NSW DPI
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SEPTEMBER 2007 PRIMEFACT 522 (REPLACES AGNOTE DAI-290)

Mineral content of common ruminant stockfeeds, crops and pastures

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Introduction

In NSW, pasture and fodder crops generally contain sufficient minerals, in the appropriate balance, for normal ruminant growth. Most energy and protein supplement feeds (except non-protein nitrogen supplements, such as urea and sulfate of ammonia) contain sufficient minerals for most production requirements associated with supplementation of grazing stock.

This Primefact reports the mineral composition data for feed samples delivered to the then NSW Agriculture Feed Evaluation Service, prior to 1996.

Minerals in perspective

When addressing problems of feeding and ruminant nutrition, the advice is to:

1. look after energy first, by increasing intake and/or improving basal feed digestibility
2. look at protein levels in conjunction with energy, to keep both in balance in the rumen
3. Look at mineral supplementation if the above have been accounted for and there has been no response to improved energy/protein intake.

Providing minerals alone will not drive intake.

Minerals can act to improve nitrogen utilisation (nitrogen and sulfur need to be balanced at 14:1) and to overcome established/known deficiencies; for example:

- responses to sodium (salt) on kikuyu pastures
- cobalt, selenium and copper ‘capsules’/pellets on country that is low in these minerals
- sulfur/sodium on summer forage crops.

Minerals are important for good nutrition, but are generally not the first limitation to rumen function. High or increased digestibility of the pasture or crop improves rumen function, forage intake, and hence animal performance.

Mineral supplements

When you purchase a commercial mineral supplement within NSW, the manufacturer is required to have the product registered as a stock feed. You should be able to obtain the mineral composition of the product from the manufacturer, and usually as part of the label feeding/use instructions.

If you buy raw minerals to make your own recipes, the manufacturer’s analysis figures should be available to you. These will help you to formulate the supplement.

Using the mineral analysis table

Table 1 shows the mineral analysis for concentrates (grains, oilseed meals), minerals, temperate pastures and crops, tropical pastures and crops, conserved hay, conserved silage, roughages and by-products. Please note that the headings in the table do not provide this detailed breakdown of classification.

The figures reported are ‘observed data’ (from a small database) rather than the typical mean for that sample type. Variations will exist between samples and due to stage of maturity.

To help you understand the abbreviations and terms used in the table, a glossary is provided.

Column heading explanations are provided at the top of each table.

Where you see the abbreviation ‘N/A’ across the column, it means that the mineral was not analysed in the data set(s). It does not mean that the mineral is not present in the feed source.

Reference

NSW Agriculture (now NSW DPI) Feed Library, Feeds Evaluation service.

Understanding the terms

Protein meals

sol
Solvent extraction – this is a chemical extraction process used to remove oil from the grain. It is used by the major oilseed crushers, such as Cargill Oils, at their plants.

ext
Extrusion extraction – this is a heat and mechanical pressure extraction process, used by smaller oil seed crushers to remove oils from oilseeds. Oil content of the residue is usually higher, so the energy level (ME) of these residues is higher than for solvent extracted residues. The amount of heat generated determines the degradability of the protein fraction.

exp
Expeller fraction – this is a screw press mechanical extraction of oil from oilseeds, used by smaller crushers, who may extract a 'cold press' oil. Oil content, and hence energy level, is higher than solvent or extruded processed meals.

Grains

cracked
Processed by hammermill, to 'crack' the grain with a minimum of flour dust. It creates coarse particles and 'shattered' grain.

gr
Gristed – a finer cracking of grain that reduces particle size, but creates more flour dust. Digestibility is enhanced, but it is not recommended for ruminants because of the high risk of acidosis (grain poisoning).

rl
Rolled grain – processed by a roller mill to 'bruise' the grain, rather than crack it into separate particles.

flaked
Rolled or cut into flat pieces, usually after steaming and before processing. Resembles uncooked porridge oats.

polished
Rice grain, ready for human consumption.

mill mix
A blend of bran and pollard, produced as a by-product of flour processing.

1
Refers to grain samples of unknown origin. Differences will exist, so the samples show to known ranges.

f
Flower

Pasture and forage crops

clover (w)
White clover

clover (r)
Red clover

early vegetative
High moisture (90%) and high digestibility, short green feed (low availability), rapid growth.

mid vegetative
Moisture at 85%, high digestibility, green feed, rapid growth, good availability.

late vegetative
At the final growth before flowering. Moisture at 25–30%, good availability, green feed. Needs grazing to keep plant and pasture in stage II of plant growth cycle (see Prograze).

early flower
Flowers have erupted from the bud.

late flower
Flowers are mature and beginning to set seed.

fl
All plants have flowered, and pollination has occurred/is occurring.

fl/stemy
Flower and stem predominating.

full bloom
Flowering stage of legume oil seed crops.

late bloom
Pollination occurring, flowers mature and beginning to die.

early seed
Dough stage – the stage of seed development when seed content is a white dough and seed is 'soft'.

Hays

'D'

Digestibility	high: over 10 ME
	medium: 8–10 ME
	low: less than 8 ME

early seed
See under 'Pasture and forage crops'.

late bloom
See under 'Pasture and forage crops'.

Table 1. Mineral analysis of feeds

Ca	Calcium	P	Phosphorous	Na	Sodium
S	Sulfur	Mg	Magnesium	K	Potassium
Fe	Iron	Coi	Cobalt	Cu	Copper
Mn	Manganese	Zn	Zinc		

No.	Feed name	Ca g/kg	P g/kg	Na g/kg	S g/kg	Mg g/kg	K g/kg	Fe mg/kg	Co mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
1	**CONCENTRATE**											
2	Barley 1	1	4	0.2	1.8	1.4	6	60	0.1	9.1	18	16
3	Barley 2	1	5	0.2	2	1.4	6.3	80	0.1	8	18	0
4	Barley 4	1	4	0.3	2	1.2	4.2	80	0.1	6	23	18
5	Brewers grain	1	6	0.6	2.4	2.6	1	270	0.1	22	59	30
6	Canola sol	7	11	3	4	5.8	6	197	0.1	10	30	40
7	Canola ext	6	10	3	4	5.9	6	200	0.1	11	30	40
8	Coconut sol	2	7	0.4	3.6	3.3	6	200	1.4	15	71	53
9	Coconut ext	2	7	0.4	3.6	3.6	6	200	1.4	15	72	53
10	Concentrate mix	12	6	5	3	2.5	15	500	2	25	200	30
11	Corn gluten feed	3	8	1	3	9	7	300	0.1	6	10	70
12	Corn gluten meal	3	6	1	2.5	3.6	11	420	0.1	11	28	29
13	Corn hominy	2	4	2.1	1.3	2.2	4.6	43	N/A	6	15	30
14	Cottonseed meal exp	2	10	0.6	3.9	6.1	15	240	0.2	22	18	21
15	Cottonseed meal sol	2	13	0.5	3.4	5.5	13	230	0.2	20	24	22
16	Cottonseed whole	2	7	3.1	2.6	3.5	1.2	150	N/A	54.6	10	N/A
17	Linseed meal exp	4	9	1.2	4.3	6.4	14	290	0.4	29	43	36
18	Linseed meal sol	4	9	1.5	4.4	6.6	15	360	0.3	28.2	41	36
19	Lucerne cubes	11	2	0.6	3.2	3.1	32	173	0.1	10	41	24
20	Lupins	2	3	0.5	2.2	1.5	8.2	98	N/A	5.5	15	35
21	Maize grain, cracked	0	3	0.6	3.9	1	5	30	N/A	3.6	8	11.6
22	Maize grain gr or rl	0	3	0.6	3.9	1	5	30	N/A	3.6	8	11
23	Maize flaked	0	3	0.6	3.4	1	5	30	N/A	3.6	8	11
25	Mill mix	1	9	2	1	4.5	12	145	N/A	19	131	80
26	Molasses	12	1	2.2	6.5	4.74	31.7	420	N/A	5	90	32
27	Oats 1	1	4	1.8	1.8	1.9	4.2	80	0.1	6.6	42	30
28	Oats 2	1	4	0.8	2.3	1.1	4.1	90	0.1	7	42	30
29	Peanut	3	7	0.8	3	1.7	12	150	0.1	17	29	22
30	Rice brain & hulls	1	6	0	0	0	0	0	0	0	0	0
31	Rice bran 1	1	16	0.3	0	10.4	19.1	210	0	14.3	459	3
32	Rice bran 2	1	16	0.3	2	10.4	19.1	210	0	14.3	459	3
33	Rice grain polished	0	1	0.2	0.9	0.2	1.1	20	0	3.3	12	2

No.	Feed name	Ca g/kg	P g/kg	Na g/kg	S g/kg	Mg g/kg	K g/kg	Fe mg/kg	Co mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
34	Rye grain	1	4	0.3	1.7	1.4	5.2	70	N/A	7.7	62	36
35	Beans (faba/mung etc)	2	5	0.5	2.6	1.5	15	110	N/A	11	24	36
36	Peas (field/etc)	2	2	0.1	2.5	3.9	14	100	N/A	10	23	33
37	Safflower seed	3	7	0.6	0.6	3.6	7.9	500	N/A	10.7	N/A	43
38	Safflower meal 1	3	8	0.6	3	3.9	8	560	2.2	10	44	34
39	Safflower meal 2	4	14	0.4	0.6	3.3	13.3	600	2.2	97.4	44	44
40	Sorghum 1	0	3	0.3	1.8	1.9	3.8	50	0.3	10.8	17	16
41	Sorghum 2	0	3	0.2	1.8	1.4	3.1	50	0.3	10.8	17	16
42	Sorghum flaked	0	3	0.3	1.8	1.9	3.8	50	0.3	10.8	17	16
43	Soya bean meal sol 2	4	8	3.1	4.9	3	22.1	130	0.1	40.8	31	48
44	Sunflower meal exp	5	8	5	1	7.9	10	100	0.3	4	25	20
45	Sunflower meal sol	4	8	5	1	8.1	10	100	0.3	4	25	20
46	Sunflower/f	4	8	5	1	8.1	10	100	0.3	4	25	20
47	Triticale	1	4	1.4	2.5	1.8	5.8	60	0.1	10	53	35
48	Triticale 2	1	3	1.4	1.7	1.8	5	80	0.1	10	53	35
49	Wheat bran	1	13	0.4	2.5	6	15	128	0.1	14	124	90
50	Wheat pollard	2	10	2.4	2	4	10	100	0.1	21	132	100
51	Wheat 1	1	4	0.4	1.8	1.1	4.6	40	0.1	9.8	48	42
52	Wheat 2	1	4	0.2	1.3	1	5.8	50	0.1	8.1	40	42
53	Wheat 3	1	4	0.3	1	1	5.8	50	0.1	8.1	40	42
61	**MINERALS**											
63	Calcium carbonate	361	0	0.5	0.4	20.5	1.2	3500	0	0	280	0
64	Calcium sulphate	232	0	0	186	0	0	0	0	0	0	0
65	Copper sulphate	0	0	0	128	0	0	0	254	500	0	0
66	Disodium phosphate	0	228	N/A								
67	Diammonium phosphate	0	256									
68	Magnesium oxide	30	0	0	0	562	0	0	0	0	0	0
69	Diacalcium phosphate	237	188	27	0.4	0	0	1320	0	6.2	153	28
70	Magnesium carbonate	0	0	0	0	308	0	0	0	0	0	0
71	Monammonium phosphate	5	245									
72	Monosodium phosphate	0	258	0	0	0	192	0	0	0	0	0
73	Phosphoric acid	0	316	0	15	5	0	0	10	0	10	0
74	Rock phosphate	317	137	1.9	1.3	2.7	16	7000	0	66	696	0
75	Sodium chloride	0	0	393	0	0	0	0	0	0	0	0
76	Sodium tripolyphosphate	0	260	313	0	0	0	40	0	0	0	0
82	**PASTURES/CROPS TEMP**											
84	Clover (w) early veg	14	4	2.4	2	7	26	175	0.5	9	98	30
85	Clover (w) late veg	11	3	2.4	2	7	26	175	0.1	9	98	30

No.	Feed name	Ca g/kg	P g/kg	Na g/kg	S g/kg	Mg g/kg	K g/kg	Fe mg/kg	Co mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
86	Clover (w) fl	11	3	2.4	2	7	26	175	0.1	9	98	30
87	Clover (r) late veg	20	3	2.5	2.6	5.1	26	180	0.2	9	60	35
88	Clover (r) early veg	15	3	2	2	5.1	20	170	0.1	10	50	35
89	Clover (r) late fl	13	3	19	1.7	4	16	160	0.1	10	47	35
90	Fescue mid veg	5	4	N/A	N/A	3.5	2.2	180	0.1	8	70	22
91	Lucerne early veg	16	4	2.2	3.3	2.6	22	250	0.1	16	42	24
92	Lucerne fl	13	2	1.4	2.8	3.3	25	200	0.1	12	35	27
93	Lucerne late veg	13	3	1.5	3.1	2.4	25	230	0.1	16	40	27
94	Annual/rye early veg	4	3	4	2	2.6	20	280	N/A	5.2	85	24
95	Annual/rye late veg	4	3	4	2	2.2	20	280	0.1	7	74	20
96	Annual/rye early fl	4	2	4	2	2.4	18	280	N/A	4	74	30
97	Annual/rye late fl	4	2	3	2	1.2	18	200	0.1	7	90	30
98	Perennial/rye autumn	4	3	4	2	2.2	20	280	0.1	7	74	20
99	Perennial/rye winter	4	3	4	2	2.6	20	280	0.1	5.2	85	24
100	Perennial/rye spring	4	3	4	2	2.3	24	280	0.1	7	74	20
101	Oats early veg	3	2	2.1	2	1.9	20	200	0.1	9	80	63
102	Oats late veg	3	2	2.1	2	1.9	20	200	0.1	9	74	59
103	Oats fl	3	2	21	2	3	16	200	0.1	9	65	59
104	Turnip roots	6	3	0.2	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A
105	Turnip tops	4	3	4	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A
112	**PASTURE/CROPS TROP**											
114	Carpet veg	3	2	1	1.4	2.3	19	270	N/A	26	180	56
115	Carpet fl	4	2	1.5	2.4	3.5	3.5	270	N/A	26	120	38
116	Greenpanic early veg	3	3	0.6	2.7	2.4	22	270	N/A	26	180	56
117	Greenpanic late veg	4	2	0.7	3.4	3.5	15.8	270	N/A	26	120	38
118	Greenpanic fl/stemy	4	2	0.6	3.1	3.2	15	280	N/A	26	120	38
119	Kikuyu early veg	3	3	0.4	2.8	3.1	28	270	N/A	10	53	56
120	Kikuyu late veg	3	3	0.5	2.8	3.7	27	270	N/A	10	53	38
121	Kikuyu stemy	3	3	0.3	2.7	3.5	27	280	N/A	10	53	38
122	Paspalum early veg	4	4	0.5	3	2.3	27.2	270	N/A	26	180	56
123	Paspalum late veg	3	4	0.4	3.1	2.1	26	270	N/A	26	120	38
124	Paspalum fl/stemy	4	4	0.3	3.2	2	26	280	N/A	26	120	38
125	Rhodes early veg	4	3	1	2.9	1.4	N/A	270	N/A	26	180	56
126	Rhodes late veg	3	3	0.7	2.8	1.5	15	270	N/A	26	120	38
127	Rhodes fl/stemy	2	2	0.8	2.7	1.5	13	280	N/A	26	120	38
128	Setaria early veg	3	3	0.8	2.9	2	17	270	N/A	26	180	56
129	Setaria late veg	3	3	0.6	2.8	2	17	270	N/A	26	120	38
130	Setaria fl/stemy	2	3	N/A	2.7	2	17	280	N/A	26	120	38

No.	Feed name	Ca g/kg	P g/kg	Na g/kg	S g/kg	Mg g/kg	K g/kg	Fe mg/kg	Co mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
131	Cowpeas full bloom	13	2	2.7	3.5	4.7	4.5	90	0.7	14	15	35
132	Cowpeas late bloom	10	3	2.7	3.5	4.5	4.7	90	0.7	14	15	35
133	Dolichos veg	7	3	0.6	N/A	2.8	1.9	180	N/A	12	20	30
134	Dolichos early bloom	7	3	0.6	N/A	2.8	1.9	180	N/A	12	20	30
135	Dolichos late bloom	6	3	0.6	N/A	2.8	1.9	180	N/A	12	20	30
139	**CONSERVED (HAY**)											
141	Kikuyu hay	3	3	0.5	2.8	3.7	27	270	N/A	26	120	38
142	Barley (dough stage)	2	3	1.4	1.7	1.9	14	200	0.1	4	39	18
143	Clover high ‘D’	13	2	1.5	1.9	3.1	12	180	0.2	7.6	35	29
144	Clover med ‘C’	13	2	1.5	1.9	3.1	12	180	0.1	7.6	35	29
145	Clover low ‘D’	13	2	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
146	Lucerne early fl	16	3	2.3	3.3	2.6	22	250	0.1	11	45	24
147	Lucerne mid fl	14	3	1.9	3.1	2.5	25	230	0.1	9	34	27
148	Lucerne late fl	12	2	1.8	2.7	3.3	25	200	0.1	9	30	25
149	Lucerne haylage	10	2	7.3	4.3	3.4	26.3	241	N/A	9.2	23	16
150	Ryegrass early veg	4	4	2	2	3.2	16	280	0.1	5	80	24
151	Ryegrass late veg	4	3	2	2	3.2	16	280	0.1	5	75	24
152	Ryegrass early fl	3	3	2	2	3.2	16	280	0.1	4	75	30
153	Rye/clover high ‘D’	8	3	3	2	4	22	180	0.1	6	85	26
154	Rye/clover med ‘D’	6	3	2.5	2	3	20	170	0.1	5	80	24
155	Oat (dough stage)	3	3	3.4	2.2	5.1	16.7	440	0.2	7.1	96	N/A
156	Oat and vetch hay	7	3	1.5	2.5	3	20	220	0.1	10	70	32
157	Setaria hay	3	3	0.6	2.8	2	17	270	N/A	26	120	38
158	Soyabean late bloom	11	3	1.2	2.6	0.8	9	300	N/A	6	16	30
159	Soyabean early seed	10	3	1.2	2.6	8	10	300	N/A	6	16	30
160	Sudangrass hay	6	3	0.2	0.6	4	15.4	200	0.1	36.8	93	N/A
161	Sorghum hay	6	3	0.2	0.6	5	19	190	0.1	30	90	38
162	Wheaten hay dough stage	2	3	1.1	1	0.6	14	220	N/A	13	32	67
166	**CONSERVED (SILAGE)**											
169	Rye/clover sil (70D)	10	3	3.5	2	5.5	24	180	N/A	7	90	28
170	Rye/clover sil (65)	8	3	3	2	4	22	180	0.1	6	85	26
171	Rye/clover sil (60D)	6	2	2.5	2	2.5	20	170	0.1	5	80	22
172	Rye/clover sil (55D)	6	2	2.5	2	2.5	20	170	0.1	5	80	22
173	Lucerne silage 36% DM	14	3	2.2	2.9	25	27.5	250	0.1	13.4	34	17
174	Maize silage 25% DM	3	2	0.1	0.8	2.8	10.5	640	0.1	13.2	34	21
175	Maize silage 30% DM	3	2	0.1	0.8	2.8	10.5	640	0.1	13.2	34	21
176	Maize silage urea	3	2	0.1	0.8	2.8	10.5	640	0.1	13.2	34	21
177	Oat silage dough stage	5	3	3.7	2.4	7.5	24.4	500	0.1	4.4	120	N/A

No.	Feed name	Ca g/kg	P g/kg	Na g/kg	S g/kg	Mg g/kg	K g/kg	Fe mg/kg	Co mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
178	Oat silage boot	5	1	3.7	2.4	7.5	24.4	500	0.1	4.4	120	N/A
179	Sorghum silage 30% DM	3	2	0.2	1	3	15.4	270	0.3	34.9	48	N/A
184	**MISC (ROUGHAGES)**											
185	Barley straw	3	1	1.4	1.6	1.2	14	200	N/A	4	17	7
186	Oat straw	3	1	1.2	2.2	1.3	24	200	N/A	5	17	6
187	Wheat straw	2	1	1.4	1.9	1.3	13	150	N/A	4	47	6
188	Whole cottonseed	2	6	5.4	2.5	4.4	12	41	N/A	9.1	16	36
190	Cottonseed hulls	2	1	1	0.9	0.8	12	300	N/A	4	18	22
191	Rice hulls	1	1	1.2	0.9	5.7	N/A	N/A	N/A	N/A	334	N/A
196	**MISC (BY-PRODUCTS)**											
197	Apple pomace	1	1	0.3	0.5	8	8.4	460	N/A	13	12	13
198	Citrus pulp	6	1	0.4	0.8	1.2	8.9	160	1.6	16	28	25

For more information on:

- major nutrient description of feeds
- feed cost calculator
- feed library

go to NSW Department of Primary Industries (DPI) website: www.dpi.nsw.gov.au/reader/1201

ISSN 1832-6668

Replaces Agnote DAI-290

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Job number 7438