

Course: B.Sc. Microbiology
Semester: II
Paper Code: MBIOCC204
Paper Name: Agricultural Microbiology

Topic: **Biotech Feed**
Unit: **4(a)**

Faculty Name: Dr. Niti Yashvardhini
Department : Microbiology
Email Id: nitiyashvardhini@gmail.com



Biotech Feed

- Biotechnology is used to improve live stock production by improving the live stock feed via improving nutrient content and also improved the digestibility of low quality animal feed by using efficient food additives.
- Biotechnology techniques like genetic engineering are used to produce genetically modified feed ingredients in order to improve nutritional quality and production capability of animal feed.
- Biotechnology is also used to improve the nutritional value of animal feed such as low protein, amino acid or deficiency of certain minerals by adding the efficient feed additives. Biotechnology is used to improve livestock feed by:
 - Biotechnology is used to improve livestock feed by:
 - Improving nutrient content
 - Improving the digestibility of low quality animal feeds
 - Increasing production capability
 - Eliminating the deficiency of mineral ions or proteins



➡ Its attention in two areas,

01) **Development of genetically modified feed ingredients**

in order to nutritionally enhance and improve the production capabilities.

02) **Improve certain feed ingredients**
which have inherently low nutritional capabilities like high fiber, anti-nutritive factors, low protein, and deficiency of certain amino acids through the addition of feed additives




Solution For Nutritional Improvement

1. Value Added Feed Stuff
2. Feed Additive



Examples of Value Added Feed Stuff

1. Low Phytate Corn:

- Natural phosphorus which is present in plant feed are mostly present in the form of phytate phosphorus, this form of phosphorus cannot be utilized by the live stock.
 - Using biotechnology techniques low phytate phosphorus and high available natural phosphorus containing corn are produced.
 - This type of genetically modified corn also contained more amount of crude protein and also high percentage of crude fat when compared to normal corn.
 - Feeding this genetically modified corn on broiler chicken improved body weight, feed conversion, better feed to egg ratio and decreased abdominal fat content and also linolenic and linolic acid content are increased in the egg yolk.
- 

2. Low Oligosaccharide soybean:


- Soybeans contain oligosaccharides that act as anti-nutritive factors .
- The oligosaccharide Raffinose and stachyose present in the soybean act as antinutritive factor.
- Genetically modified soybean with low concentration of oligosaccharide Raffinose and stachyose produced using genetic engineering technique, improved amino acid digestibility and also increased dry matter digestibility.
- So less oligosaccharide content means increased amino acid and dry matter digestibility.



3. Soybean with High Lysine:

- Genetically modified soybean with improved content of lysine, decreased the need of supplemental addition of lysine in animal feed or diet.
- Lysine is essential for animal diet
- **3 to 4.5%** increase in lysine
- Reduces the supplementation addition of lysine

4. Genetically Modified Crops with improved Amino Acid Profile:

- Crops are genetically modified in such a way that the amino acid production is improved in these crops.
 - Using these genetically modified crops as feed decreased the amount of nitrogen excretion in poultry.
- 

Top 10 Genetically modified crops



Corn



Soy



Cottonseed



Papaya



Rice



**Rapeseed
(Canola)**



Potatoes



Tomatoes



Dairy products



Peas



Feed Additive

- A **feed additive** is a food supplement for farm animals that the animal cannot get enough from regular meals that the farmers provide.
- these additives include vitamins, amino acids, fatty acids, and minerals.
- In some cases if an animal does not have some specific nutrition in its diet it may not grow properly.
- Adding specific and efficient additives to the animal feed drastically improves the digestibility of animals and hence reduces feed cost.



Commonly used Feed additives are:

1. Enzymes
2. Pre-biotics
3. Pro-biotics
4. Dietary amino acids
5. Metabolic modifiers



1. Enzymes:

- Enzyme are biological catalysts, they help in digesting the feed and also improves the availability of nutrition from feed stuff.
- Microbial phytase enzyme produced using biotechnology is used as feed additives as these enzymes help in digesting phytic acid, which are present in cereals and oil seeds.
- This provides digestible phosphorus to the animal stock.

2. Pre-biotics:

- Prebiotics are non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and activity of one or a limited number of bacteria in the colon.
- The advantage of pre-biotics is that it can stand high palletizing temperatures and help in long shelf life of the feed
- These are food for pre-biotics
 - 1.Mannan oligosaccharide (MOS)
 - 2.Mixed oligo dextrin



3. Probiotics

- Probiotics is a term used to describe live bacteria in animal feed.
- Such beneficial, probiotic bacteria aid in digestion and nutrient uptake of feed.
- Probiotics also help to build beneficial bacteria in intestine and exclude pathogenic bacteria
- These probiotics release enzymes which helps in the digestion of feed.
- The most commonly used pro-biotic organisms are:

1. Aspergillus oryzae

2. Lactobacillus acidophilus

3. Streptococcus lactis

4. Saccharomyces cerevisiae



4. Dietary Amino Acid:

- Genetically modified microorganisms are used to produce amino acids in large quantities like tryptophan, threonine and other amino acids.
- Using all these amino acids as feed additive reduces the required dietary crude protein level in the animal feed by 5%, hence reduces the feed cost.

5. Metabolic modifiers:

- These molecules are the group of compounds that modify animal metabolism in specific and

directed ways:-

1. Improving productive efficiency (milk yield per feed unit)
2. Improving carcass composition in growing animals
3. Increasing milk yield in lactating animals



Advantages

1. Developing genetically modified crops with improved nutritional value, decreases the antinutritive factors such as trypsin inhibitor, high fiber content and also limitation of phosphorus content during feed formulation.
2. Less phosphorus content is excreted from the live stock hence this would help in controlling eutrophication.
3. Increases digestibility of low quality animal feed by adding additives to the feed.
4. Drastically reduces the cost of animal feed.
5. Decreases animal waste



Thank you

