

SPANISH JOURNAL OF AGRICULTURAL RESEARCH

Formerly known as «Investigación Agraria» merged from two series: «Producción y Protección Vegetales» and «Producción y Sanidad Animales» founded in 1985, the predecessor of which was «Anales del Instituto Nacional de Investigaciones Agronómicas», first published in 1952

EDITORIAL BOARD

Editors

Carmen de Blas Beorlegui. INIA. Madrid (Spain). cbblas@inia.es
Antonio López Sebastián. INIA. Madrid (Spain). alopez@inia.es
Victoria Baonza. INIA. Madrid (Spain). baonza@inia.es

Technical Editor

Gemma Pérez Rivera. INIA. Madrid (Spain). publinia@inia.es

Associate Editor-in-Chief for the Sociedad Española de Agroingeniería

Francisco Rovira Más. UPV. Valencia (Spain). frovira@dmta.upv.es

Associate Editor-in-Chief for the Sociedad Española de Ciencias Hortícolas

Lorenzo Burgos Ortiz. CEBAS-CSIC. Murcia (Spain). burgos@cebas.csic.es

Associate Editor-in-Chief for the Asociación Española de Ingeniería de Proyectos

José Luis Ayuso Muñoz. ETSIAM-UCO. Córdoba (Spain). jrlaymuj@uco.es

Associate Editors

Ricardo Alberio (INTA, Balcarce, Argentina). **Carlos J. Álvarez** (USC, Santiago de Compostela, Spain). **Francisco Ayuga** (UPM, Madrid, Spain). **Donald Baird** (U Stirling, UK). **Jesús Barreiro** (IFAPA, Granada, Spain). **Manuel Baselga** (UPV, Valencia, Spain). **Julio Berbel** (UCO, Córdoba, Spain). **Loys Bodin** (INRA, Castanet-Tolosan, France). **Joan Bonany** (IRTA, Gerona, Spain). **Agustín Brenes** (CSIC, Madrid, Spain). **Vicente Caballer** (UPV, Valencia, Spain). **Rosa Calvo** (INIA, Madrid, Spain). **Rodolfo J.C. Cantet** (UBA, Buenos Aires, Argentina). **Angeles Cappa** (INTI, San Martín, Argentina). **Manuel Carrillo** (CSIC, Castellón, Spain). **Jorge Casal** (UBA, Buenos Aires, Argentina). **Nicolás Castilla** (CIFA, Granada, Spain). **José M. Castro** (UCM, Madrid, Spain). **Pedro Cermeño** (IFAPA, Sevilla, Spain). **Paul Chen** (UCDavis, California, USA). **Julio Coll** (INIA, Madrid, Spain). **Dario Colombatto** (UBA, Buenos Aires, Argentina). **José M. Díaz** (UPM, Madrid, Spain). **María José Díez** (UPV, Valencia, Spain). **Alberto Escande** (INTA, Buenos Aires, Argentina). **Rafael Espejo** (UPM, Madrid, Spain). **Ricardo Fernández Escobar** (UCO, Córdoba, Spain). **Pilar de Frutos** (CSIC, León, Spain). **Jaime Gallegos** (Colegio Postgraduados, Texcoco, Mexico). **Carlos Gamazo** (UNAV, Pamplona, Spain). **Julián Garde** (UCLM, Albacete, Spain). **Lorenzo González** (Moredum Res Inst, Midlothian, Scotland, UK). **Azucena Gracia** (DGA, Zaragoza, Spain). **George D. Hill** (Lincoln U, Canterbury, New Zealand). **Carmen Jarén** (UPNA, Navarra, Spain). **Nicolás Jouve** (UAH, Alcalá de Henares, Spain). **Duane H. Keisler** (U Missouri, USA). **José M. Lasa** (CSIC, Zaragoza, Spain). **José López** (UH, Huelva, Spain). **Manuel F. Marey** (USC, Santiago de Compostela, Spain). **Alberto Masaguer** (UPM, Madrid, Spain). **Margarita Medina** (INIA, Madrid, Spain). **Gary Merkley** (USU, Utah, USA). **Francisco J. Montero** (UCLM, Albacete, Spain). **Luis Navarro** (IVIA, Valencia, Spain). **Amando Ordás** (CSIC, Pontevedra, Spain). **Luis Ortega** (UCM, Madrid, Spain). **Jaime Ortiz-Cañavate** (UPM, Madrid, Spain). **Koldo Osoro** (CIATA, Asturias, Spain). **Victoria Pablos** (INIA, Madrid, Spain). **Alejandra Palacio** (INTA Balcarce, Argentina). **Vicente Pallás** (UPV-CSIC, Valencia, Spain). **Alfonso Pardo** (CIDA, Logroño, Spain). **Marcelino Pérez de la Vega** (UL, León, Spain). **Enrique Playán** (CSIC, Zaragoza, Spain). **Carlos Quirós** (UCDavis, California, USA). **Carlos Ramos** (IVIA, Valencia, Spain). **Detlef Rath** (Inst Animal Sci, Mariensee, Neustadt, Germany). **Carlos Romero** (UPM, Madrid, Spain). **Raúl de la Rosa** (IFAPA, Córdoba, Spain). **Raul Rosadio** (CONOPA, Lima, Peru). **Salvador Ruiz** (UM, Murcia, Spain). **Fermín San Primitivo** (UL, León, Spain). **Federico Sau** (UPM, Madrid, Spain). **Vicente Sotés** (UPM, Madrid, Spain). **José V. Tarazona** (INIA, Madrid, Spain). **José M. Tarjuelo** (CREA-UCLM, Albacete, Spain). **Alfredo Teixeira** (Inst Politécnico Bragança, Portugal). **José Torrent** (UCO, Córdoba, Spain). **Daniel Valero** (UMH, Orihuela, Alicante, Spain). **Fernando Vidal** (UMH, Orihuela, Alicante, Spain).

Journal Editorial Office

Servicio de Publicaciones-INIA. Autopista A-6, km 7.5. 28040 Madrid (Spain).
E-mail: sjar@inia.es. Phone: +34 91 347 39 16. Fax: +34 91 357 22 93

AIM AND SCOPE

The Spanish Journal of Agricultural Research publishes research articles, reviews and short communications. Research articles and short communications must report original work not previously published in any language, nor under consideration for publication elsewhere.

After peer review and approval by the editorial board, SJAR publishes papers reporting research findings dealing with all aspects on production and health in plants and animals, such as genetics, breeding, organic, biological agriculture and sustainable production systems, apiculture, aquaculture, forages and pastures, plant and animal diseases, pests and weeds, epizootiology, immunology, parasitology, physiology, reproduction, management and food technology, natural and genetic resources, agricultural economics, rural engineering and mechanization, soils, fertilization, irrigation and watering, etc.

SJAR is indexed in **Agrícola, Agris, Biosis, CAB Abstracts, CABI full text databases, Current Contents Connect (Agriculture/Agronomy), Dialnet, FSTA (Food Science and Technology Abstracts), Georef, Global Health, ICyT, Pascal, Science Citation Index Expanded and Scopus**. It is also included in the following automated directories: Jake, Latindex Catalogue, Latindex Directory, Ulrich's Periodicals Directory. Recognised by the Cuban Academy of Sciences.

SJAR is published quarterly (March, June, September and December) by the Spanish National Institute for Agricultural and Food Research and Technology (INIA). Autopista A-6, km 7.5. 28040 Madrid (Spain).

ALERT SERVICE

If you wish to receive via e-mail, whenever a new issue of SJAR appears, the table of contents with direct links to the respective abstracts, take advantage of our free Alert Service. To register, simply send an e-mail with the message «Subscribe SJAR» to publinia@inia.es.

OPEN ACCESS JOURNAL

Full contents available online at
www.inia.es/SJAR