INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Genetic Biotechnology and Breeding Plans			Field of study	Animal Science	
Master in	Technology and Animal Science			School	School of Agriculture	
Academic Year	2021/2022	Year of study	1	Level	2-1	ECTS credits	6.0
Type	Semestral	Semester	2	Code	5026-453-1201-00-21	

Workload (hours)	162	Contact hours	T	30	TP	-	PL	20	TC	2	S	8	E	-	OT	20	O	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tuturial; O - Other

Name(s) of lecturer(s)	Teresa Maria Montenegro Araújo A. Correia

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Meet the new genetic technologies and their possible application to various aspects of livestock production
2. Enable the production of some organic products. Transgenic technology and its application to the Animal Production and other scientific fields.
3. Know the access to various databases on animal genetic information. Introduction to testing / research in biotechnology Animal Genetics.
4. Know the procedures to implement breeding programs, and the technical aspects of the genetic evaluation.
5. Identify the key points of a breeding program.
6. Implement breeding programs using molecular markers.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Knowledge in cellular biology and genetics.
2. Knowledge in reproduction technologies.
3. Knowledge in computer science and databases.
4. Knowledge in animal breeding.

Course contents

Recombinant DNA technology. Molecular markers applied to the Animal microarray. Major Genes involved in animal growth. Cloning of genes. Biopharmaceutical products. Gene therapies. Revision about the techniques of animal genetic improvement. Selection goals. Selection indexes. Estimation of genetic parameters. Design of selection plans. Use of genetic markers in animal breeding programs and their impact.

Course contents (extended version)

1. Guidelines for the curricular unit
2. Citogenetic
   - Preparation of karyotypes at screening for some diseases. Hybridization in situ. Freemartinism.
3. Introduction to recombinant DNA technology
   - Colonagem vectors. Plasmids. Phages. Cosmids. Genomic libraries
   - Isolation of genes. Cleavage of DNA. hybridization techniques. Molecular markers.
   - Real-time PCR. Verification of amplification by electrophoresis.
   - Applications in studies of paternity and genealogy. Application to the detection of pathogens.
4. Microarray technology and its application to animal production.
   - Overview of the technique. Microchips and expression of various genes.
5. Genomic selection
   - Application of molecular genetics to animal breeding. Detection of QTLS and QTNs. Major genes
   - Genome- wile association (GDA)
   - Análysis based on SNPs chips
6. Animal breeding programs
7. Large scale genetic evaluation (BLUP)
8. Drawing selection programs using molecular markers.
9. Breeding plans and conservation of genetic resources
10. Pratic program.
    - Preparation of karyotype and banding
    - Extraction of DNA from blood and hair
    - Preparation and scanning of a PCR amplification by electophoresis.
    - Consulting databases of animal genomes.

Recommended reading

1. GÀMEZ, G. G, 2012. Mapeo fino de regiões genómicas portadoras de QTL con influencia sobre caracteres de producción de leche en el ganado ovino. Thesis Doctoral. Léon . Espanha.
2. CASTRO, F. O. ; JUNNE, J. , 2013. Mammary gland Transgenesis. Therapeutic Protein Production. Springer.
3. Cameron, N. D. , 1997. Selection indices and prediction of genetic merit in animal breeding. CAB International, New York, USA.
4. SUÀREZ A. , V. , 2015. Using genomic Toolsfor the study of the molecular archicteture of economically important traits in sheep Thesis Doctoral. Léon . Espanha.
5. PÉREZ, J. , 2015. Estudio de la variabilidad genética de genes candidatos implicados en la producción láctea en el ganado ovino. Tesis Doctoral. Universidad de Léon.

Teaching and learning methods

Teaching of theoretical and practical classes. Realization of a monograph on recent issues of genetic biotechnology. Encourage further and continuous studies on topics discussed in lectures. Resources: media, multimedia. Computer and labor, use of databases and online library.

Assessment methods

1. Continuous evaluation - (Regular, Student Worker) (Final, Supplementary)
   - Final Written Exam - 60% (Minimum mark 8. 5.)
   - Practical Work - 40% (Minimum mark 9. 5.)
2. Final exam - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 100% (Final exam with theoretical (60%) and practical (40%).)

Language of instruction

1. Portuguese
2. Spanish

Electronic validation

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29-11-2021	02-12-2021	03-12-2021	07-12-2021