

FEED TECHNOLOGY

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• EFFECTS ON FEED OF YOUR FEEDING PROCESS

- • Processing of feeds covers all the changes that will increase the nutritional value of the feeds and provide the highest profit for them.
- • These actions can be physical and chemical.

- Physical processes;
 - moisture addition or reduction,
 - heat and pressure application,
 - change particle size
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- Chemical processes;
 - to change the structure of starch and
 - is applied to disrupt the protein matrix.
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- Feed cost
 - 70% of the expenses in beef cattle breeding,
 - 55% of milk production expenses,
 - and 50% of the lamb weight.

- Some of the nutrients increase during processing of the feed, but some decrease.
- Grain heat treatment causes gelatinization of starch, causing the proteins to become denatured.
- Thin chopping and pelleting of roughage accelerate passage through the digestive tract and reduce crude cellulose digestion.
- Feed processing also affects onboard. For example; pelletized dry grass facilitates automation, reduces workmanship and deterioration.

FEED PURPOSES OF PROCESSING

- 1. Providing more income: Benefits from feed can increase by 10-20%. Techniques such as extrusion, flaked, micronization provide energy savings during milling.
- 2. Change particle size: Some feeds are reduced in size (such as grinding, crushing) to increase the rate of consumption and the degree of digestion.
- In the case of prevention dusting in the feeds, feeding in the marina, selecting a non-delicious feed, the sizes of the feeds are enlarged (pellets, cube feeds) to facilitate the passage of the feeds.

- 3. Change the moisture content: The moisture content of the food is changed to prevent deterioration during digestion, digestion and increase the taste.
- The storage moisture for grain feed should be below 14%.
- Water is added when the moisture content of the feeds used in silage falls below 26%.
- 4. Change feed density: Bulky feeds that fill the stomach reduce dry matter consumption. To prevent this, bulk feeds are pelleted to increase energy intensity and feed consumption. Pelletizing also reduces transportation and storage costs. Bulky rations are sometimes used to limit energy consumption.
- In the case of horse feed, less dense feeds converted to flaked shapes are preferred. These feeds are lighter and do not cause digestive disorders.

- 5. Change the taste of the feed:
- Sweetener (such as molasses) and oil are used to increase the consumption of feed.
- Sometimes salty feed mixes are prepared to reduce flavor and limit feed consumption.
- 6. Change nutrient content: There are very few natural feedstuffs that animals can meet total nutrient needs alone. Even milk, when given to young animals for a long time, should be supported in terms of some vitamins and minerals.
- 7. Increase utilization of nutrients: Pelleting increases the availability of phosphorus in poultry.

- It has been observed that starch molecules break down due to the effect of heat on grain feed and gelatinization increases the digestibility of the resultant.
- The breakdown of fat cells results in the release of tocopherols and lecithin in the free state and the fat digestibility is increased.
- It has been shown that certain amounts of B₁, B₂ and Niasin are degraded in feeds stored at various periods and temperatures.
- Formaldehyde treatment of quality protein sources such as soybean meal provides more efficient use of protein in abomasum.

- 8. Removal of antinutritional factors: Some toxic (inhibitor) substances in feedstuffs can lead to infertility and mortality in animals.
- Soybean fiber protease inhibitors include hemagglutinins, saponins, guatrogenic factors, racitogenic factors, allergic factors.
- Rice hulls are enzymes that rapidly destroy the nutritive properties of various raw materials;
- Tapioca hydrocyanic and oxalic acids;
- Cotton seed contains gossipol.
- These factors become ineffective during the applied heat treatment.

Some toxic substances and detoxification processes in feedstuffs

Feedstuff	Inhibitor substance	Applied transaction
Cotton meal	Gossypol	Addition of iron salts
	Cyclopropane fatty acid	Disintegration of pigment glands
Soja meal	Tripicin inhibitor	Heating, autoclaving
Flax seed meal	Linemarin	Water treatment
Clover meal	Pectin methylesterase saponins	Limited feeding
Rye	Rye spur?	Limited feeding
ordinary Clower	Dicumarol	Heat application
Rape	Isotiyocyonate	Heat application

- 9. Increasing storage quality: Drying, treatment with organic acids and oxygen reduction are carried out in order to store the grain feeds containing more than 14% moisture without mold and escalation
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- 10. Processing of coarse feeds to provide mechanization and reduce storage area: Costing and feeding losses are reduced in transport, storage and feeding operations when roughage is assessed by making straw, bale, cube and pellet.
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- 11. Reduce harmful effects in feeds:
- Harvest time, storage and drying are important to prevent mold contamination and toxin production.
- To prevent mold growth, ammonia and ammonium hydroxide are added to feeds to reduce propionic acid and acetic acid, and toxin-producing feeds to reduce toxicity.
- Pelleting destroys Salmonella, which breeds in meat.
- Short-term heat, pressure, microwave applications, bacteria, yeast and fungi make it possible to destroy.

CONCENTRATED FEED PROCESSING TECHNIQUES

1. MECHANICAL OPERATIONS

- 1. Dehulling: The outer cover layer is passed through the same mill is called shell cleaning, shelling or polishing.
- Barley, oats and rice husks are removed from the grains.
- The nutritional value of feedstuffs such as soybean meal, cottonseed, sunflower and peanuts is low. The crude protein and energy levels are increased while the percentage of celluloses in shells removed decreases.
- For example, while roughly ground crustacean cotton seeds have 22% CP, the same level of crustless and flour has the CP level of 50%.

- 2. Clipping: Cutting off the tips of the oat and lowering the cellulose content.
- 3. Grinding: It is the most important step in the production of mixed feed. Benefits:
- The feedstuffs separated by small particles by grinding show a homogeneous distribution.
- Better mixing of feed ingredients is ensured.
- During the transport of feedstuffs and discharging to feedstuffs, the collection of small particles at the bottom and at the top is prevented.
- The growth of the total surface of the particles, the effect of the enzymes on the larger surface, makes the digestion more dense and faster.

- Rolling: Grain feeds are passed through the cylinders to form flat, flat particles. The cattle, especially the sheep are given out of mixed feed.
- a. Dry rolling: The granules are crushed between the rollers on the grooved surface. Roughly crushed grain image.
- b. Steam rolling: Grains are first held in the buhard (1-8 minutes) and passed through the cylinders. It is delicious and the humidity is increased by an additional 6%.

5. Steam compression (**extrusion**): The grain are milled, soaked to soften and forced through a steel tube under pressure by means of a screw. This **coercion** results in a temperature of 105-170 ° C as the result of friction. The pressure reaches a value of 100 bar.

The extrusion takes place in a few seconds. No shortening of roasting or other nutritional values in high-temperature end-feed applied with short-acting shortening, eliminating antinutritional factors in the raw material. The starch present in the exudate material is gelatinized in high proportion (80%).

Cat, dog, fish and laboratory animal feed production; meat and fish meal, salmonella-free feather meal, and ruminants for the cooking of cereals.

- It has also been shown that the extrusion process is also effective in increasing the utilization of fat energy.
- The pulping and extrusion processes of the sorghum yielded 9% and 15% better results, respectively (breakdown of starch granules), from dry feed, compared to dry feed.
- In recent years, mixed feeds, oil and molasses have been added to the structure required for pelletizing with machines called Ekspander.

- There are three types of extrusion cooking used in the feed and cat-dog diet industry;
- Short time and high temperature extrusion cookers,
- Pressure cookers,
- Dry extrusion cookers
- Extrusion cookers are capable of granulating and grinding milled grain, factory feeds, embryonated wheat and corn crumbs, root-tuber and legume flour, and uniformly expanding. This is also the case with cushions.

- Drying and cooling of extruded products: Extruded products can be dried in the dryer at 177-190 °C for 4-6 minutes without loss of nutrients.
- After all the extruded products have been dried, they must be cooled before being placed in the silo or packaging to prevent degradation caused by the flake.
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- **GELATINIZATION OF STARCH:** Gelatinization is the destruction of the starch granule so that it is not reversible. This ensures that each molecule, solution or effector is more easily accessible.
- Digestion of gelatinization of starch has two important effects.
 - 1. Gelatinization increases the ability of starch to absorb water in large quantities.
 - 2. Enzymes break the bonds of starch and provide better dissolution.

- Gelatinization is carried out by applying combinations such as moisture, heat, mechanical energy, pressure difference, pH change.
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- There are many ways to gelatinize starch.
- Grain or flour will be gelatinized when boiled in water.
- The saman is kept under vapor pressure and then gelatinized in the middle of the radish starch.

● 2. HEAT APPLICATIONS

- High temperature destroys amino acids and vitamins and some other nutrients.
- Proper heating improves the utilization of carbohydrates and proteins, improves the evaluation of fats and improves energy value.
- Proper heating of cereal grains such as corn, barley, sorghum causes partial gelatinization. This affects fattening performance positively.
- By heating the soybean, the trypsin inhibitor is destroyed and the utilization of amino acids is increased. However, the result of overheating is that many amino acids and especially lysine, arginine, tryptophan and cystine are destroyed.

- 1. Dry heating method: Moisture content drops, storage becomes easy. Principal methods:
 - a. **Micronizing**: Infrared rays are used to dry the grain. The temperature rises to 149 ° C and the humidity in the grains decreases by 7%. The grains did not explode. The appearance of a uniform, durable, dry, easy-to-flow product is similar to that of steam-treated flakes.
 - b. **Popping**: The rapid application of dry heat results in the swelling of the grains. Grains with 15-20% moisture are heated rapidly at 150-155 oC for 15-120 seconds. Increases energy, digestion and feed..
 - c. **Roasting**: It is the process of heating the feed at 150 °C. The rate of nutrient evaluation is increased. Roasted corn has a pleasant and aromatic odor, it gets a fluffy caramelized appearance. Moisture content drops to 5-9%. In beef cattle, 14% of live weight gain and 10% improvement in feed injury were achieved by roasted corn.

- 2. Moisture heating method: Samen is cooked or kept under pressure with water or water vapor. Cooking and expansion processes are applied for this purpose.
- a. Cooking: It can be used to relieve the pain and relieve the toxic effects of food that is hot. It is especially preferred to cook the potatoes.
- b. Exploding: Exploding the granules by vapor under pressure. It is inflated to several folds of its original size by cooking the granules with steam for 20 seconds at 250 psi pressure.

- 3. Flaking: It is a modification of the moist roll. The grain feed is exposed to water vapor or pressure for longer. The final product has a pleasant aroma similar to that of cooked cereals.
- It allows better processing of starch by rumen microorganisms and enzymes. According to the milling and grinding of the sorghum, it is 100-200 g per day in cattle and 5-10% in the utilization of feed.

- a. **Steam flaking:** Steam flaking is carried out at 80-90 ° C for 15-30 minutes. Tannin is provided with 20-22% moisture. The beads are crushed by passing between two waltzes rotating at equal cycles. Thus, up to 80% of the starch molecules are gelatinized. Finally, the humidity level is lowered by cooling. The baked material is crushed to form thin layers and dried.
- It is recommended in horses. It causes less digestive disturbance. Light and loose particles are produced.
- b. **Pressure flaking:** The particles, which are subjected to 45-65 psi vapor pressure for 1.5 minutes, are sprayed rapidly from the cooking tank to another vessel. The scales obtained are hard and resistant to breakage.

- **4. Pelleting:** It is to combine the feeds with moisture, temperature and pressure under mechanical processes. Diameter can be different in length and length. Pellet sizes generally range from 2.5 to 20 mm.
- The amount of heat applied during pelletizing is important. If high heat is applied, the proteins, amino acids and vitamins in the feeds will be damaged. Pelleting is done in coarse fodder as for concentrated feeds (such as dry grass pellets).

● Benefits of the pellet:

- 1. Fine grinded, easy-to-consume of unpleasant feed ingredients alone,
- 2. Reduce the collapse or separation of many different raw materials in the finished product
- 3. Less moisture and dusting than eating powder,
- 4. Heat and pressure increase the nutritional value of the feed,
- 5. Prevents selection of feed by providing homogeneous distribution of feedstuffs,
- 6. Since there is a lot of fluency compared to eating powder, it provides mechanization during transportation and feeding,
- 7. Narrow the storage area,
- 8. Mold mildew and harmful bacteria formation is less,
- 9. Addition of liquid to the food is possible.

- **Disadvantages of pellet;**
- 1. increase in cost, 2. damage of proteins, vitamins and enzymes during heat application, 3. increase in cannibalism events due to premature saturation in poultry, 4. increase in water consumption can be summarized as watery stool and egg pollution.
- The density of the physical quality of the pellet feed, the pellet angle, the particle size; chemical properties also affect the oil content. In the case of incompatibility, the pellets are crumbled and dispersed in a short time, hardened and dissolvable. If the material to be pelleted is overheated, the top surface of the pellet will be damaged, dark and light. In addition, the force of holding the feeds tightly together decreases, the friction increases, and dusting occurs.

- It consists of combining powder feeds by means of adhesives (molasses, oil, sodium bentonite, paper industry lignin sulphonates, steam).
- The compound feed fed into the press with the adhesive is forced to come out of the appropriate pinholes and cut to the desired length on the one hand. The pellets, cooled for 5-12 minutes with cold air, are also separated from the dusty parts by passing through the sieve.

- a. **Granulation** (Crumbling): Pelleted feed is granulated between two rolls, one fast and the other slowly rotating.
- Obtained coarse granules are more suitable for automatic feeding.
- It is used to cater for chicks, chicks and feeds of fowl.
- Reduces chewing, swallowing and digestion.

3. CHANGE THE MOISTURE RATE (HUMIDITY)

- Drying of the grain for storage, fading of roughage for silos to wiper, low moisture content for the silage of the forage should be added some water.
- 1. Watering, Soaking: Dried sugar beet pulp is a few times more water than its own weight, so it is more suitable to be wetted before it is given to animals.
- By adding water to grains, dry matter can be increased from 10-14% to 25-30%. With wetting **sorghum**, positive results were obtained in beef cattle and protein assessment was increased. It can also be moistened in powdered food and given to animals.

- Some horses do not drink water directly. They are mixed with water, dry grass or licking stone. The dandruff which is given to the horses to regulate the digestive system is also prepared with water.
- When preparing milk substitutes for calves and foals, water is added to dry feed in certain proportions.
- 2. Drying (dehydrating): In order to prevent deterioration during storage, the water in the feeds is reduced to 12-13% by natural or artificial heating. The feeds are dried by blowing dry air or passing through a heated environment. High heat during drying adversely affects proteins and vitamins.

- 3. Early harvesting: The grain to be fed directly to the animal is to be harvested early while containing high humidity.
- Positive results were obtained in the fattening studies with early harvested corn and sorghum.
- Wheat, barley and oats can be harvested early and harvested.
- Thanks to early harvest; losses in the field are reduced and time is saved for a second product.

- They are not suitable for marketing, storage difficulties, adverse effects such as freezing.
- The grain feeds are harvested early, while the moisture content is 20-40%, they are stored with the addition of 1-1.5% propionic acid. The optimum moisture content for storage is 25-32%.

4. MOLDING

In this regard, protein and energy forms have been prepared for the pasture as well as the old licking stones and mineral molds. For livestock feeding animals, a pattern is usually considered for 15 cattle.

5. LIQUIDS

Liquid additives consist of water, molasses, urea and oil. Composition trace elements and vitamins can also be added. The structure contains 50-70% molasses and 1.5-2% phosphorous in the form of phosphoric acid. Ethyl and propylene alcohols may be added to these. Lately preserved oils can also be used in this form.

- 6. FERMENTATION PROCEDURES
- The first one is silting and the other is fermentation with the additives of the feedstuffs to correct the nutrient content.
- - Changing the nutrient content of feeds by adding fermentation process by adding additives:
- By fermentation process, various by-products and residual substances are converted into animal feed. For example; The feces of the birds are evaluated as animal feed by subjecting to bacterial fermentation.
- Enzymes can be considered as products of fermentation of certain amino acids (such as lysine and glutamic acid) with antibiotics, vitamins (for carotene, vitamin A, vitamin B₁₂ and riboflavin) and proteins (such as baker's yeast, brewer's yeast and torafer's yeast).

- 7. Germination of grain?
- It is the process of growing grain feed in an aqueous medium containing essential mineral salts instead of soil. The oat obtained in this way is more rich in Ca, P, carotene, vitamin E, thiamine, riboflavin, niacin and vitamin C than normal oat. As the cost of germination increases, dry matter level also decreases.
- It is very useful to have germinated oat cures on pregnant mare especially in winter months when there is little green oats.

- 8. PROCESSING OF SOME PROTEIN RESOURCES
- The protein synthesis ability of rumen microorganisms is limited. It is assumed that 15-20 g of bacterial protein is synthesized from each digestible 100 g OM.
- Feed proteins are degraded to rumen NH_3 , ammonia absorption from the rumen wall increases. Ammonia increases the load on the liver and kidneys, and most of the nitrogen is released in the form of urea in the urine, leading to diarrhea.
- For this reason, feeds containing proteins at high levels and proteins destroying large amounts are treated with chemical substances when given to animals.
- The most common of these processes are protected proteins obtained by processing feeds with formaldehyde.
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- **Processing of protein sources with formaldehyde:** Protein sources are obtained by mixing 0.2-0.3% formaldehyde.
- The effect of formaldehyde is abomasum, which has a low pH environment, and the proteins are evaluated in the small intestine.
- If too much formaldehyde is used, the protective effect is continued in the small intestines and protein digestion and valence are reduced. Nowadays soybean pulp and casein are protected with formaldehyde intensively.

- **By-pass amino acids:** Recently it has been shown that methionine and lysine are physiologically and economically important in dairy ration.
- By-pass lysine and methionine are protected from digestion in the rumen, absorbed in the small intestine. The lipase from the bile dissolves in the intestine and the amino acids are released.
- These additives reduce the ability of the clown to use its own tissues in lactation. High yield cows are characterized by increased lactation, increased body condition, less ketosis, and increased production performance.

- **2. Heat treatment of protein sources:** Short time / high temperature extrusion cooking of oil seeds can provide a very low N solubility by-pass protein formation and protein does not suffer significant damage in quality.
- When oiled seeds and legumes are cooked, it has been observed that the inhibitory factors for development are controlled, the oil is released for energy evaluability and ease of use and plays a role as a protected protein.

- **9. OIL PROCESSING**
- When untreated fat is added to the ruminant rations by more than 4-5%, it breaks the fermentation of the rumen, reduces the digestibility degree of crude cellulose, decreases the feed consumption and milk fat ratio.
- The oils need to be processed to add more oil to the rations. The oils are processed and protected by various methods (by pass oil-energy).
- 1. Processing of oils with formaldehyde: Oil-rich material or oil is emulsified and protected with formaldehyde-treated protein. The oils obtained in this method can be added to rations at higher levels in animals without fermentation failure. Formaldehyde has not found widespread use due to its bacteriostatic effect on the rumen microflora.

- **2. Crystallization of oils:** The animal oils are refined and hardened, the melting point is raised to 46-48 degrees. It is then stabilized against oxidation and finally the oil droplets are finely sprayed with starch, the carrier substance in the spraying apparatus. During this time, the oil droplets are crystallized by cooling under the melting point so as to effect shock.
- The particle size of the crystallized oils is at most 50 microns. Crystallized oils are protected against rumen hydrolysis and hydrogenation.

- **3. The use of calcium soaps:** The bond of fatty acids with Ca is little affected by the microorganisms of the rumen and passes through the small intestines without ruminal **processing**.
- Commercially available calcium salts are mainly derived from palm oil. Calcium soaps (salts) do not have an adverse effect on ruminal fermentation, so they provide a high dose of fat to the rations.
- The positive effect of calcium on fat-rich rations is linked to the formation of water-insoluble compounds by fatty acids.
- An oil by-pass increases digestibility. As a result, the product is reduced in excess of ME.

● **ROUGH FEED PROCESSING TECHNIQUES**

- In our country, quality raw feed and feed production is inadequate. Growers often cover this openness with a straw-based fattening program.
- Quality of roughage concerns digestibility grades. As the plants grow, the amount of lignin increases.
- Cellulosic ruminants found in the straw's structure can digest, while lignin and lignocellulose complex can not be digested.
- The straw is low in the density of the nutrients (such as protein). The treatments for better utilization of the straws are grouped into 2 main groups: these are physical and chemical treatments.

1. PHYSICAL TREATMENTS:

- Chopping, grinding and shredding: Machines called "Batöz" are used. Rough feeds are separated into pieces smaller than 5 cm on these machines. There are disadvantages such as leaf loss and dusting. It has advantages such as easy transportation and feeding, less space occupation in storage and less waste of feed.
- Grinding is not recommended for ruminants. Because the speed of the passage increases in these animals, the evaluation of the feeds falls, and ostrich constipations can be seen. Grinding is a method that is usually resorted to for the wingers during the alfalfa meal.
- b. Cube making: Long and roughly chopped dry grass is compacted into cubes 3.5-5 cm long. It facilitates storage of dry weeds.

- c. Pelletizing: Grinded roughage is moistened and pellets are obtained in different sizes in special machines. Pellets facilitate workmanship and feeding. Increases the digestion rate of foods such as cotton swabs. Increases live weight gain by increasing feed consumption in fattening animals.
- Pelletization of roughage:
- 1. Consumption of raw cellulose-rich feedstuffs (such as straw) increases. This is not observed when drying green food.
- 2. Secretion of saliva decreases and rumen pH shifts to acid.
- 3. Fodder parts rapidly rumen through, the cellulose digestion falls by 10-20%.

● 2. CHEMICAL TREATMENTS:

- The most common is the treatment of hay with alkalis such as NaOH, NH₃.
- It is disadvantageous to use excessive water for environmental pollution and for recycling chemicals.
- If the ligninized cell walls are chemically treated with NaOH and ammonia, the lignin bonds break up and are absorbed and absorbed by the cellulose and hemicellulose microflora. Water needs increase in cattle consuming rations containing straw treated with NaOH.
- a. Treatment of straw with NaOH
 - 1. Immersion method (aqueous method): This method is the essence; each kg of straw is treated with 8-10 liters of 1.5% NaOH for 24 hours, then under water for 24 hours and dried.
 - 2. Dry method: In this method, NaOH is added directly into the straw, after a while the straw is removed from the medium and fed directly to the animals. The success rate is less than the aqueous method.

- b. Treatment with ammonia
- For this purpose ammonia is used in gas or liquid form. 4 liters of ammonia are given for 100 kg of straw after putting a plastic cover or sacks of straw and stalk so that they do not get air. It is left in the incubation for 30 days after it is turned off in a way that it does not get air.
- With this method, the mold of the fully dried straw is also prevented. In this method, the product N level increases from 3% to 10%.
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- c. Urea treatment
- Straw is wetted with water and added with 4% urea. After 4-6 weeks, animals are consumed. Nitrogen levels and digestibility of the straw are increased. The energy level can be increased by adding molasses (10%) to this product.

- D. Treatment with acids
- There are two methods of treatment with acids. The first is treated with 40% HCl in room heat and the second is treated with 0.2-0.4% H₂SO₄. Here, low acid density, high pressure and heat are required (175-180 °C, 7-10 atm pressure). Propionic and lactic acids can also be used for this purpose.
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- E. Combined operations
- Better results were obtained when the straws were treated with combinations of NaOH + ammonia, H₂SO₄ + ammonia, NaOH + urea and HCl + urea.

● **MIXED RACE - FULL FEED PREPARATION**

- Studies show that there is no difference in terms of utilization of feed and efficiency in the case that concentrated feed and roughage are mixed or given to animals separately.
- Advantages of preparing mixed ration (TMR = Whole feed);
 - - reducing the variety of feed **storage**,
 - - improvement of feed consumption by increasing the flavor of mixed low-quality feeds,
 - - reduction of consumption of consecutive feed selection and consumption,
 - - ensuring the normal course of fermentation in the digestive system,
- can be summarized as the possibility of automatic feeding.

● **SEEDS STORAGE**

- Watery foods are stored as given in conservation methods.
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- Coarse feeds are stored on the outside freely, under the arbor or in the warehouse and inside the building.
- The amount of moisture (14% depletion), the duration of storage and the ambient temperature at the storage site affect the storage of feed.
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- Grain feed can be stored in silos and warehouses for a year under 15% humidity.

- The moisture level is limited to 12% in the soybean cube and 12.5% in the other cube. Otherwise, pain and taste deterioration are observed.
- Animal-derived feeds have different storable moisture levels. It should be 5% in skimmed milk powder, 8% in whey, 6% in churn, 12% in fish flour and 10% in animal flour.

- The moisture content of the raw materials to be purchased and stored should not exceed 13-14%. Whether it is for casting or for packaged goods, the warehouse or silo must be cool and dry.
- They rapidly degrade in humidity and temperature through mold fungi and bacteria. New goods should not be spilled on old goods.
- The first entry method should be applied in warehouses.
- It is possible to divide raw materials into two as granules and other raw materials.
- - The tanks are stored in concrete or steel silos.
- - The other raw materials are processed very little, ground or pulp.
- They can be stored in bulk or nuts. There are some advantages and disadvantages to storing raw materials.

- Advantages:
- 1. States are easily controllable.
- 2. Nuts that are overheated or have high moisture content can be stored in stacks that can be well ventilated and can be controlled without deterioration
- 3. It is easy to separate the nuts from the others if there is a reaction
- 4. There is no difficulty of evacuating silos from goods without easy flow.
- The disadvantages are;
- 1. Labor costs are high,
- 2. Large warehouse space is needed,
- 3. Damage to sack stacks of animals such as rats and mice,
- 4. Risk of fire in large stacks,
- 5. We can summarize the loss of goods with dust and powder.

- **Flow of Feeds in Pouring from Storage**
- Feed flow is in the form of mass and funnel. If the slope of the silo walls is weak and the surfaces are too rough, the funnel flows. In the funnel-shaped stream, the small granular material in the center first leaves the silo, while the larger materials remain until the silo is empty.
- If an ongoing burn is detected for grain storage, it should be neutralized using nitrogen and carbon dioxide.

● **Storage of Roughage**

- If coarse feeds containing hay or other excess moisture are placed in the pan or pile, a rapid fermentation takes place where a large amount of heat is released.
- A large part of the resulting heat remains in the heat and causes the temperature to rise rapidly.
- In this fermentation, the non-stable elements are ready for oxidation.
- All bacteria or fungi die or become inactive at 65-80 ° C.
- Oxidation continues and the weed mass heats up. As a result, they start to weed coal, they may come to spontaneous combustion, and weed can ignite. This can usually occur one month or six weeks after storage.

- The only way to avoid these losses is to never store the grass in large quantities without drying out completely.
- For safety reasons, stacks should be checked at least twice a week during the first two months of storage. If the herb becomes overheated and emits bad odor within 2-3 days of storage, it must first be removed and spread for drying.
- Too late to take off the pond only speeds up the spontaneous combustion. When this danger arises, it is wise to take the temperature inside the weed by lowering a thermometer from a pipe inserted into the weed.
- If the temperature rises to 70 ° C, there is a serious danger and fire pockets can be expected at 80-85 ° C. Injecting carbon dioxide under pressure from a compressed gas cylinder into grass, cooling dry ice and soot helps prevent fire.

- **Spontaneous Combustion in AYEM Material?**
- There is a risk of storing feedstuffs. Especially fish meal, oilseed rape seeds, rice cobbles and high moisture mixed feeds are sensitive to the problem of self heating.
- Microbial growth produces water and heat, loss of nutritional value and sometimes spontaneous burning.
- Some mushrooms are able to grow very quickly when conditions are appropriate and can increase the temperature of feedstuffs up to 50-55 ° C and increase the moisture level.
- Maya cause warming very quickly when relative humidity is 90-95%. If the heat is permanent, a group of thermophilic fungi will emerge and the temperature can rise to 60-65 ° C.

- The deterioration leads to a blackening of the remaining bait and a charred image. In addition, this rising temperature can accelerate the spontaneous heating due to oil oxidation.
- Sometimes mushrooms can be followed by thermophilic bacteria that can raise temperatures to 70-75 ° C, causing ignition and burning.
- Moisture content should be used within 10-12 days of high feed. Alternatively, antifungal compounds may be added which will extend the feed storage life to about 30 days.
- Overheating of fish flour during storage causes loss of amino acid. Lysine (30%), histidine (46%), arginine (8%) and cystine (36%) decrease from the top to the inside when stored for up to 7 m in height for one month (temperature ranging from 18-34 ° C) .

● **Cold Storage of Feeds?**

- Chilling is used in many countries without the use of chemical substances to reduce mold and insect growth in raw materials or without overdrying.
- If the pellet is broken in half, storage will be more convenient for storage food plants when it exceeds 2-3 days.
- Chilling technology has been developed to combat mold and insect infestation of stored beans.
- In Chilling technology, appropriate air (cool, 10-12 ° C and relatively dry, relative humidity of 65%) is passed through the silo, warehouse or storage.
- Normally only one cooling is sufficient for storage for several months.
- It is reported that the activity and production of insects are stopped at about 13 ° C.

- Cold storage does not remove mold fungi, it only suppresses its growth.
- Once the granules are cooled, they remain at this temperature for a long time because they are good insulators.
- These applications can be made to raw material and feed pellets.
- The granules or pellets cooled to 10°C with 15.5-17.5% moisture are safely stored in the warehouse for 6-10 months.
- Inadequate or poor cooling and pellet internal heat can be around $3-7^{\circ}\text{C}$ above the ambient air.
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- The heat and moisture remaining in the pellet during storage can be spread out and out of the pellet.
- This leads to condensation on the inside of the unheated warehouse walls and even on the baits of the feeder.
- A traditional pellet cooler is arranged to reduce the moisture content of the pellet by 1-5%.
- The equilibrium state of the pellets and granules is 12% moisture content and 50-60% relative humidity. If the air with 90% relative humidity is brought to the basement with dry beads, the humidity content of the grain at the entrance of the air increases to 20-25%. Falling temperatures ($<10^{\circ}\text{C}$) reduce the temperature of material stored near the silo wall. Thus, condensation is observed inside the silo walls. The material in this area is highly moisture-absorbing, prone to mold and insect damage.

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