Energy sources – Conventional and unconventional feed sources

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Energy sources – Conventional and unconventional feed sources

Concentrate

Energy rich Sources

- Ingredients which contain **less than 18 % crude protein** are classified as energy sources.
- Grains and seeds
- Milling by products
- Molasses
- Roots and tubers

Protein rich sources

- Ingredients which contain **more than 18 % crude protein** are classified as protein sources
- Oil cakes
- Milling by products
- Distillers grain
- Single cell protein

Cereal grains

- Rich in energy
- Crude fibre present in husk and hull of the grain
- Contains 8 -12 % cp. Limiting amino acids
  - lysine and methionine
- Rich in phosphorus and Vit E
- Deficient in Vit D and calcium
- Rich in Unsaturated fatty acids (linoleic and oleic).

Cereal grains - Maize

- Maize starch which is slowly digested in rumen leads to slow release of energy in rumen compared to other grains preventing occurrence of acidosis.
- Rich in linoleic acid
- Rich in Cryptoxanthin – precursor of Vit A
- Xanthophyll – poultry – yellow color of egg yolk
- Limiting amino acids - Lysine and methionine
  - New variety – opaque -2 – rich in lysine
  - Floury – rich in both methionine and lysine
- Acceptable moisture - <12%. If it is more than 12 % often contaminated with mycotoxin

Nutrient	%
Crude Protein	8 -12
TDN	85 -90
ME (Kcal / Kg)	3350
Ether extract	4

Cereal grains – Broken rice

- Broken rice unsuitable for human consumption can be used for cattle and poultry
- First limiting amino acid - Lysine
- Inclusion level – 10 % - in cattle, sheep and goat feed, 20 % in poultry feed
- Unprocessed grain contain 25 % of its weight as hull
- Hulls contain high silica
- Hulls are abrasive to digestive tract.
- Hulls – not recommended for livestock feeding

Nutrient	%
Crude Protein	8 -10
TDN	78 - 82
Crude fiber	9
Ether extract	1.9
ME (Kcal / Kg)	3350

Cereal grains - Sorghum

- Sorghum grain very similar to maize but contains more protein less oil and no pigment
- Sorghum grains are less palatable than maize because of tannin content
- Limiting amino acids – lysine, threonine and methionine
- Low calcium, high phytate phosphorus
- No Vit B12

Nutrient	%
Crude Protein	8 -12
TDN	80 -85
ME (Kcal / Kg)	3200
Ether extract	2 - 3

Cereal grains – Oats

- Feed of choice **for horses**
- **Low energy grain** – low starch content
- **High crude fibre** content (13.9 %)
- Limiting amino acid - methionine, histidine and tryptophan
- Oats has **high oil** than other cereal grains leading to softening of body fat
- Oats rich in high minerals than other cereal grains

Nutrient	%
Crude Protein	8 -12
TDN	70 -73
ME (Kcal / Kg)	2800
Crude fiber	13.9
Ether extract	5.4

Millets – Pearl millet

- It can be grown in area (high salinity soils or low pH areas) where maize and wheat don't survive
- Pearl millet is similar to nutritive value that of **sorghum**
- **High** proportion of **indigestible fibre** – because of presence of hulls and which can not be removed by ordinary harvesting methods
- **High in tannin content**

Nutrient	%
Crude Protein	12 - 15
TDN	70 -75
ME (Kcal / Kg)	3100
Ether extract	4.8

Milling by products – Deoiled Rice Bran

- Contains fibrous outer layer of grain, some hull, chipped grain and calcium carbonate which is added during milling process
- Raw rice bran – 13 -19 % of oil which is extracted and produced as deoiled rice bran
- Deleterious factors
  - Contains variable quantity of hulls
  - Hulls contain high silica which is abrasive leading to low digestibility

Nutrient	%
Crude Protein	13 -16
TDN	55 - 65
ME (Kcal / Kg)	2000
Crude fiber	13

Milling by products – Wheat bran

- Outer most layer of seed along with some flour
- Presence of NPS - **β – glucan** - because of its swelling and water holding capacities which prevent constipation
- Phytate phosphorus digested by rumen microorganisms
- Low calcium

Nutrient	%
Crude Protein	13 -16
TDN	65 -70
Phytate phosphorus	0.95
ME (Kcal / Kg)	1300

Molasses

- Highly palatable and rich energy source
- Used as appetizer
- Reduce dustiness in feed
- Used as binder in pellet feed
- Low in phosphorus but excellent source of other minerals
- Rich in niacin and pantothenic acid
- Deficient in thiamin, riboflavin, vitamin A and D

Nutrient	%
Crude Protein	1 - 2
TDN	55 – 60
Sugar	43

Unconventional energy sources – Tamarind seed powder

- Tamarind seed contain 30 - 40 % red hulls and 55 - 70 % white kernels
- Deleterious factors are
  - high tannin (13 – 14 %)
  - Contain lectins which agglutinate RBCs
  - Proteins are poorly digested and utilized by cattle
- Treatment
  - Overnight soaking in cold water

Nutrient	%
Crude Protein	12
TDN	64

Unconventional energy sources – Mango seed Kernel

- It is a **waste product of mango fruit canning industry** / after extraction of juices from mangoes
- High tannin (5 -6 %)
- Poor source of protein

- Inclusion
  - Kernels can be incorporated up to 10 % in oncentrate feeds of cattle (Puni, 1988)
  - 20 - 40 % in calves and bullocks (Talpada et al., 2002)

Nutrient	%
Crude Protein	6
TDN	55
ME (Kcal / Kg)	2000

Unconventional energy sources Tapioca Thippi

- It is a fibrous residue obtained during the manufacturing process of sago.
- CF content is 8 -9 %, ME – 3300 Kcal / Kg
- Sand and silica – 5 -10 %
- It contains **Cyanogenic glycoside** (15 - 400 mg / Kg). Drying the roots eliminates HCN
- Cassava flour and thippi mixed in equal proportion (1:1) can be used in calf and cattle rations upto 25 % and 30 % respectively.

Conclusion

- Concentrates less than 18 % CP is a energy concentrate
- Commonly available energy sources are maize, broken rice, bajra and sorghum in India
- Maize is an ideal energy source for both ruminants and poultry
- Unconventional energy sources are Molasses, tamarind seed powder, mango seed kernel and tapioca thippi
- Having a knowledge on energy sources will help in formulating least cost balanced rations

agMOOCs

Thank you