



Department Of Animal Genetics and Breeding

College of veterinary science and A.H., NDUAT, Kumarganj, Faizabad (UP)

1. Faculty Position

Name	Degree	Contact No.	Email	Photo
Dr. V. K. Singh Professor & Head	Ph. D	7310299414	vsvsingh83@gmail.com	
Dr. Jaswant Singh Assistant Professor	Ph. D	9453515847	dr.jaswant75@gmail.com	
Dr. M. K. Verma Assistant Professor	M.V.Sc.	8005322623	manojvet550@gmail.com	

2. Non Teaching staff:

S. No.	Name of Staff Member	Designation
1	Sri Ajay Kumar	Lab. Technician
2	Sri Surya Narayan Singh	Junior Clerk
3	Sri Ram Bachan Verma	Account Clerk

3. UG Courses:

- AGB -111 (Biostatistics and computer application)
- AGB – 121 (Principle of Genetics and Population genetics)
- AGB - 211 (Livestock and Poultry Breeding)

BIO-STATISTICS AND COMPUTER APPLICATION

AGB-111 Credit Hours 2+1=3

THEORY

A. Basic Statistics:

Introduction and importance. Statistics, parameters, observation, recording and graphical representation of data Probability and probability distributions: binomial, Poisson and normal. Measures of central tendency and measures of dispersion (simple and grouped data). Moments and skewness to kurtosis. Correlation and regression. Tests of hypothesis and t Z, X^2 and F tests of significance and their interrelationship. Livestock census procedure and census. Introduction to sample survey methods for livestock and livestock products. Bioassay - meaning and uses.

B. Experimental designs:

Completely Randomized Design (CRD.) and Randomized Block Design (R,B.D). Analysis of variance.

C. Computer application:

Computer and its components; Types of computers; Hardware, software, human ware and firm ware. Type of memories. Computer languages and their scope and limitations. Computer programming : Data types: Constants, variables, expressions, operations, functions, flow charts, commands, simple programs and their execution- scope and limitations. Data base management system: Storage of data, filing, retrieving, reproduction. Use of computer in animal husbandry and veterinary practices.

PRACTICAL

Systematic approach of data, tabulation, simple probability problems. Estimation of measures of central tendency (mean, median, mode) and estimation of measures of dispersion (variance, standard deviation, standard error and coefficient of variation): for simple and grouped data. Graphical representation of data. Tests of significance -t Z. χ^2 and F tests. Estimation of correlation. Estimation of regression. Analysis of variance: CRD., R.B.D. Computer basics and components of computer. Simple operations: Entering and saving biological data, database management systems. MS-Office. Spread sheet Internet e-mail and geographic Information system (GIS).

PRINCIPLES OF ANIMAL GENETICS AND POPULATION GENETICS

AGB-121 Credit Hours: 2+1=3

THEORY

History of Genetics. Chromosome numbers and types in livestock and poultry. Mitosis, Meiosis and gametogenesis. Overview of Mendelian principles; Modified Mendelian inheritance: gene interaction; multiple alleles; lethals; sex-linked, sex limited and sex influenced traits; linkage and crossing over, Mutation, Chromosomal aberrations; Cytogenetics, Extra-chromosomal inheritance. Gene concept -classical and molecular.

Population genetics: Genetic structure of population: Gene and genotypic frequency: Hardy - Weinberg law and its application; Forces {eg Mutation, migration, selection and drift) changing gene and genotypic frequencies.

Quantitative genetics: Nature and properties; Values and means. Components of phenotypic and genotypic variance; Concept of genotype and environment interaction, Resemblance between relatives; Heritability, repeatability, genetic and phenotypic correlations.

PRACTICAL

Demonstration of karyotype of Farm animal species; Solving problems on inheritance of Mendelian traits. Linkage and Crossing over. Calculation of gene and genotypic frequencies, Testing a population for Hardy-Weinberg equilibrium; Calculation of effects of various forces that change gene frequencies, Computation of population mean; Estimation of heritability, repeatability, Most probable producing ability (MPPA), genetic and phenotypic correlations.

LIVESTOCK AND POULTRY BREEDING

AGB-211 Credit Hours 2+1=3

THEORY

History of Animal Breeding; Classification of breeds; Economic characters of livestock and poultry and their importance; Breeding/Selection techniques for optimal production. Selection: Response to selection and factors affecting it; Bases of selection individual, pedigree, family, sib, progeny and combined; Indirect selection; Multitrait selection.

Classification of mating systems; Inbreeding and out breeding-genetic and phenotypic consequences viz., inbreeding depression and heterosis: Systems of utilization of heterosis; Selection for combining ability; Breeding methods for the improvement of dairy cattle and buffaloes {crossbreeding, sire evaluation, field progeny testing, open nucleus breeding system (ONBS)}, sheep, goat, swine and

poultry; Breed development; Conservation of germplasm, Current livestock and poultry breeding programmes in the state and country.

PRACTICAL

Description and measurement of economic traits of Livestock & poultry. Standardization of performance records, Computation of selection differential, generation interval and expected genetic gain; Construction of selection index; Sire indices. Measurement of inbreeding and relationship coefficients; Estimation of heterosis.

4. Post Graduate Courses

AGB 611 MOLECULAR GENETICS IN ANIMAL BREEDING 2+1

Theory

UNIT I Basic concept: Genesis and importance of molecular techniques; Genome organization– physical and genetic map, current status of genome maps of livestock

UNIT II Molecular markers and their application; RFLP, RAPD, Microsatellite/Minisatellite markers, SNP marker, DNA fingerprinting

UNIT III DNA sequencing, Genome sequencing, Genomic Library, Polymerase Chain Reaction (PCR), its types (PCR-RFLP, AS-PCR etc.) and applications; Transgenesis and methods of gene transfer

UNIT IV Statistical techniques for analyzing molecular genetic data, Quantitative Trait Loci (QTL) mapping and its application in animal breeding, Genome scan, Candidate gene approach, Genomic selection, Marker Assisted Selection- basic concept

Practical

Extraction and purification of genomic DNA, Gel electrophoresis, Restriction enzyme digestion of DNA and analysis, PCR, PCR-RFLP, PCR-SSCP, Bioinformatics tool for DNA sequence analysis, Design of primer, Isolation of RNA, cDNA synthesis, Statistical methods for analyzing molecular genetic data.

AGB 612 POPULATION AND QUANTITATIVE GENETICS IN ANIMAL BREEDING 2+1

Theory

UNIT I Individual verses population. Genetic Structure of population. Factors affecting changes in gene and genotypic frequencies and their effect on genetic structure of animal populations. Approach to equilibrium under different situations: Viz: Single autosomal locus with two alleles, single sex-linked locus, two pairs of autosomal linked and unlinked loci;

UNIT II Small population: random genetic drift, effective population size, pedigreed populations, regular and irregular inbreeding systems.

UNIT III Quantitative genetics-gene effects, population mean and variance and its partitioning, biometric relations between relatives.

UNIT IV Genetic and phenotypic parameters-their methods of estimation, uses, possible biases and precision. Scale effects and threshold traits.

Practical

Problems relating to gene and genotypic frequencies under different conditions. Estimation of inbreeding in regular and irregular systems. Estimation of effective population size. Computation of quantitative genetic effects. Estimation of variance components. Computation of heritability, repeatability, genetic, environmental and phenotypic correlations and their standard errors.

AGB 613 BIOMETRICAL TECHNIQUES IN ANIMAL BREEDING 3+1

Theory

UNIT I Review of basic concepts in statistical inference and balanced experimental designs. Nature of structure of animal breeding data and sources of variation.

UNIT II Introduction to matrix algebra, types of matrices and matrix operations. Determinants and their properties, methods of finding inverse of a matrix and their application

UNIT III ANOVA, Regression and Correlations, Henderson's methods for estimation of variance components, Basic concepts of linear models, Least-squares analysis, maximum likelihood; Method of estimation; Generalized LS and weighted LS. Fisher's discriminant function and its application, D2 - Statistics in divergent analysis.

UNIT IV Linear models in animal breeding, Methods of analysis of unbalanced animal breeding data. Adjustment of data. Data base management and use of software packages in animal breeding.

Practical

Matrix applications, determinant and inverse of matrices; Building of models for various types of data; Estimation of variance components; Least squares method for analysis of research data; Collection, compilation, coding, transformation and analysis of animal breeding data by using above biometrical techniques with computer application.

AGB 614 CONSERVATION OF ANIMAL GENETIC RESOURCES 2+0

Theory

UNIT I Domestic Animal Diversity in India, its origin, history and utilization. Present status and flow of Animal Genetic Resources and its contribution to livelihood security. Methodology for genotypic characterization of livestock and poultry breeds through systematic surveys. Fodder availability; management of breed; physical, biochemical and performance traits and uniqueness of animals of a breed; social, cultural and economic aspects of their owners/communities rearing the breed.

UNIT II Methodology for molecular genetic characterization, diversity analysis and relationship among the breeds. Concept of conservation, *In-situ* and *ex-situ* (*invivo* and *in-vitro*); models of conservation; prioritization of breeds for conservation. National and international strategies for conservation of Animal Genetic Resources.

UNIT III Status, opportunities and challenges in conservation of AnGR. IPR issues pertaining to animal genetic resources/animal products or by-products. Registration of livestock breeds and protection of livestock owner's rights in India.

AGB 615 SMALL FARM ANIMAL BREEDING 2+0

Theory

UNIT I Breeds–Economic traits–Prolificacy–Breeding records and standardization.

UNIT II Genetic parameters – Selection of males and females – Breeding systems. Development of new breeds.

UNIT III Breeding policy – Breeding research – Conservation of breeds.

UNIT IV Culling and replacement – EADR.

AGB 621 ANIMAL CYTOGENETICS AND IMMUNOGENETICS 2+1

Theory

UNIT I Development in animal cytogenetics and immunogenetics of farm animals. Immunoglobulins and their types: antigen-antibody interactions, Immune response, ELISA.

UNIT II Major histocompatibility complex; genetics of biochemical variants and their applications; Ir-genes and concepts of disease resistance including major genes; hybridoma and its significance; concept of immuno-fertility, BoLA, BuLA, TLRs, Interleukins.

UNIT III Chromatin structure of eukaryotes; chromosome number and morphology in farm animals banding and karyotyping; chromosomal and genetic syndromes, DNA packing in chromosomes, Z+B DNA, FISH chromosome painting and PRINS. RH Panel Mapping.

UNIT IV Mutation and assays of mutagenesis; sister chromatid exchanges; recombinant DNA technique and its application in animal improvement programme.

Practical

Polymorphism of haemoglobulins, transferrins, enzymes/proteins; preparation of monovalent blood reagent-isoimmunization, titre testing and absorption of polyvalent serum; identification of bar bodies; in vitro and in vivo preparation of somatic metaphase chromosomes; screening of chromosomal abnormalities; microphotography and karyotyping; banding procedures for comparing the chromosomal complement, FISH and PRINS.

AGB 622 SELECTION METHODS AND BREEDING SYSTEMS 2+1

Theory

UNIT I Type of selection and their genetic consequences. Response to selection and its prediction and improvement of response to selection.

UNIT II Theoretical aspects of accuracy and efficiency of different base of selection. Prediction of breeding value using different criteria. Combined Selection. Correlated response to selection and efficiency of indirect selection.

UNIT III Selection of several traits. Evaluation of short term and long term selection experiments viz: bidirectional selection and asymmetry of response, selection plateau and limit.

UNIT IV Genetic aspects and consequences of various mating systems. Effects of mating systems on mean and variance. Application of various mating system in animal improvement. Selection for general and specific combining ability. Genetic polymorphysim and its application in genetic improvement.

Practical

Estimation of breeding values from different sources of information. Prediction of direct and correlated response to different bases of selection. Computation of breeding values using different sources of information for female and male

selection. Computation of realized heritability and genetic correlation. Selection index: Computation, Accuracy and response in component traits. Estimation of heterosis for different types of crosses. Estimation of GCA and SCA

AGB 623 CATTLE AND BUFFALO BREEDING 2+1

Theory

UNIT I History of dairy cattle and buffalo breeding. Breeds of cattle and buffalo and their Characterisation. Inheritance of important economic traits. Recording and handling of breeding data. Standardization of records. Computation of correction factors for the adjustment of the data. Estimation of breeding values of the cows and bulls.

UNIT II Sire evaluation methods using single trait and multiple traits: construction of Sire indices, Sire evaluation under animal model, sire mode; and maternal grand sire model. Open nucleus breeding systems with MOET.

UNIT III Methods of cross breeding. Breeding of type, milk quality and production efficiency. Plans for developing new breeds of dairy cattle. History of development of important breeds of dairy cattle.

UNIT IV Considerations in the import of exotic germplasm for breeding cattle in the tropics. Appraisal of buffalo and cattle breeding programme. Role of breed associations in dairy improvement.

Practical

Performance recording – milk recording - Estimation of economic traits – Standardization of records – Index cards – Sire evaluation – Comparison of latest methods - Computation of genetic parameters – Genetic gain – Estimation of heterosis – Culling and replacement.

AGB 624 POULTRY BREEDING 2+1

Theory

UNIT I

Origin and history of poultry species: Chicken, turkey, duck and quail – Important qualitative traits in poultry including lethals – Economic traits of egg-type chicken and their standardization – Selection criteria – Aids to selection: Index selection and Osborne index – Restricted selection index – Economic traits of meat – type chicken and their standardization.

UNIT II Selection criteria and selection indices – Response to selection – Genetic controls – Genotype and environment interaction – Inbreeding, and its effects on production traits in egg and meat-type chickens – Inbred lines – Strain development – Crossing : strain and line crosses – Introduction to diallel cross – Utilisation of heterosis and reciprocal effect – Reciprocal recurrent selection and recurrent selection.

UNIT III Industrial breeding – Artificial insemination in chicken – Autosexing – Random Sample Test.

UNIT IV Biochemical variants and immunogenetics of poultry – Use of molecular genetics in poultry breeding – Quantitative trait loci and marker-assisted selection – Conservation of poultry genetic resources

Practical Inheritance of qualitative traits – Economic traits of egg-type and meat-type chicken – Procedures of standardization – Estimations of heritability, correlation between various production traits, inbreeding co-efficient and heterosis – Selection of sires and dams – Osborne index – Restricted selection index – Collection and evaluation of semen and insemination – Diallel cross.

AGB 625 LABORATORY ANIMAL BREEDING 1+0

Theory

UNIT I

Introduction to laboratory animal genetics – Breeding colonies of mice, rats, hamsters, guinea pigs and rabbits.

UNIT II Selection and Mating methods/systems – monogamous, polygamous and others.

UNIT III Development of genetically controlled laboratory animals – Rules for nomenclature, inbred strains, outbred stocks, mutant stocks, recombinant inbred strains, transgenic strains, gene targeting and production of 'gene knock-out' animals.

UNIT IV Genetic control and monitoring – Record keeping – Ethics of laboratory animal use.

5. Practical Manual Prepared: (02)
 - AGB – 111 (Biostatistics and Computer Application)
 - AGB – 121 (principles of Animal Genetics and Population Genetics)
 - AGB – 211 (Livestock and Poultry Breeding)
6. Post Graduation study and research in the field of Animal Breeding.