

# LEGUMINOUS SEEDS (*LEGUMINOSAE*)

- Broad bean
- Common Pea
- Lupin
- Common vetch
- Bitter vetch
- Lentil
- Grass or Indian pea (*Lathyrus sativus*)
- Chick pea
- Soybean

# CHARACTERISTICS OF LEGUME SEEDS

- Nutrient contents vary depending on species, growth, harvest and storage conditions.
- In leguminous seeds such as broad beans, peas and vetch have **high content of starch** (30-40%), whereas in soybean the **fat content** is high.

# CHARACTERISTICS OF LEGUME SEEDS

- DM: 88-90%
- CP: 20-45% (NPN, free amino acids, purine & pyrimidine bases, nucleic acids, albumin, globulin, alkaloids, globulins including legumelin or vicilin)
- Essential amino acid level better than cereal grains
- Poor source of sulfur containing amino acids

# CHARACTERISTICS OF LEGUME SEEDS

- Lysine↑
- Tryptophan, cystine, methionine ↓
- Protein biological value is not high
- Only soybean protein is good in terms of quantity and quality, close to animal-derived proteins
- CF 3-12%
- EE Soya 18-20%,
- Common vetch & Grass pea 1-2%

- Calcium and potassium ↑
  - (As compared to cereal grains)
- Most of P is in the form of phytate
- Carotene (provitamin A) is abundant in green peas and broad beans, but its amount significantly decreases in mature seeds
- Vitamin D content is poor
- Vitamin E is ↑ in their embryos
- They should be roughly ground or crushed before feeding.

# Anti-Nutritional factors present in Leguminous seeds

- Tannins (cause constipation due to slowing the bowel movement)
- Cyanogenic glycosides
- Alkaloids
- Toxalbumin
- Lectins
- Proteinase inhibitors

- When consumed excessively by poultry and single stomach animals problems arise like Liver degenerations, hypertrophy of gallbladder and pancreas, renal damage
- To increase the feeding value of leguminous seeds
  - i. Cooking
  - ii. Boiling
  - iii. Steaming

- Lectins

- They have the ability to bind glycoproteins and carbohydrates.
- They impair the digestion and absorption of nutrients in the digestive tract.

- Proteinase inhibitors

- Inhibit trypsin and chymotrypsin and reduce the value of proteins.



# Broad Bean

- CP ↑ 22-26%
  - Lysine ↑ Methionine & cystine ↓ BV ↓
  - Vicine, convisine
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- Egg production and egg size ↓
  - Tannin ⇒ Constipation
  - Consistency of butter ⇒ Hard
  - For dairy cows should not exceed 20% in compound feed
  - For fattening beef cattle up to 25% (Tight and brittle meat formation)
  - For young calves (aged 3 months) up to 15%
  - For horses max. 1.5-2 kg (as tannins cause cholic in horses)
  - Poultry breeder 2.5-10% (Young), 5-10% (adult birds)

# Common Pea

- Digestibility ↑
- CP 16-26% (Methionine ↓)
- Young poultry breeders 2.5-10%, for adult 5-15%
- Dairy cattle 1-1.5 kg/day (20% in compound feed)
- Beef cattle 0.5-1 kg/100 kg live weight
- Sheep 0.25-0.5 kg/day

# Lupins

- According to the color of the flowers white lupin, blue lupin, yellow lupin
- Bitter and sweet types
- Alkaloid in blue lupin
- White lupin is used in poultry feeding
- Sweet lupins in animal feeding
  - ✓ dairy cows, fattening cattle, horses 1.5-2 kg / day
  - ✓ sheep 300 g / day
  - ✓ Up to 10% for poultry

# Common Vetch

- Common vetch (*Vicia sativa*), Hairy vetch, Narbon vetch, Hungarian vetch
- Vicin, vicianin cyanogenic glycosides
- If over-consumed
  - Cholic in horses
  - The deterioration of milk taste in cows
- Cooking and Steaming
- CP 25-30% (Choline and betaine)
- Cattle 2 kg / day
- Sheep 250 g / day
- Young poultry breeder 5%, for adults 5-10%

# **Bitter Vetch**

## **(*Vicia ervillia* L.Wild)**

- CP 21-23%
- ME 2750 kcal/kg
- Tannins: should not use in horse feeding
- Anti-nutritional factors ↑
- It is useful to give it to animals after grinding and with slowly adaptation

# Grass Pea

## *(Lathyrus sativus L.)*

- CP: 25-32%
- EE: 1-3%
- CF: 2-6%
- Crude Ash: 2.5-4.5%
- Most of NFE is starch
- Alkaloids, protease inhibitors, tannins, lathyrogens
- Up to 10% for poultry
- Up to 10% in compound feed for ruminant

# Grass Pea

## *(Lathyrus sativus L.)*

When consumed too much:

- Skeletal disorders
- Reduce sexual development
- Paralysis cases
- Death

These are the basic symptoms of disease called Lathyrism.

# Chick Pea

- CP 16.5%
- Young poultry 5-10%
- Adult poultry 20%
- Cattle 1.5-2 kg/day
- Sheep 250 g/day
- Protease inhibitors → protein value ↓



# Soybean (*Glycine max*)

- EE 18-20% linoleic acid ↑
  - CP 36-38% lysine ↑ methionine ↓
  - Raw soybean protein fermented quickly in rumen
  - Digestibility ↑
  - Protease inhibitors (trypsin inhibitor)
  - Guatrogenic substances
  - Rickets-forming factors
  - Urease
  - Hemagglutinin called Soyin
  - B12 Antagonist
  - Factor causing pancreatic hypertrophy
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- Dairy cows 1 kg / day, Horses 0.5 kg / day
  - Ruminant concentrate feeds up to 15-20%

# Extruded Soybean

- Processed under heat and pressure
- Extruded
- Full fat soya
- Free of antinutritional factors
- Nutrient composition is same as soybean
- In extruded soya soluble protein ↓
- Protein degradability in rumen ↓
- Digestibility of rumen degradable protein ↑
- Metabolizable protein ↑

Up to 15-20% in poultry rations

Up to 15-20% in ruminant compound feeds

# OILSEEDS

- Soybean
- Canola
- Cottonseed
- Safflower
- Sunflower
- Linseed
- Hempseed
- Camelina
- Black seed (*Nigella sativa*)

# Canola

- DM: 90%
- CP: 20-25%
- EE: 43-50%

Unsaturated fatty acids ↑,  
oleic acid, linoleic acid ↑

Alfa linolenic acid ↑

- Crude ash: 2%
- ADF: 18%
- Glucosinolate & Erucic acid ↓

# Canola

- It is also possible to use canola as full-fat or half-fat
- Since fat is present in the form of a thick layer around the polysaccharides, it is not possible to evaluate the energy optimally.
- It is also difficult to disintegrate seed cells because the canola seeds are very small.

- Due to high oil content, if given to animals in high quantity, it negatively affects microbial activity in rumen, decreases feed consumption and cellulose digestion. This is why amount of fat in ruminant rations is limited to 5%.
- In poultry rations up to 10%
- In ruminant rations 5%

# Cottonseed

- Cottonseeds can be used as whole seed or after removing the seed coat
- Due to high energy (from fat), protein and fiber cottonseed is a good feed ingredient for meat and dairy cattle
- Since fermentable carbohydrates are low, methane production in rumen is less.
- When it is not possible to break the seed coat it should be kept in water and should be given with green roughages
- Due to Gossypol content, it should not be given to young ruminants in high quantity.

- Cotton seed in ruminant rations should be used in such a way to not to exceed the total fat content of ration more than 6%
- Excess fat in rumen has a negative effect on cellulolytic bacteria.
- Processes such as heat and extrusion reduce the amount of free gossypol.
- Addition of iron sulphate to feed (up to 500g/kg DM of mixed feed) also reduces the amount of gossypol in the blood.
- Cyclopropenoid fatty acids cpe18:1 malvalic, cpe19:1 sterculic fatty acids



# Cottonseed

- Whole cotton seed  
DM: 90%  
CP: 20%, Rumen N degradability: over 70%  
CF: 27%, ADF: 35%, lignin 10%  
EE: 19% (linoleic, oleic, palmitic ↑)  
Ash: 4%  
ME (ruminant): 2870 kcal / kg

# Cottonseed

- Dehulled Cotton seeds

DM: 90%

CP: 32%

CF: 13%, ADF: 18%, lignin 6%

EE: 31%

Ash: 5%

1 kg per day for cattle, 10-15% (ration DM)

300 g / day to sheep

# Sunflower seeds

- DM: 90%
- CP: 16-20%
- CF: 16-20%
- EE: 42-50% (oleic acid, linoleic acid ↑)
- Ash: 3-4%

# Sunflower seeds

- It is an important high-energy diet.
- It is also used in dehulled form
- After dehulling, amount of cellulose decreases and feeding value increases
- Up to 10% in layer rations
- Up to 20% in broiler rations
- Up to 10% in lamb, sheep and goat diets

# Sunflower seeds

- Up to 8% in dairy rations  
Increases the polyunsaturated fatty acids content in milk, especially conjugated linoleic acid and omega-6 fatty acid.  
Due to high fat content, over feeding decreases feed consumption and decreases milk yield.
- For beef cattle, at the end of the fattening period, feeding 15% of sunflower seeds instead of crushed barley improves the feed efficiency & CLA content of meat; decreases loss of energy through feces and protects from liver abscess

# Linseed/ flaxseed

- DM: 90%
- CP: 20-28%
- CF: 10-12%
- EE: 31-43%

Unsaturated fatty acids ↑, alpha Linolenic acid (ALA, omega 3 fatty acids, 45-60%) ↑

Conjugated linoleic acid ↑

- Ash: 3-5%
- ME ruminant: 4300 kcal/kg DM
- ME poultry: 3800 kcal/kg DM

- Laxative effect
- Positive effect on skin and hair
- Contains lignan which has Phyto-estrogenic and anticarcinogenic properties
- Cyanogenic glycoside called linamarin
- Linatin, vitamin B6 antagonist
- 2-7% water soluble carbohydrate, mucilage. Mucilage absorbs water, increases intestinal viscosity, leads to laxative effect
- Phytic acid
- Goitrogen substances

# Linseed/ flaxseed

- For dairy and beef cattle up to 10%
- Poultry 10%
- Omega 3 fatty acid content increases in animal products, omega 6/ omega 3 fatty acid ratio decreases
- Reduces cholesterol in egg yolk