

New Feeding Methods of Livestock

Pranjali B. Meshram and Abasaheb K. Parade

Ph.D Research Scholar, Department of Animal Husbandry and Dairy Science, Mahatma Phule Krishi Vidyapeeth Rahuri-413722, Ahmednagar(MH)

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Background

Population Explosion- The total Livestock population is 535.78 million in the country showing an increase of 4.6% over Livestock Census 2012. Increasing Demand- 2020 India would require 494Mt of dry fodder, 825 Mt of green fodder and 54 Mt of concentrate feed. Shortage of Both Protein and energy rich animal feed.

New feeding methods of Livestock are as follows:

- Hydroponic fodder
- Azolla production
- Silage preparation in plastic bags
- Total mixed ration
- Application of nano-technology
- Nutraceuticals in livestock feeding
- Biological treatment of crop residue for livestock feeding- solid state fermentation.

Hydroponic fodder system

The word hydroponics has been derived from the Greek word, “Hydros” meaning ‘water’ and “Ponic” meaning ‘working’. Hydroponics is a technique in which growing of plants/crops in water without any soil, generally in controlled conditions/environment. For cultivation of green fodder through hydroponic seed, water sunlight and added nutrients are the only inputs that are required as the green fodder is fed to the animals after about 6-8 days of plant growth.

Maize, Oats, Barley, Wheat, Cowpeas, etc., are the important cultivars using hydroponics to produce high quality nutritious green fodder for dairy animals. Sorghum when fed, less than 45 days of growth causes prussic acid (HCN) toxicity so it is not preferred in hydroponic fodder production.

Why hydroponics fodder...Key fact-

The digestive system of ruminating mammals, does not fit to grain-fed. Up to 25% of in digestion and lactic acidosis from rapid fermentation of grain lead to dehydration heart failure, kidney failure, infertility and even death. Feeding with fresh green fodder allows their digestive system to function to maximum efficiency. Consumes 98% less water than conventional method and the used water is recycled. Takes only 8 days duration to develop from seed to fodder while it took 45 days for a conventional fodder to grow. (Reduced growth time)

What can be grown as a fodder?

Yellow Maize, Cowpea, Horse gram, Sun hemp, Ragi, Bajra, Foxtail millet and Jowar has been grown successfully and received good response from the livestock as a fodder. For the production of hydroponics fodder, seeds are soaked in normal water for 4-24 hours, draining and placing it in the individual greenhouse trays for growing inside the greenhouse. For maize, 4 hours soaking in normal water is sufficient. The seed rate (quantity of seeds loaded per unit surface area) also affects the yield of the hydroponics fodder, which varies with the type of seeds. Hydroponics maize fodder can be well produced with seed rate of 6.4-7.6 kg/m²

Comparison of traditional fodder and hydroponic

Traditional	Hydroponics
<ul style="list-style-type: none"> • Lack of water resources • High cost of labor • Lack of power supply • High residue of pesticides/fertilizers 	<ul style="list-style-type: none"> • Very less usage of water • Minimal use of labour • Solar/generator backed • 100% organic

Take 7 days to grow from seed to fodder



Advantages:

Nutritional advantages, More Palatability, Water saving, Winder temperature range Minimum land requirement, easily measurable, less labour required, More fodder in less time, 365 days in year fodder production, Minimum losses.

Azolla Production

Azolla has enormous potential as a livestock feed due to its high content of protein, essential amino acids, vitamins, growth promoter intermediaries and minerals. The water fern Azolla (*Azolla pinnata*) is an unconventional feed ingredient. Azolla is a free-floating fresh water fern belonging to the family Salviniaceae and order Salvinales. Azolla is rich in protein; total protein is 25-30%. It is also a potential source of nitrogen and is a potential feed ingredient for livestock (Lumpkin, 1984). Azolla develops a symbiotic relationship with blue green algae, *Anabaena azollae*. An azolla plant is a fern frond consisting of a main stem growing at the surface of the water, with alternate leaves and adventitious roots at regular intervals along the stem. There are at least eight species of Azolla worldwide; *Azolla caroliniana*, *Azolla circinata*, *Azolla japonica*, *Azolla mexicana*, *Azolla microphylla*, *Azolla nilotica*, *Azolla pinnata* and *Azolla rubra*. The common species of Azolla in India is *Azolla piñnata*. It produces more than 4 to 5 times of protein of excellent quality in comparison to lucern and hybrid napier.

Environmental requirements

Azolla is found in ponds, ditches, and wetlands of warm temperate and tropical regions throughout the world. It must grow in water or wet mud, and it dies within a few hours under dry conditions. 50% Full sunlight, Water (standing in the tank) 5 - 12 cm. Azolla can survive a water pH range of 3.5–10, but optimum growth occurs when the water is between pH 4.5 and 7. The optimum temperature for azolla is between 64 and 82 0F (18–28 0C).

Azolla Production: -



An artificial water body is made, preferably under the shade of a tree, with the help of a silpauline sheet. A pit of the size of 2M X 2M X 0.2M is dug as a first step. This pit is covered with plastic gunnies to prevent the roots of the nearby trees piercing the silpauline sheet, which is spread over the plastic gunnies. About 10 – 15 kgs of sieved fertile soil is uniformly spread over the silpauline sheet. Slurry made of 2-kg cow dung and 30 gms of Super Phosphate in 10 liters water, is poured onto the sheet. More water is poured to make the water level reach about 10 cm. About 500 gms to 1kg of fresh and pure culture of Azolla is inoculated in the pit. Azolla will rapidly grow and fill the pit within 10-15 days and about 500 gms – 600 gms of Azolla can be harvested daily thereafter. A mixture of 20 gms of Super Phosphate and about 1 kg of cow dung should be added once in 5 days. This is done to keep the Azolla in rapid multiplication phase and to maintain the daily yield of 500 gm /pit. Micronutrient mix containing magnesium, iron, copper, sulphur etc., can also be added at weekly intervals to enhance the mineral content of Azolla.



Harvesting-Will grow rapidly and fill the pit within 10 - 15 days. From then on, 500 - 600 g of azolla can be harvested daily. Can be done every day from the 15th day onwards with the help of a plastic sieve or tray with holes at the bottom. The harvested azolla should be washed in fresh water to get rid of the cow dung smell.



Feeding of azolla-

Fresh Azolla thus collected should be mixed with commercial feed in 1:1 ratio to feed livestock. However, it is advisable to mix Azolla in regular feed in 1:1 ratio at the beginning, for one week. After a fortnight of feeding on Azolla mixed with regular feed, livestock may be directly fed with Azolla, without the addition of regular feed material. 25- 30% Protein and low in lignin with makes it digestible to many animals as well as nutritious. Rich in essential amino acid, vitamins (VitA, VitB, and Beta-carotene), growth Promoters Intermediaries and minerals like calcium, phosphorous, potassium, ferrous, copper, magnesium etc. On a dry weight basis, it contains 25-35% protein, 10- 15% Minerals and 7-10 % amino acid, bio-active substances and Bio-polymers. Palatable to Duck, chickens, pig, cow, goat, sheep and rabbits

2. Nano Technology for Higher Bioavailability Application of Nanotechnology in Animal N



nutrition Digestion & Absorption improvement (Nano particles) Feed Quality Control Feed supplements/ Nanocapsulation, Feed Biosafety (Livestock, Environment), Pathogens/contaminant Detection & Control (Nano sensor/Biosensor, Packaging/storage/Stability (Smart packaging Nanomaterials)

Nutraceuticals

The words “nutrition” and “pharmaceutical”, is a food or food product that provides health and medical benefits, including the prevention and treatment of disease. Nutraceuticals can be defined as raw or processed chemical compounds from natural origin having a specified therapeutic value and health benefits which are used as nutrient supplements.

Therapeutic components derived mainly from plant, animal, and marine sources are commonly referred as Nutraceuticals’ uses of such therapeutic compounds in animal feed are referred as nutraceuticals. Various active compounds of plants origin viz. tannin, saponins, polyphenols, phenyl propanoids, carotenoids, isoprenoids, alkaloids, flavonoids, and phytoestrogens are Regularly used as nutraceutical’s or phytochemical supplements in ruminant nutrition.



What is Silage

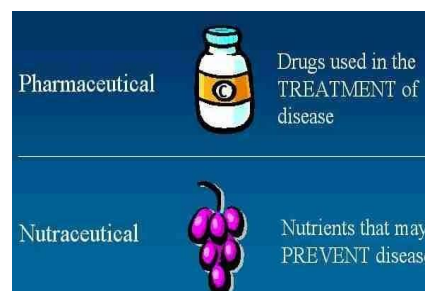
“Silage is a feed stuff resulting from the preservation of green forage crops by acidification is called as silage”. Silage is the conserved green fodder having moisture content in range of 65-70 %. Lactic acid will preserve silage as long as the silage is not exposed to oxygen. Contain 20 to 40% DM and 14 to 16% CP. Under proper storage condition, silage can be stored even up to two years.



Advantages:

- Silage can be prepared from green fodder when the weather does not permit for hay making
- Land available for next crop without delay.
- Silage can prepare from plant having thick stems and are generally not very suitable for haymaking like sorghum, maize.
- Silage makes the fodder more digestible.
- Animal get the nutritious feed whole year.

Conclusion



- Hydroponics fodder is nutritious, palatable and digestible and can be grown in low-cost techniques with locally home-grown grains.
- The search for alternatives to green fodder and concentrates led to a wonderful plant Azolla, which holds the promise of providing a sustainable feed for livestock.
- Silage is a feed option that can make nutritious green fodder available in times when it would otherwise be unobtainable.
- Nanotechnology can be used in animal feeding to improve bioavailability of nutrients, production performance and immune status in livestock.

