ISSN 1819-1878

# Asian Journal of Animal Sciences

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Asian Journal of Animal Sciences 6 (6): 316-318, 2012
ISSN 1819-1878 / DOI: 10.3923/ajas.2012.316.318


# Scope of Biotechnology in Animal Nutrition

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## ABSTRACT

Recently, there are wide potential application of biotechnology in the field of animal production to increase the productivity of animals through better plane of nutrition, better production potential and improved health conditions. Nutrients like protein, aminoacids and fats can be produced or protected according the need at different physiological states of the animals. Enzymes can be used to improve the availability of nutrients from feed and to reduce the wastage of the feed and fodder. Prebiotics and probiotics or immune supplements can be useful to inhibit enteric pathogenic bacteria. Along with these use of plant biotechnology to produce feed and fodder with good nutritive values can be done with ease. Addition of vaccines or antibodies in feeds can be used to protect the animals from the disease. Genetic manipulation of rumen microbes can be done to improve the animal health. However, it is very difficult to accept the role of biotechnology in animal nutrition and it mainly depends on social and cultural aspects and economic importance to consumers and society.

**Key words:** Biotechnology, livestock, animal, nutrition, probiotics

## INTRODUCTION

In spite of various advances in developed countries, the traditional system of livestock rearing in developing countries remain unchanged because of poor socioeconomic conditions, scarcity of feed and fodder, poor production potential of animals, poor health and managemental conditions (Krishna *et al*., 1998). Due to improved breeding policy, the genetic makeup of animals has been improved but the major constraint is shortage of good quality of feed and fodder to meet their balanced nutritional requirements. Hence, there is an urgent need to handle this deficiency of balanced nutrition of ruminants. The present article is an attempt to focus the role of biotechnology in improving the nutritional base of livestock.

In animal nutrition, the biotechnology can improve the plane of nutrition through protection of protein, aminoacids (Walli, 2005; Yadav and Chaudhary, 2010) and fat (Shelke *et al*., 2011), use of enzymes to improve the availability of nutrients from feed and to reduce the wastage of the feed and fodder, prebiotics and probiotics or immune supplements to inhibit enteric pathogenic bacteria, use of plant biotechnology to produce feed and fodder with good nutritive values can be done with ease, addition of vaccines or antibodies in feeds can be used to protect the animals from the disease, genetic manipulation of rumen microbes to improve the animal health.

## PROTECTION OF PROTEIN, AMINOACIDS AND FAT

Rumen degrades the protein to form ammonia and then the ruminal microbes use this non-proteinous nitrogen to synthesize the microbial protein. To increase the efficient utilization of degradable protein, it should be protected from ruminal degradation through chemical treatments such as formaldehyde and physical treatments like heat treatment and extrusion cooking (Kumar *et al*., 1994). Some researchers have reported 33% reduction in protein degradability by formaldehyde treatment of groundnut cake. Fat can be protected using the saponification of fat with calcium salts. Feeding Ca soaps of fatty acids, which are inert in rumen, to negative energy balance animals enhances dietary energy density and thus, energy intake in early without compromising the activity of rumen microflora (Thakur and Shelke, 2010). Thus, the deleterious effect of negative energy balance on animals can be alleviated.

## USE OF ENZYMES

There is an increasing trend of use of enzymes to enhance the feed utilization. It can also be helpful by reducing the methane production thus help in reducing the carbon foot print. Most of enzymes are cocktail of various enzymes (pentosanase, pectinase and a-galactosidase activity and phytase) of bacterial or fungal origin. Enzymes can be used for removal of antinutritional factors (e.g., 13-glucans and arabino-xylans in barley grain cell-wail), increasing the digestibility of nutrients (e.g., Phytate phosphorus in grains) and non-starch polysaccharides (e.g., xylose and arabinose in plants). Bhatt *et al*. (1991) reported the improvement in weight gain and feed efficiency with supplementation of enzymes such as cellulose and hemicellulase in diet.

## PREBIOTICS AND PROBIOTICS

Prebiotics are some oligosaccharide like fructo-, gluco- and galacto-oligosaccharides resist attack by the digestive enzymes of animals and thus are not metabolized directly by the host and act as bed for growth of beneficial microbes. Probiotics are live microbial feed supplements which beneficially affect the host animal by improving the intestinal microbial balance (Madan, 2005). The most common probiotics are lactic acid producing bacteria.

## ADDITION OF VACCINES OR ANTIBODIES IN FEEDS

Now a days many feeds and fodder are from crop plants that have been modified for characteristics such as disease or pest resistance and their nutritive value remain unaffected. Secondly, plants are used as bioreactors for the production of recombinant biopharmaceuticals like cytokines, hormones, monoclonal antibodies, bulk enzymes and vaccines (Miele, 1997).

## METABOLIC MODIFIERS

Metabolic modifiers like recombinant bovine somatotropin (rBST) have been used to increase efficiency of production such as weight gain or milk yield per feed unit), improve carcass composition (meat-fat ratio). In developed countries like USA, its use increases 10-15% of milk yield. Similarly, researchers have also developed porcine somatotropin that increases muscle growth and reduces body-fat deposition, resulting in pigs that are leaner and of greater market value.

## GENETIC MANIPULATION OF MICROBES

The rumen microbes can be altered genetically to increase their cellulolytic ability and reduction in methanogenesis to improve the overall utilization of feed and fodder. This can be done to

eliminate the antinutritional factors in feeds and also increase the essential amino acid specially limiting aminoacids synthesis by rumen microbes. Attempts are being made to introduce the lignin breakdown property into ruminal microbes. Depolarization of lignin by lignase enzyme which is produced by the soft-rot fungus (*Phanerochaete chrysosporium*) (Tien and Kirk, 1983) can be useful for the animals. Efficiency and stability of lignase gene has been modified by Recombinant DNA technology (Tien and Tu, 1987).

## CONCLUSIONS

In developing countries, use of biotechnology in animal production is limited to some areas like conservation, animal improvement, healthcare (diagnosis and control of diseases) and increase supply of feed resources. By the adoption of biotechnology, the animal owners, livestock entrepreneurs will be benefitted. However, we have to address some issues like political will, infrastructure, funds and trained human resource. So, this is the time, when investment in biotechnology and animal nutrition is important for sustainability of human and animals, food security, rural health and wealth creation and for upliftment of poor people living in the villages.

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