

MINERAL SUPPLEMENTS

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Nutrition Specifications for As-Hatched Broilers - Target Live Weight 2.50 - 3.00 kg (5.50 - 6.60 lb).

		Starter		Grower		Finisher 1		Finisher 2	
Age Fed	days	0 - 10		11 - 24		25 - 39		40 - market	
Energy	kcal	3000		3100		3200		3200	
	MJ	12.55		12.97		13.39		13.39	
AMINO ACIDS									
		Total	Digest¹	Total	Digest¹	Total	Digest¹	Total	Digest¹
Lysine	%	1.44	1.28	1.29	1.15	1.15	1.02	1.08	0.96
Methionine + Cystine	%	1.08	0.95	0.99	0.87	0.90	0.80	0.85	0.75
Methionine	%	0.56	0.51	0.51	0.47	0.47	0.43	0.44	0.40
Threonine	%	0.97	0.86	0.88	0.77	0.78	0.68	0.73	0.64
Valine	%	1.10	0.96	1.00	0.87	0.89	0.78	0.84	0.73
Isoleucine	%	0.97	0.86	0.89	0.78	0.80	0.70	0.75	0.66
Arginine	%	1.52	1.37	1.37	1.23	1.21	1.09	1.14	1.03
Tryptophan	%	0.23	0.20	0.21	0.18	0.18	0.16	0.17	0.15
Leucine	%	1.58	1.41	1.42	1.27	1.26	1.12	1.19	1.06
Crude Protein ²	%	23.0		21.5		19.5		18.3	
MINERALS									
Calcium	%	0.96		0.87		0.78		0.75	
Available Phosphorus	%	0.480		0.435		0.390		0.375	
Magnesium	%	0.05 - 0.50		0.05 - 0.50		0.05 - 0.50		0.05 - 0.50	
Sodium	%	0.16 - 0.23		0.16 - 0.23		0.16 - 0.20		0.16 - 0.20	
Chloride	%	0.16 - 0.23		0.16 - 0.23		0.16 - 0.23		0.16 - 0.23	
Potassium	%	0.40 - 1.00		0.40 - 0.90		0.40 - 0.90		0.40 - 0.90	
ADDED TRACE MINERALS PER KG									
Copper	mg	16		16		16		16	
Iodine	mg	1.25		1.25		1.25		1.25	
Iron	mg	20		20		20		20	
Manganese	mg	120		120		120		120	
Selenium	mg	0.30		0.30		0.30		0.30	
Zinc	mg	110		110		110		110	

Table 1. Composition of basal diet.¹

Item	Starter 0 to 14 d	Grower 15 to 35 d	Finisher 36 to 42 d
Ingredient,%			
Corn	46.60	49.00	53.60
Soybean meal (CP, 47%)	30.00	26.60	22.00
Soybean (Full fat)	15.00	15.00	15.00
Vegetable oil	4.00	5.50	5.50
Limestone	0.90	0.90	0.90
Dicalcium phosphate	2.35	2.20	2.20
DL-Methionine (98%)	0.35	0.25	0.25
L-lysine-HCl (78%)	0.15	0.00	0.00
L-Threonine	0.10	0.00	0.00
Salt	0.35	0.35	0.35
Vitamin premix ²	0.10	0.10	0.10
Mineral premix ³	0.10	0.10	0.10
Total	100.00	100.00	100.00
Chemical composition (calculated)			
ME, kcal/kg	3,065	3,176	3,200
CP,%	23.40	21.70	19.90
Lysine,%	1.46	1.25	1.15
Methionine + cysteine,%	1.09	0.95	0.91
Calcium,%	1.03	0.99	0.98
Available phosphorus,%	0.50	0.47	0.46
Analyzed composition			
ME, kcal/kg	3,106	3,230	3,282
CP,%	23.25	21.70	20.13

¹As-fed basis.

²Provided per kilogram of complete diet: vitamin A, 12,000 IU; vitamin D₃, 2,500 IU; vitamin E, 40 IU; vitamin K₃, 5 mg; thiamin, 2.5 mg; riboflavin, 6 mg; pyridoxine, 5 mg; pantothenic acid, 15 mg; niacin, 25 mg; folic acid, 1 mg; biotin, 50 μg; vitamin B₁₂, 20 μg.

³Provided per kilogram of complete diet: Cu, 5 mg; I, 1 mg; Co, 200 μg; Se, 150 μg; Fe, 60 mg; Zn, 60 mg; Mn, 80 mg.

Item	T1
Ingredient, % of DM	
Alfalfa hay	15.0
Corn silage	20.0
Oat hay	0
Ground corn	35.0
Soybean meal	15.0
Extruded soybean	5.0
Whole cottonseed	3.0
Beet pulp	2.5
EB100 ¹	2.0
Limestone	1.4
Sodium chloride	0.6
Premix ²	0.5
DM, %, as-fed basis	47
Nutrition composition, % of DM	
OM	93.0
CP	17.5
NDF	29.8
Starch	34.4
Calcium	0.9
Phosphorus	0.4
NE _L , ³ Mcal/kg	1.83

¹Mainly saturated free fatty acid fat supplement (EnergyB MN).

²Contained (per kg of DM) 250,000 to 560,000 IU of vitamin E, 4,500 IU of vitamin E, 400 to 600 mg of Fe, 540 to 1,200 mg of Mn, 15 to 60 mg of Se, 35 to 70 mg of I, and 68 to 120 mg of Zn.

³Calculated based on Ministry of Agriculture of P.R. China

- The objective of feed formulation is to derive a balanced diet that will provide appropriate quantities of biologically available nutrients required by the bird.
- In addition to energy and protein, formulations contain supplements to provide **minerals**, vitamins and specific amino acids.



NATURAL MINERAL RESOURCES

- Salt
- Limestone
- Bone meal
- Meat and Bone meal
- Egg shells
- Chalk

COMMERCIAL PRODUCTS

- Calcium carbonate
- Sodium bicarbonate
- Dicalcium Phosphate (DCP)
- Monocalcium Phosphate (MCP)
- Organic minerals

POINTS NEED TO CONSIDER

- Check animal requirements
 - Species, gender, age
- Check mineral composition of the feedstuffs in the diet
- Consider extra needs under certain conditions
 - E.g. Heat stress-Selenium

MACRO MINERALS

Macro minerals are present at larger levels in the animal body or required in larger amounts in the diet.

MICRO MINERALS

Micro minerals are often referred to as trace minerals, meaning they are present at low levels in the body or required in smaller amounts in the animal's diet.

MACRO MINERAL LIST

Calcium • Chlorine •
Magnesium • Phosphorous •
Potassium • Sodium • Sulfur

MICRO MINERAL LIST

Chromium • Cobalt • Copper •
Fluorine • Iodine • Iron •
Manganese • Molybdenum •
Selenium • Zinc

CALCIUM SOURCES

- Calcium is an important macro mineral for all animals
- Physiological functions
- Milk, egg production
- Usually grain-based diets do not meet the requirements
- Diets have to be supplemented with several calcium sources

Why calcium matters to laying hens



Strong shells help keep bacteria out.



Each eggshell includes 2 grams of calcium.



It takes 20 hours to make an eggshell. Calcium is needed the entire time.



To make an eggshell, a hen needs 4 grams of calcium per day.

CALCIUM SOURCES

- **Limestone:** There is approximately 93% calcium carbonate in the structure of this compound. Calcium content is 37-40%.
- **Calcium carbonate:** is a chemical compound with the formula CaCO_3
- **Eggshell:** contains 90-91% calcium carbonate

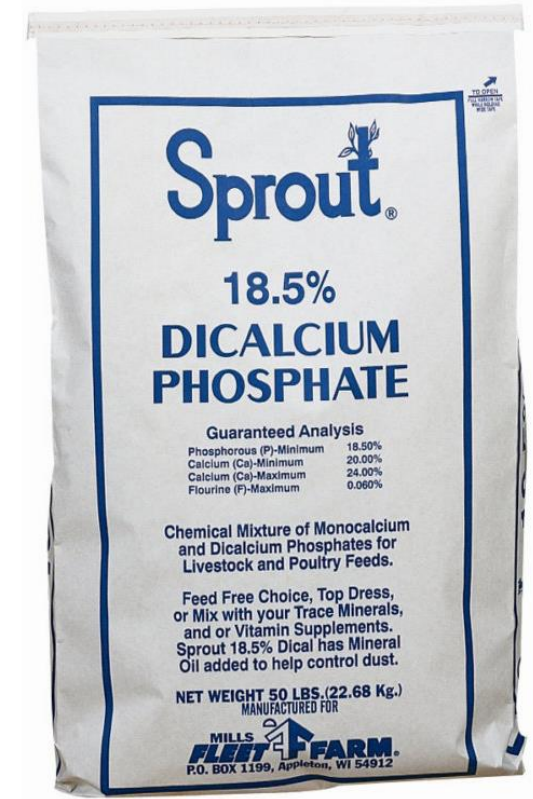


PHOSPHORUS SOURCES

- It is the second most abundant mineral in the body.
- It is present in every cell of the body.
- Most of the phosphorus in the body is found in the bones and teeth.
- Phosphorus in grains – mostly in **phytate/phytic acid** form
 - Not available for poultry and pigs,
 - Available for ruminants
- Diet Calcium level, Ca/P ratio, phytic acid content, Vitamin D level

PHOSPHORUS SOURCES

- **Monocalcium Phosphate (MCP):** Ca: 19% - P: 21.20%
- **Dicalcium Phosphate (DCP):** Ca: 22.70% - P: 19%
- **Potassium Phosphate (KH₂PO₄):** mono-potassium phosphate contains 22.8% phosphorous and 28.7% potassium.



TRACE MINERAL SOURCES

FOR LAYERS



PREMIX

Composition per kg

E672	Vitamin A	3,650,000 UI
E671	Vitamin D3	670,000 UI
3a700	Vitamin E	3,370 mg
	Vitamin K3	3,340 mg
	Vitamin B1	334 mg
	Vitamin B2	1,670 mg
	Vitamin PP	11,000 mg
	Vitamin B6	500 mg
	Vitamin H(Biotin)	16,7 mg
	Vitamin B9(Folic acid)	334 mg
E1	Vitamin B12	3,4 mg
E4	Iron-Ferrous (Oxide)	15,000 mg
E6	Copper (Oxide)	3,500 mg
E5	Zinc (Oxide)	18,000 mg
E2	Manganese (Oxide)	27,000 mg
E3	Iodine (Potassium iodide)	500 mg
E8	Cobalt (Sulphate)	84 mg
E320	Sodium Selenite	67 mg
3.2.3	Antioxidants(BHA)	600 mg
3.1.1	Lysine	3 %
3.3.1	Methionine	5 %
	Threonine	2 %
	Carrier: Calcium carbonate up to	1,000 gr

Table 1 : Nutrients and its sources

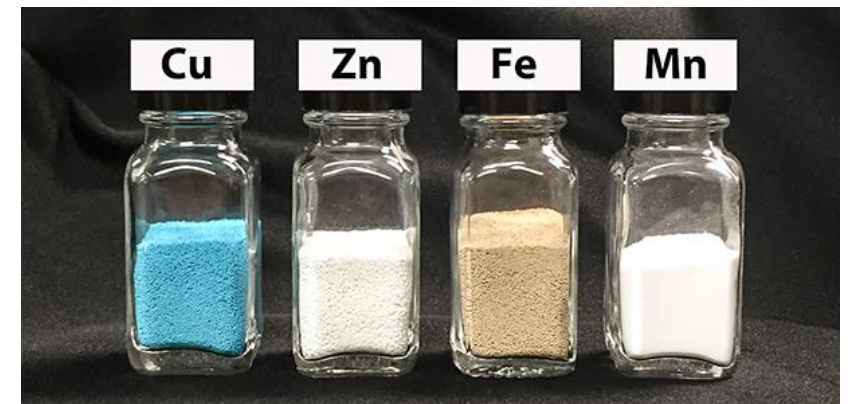
Nutrient	Sources
Iron	Ferrous sulphate monohydrate Ferrous carbonate
Copper	Copper sulphate pentahydrate Tribasic copper chloride
Zinc	Zinc oxide, Zinc sulphate
Manganese	Manganese oxide, Manganese sulphate
Magnesium	Magnesium oxide
Iodine	Calcium iodate , Potassium iodate
Cobalt	Cobalt carbonate
Molybdenum	Sodium molybdate
Selenium	Sodium selenite

ORGANIC TRACE MINERALS

- Trace minerals carry out key functions in body
- The market of trace minerals consists of inorganic and organic compounds.
- Inorganic trace minerals (also called traditional) come as **sulphates, oxides, carbonates or chlorides.**
- Organic metal complexes are compounds containing a central metal atom (acceptor of electrons) together with ligands (i.e., proteins, amino acids, carbohydrates, or lipids)

ORGANIC TRACE MINERALS

- Studies have shown that animals absorb, digest and use organic mineral sources better than inorganic ones, resulting in a greater bioavailability.



Zn absorbed (% Zn intake)

