elevating effect on blood insulin levels. You cannot lower starch levels by soaking or rinsing hay or haylage. It is therefore wise to feed hay or haylage which is low in starch. As stated above it is wise to feed hay to IR/Laminitic horses which has a *combined ESC and Starch amount of less than 10%*. Some horses will do better on an even lower percentage so experimenting with rinsing hay below the 10% level is also sometimes necessary.

Non-Fiber Carbohydrates (NFC)
This is a mathematical estimate of non-cell wall (non-fiber) carbohydrates consisting of starch, sugar, pectin and fermentation acids that can serve as energy sources for the animal. NFC is calculated as 100% – (CP% + NDF% + Fat% +Ash%).

Nitrates - Excessive intake of nitrates decreases the blood's oxygen carrying ability, which causes anxiety, increased respiration rate, and breathing difficulty. Severe cases result in loss of coordination, muscle twitching and death. Less severe cases can be evidenced by more vague symptoms including depression, inappetence and tripping.

Excess levels of nitrates can occur where more fertilizer nitrogen is applied than needed or soil sulphur supplies allow and from drought stress on plants. A higher than expected protein level in grass is sometimes the first indication we have that hay might have high nitrate levels. A higher than expected protein level in the UK would be over 12% but another indication of excessive nitrates is the nitrogen to sulphur ratio which should be no more than 10:1. The nitrogen sulphur ratio is calculated from the protein level and sulphur level of the forage. A ratio above 10:1 indicates that the quality of the protein is poor and that high levels are incompletely formed and perhaps high in nitrates.

The maximum acceptable nitrate level in forage for all adult horses is 0.5% (5000ppm). Higher levels may be "diluted" with very low nitrate hay to bring the nitrate levels for total forage fed below 0.5% (5000ppm). Hay for breeding mares and growing horses should not exceed 0.20% (2000ppm) nitrate.

The nitrate test should be requested for:

- any grass with protein >12%
- mixed hay with protein levels above 12% and calcium <0.9%
- "known" nitrate accumulators (small grain hays)
- any hay grown in drought conditions
- any hay that may be fed to pregnant mares.

Nitrogen/Sulphur Ratio – See Crude Protein section on page 2, this will only be reported if you have also carried out a full mineral analysis of your forage. Ideal ratio is no greater than 10:1.