UPV UAB CIHEAM IVIA INIA

International Master in

ANIMAL BREEDING AND REPRODUCTION BIOTECHNOLOGY (7th edition)

Valencia and Barcelona (Spain), 1 October 2020 – June 2021
September 2021 – June 2022

1. Objectives

Genetic improvement is a main factor contributing to profitability, sustainability and welfare in animal production. It is a complex discipline bringing together relatively disparate subjects. On one hand, population and quantitative genetics, that to date have been responsible for the main advances in the breeds and populations of the animals used in production. On the other hand molecular genetics, of more recent development, that is making an increasing contribution to breeding. Finally, reproduction biotechnology, that offers tools to enhance and facilitate the application of both quantitative and molecular breeding methods.

The programme provides sound training in these basic subjects that are essential to animal breeding and lead to the acquisition of experience through the critical revision of breeding and biotechnology programmes currently conducted in different species, discussions with professionals of the sector and technical visits to public and private institutions involved in breeding programmes.

The general objective of the Master is to train young professionals and scientists so that, both from the public and private sectors they will have the operative capacity to establish, develop and evaluate animal breeding programmes. Moreover, the second part of the programme represents a period of initiation to research.

The Master enables the participants to:

- Update the scientific grounds of the disciplines that constitute animal breeding.
- Acquire experience in the application of the most advanced methods and techniques and in the formulation of breeding strategies related to the main species of zootechnical interest.
- Gain the necessary expertise to join programmes of molecular genetics, genetic improvement, reproduction biotechnology and conservation of genetic resources, providing alternatives that improve the effectiveness of such programmes.
- Be competent in responding to the specific demands of administrations or firms.
- Be introduced into research, critically applying acquired knowledge, capacities and abilities to the treatment of real problems related to animal breeding.
- Exchange enriching experiences and points of view through a programme developed in contact with the sector in an interprofessional and international environment.

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2. Organization

The Master is organized by the Polytechnic University of Valencia (UPV) and the Autonomous University of Barcelona (UAB) as an Interuniversity Official Master of the Spanish university system, and by the Mediterranean Agronomic Institute of Zaragoza (IAMZ) of the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), with the participation of the Valencian Institute for Agricultural Research (IVIA) and the National Institute for Agro-food Research and Technology (INIA).

The Master is developed over two academic years on a full-time basis [120 credits, following the European Credit Transfer System (ECTS)] and is structured in two parts.

The first part of the Master (60 ECTS) is professionally oriented and comprises lectures, practicals, round table discussions and technical visits and it will be held from 1 October 2020 to June 2021. The first term will take place in Barcelona, at the Department of Animal Science and Food of the UAB, and the second and third terms will take place in Valencia at the Department of Animal Science of the UPV. Lectures will be given by well qualified lecturers from the organizing institutions, international organizations, and universities and research centres in different countries. Completion of the first part will lead to the Postgraduate Specialization Diploma described below and access to the Doctorate in the official postgraduate programmes that recognize the credits obtained.

The second part of the Master (60 ECTS) constitutes a period of initiation to research in which participants work on the Master of Science Thesis. This part will begin from October 2021 onwards and will last for 10 months in which research work will be conducted followed by the elaboration of the thesis, that must be publicly defended and approved by an examining board.

3. Degrees awarded

UPV, together with UAB, will award the Interuniversity Official Master Degree to participants that have obtained the necessary 120 ECTS.

CIHEAM will award the Postgraduate Specialization Diploma to participants that have obtained 60 ECTS taking the full first part of the Master.

CIHEAM will award the Master of Science Degree to participants that have obtained 120 ECTS.

4. Academic organization

The first part of the Master is held in three terms, with morning and afternoon sessions. This part is made up of complementary but independent units so that participants may attend, if they wish, only one or several. Point 8 shows credits awarded to each unit.

This part requires personal work and interaction among participants and with lecturers, its international characteristics favouring the exchange of experiences and points of view. Formal lectures are complemented by laboratory practicals, computer practicals, round table discussions and technical visits.

During the second part of the Master, participants complete 60 ECTS focused on the introduction to research and on the elaboration of a Thesis based on the results of an original research work, once the candidate has prepared an experimental protocol submitted under the supervision of the thesis tutor. Only those participants that have obtained an average score of 70 over 100 or more in the first part of the Master may opt for second part scholarships awarded by the organizing institutions. The experimental work for the elaboration of the thesis will be carried out in the organizing institutions or in other institutions collaborating in the programme, for a period of approximately 10 months, under the direction of a tutor who should be a doctor of renowned experience.

5. Admission

The first part of the Master is designed for a maximum of 25 participants complying with the following conditions:

a) University degree, preferably in agronomy, veterinary sciences, biology or any related field.
b) Knowledge of genetics and statistics. Previous professional experience related with the Master subject will be valued.
c) Knowledge of Spanish which will be the working language. Nevertheless, knowledge of English will also be considered in the selection of candidates, since bibliographical material may be distributed in either of the two languages. From July to September 2020, an intensive Spanish language course will be organized for those participants who require it.

INFORMATION CONTINUES OVERLEAF

6. Registration

Candidates should formalize their pre-registration at UPV requesting an access code for the UPV student service servicesealu@upvnet.upv.es and later enter via the link: http://www.upv.es/entidades/SA/mastersoficial/592623normalc.html to formalize the pre-registration.

Applicants must submit:

- *Curriculum vitae*
- Copy of the university diploma (or certificate stating that they are following the last year of studies)
- Copy of the transcript of records (or those of the academic years already completed
- Other supporting documents that the candidates may consider of interest, especially if they have any language knowledge certificates

Once the pre-registration is done, you will be notified to enroll through the same telematic application.

The deadline in accordance with the regulations are defined on the following website:
www.upv.es/entidades/SA/mastersoficiales/592623normalc.html

Alternatively, candidates who wish to apply to a CIHEAM scholarship, or who not speak Spanish, may apply in English or French through the webpage:
http://www.masteranimalbreeding.com/

Registration fees for each academic year of the Master amount to 2750* euro, according to the official fees. This sum covers tuition fees only.

(*) This price is indicative and may vary slightly when 2020 official prices for credits of Master postgraduate programmes are determined.

7. Scholarships

Candidates from CIHEAM member countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey) may apply for scholarships covering registration fees, and full board accommodation.

Candidates from Latin American countries may apply for scholarships covering entirely or partially the registration fees and full board accommodation costs.

Candidates from other countries who require financial support should apply directly to other national or international institutions.

The deadline for the submission of applications for non-Spanish candidates expires on 5 May 2020.
Candidates must apply for admission through the online system at the following address:
http://www.masteranimalbreeding.com/

At the application stage, these documents can be sent in English, French or Spanish.

Participants that have to attend the Spanish language course should have medical insurance valid for Spain covering the duration of the course.

8. Structure and contents of the first part of the Master

1. MOLECULAR GENETICS
   - 1.1. Molecular bases of animal genetics (5 ECTS)
     - 1.1.1. Basic concepts of animal genetics
     - 1.1.2. Organization and structure of the eukaryotic genome
     - 1.1.3. Control of gene expression in eukaryotes
     - 1.1.4. Molecular techniques to study variability
     - 1.1.5. Genetic markers
   - 1.2. Animal genomics (5 ECTS)
     - 1.2.1. Structural genomics: genetic maps; comparative mapping; gene identification; genome sequencing
     - 1.2.2. Functional genomics: general techniques in the studies of gene function; microarrays; proteome analysis; mutation-independent techniques; molecular bases for disease resistance; animal transgenics and modifications of the genome
   - 1.3. Laboratory of molecular genetics (5 ECTS)
   - 1.4. Bioinformatics practicals (5 ECTS)
2. APPLIED BREEDING
   - 2.1. Fundamentals of statistical genetics (4 ECTS)
   - 2.2. Quantitative genetics I (5.5 ECTS)
     - 2.2.1. Variation and types of gene action
     - 2.2.2. Concepts and basic types of selection by additive value: individual selection; prediction of the additive value; selection methods; multiple selection for several traits
   - 2.3. Quantitative genetics II (4 ECTS)
     - 2.3.1. Mixed linear model
     - 2.3.2. Detection and use of QTLs
     - 2.3.3. Crossbreeding
   - 2.4. Quantitative genetics III (4 ECTS)
     - 2.4.1. Estimation of variance components, random regression and Bayesian estimation
     - 2.4.2. Analysis and experimental design in animal breeding
   - 2.5. Management and conservation of genetic resources (3 ECTS)
   - 2.6. Breeding programmes (7 ECTS)
     - 2.6.1. Dairy and beef cattle
     - 2.6.2. Dairy and meat sheep
     - 2.6.3. Goats
     - 2.6.4. Pigs
     - 2.6.5. Poultry
     - 2.6.6. Rabbits
     - 2.6.7. Aquaculture
     - 2.6.8. Breeding applications in developing countries
3. REPRODUCTION BIOTECHNOLOGY
   - 3.1. Reproduction fundamentals and techniques (5 ECTS)
     - 3.1.1. Bases of reproduction
     - 3.1.2. Semen technology
     - 3.1.3. *In vivo* oocyte and embryo production
     - 3.1.4. *In vitro* embryo production and embryo transfer
     - 3.1.5. Fundamentals of cryobiology: cryoconservation of oocytes and embryos
     - 3.1.6. Transgenic embryo production. Microinjection, ICSI and somatic cloning
   - 3.2. Practicals in reproduction techniques (3.5 ECTS)
   - 3.3. Reproduction biotechnologies per specie: cattle, sheep, goats, pigs, rabbits, poultry (4 ECTS)

LECTURERS PARTICIPATING IN THE FIRST PART OF THE MASTER

M. AMILLS, Univ. Autónoma Barcelona (Spain)
J. ARANGO, Hy-line Int. Dallas (USA)
S. AVENDAÑO, Aviagen Group, Newbridge (UK)
M. BALLESTER, IRTA, Caldes de Montbui (España)
A. BLASCO, Univ. Politécnica Valencia (Spain)
E. BLESBOIS, INRA, Tours (France)
R. CANTET, Univ. Buenos Aires (Argentina)
M.J. CARABAÑO, INIA, Madrid (Spain)
A. CLOP, CRAG, Barcelona (Spain)
J. FERNÁNDEZ, INIA, Madrid, (Spain)
J.M. FOLCH, Univ. Autónoma Barcelona (Spain)
M.A. GIL, Univ. Murcia (Spain)
E. GÓMEZ, IVIA, Segorbe (Spain)
D. GONZÁLEZ-PENA, Zoetis, Madrid (USA)
O. GONZALEZ, INIA, Madrid (Spain)
A. GUTIÉRREZ, INIA, Madrid (Spain)
J.P. GUTIÉRREZ, Univ. Complutense Madrid (Spain)
N. IBAÑEZ, Univ. Politécnica Valencia (Spain)
F. MARCO, Univ. Politécnica Valencia (Spain)
E. MOCE, IVIA, Segorbe (Spain)
B. NIELSEN, Pig Research Center (Denmark)
M. PÉREZ-ENCISO, Univ. Autónoma Barcelona (Spain)
Y. RAMAYO-CALDAS, Univ. Autónoma Barcelona (Spain)
S. RAMOS-ONSINS, CRAG, Barcelona (Spain)
D. RIZOS, INIA, Madrid (Spain)
J. ROCA, Univ. Murcia (Spain)
D. SÁNCHEZ, Univ. Politécnica Valencia (Spain)
A. SÁNCHEZ, Univ. Autónoma Barcelona (Spain)
M.A. SANTACREU, Univ. Politécnica Valencia (Spain)
A.J. SOLER VALLS, Univ. Castilla-La Mancha (Spain)
A. SONENSON, NOFIMA (Sweden)
E. UGARTE, NEIKER, Vitoria (Spain)
J.S. VICENTE, Univ. Politécnica Valencia (Spain)
M. VALERA, Univ. Córdoba (Spain)
O. VIDAL, Univ. Girona (Spain)
B. VILLANUEVA, INIA, Madrid (Spain)

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