NEW ERA AGRICULTURE MAGAZINE

SILAGE MAKING

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Introduction:

Silage is the preserved green fodder in succulent form under air tight conditions involves controlled natural fermentation produce lactic acid.

Ensiling is a process which involves the conservation of green fodder crops, grasses and store them over long period.

Crops Suitable for Silage:

To prepare best quality silage **cereal green fodders and grasses** like: Green fodder maize, Fodder sorghum, Bajra (millet), Hybrid Napier, Sugar cane tops, Oats, Barley, Guinea grass and para grass.

Preference of cereal green fodder (monocotyledons) is due to it has more sugar content than protein as sugar is utilised in fermentation process to make lactic acid by micro organisms.

Legumes like berseem, cowpea and Lucerne are less suitable for silage making as they contain more amount of protein.

Stage of Harvesting the Crop:

Flowering to milk stage is recommended for making silage - nutrient content is at peak stage and it has enough dry matter.

The crop must have sufficient sugars to permit the quick production of **lactic acid** preservative. Dry matter should be 30-35 percent for good quality silage. Take a hand full of chaffed fodder in between the hands and press. If hands do not moist, the fodder has desired dry matter.

Silage is made by compressing the chaffed green fodder in tight pits called silos. There are many types of silos such as:

1. Pit/trench silo:

Under **village conditions** the ordinary **pit silo** is recommended. A trench silo can be built by simply digging the ground, but it is better to place plastic sheets inside to prevent loss. A trench silo whose interior is coated with concrete can be used for a long time.

2. Bunker silo:

A bunker silo is generally built on the ground side walls are made of concrete and interior preferably sealed with plastic sheets.

3. Plastic silo bags:

Hermetric storage system. In this type plastic bags with thickness of 0.1 mm are taken and fill bags with chopped raw materials, compressed as much as possible to

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remove the internal air and then sealed completely. It prevents the normal replenishment of oxygen which is used for aerobic respiration.

4. Stack silo (flat silo): Simplest type of silo.

A plastic sheet of 0.1 mm thickness is spread over the ground, and similarly chopped silage materials on the sheet are covered with a plastic sheet. Proper tread pressure and complete sealing are required.

5. Tower silo:

In this type storage silos are cylindrical structures typically10 to 90 ft. (3 to 27m) in diameter and 30 to 275 ft. (10to 90 m) in height Tower silos containing silage are usually unloaded from the top of the pile. The frame is made of bamboo, wooden, iron materials etc. the shape of cross section may be circular or rectangular and inside is sealed with plastic sheets.

Size of it depends up on: no. of animals, body wt. of animals, length of feeing period and amount of fodder available

For every 7 quintal silage -1cubic meter silo pit. Walls should be strong and boundaries should be raised so that rain water cannot enter in to silo.

Silage Making Process:

Filling the pits:

Prior to filling silo pit / tank, clean& dry it. Cover with plastic film inside pit/tank in such way that it will cover all sides. Chaff the fodder in to small pieces of size 2.5-4 cm with a chaff cutter before ensiling for better compaction. Fill the chopped fodder in to the silo and press the fodder in the silo layer by layer of 30-45 cm. Filling and pressing should be completed as fast as possible and use additives if required.

Silage Additives:

Direct acidifiers: inorganic /organic acids –decrease pH

Ex: sulphuric and formic acids

Fermentation inhibitors: slow down unwanted silage degradation. reduce mould growth/reduce the breakdown of plant proteins. Immediately decrease pH sterilients to inhibit microflora.

Ex: formaldehyde, sorbic acid salts.

Fermentation stimulants:

Aid in the growth of the lactic acid bacteria and the production of their acids so as to reduce silage pH at a faster rate.

Provides substrates for fermentation-ex:sugars such as molasses, glucose dextrose.

Enzymes speed up fermentation. ex: cellulose

Inoculants –microbial cultures.

Ex: Homofermentive lactobacilli and heterofermentive L.buchneri

Preservatives like salt @18-20kg/ton or dilute acetic acid @ 10lts or phosphoric acid @kg/ton are used.

Fermentation of Silage

Types of fermentation in Silage formation:

Homolactic fermentation (homo fermentative pathway): Very desirable, common in high sugar grasses. Sugars fermented to lactic acid, low pH. Mediated by Lactobacillus plantarum, L.acidilacti etc.

Heterolactic fermentations (heterofermentative pathway):

Less desirable, occurs when limited sugars are available. Mediated by Lactobacillus brevis, L. buchneri. Sugars mainly fermented to acetic acid, & alcohols. Less efficient than Homolactic fermentation.

Secondary fermentation:

Very undesirable. Degradation of lactate by clostridial bacteria to Acetic & Butyric. Facilitated by high moisture contents & high Ph.

Stages of Fermentation: (6 phases)

Phase 1 (respiratory phase):

It starts at harvest and under ideal conditions of moisture, chop length and packing lasts for about few hrs only. It continues until oxygen supply and water soluble CHO'S have been depleted. Temperature increase to 32degree centigrade around 4 days after packing. In poorly sealed silos life of the resulting feed is decreased due to initial growth of the yeast and bacillus organisms.

Phase 2 (early fermentation):

Occurs when trapped oxygen is depleted. Lasts for 24-72 hrs. Hetero fermentation occurs and produce acetic and lactic acid. Primary bacteria during this phase is enterobacteria. pH falls to 5.

Phase 3:(transitional phase):

Lasts for 24 hrs. Homo fermentation begins and lactic acid production occurs and there is rapid drop in pH.

Phase 4 (lactic acid fermentation):

Lactic acid production continues for 2 weeks. In well fermented silages L.A can account for 65% of total V.F.A. pH is maintained at 4.

Phase 5(stabilisation phase):

Fermentation process is stable as long as oxygen does not penetrate silage. Up on longer storage starch become more quickly degraded in rumen and and there is increase in NDF digestibility.

Phase 6(aerobic decomposition):

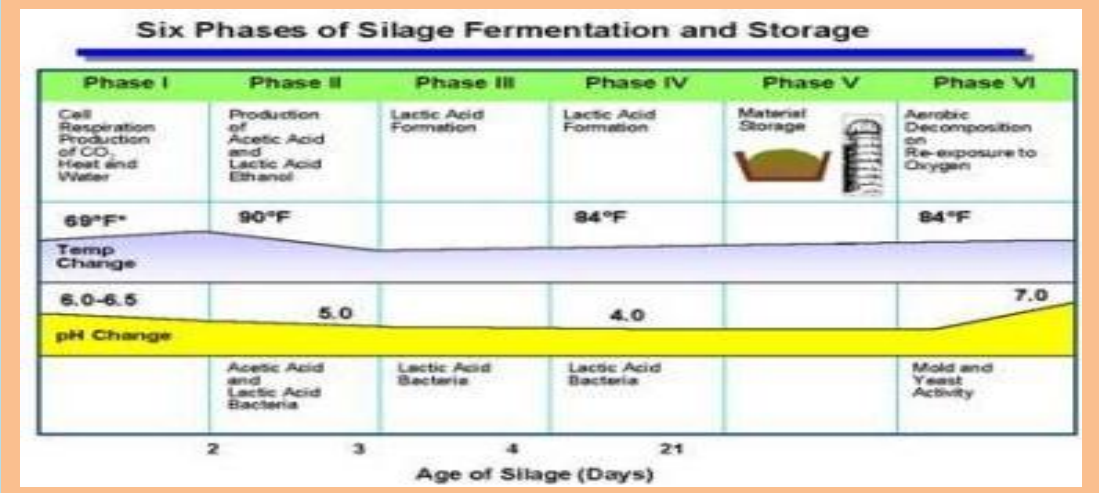
- It occurs during feed out as the silage is exposed to oxygen.
- Prepare 15 to 20 litres of Urea solution, Jaggery, Mineral mixture & common salt separately.
- After making 4" thick layer of chaffed green fodder in silo pit, press it so that the air should not entangled in chaffed fodder and then sprinkle it with prepared solution.

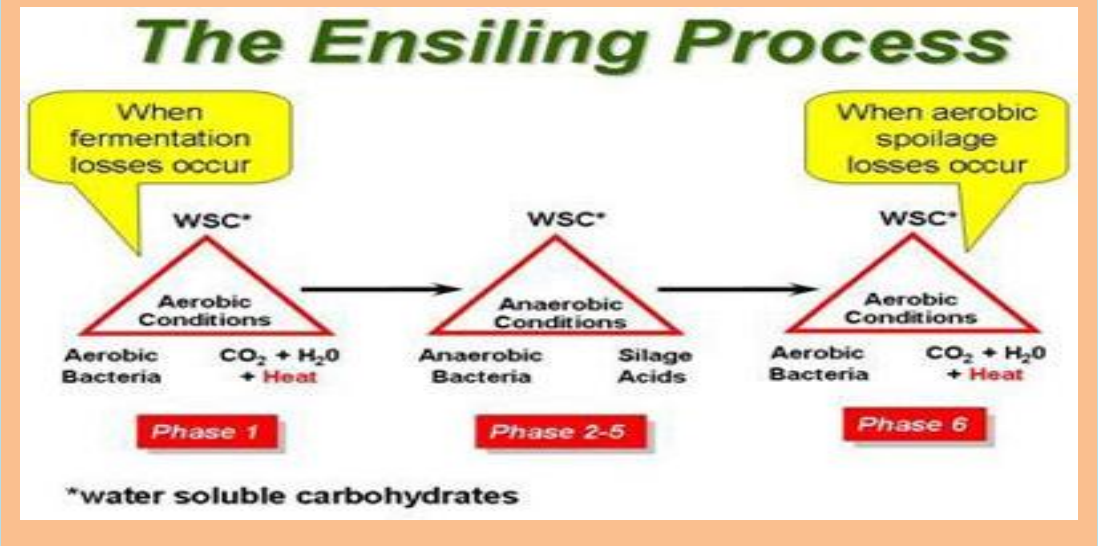
- Follow the same procedure until filling of pit/tank 1 to 1.5 feet above the ground level and it should be dome shape to drain the rain water. Then cover it with plastic film from all side carefully.
- Cover it with Wheat straw, Soil, clay & dry hay to protect it from entering rain water in to it.
- If possible a temporary arrangement of shed above the silo pit/tank.

Care of Pit:

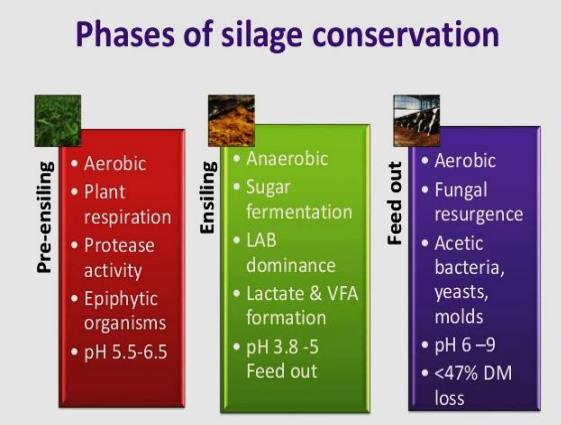
After few days the earth covering shows cracks caused by sinking down of the green material due to fermentation due to this, some portion may bulge out; such portion should be chaffed off to allow the whole mass to go down properly.

The cracks should be covered with some waste fodder or weed grass and plastered over with a mixture of mud and cow dung, to maintain air tight condition.





It will require 45 to 60 days to make good quality of silage and ready to use.



Feeding of silage:

- Silo is opened from one side and closed properly after use.
- The animals may not like its taste for the first few feedings. Help them to develop the taste by mixing 5 to 10 kg of silage in their green fodder ration for the first 5 to 6 days.
- Later 20 to 30 kg of silage along with other fodders. Silage feeding is suited to milch cow as silage and concentrate ration produces more milk than straw and concentrate ration.
- Among the cereal crops more preffered is maize which is valuable forage for ruminant livestock.
- It contains: high fermentable sugars, low protein and dry matter not less than 1/3.

Silage quality by Shephered et al. (1948)

Very Good Silage: Green yellow or green brown color. Acidic taste and odour, free from butyric acid, moulds, sliminess. Ammoniacal nitrogen <10% of total N2. Lactic acid-12%. pH 3.5-4.2.

Good Silage: Acidic taste and odour, traces of butyric acid< 0.2%, pH 4.2-4.5 Ammoniacal nitrogen-10-15% of total N2

Fair Silage: some butyric acid, a slight proteolysis, some moulds, pH 4.8. Ammoniacal nitrogen -20% of the total N2.

Baby Corn Silage:

Baby corn consists of immature cobs of maize plants harvested young, second milk line stage or 2-3 days before pollination.

Because it is harvested at an early stage of growth, the crop residues including stalks, leaves, husks and silk provide very good quality forage palatable to livestock.

Factors effecting good quality of silage:

Type of silo: surface silo is best due to ease of ensiling.

Dry matter: ideal 30-35% Chop length: 2-4cms for easy compaction. compaction should be done as quick as possible to reduce aerobic fermentation

Advantages:

- ✓ Ensure regular supply of fodder to dairy animals in different.
- ✓ Silage can be made under almost all conditions.
- ✓ Surplus green fodder can be conserved, minimising wastage.

- ✓ Feeding silage is an effective tool for the control of parasitic diseases, as the parasites present in different stages in green fodder are destroyed during ensiling.
- ✓ Enhances livestock productivity by ensuring fodder supply, especially during the lean period.
- ✓ Loss of proteins, vitamins and other nutrients are less in silage.

Disadvantages:

- Bulkiness in handling and storage; it requires additional equipment and structures for harvesting, storing, and feeding.
- There is high potential for loss if not stored properly. **silage** is not readily marketable off-farm; and **silage** must be fed soon after removal from the silo.