# Protein sources – Conventional and unconventional feed sources

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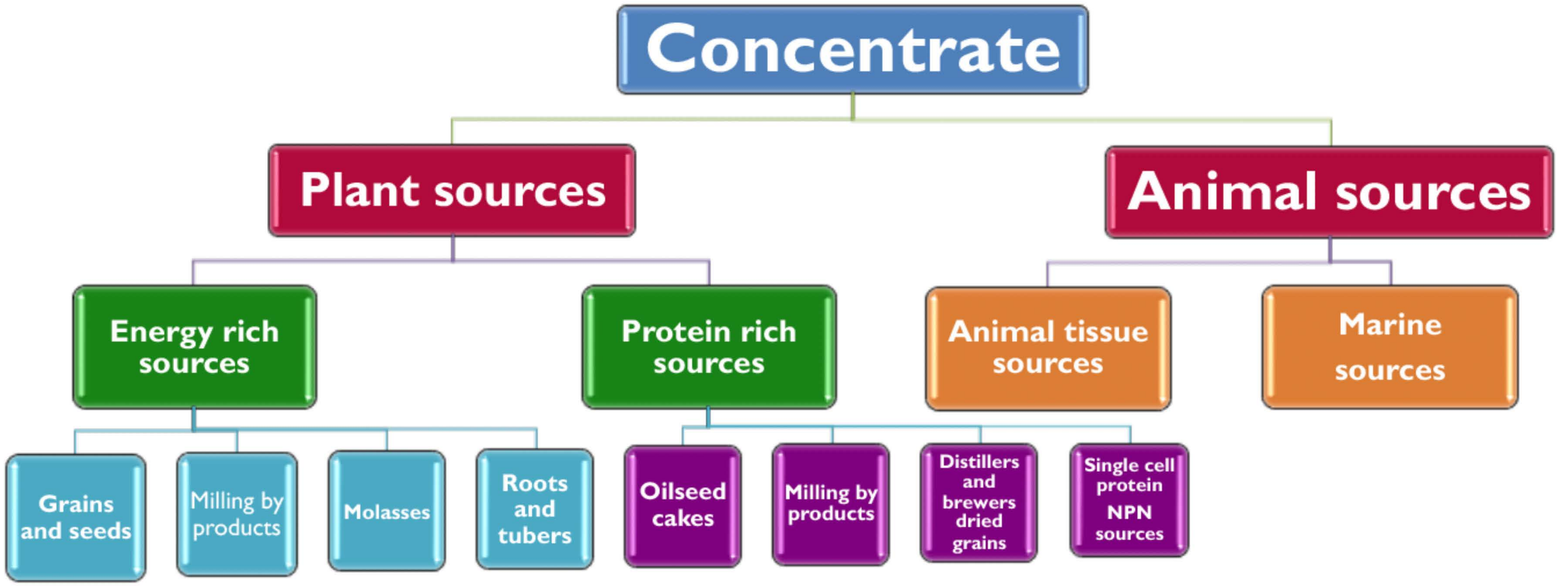
# Classification of Concentrate



# Concentrate

## 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

# Oilseed cakes and meals

- **It is the residue which remains after the removal of the oil from oil seeds**
  - **Ghani pressed – more oil**
  - **Expeller pressed – high temperature and pressure leads to denaturation of proteins, Hence low digestibility**
  - **Solvent extracted – traces of oil**

# Vegetable protein sources – Soyabean meal

- Very palatable, Highly digestible
- Rich in Lysine. First **limiting amino acids – Methionine**
- Feeding full fat soya in cattle leads to increase in conjugated linoleic acid level in milk
- **Antinutritional factors** present in soyabean meal
  - Trypsin inhibitor – removed by heat treatment
  - Saponin
  - lectins

| Nutrient | Soyabean meal | Full fat soya |
|---|---|---|
| Crude Protein | 45 - 55 | 37.8 |
| TDN | 75 - 84 | 75 |
| ME (kcal / Kg) | 2400 | 3650 |
| Ether extract | 0.9 – 1.4 | 18.5 |

## Vegetable protein sources – Groundnut de-oiled cake

- Ghani pressed – 10 -12 % oil
- Expeller pressed – 6 - 8 % oil
- Solvent extracted – 0.5 - 0.7 % oil
- Undecorticated GNC – high fibre content
- First limiting amino acids - Lysine
- Low in calcium, carotene and Vit D
- Contain **Aflatoxin $B_1$** metabolite of fungus Aspergillus flavus

| Nutrient | % |
|---|---|
| Crude Protein | 40 -50 |
| TDN | 75 - 85 |
| ME (Kcal / Kg) | 2400 |
| Ether extract | 1.0 |

# Vegetable protein sources – Sunflower meal

- Produced when the black oil seeds are crushed
- Seed consist of 25 - 40 % shell
- No dehulling – CP – 25 - 28 %
- Partial dehulling – CP - 34 - 38 %
- Complete dehulling – CP - >40%
- Inclusion level – 20 % in cattle ration
- Contain aflatoxin B1, Ochratoxin

| Nutrient | Sunflower decorticated | Sunflower undecorticated |
|---|---|---|
| Crude Protein | 41 | 28.9 |
| TDN | 65 | 65 |
| ME | 2560 | 1485 |
| Crude fiber | 12.2 | 24.6 |

# Vegetable protein sources – Coconut meal / copra

- Produced after extraction of oil from dried endosperm of coconut
- Limiting amino acids - **lysine and histidine**
- High fiber limits usage in simple stomached animals
- Ruminants –
  - very useful protein supplement
  - Contains higher % of RUP
  - Increases milk fat content

| Nutrient | % |
|---|---|
| Crude Protein | 25 -30 |
| TDN | 70 -75 |
| ME (Kcal / Kg) | 2300 |
| Crude fiber | 10 |

# Vegetable protein sources – Sesame meal

- High grade protein rich in leucine, arginine and methionine
- Limiting amino acids - lysine
- Ruminants – protein degradability is 65 -75 %
- Mildly laxative
- Presence of sesame meal leads to production of soft butter in milk

| Nutrient | % |
|---|---|
| Crude Protein | 40 - 50 |
| TDN | 70 -75 |
| ME (Kcal / kg) | 2300 |
| Ether extract | 10 |

# Vegetable protein sources – Cotton seed meal

- Undecorticated cotton seed meal, CP – 22 %, CF – 26.9 %
- Decorticated cotton seed meal, CP – 42 %, CF – 7.9 -16 %
- Limiting amino acid – **Lysine**
- **High phosphorus** content
- **Gossypol** – hemolytic effect – reduce oxygen carrying capacity
  - Male – antifertility effect
  - Ruminants – less susceptible – because rumen micro organism detoxify
  - Gossypol binds with protein – reduce protein quality
- **Detoxification methods**
- Supplementation of lysine and methionine
- Chemical treatment (lime and iron) – 1 % Ca(OH)2

## Cotton seed meal

| Nutrient | % |
|---|---|
| Crude Protein | 22 - 42 |
| TDN | 78 |
| ME | 2100 |
| Ether extract | 1.2 – 7.0 |

## Rape seed meal

# Vegetable protein sources – Rape seed meal

- Amino acid profile comparable to soybean meal.
- Deleterious factor
- Glucosinolates – inhibit thyroid metabolism – cause goitre
- Canola – low glucosinolate variety
- Tannin – binds with protein – form enzyme resistant substances – lowers digestibility
- Other antinutritional factors like erucic acid and phytic acid are present
- Sinapine – reduces palatability
- Myrosinase – act on different glucoside – produce irritant oil – toxic to livestock

- Detoxification
  - Heating with 5 parts of water at 85°C for 1 hr
  - Ethyl alcohol treatment
  - Ammoniation
  - Sodium carbonate treatment
  - Prolonged steam treatment (2 hours)
- Inclusion
  - 10 % in cattle ration

| Nutrient | % |
|---|---|
| Crude Protein | 32 -39 |
| ME (Kcal / Kg) | 2400 |

# Vegetable protein sources

- Corn gluten meal
- Niger cake
- Karanja cake
- Neem cake
- Rubber seed cake
- Sunhemp seed

**Unconventional protein sources**

- Brewers distillers dried grain
- Rice DDGS

**Single cell protein & Distillers dried grain**

# Unconventional protein sources – Corn gluten meal

- Corn gluten meal is a byproduct from the manufacturing process (wet milling) of maize syrup or starch obtained as a dry residue after the removal of bran, germ and starch.
- It is **protein ingredient**

  It is a **good source of methionine and cysteine**
- It is a source of **rumen undegradable protein**
- It is rich in **xanthophylls**
- Nitrogen digestibility – 81 %,
- OM digestibility – 96 %
- Often Contaminated with **mycotoxin**
- Poultry feed inclusion level – 5 – 8 %


| Nutrient | % |
|---|---|
| CP | 65 - 69 |
| ME (Kcal / Kg) | 3680 |
| Crude fiber | 1.2 |
| EE | 3.6 |

# Unconventional protein sources – Rice / Corn DDGs

- It is the byproduct of dry milling distillery process of grain for producing ethanol
- It is rich in protein. Low in lysine content
- Nitrogen digestibility in ruminants – 77 %, OM digestibility – 83 %
- Mycotoxin concentrations are 3 fold higher in DDGS than original grain
- Inclusion level
  - Broilers – 3 - 5 %
  - Layers – 5 -10 %
  - Dairy – 10 – 20 %

| Nutrient | Rice DDGS | Corn DDGS |
|---|---|---|
| CP | 38.36 – 53.61 | 24.01 – 34.93 |
| CF | 1.14 – 6.74 | 6.88 – 11.41 |
| ME (Kcal / Kg) | 2700 - 2900 | 2820 |
| Crude fat | 5 | 10 |

# Animal sources

## Animal tissue sources

- Meat meal
- Meat cum bone meal
- Silkworm pupae meal
- Hatchery by product meal
- Poultry by product meal
- Poultry offal meal
- Feather meal
- Squilla meal

## Marine sources

- Fish meal
- Shrimp shell powder
- Crab meal
- Processed fresh ensilage

# Animal tissue protein sources – Meat cum bone meal

- Produced from slaughter house wastes
- It consist of portions of animals that are not suitable for human consumption such as carcass trimmings, condemned carcass, condemned lives, inedible offal and bone
- Hair, Hooves and blood not included
- Excellent source of protein and well balanced amino acid profile
- Rich in calcium and phosphorus

| Nutrient | % |
|---|---|
| CP | 54.9 |
| ME (Kcal / Kg) | 2800 |
| Total ash | 28 - 36 |
| Calcium | 7 – 10 |
| Phosphorus | 4.5 - 6 |

# Marine tissue protein sources – Fish meal

- It is obtained by cooking, pressing, drying and milling fresh raw fish or fish trimmings
- It is a good source of protein and omega 3 fatty acids
- Toxic substance gizzerosine is formed when fish meal is dried at 180°C. It causes gizzard erosion and black vomition in poultry.
- European union banned usage of fish meal in ruminant rations.
- Inclusion level
- Lambs – 2.5 %,
- Ewes – 7.5 %
- Poultry – 5 %

| Nutrient | % |
|---|---|
| CP | 62 - 70 |
| EE | 11 |
| ME (Kcal / Kg) | 3700 |
| Ash | 13.6 |

## Conclusion

- Concentrates more than 18 % CP is a protein concentrate
- Protein is costlier than energy in India
- Commonly available protein sources are soyabean meal, De-oiled GNC, SFDOC, Coconut oil cake, etc.,
- Unconventional protein sources are Corn gluten meal, Rice DDGs, Maize DDGs
- Having a knowledge on protein sources will help in formulating least cost balanced rations


agMOOCs
C·O·L
Thank you