

K. K. WAGH COLLEGE OF AGRICULTURAL BIOTECHNOLOGY

ANIMAL BIOTECHNOLOGY

OLD SYLLABUS

Course No : AB-231 Title : Basics in Animal Biotechnology

Credit : 2+1=3 Semester : III

Theory

Importance and classification of livestock and birds of economic importance; Important breeds of Cattle, Buffalo, Sheep, Goats and their physical and economic characteristics; Anatomy of reproductive system of male and female bovine and ovian; Role of hormones in male and female reproductive mechanism, gametogenesis, oogenesis, estrous cycle, ovulation, fertilization, implantation and pregnancy diagnosis; Fertility and infertility and sterility; Systems of breeding: inbreeding, outbreeding
Anatomy and structure of mammary gland, hormonal regulation of reproduction and lactation; Biosynthesis of milk and its constituents, factors affecting milk yield and composition of milk.

Practicals :

1. Routine and periodic livestock farm operations.
2. Anatomy of male reproductive system.
3. Anatomy of female reproductive system.
4. Anatomy of reproductive system of poultry.
5. Determination of inbreeding coefficient of animal.
6. Anatomy and structure of mammary gland of different livestock species.
7. Hormonal regulation of reproduction and lactation.
8. Study of milking systems in relation to scientific and hygienic milk production.
9. Factors affecting milk yield and composition of milk.

References :

1. Textbook of Animal husbandry by GC Banerjee
2. Livestock Production and Management by NSR Sastry and CK Thomas
3. Textbook of Animal genetics and breeding by Kanakraj
4. Animal Reproduction by ESE Hafez
5. Animal reproduction by Roberts
6. Poultry – GC Banerjee

Course No: AB-243 Title: Biotechnology of Ruminant Feed Utilization

Credit: 2+1=3 Semester : IV

Theory:

Anatomy of ruminant and non-ruminant digestive system; Mechanism of digestion and the role of rumen micro flora; Source of feeding stuff, nutritive value of common feedstuff; Nutrients and animal body – water, carbohydrates, lipids, proteins, minerals and vitamins; Digestion, absorption and metabolism of carbohydrates by ruminants and non ruminants; Digestion, absorption and Metabolism of proteins and NPN by ruminants and non ruminants; Digestion, absorption and Metabolism of Fats; Rumen manipulation ,defaunation and its effect on rumen digestion and feed utilization; Characteristics of good ration, nutritive ratio and starch equivalent; Computation of balanced ration for livestock; Feeding standards and thumb rule for feeding of Cattle and Buffaloes- Calf, heifer, lactating cows, dry and pregnant animal; Single cell proteins in ruminant nutrition; Conventional and non- conventional industrial byproducts as cattle feed.

Practicals:

1. Identification of feed stuffs of their chemical composition and nutritive value.
2. Proximate analysis of feed.
3. Dry matter
4. Crude protein
5. Crude fibre
6. Ether extract
7. Nitrogen Free extract
8. Calcium and Phosphorus
9. Determination of digestibility coefficient, calculation of TDN, SE, DE and NE
10. Preparation of Bypass protein and fat feed
11. Toxic factors in feed—saponins, gossypol, mimosine, aflatoxin, HCN, Nitrates and nitrites.
12. Visit of Cattle feed plant.

Reference:

1. Rumen and its microbes by Hungate RE 1966. Academic Press, New York
2. Straw and other fibre by-products as feed by Sundastol F. and E. Owen. 1984 Elsevier Publishers, Amsterdam
3. Matching livestock system to available feed resources in the Tropics and Sub tropics by Preston TR and RA Leng. 1987 Penambal Books, NSW, Australia
4. Advanced Animal Nutrition for developing countries by Singh UB. 1987. Indo Vision Pvt. Ltd., Ghaziabad
5. Biological and physical treatment of fibrous crop residue as animal feed by Singh K, TW Fligel and GB Schiere. 1987 Proc. Indo Dutch Bioconversion Workshop , New Delhi
6. Food Biotechnology by King RD and PSJ Chetan 1989 Elsevier Applied Science, London

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6. Textbook of Animal Husbandry by GC Banerjee
7. Applied Animal Nutrition research techniques by Raman Mullick and SK Sirohi, NDRI, Karnal
8. Animal Nutrition by SK Ranjan (CBS)
9. Application of biotechnology to nutrition of animals in developing countries FAO, 1995
10. Feeding of ruminants on fibrous crop residues. ICAR, New Delhi

Course No : AB-354 Title : Dairy Process Biotechnology

Credit : 2+1 =3 Semester : V

Theory:

Present status of dairy industry in India; Physico-chemical properties of milk, factors affecting of abroad milk and milk constituents; Microorganisms associated with milk and milk products; Hygienic milk production- sources of contamination; Role of microorganisms in spoilage of milk and milk products; Milk borne diseases; Role of lactic and non-lactic acid bacteria in the preparation of various fermented milk products, classification of fermented milks; Propagation of starter cultures – factors affecting propagation, bacterial interaction, characteristics of good starter culture; Health benefits of fermented milk and milk products and benefits derived through genetic improvement of starter culture; Industrial production/processing of fermented milks; Application of membrane processes and hurdle technology in the dairy industry; Impact of biotechnology on dairy industry; Developments in probiotic foods; Use of Probiotics/Prebiotics/Synbiotics in fermented milk products; Application of bio additives in dairy processing; Application of biotechnology in dairy waste management; Role of enzymes in dairy processing

Practicals:

1. Quality assessment of raw milk.
2. Detection of preservatives in milk
3. Detection of adulterants in milk
4. Separation of cream.
5. Heat processing and homogenization of milk.
6. Type, preparation and propagation of starter culture and preparation of fermented milks
7. Preparation of Paneer, Channa, cheese
8. Preparation of indigenous milk products
9. Preparation of partially hydrolysed milk
10. Application of membrane processing and hurdle technology
11. Dehydration

Reference:

1. Principles of Biotechnology by Wiseman A. 1980. Survey University Press, New York

2. Food Biotechnology by Rogers A.1989.Elsevier Applied Sciences,London
3. Functional food by Goldberg I .1994.Chapman & Hall , NewYork
4. Biotechnology : Theory and Techniques by Chirikjian,JG1995.Jones and Bartlet Publishers,London
5. Fundamentals of food biotechnology by Byong HL,1996.VCH Publishers,New York
6. Dairy Biotechnology by Sukumar De
6. Dairy technologists textbook by Ramaswamy and Shibu
- 7 Laboratory manual of dairy analysis. Third edition,Richmond HDrop
- 8.Handbook ofMilk Microbiology by Shrivastava and ManishL
9. Laboratory manual of market milk by DKThompkinson and Latha Sabikhi,NDRI,Karnal
10. Laboratory manual of cheese and fermented milk by DKThompkinson and Latha Sabikhi,NDRI,Karnal
11. Dairy Microbiology by Parihar and Parihar.Agrobios India,Jodhpur.
12. Analysis of milk and milk products : A Lab manual.Milk Industry Foundation
13. Laboratory manual of dairy analysis by Richmond

Course No: AB-355 Title : Livestock Genome

Credit: 2+1 =3 Semester : V

Theory:

History , common terms in genetics and breeding; Chromosome, numbers in livestock and poultry; Mitosis, meiosis –linkage, crossing over, Mendel’s laws and modifications; Gene and genotype frequency and their estimation, Hardy-Weinberg’s law of equilibrium; Gene actions; Concepts of probability and its application in genetics; Important economic traits of livestock and poultry; Environment and genotype; Preliminary concepts of heritability, repeatability, genetic and phenotypic correlation of different economic traits, breeding efficiency; Selectionbasis, response, measures. Marker assisted selection; Gene mapping. Karyotyping; Transgenic animals- production, merits and demerit, Study of important genome sequencing projects of animals, Application possibilities for gene transfer, Growth, Disease resistant, Quality of animal products, Gene farming.

Practicals:

1. Laws of probability.
2. Problems onMendel’s laws and the modification.
3. X2 test and detection of linkage.
4. Estimation of gene and genotype frequencies
5. Mapping of chromosomes.
6. Problems on multiple alleles.

7. Estimation of heritability, repeatability, genetic and phenotypic correlation.
8. Breeding records of livestock farms
9. Breeding value of cows and sire evaluation
10. Karyotyping

Reference Books:

1. General Cytogenetics by Sybenga J, North Holland Publishing Corp.,Amsterdam
2. Eukaryotic chromosomes by Bostock CJ and AT Summer.1980.North Holland Publishing Corporation, Amsterdam
- 3.Chromosome techniques by AKSharma 1980 Butterworths, London
- 4.Eukaryotic Genes by MacLean,N.,SP Gregory and RA Hanell.1983.Buttreworths , London
- 5.Genetic Engineering in Higher Organisms by Warr, J.Rober . 1985.Edward Arnold Pvt.Ltd., Victoria ,Australia
- 6.Textbook of Animal Husbandry by GCBanerjee
- 7.Textbook of animal genetics 2nd revised edition Kanakraj
- 8.Basic Genetics by Miglani .Narosa
- 9.Genetics;Principles,concepts and implications by HKJain Oxford and IBH
10. Gene Biotechnology by SNJogdand. Himalayan Publishing
- 11.Cell Biology ,Genetics,Molecular Biology,Evolution and Ecology by PSVerma and VKAgarwal. S.Chand
- 12.Biotechnology:Expanding horizons by BDSingh.Kalyani Publishers
- 13.Genetics by Strickberger.Prentice Books,India

Course No: AB-366 Title: Animal Genetic Engineering

Credit: 2+1=3 Semester : VI

Theory :

Introduction to recombinant DNA techniques using restricted enzymes;Cloning vectors, plasmid, phages, cosmids, and transposons. DNA and RNA separation and characterization; Oligo nucleotide synthesis, DNA and RNA sequencing. *In vitro* site directed mutagenesis , radioactive probes, Southern, Northern, Western and Dot blot; *In vitro* transfer and expression for foreign DNA in host cell; Genetic markers in farm animal classes of genetic markers. Microsatelite markers and their role in assistance in animal genetic resources.

Single

nucleotide polymorphisum (SNPs) identification and genotyping; QTLs for candidate gene in animal production; Physical gene mapping and current status of gene maps of farm animals.

Bio hazards and safety aspects in genetic engineering; Physical and biological containment, Status and prospectus of transgenic animals and animal products.

Practicals

1. Isolation of DNA
2. Preparation of plasmid DNA and large scale preparation of phage DNA and invitro packaging in E-coli
3. Amplification of plasmid copy number by Chloramphenicol treatment
4. Use of restricted enzymes and mapping of purified DNA samples(Plasmid DNA, *lamda phage*)
5. Visit to leading Biotechnological laboratory
6. Computer applications in DNA and RNA sequencing

Reference Books:

1. Principles of Gene Manipulation –An Introduction to Genetic Engineering by Old, F. W. and S. B. Primrose. 1981. Blackwell Sci. Pub. London.
2. Molecular Cloning –A Laboratory Manual by Maniatis, T., E.F. Fritsch and J. Sambrook 1984. Cold Spring Harbor, New York.
3. Gene Cloning – The Mechanics of DNA Manipulation by Glover D.M. 1984. Univ. Press, Cambridge.
4. Experiments with Gene Fusions by Silhavy T.J., M.L. Berman and L.W. Enguist. 1984. Cold Spring Harbor, New York.
5. Genetic Engineering in Higher Organisms by Warr J. R. 1985. Edward Arnold Pvt. Ltd. Victoria, Australia.
6. Recombinant DNA Methodology by Dillon J.R.A. Nasim and E.R. Nestmann. 1985. John Wiley and Sons Inc., New York.
7. Recombinant DNA-A Short Course by Watson, J.D., J. Tooze, and T.T. Kurtz 1987. Scientific American Books, New York.

Course No : AB-4710

Title : Advances in Dairy Microbiology

Credit :1+3 = 4 Semester : VII

Theory:

Milk and milk constituents, factors influencing composition of milk, microorganisms associated with milk and milk products. Microbiology of fermented milk , microbiology of Cheese, role of starter and non starter organisms during cheese making, role of enzymes in cheese making, microbiological quality of milk: milk pathogens *Staphylococcus aureus*, *Salmonella* ,*Coliforms*, *Listeria monocytogens*.

Practical:

1. Collection and examination of milk.
2. Grading of milk on the basis of dye reduction test.

3. Bacteriological examination to determine quality of water (MPN index).
4. Test for Pasteurization (phosphatase test).
5. Microbiological analysis of milk and milk products.
6. Detection of antibiotics residues in milk and milk products.
7. Test for detection of mastitis milk.
8. Use of biopreservatives in milk and milk products.

Suggested readings:-

1. Comprehensive dairy microbiology by J.S.Jadhav,Sunita Grover, V.K. Batish 2nd edition , Metropolitan publication, New Delhi India.
2. Dairy microbiology by Robinson R.K., Applied science publication,London, NJ.
3. Milk and milk products by Uarence Henry Eckles, Willes Barnes Combs, Harold Macy

NEW SYLLABUS

Course No : AS-233 Title: **Livestock Production and Management**

Credit: 3(2+1) **Semester : III**

Theory

UNIT I

Livestock history in India: Vedic, medieval and modern era; Demographic distribution of livestock and role in economy; Introductory animal husbandry; Breeds of livestock; Cattle, Buffalo, Sheep, Goat and Pig; Important traits of livestock; General management and feeding practices of animals; Handling and restraining of animals; Housing systems. Importance of grasslands and fodders in livestock production; Common farm management practices including disinfection, isolation, quarantine and disposal of carcass; Common vices of animals and their prevention; Diseases and parasite control & hygiene care.

UNIT II

History and economic importance of poultry; Poultry breeds; Reproductive system of male and female birds; Formation and structure of eggs; Important economic traits of poultry, Egg production, Egg weight, Egg quality; Fertility and Hatchability, Plumage characteristics and comb types.

Care and management of chicks, grower and layers/broiler; Brooding management; Hatchery practices; Poultry Diseases, control and hygiene care;

Practical

Visit to livestock farms/demonstration centres; Breeds of cattle, buffalo, sheep, goat and Pigs; Familiarization with body parts of animals; Handling and restraining of cattle, buffalo, sheep, goat and swine; Male and female reproductive system and Artificial Insemination; Feeding of livestock; Methods of identification: marking, tattooing, branding, tagging; Milking methods; Record Keeping

Visit to the Poultry farm; Poultry breeds; Body parts of chicken, duck, quail and turkey; Housing, equipment, nesting and brooding requirements; Male and female reproductive system; Methods of identification and sexing; Hatchery layout and equipment; Identification of diseases and control of parasites, Vaccination; Maintenance of farm records;

Suggested Readings

Banerjee GC. 1989. *Text Book of Animal Husbandry*. Oxford and IBH.

ICAR. 1962. *Handbook of Animal Husbandry*. ICAR Publication.

Parsad Jagdish. 2001. *Poultry Production and Management*. Kalyani Publishers.

Sastry NSR & Thomas CK. 1991. *Dairy Bovine Production*. Kalyani Publishers.

Singh RA. 1990. *Poultry Production*. Kalyani Publishers. Thomas CK & Sastry NSR. 2013.

Livestock Production Management. Kalyani Publishers.