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## Europe's major rice fields use biological control to sustainably prevent mosquito proliferation

- A study led by the CSIC concludes that biological larviciding is by far the primary adopted method to control mosquitoes, respecting biodiversity and protecting nearby populations.
- Researchers recommend applying this type of strategy in the Lower Guadalquivir, in southwest Spain, to reduce the presence of mosquitoes and the transmission of diseases such as the West Nile virus.



Image of a waterlogged rice board in the town of Los Palacios y Villafranca (May 2024, Seville) / Mikel Alexander González.

Rice is a crucial source and an important economic activity globally. In addition, rice fields serve as ideal breeding ground for mosquitoes, including potential vectors of diseases such as West Nile virus. Now, a research team led by the Spanish National Research Council (CSIC), an agency of the Spanish Ministry of Science, Innovation and Universities (MICIU), has coordinated an analysis of mosquito surveillance and

management methods used in the major rice-producing regions in Europe. This study, published in the [Journal of Environmental Management](#), was conducted together with public health and vector control specialists from 13 institutions in Spain, Portugal, France, Italy and Greece.

The need to effectively manage mosquito populations associated with rice fields has become urgent and particularly relevant in Spain in 2024, where a new outbreak of West Nile virus has affected areas of western Andalusia and Extremadura. As in the 2020 outbreak, initial cases were concentrated in the communities closest to rice fields and eventually spread to more distant populations. This increase in the number of cases has generated great concern among health authorities and the local population, with important consequences not only for public health, but also for the local economy.

**Jordi Figuerola**, CSIC Professor of Research at the Doñana Biological Station (EBD-CSIC) and expert on the West Nile virus, which is supported by the 'La Caixa' Foundation to research prevention strategies: 'All the countries analysed in the study have recent entomological and virological surveillance programmes, which are essential for early detection and the adaptation of control strategies according to the needs of each region,' the researcher says.

To manage the abundant mosquito populations in rice fields, most regions have adopted sustainable measures, such as the use of biological control using *Bacillus thuringiensis israelensis* (Bti), a larvicide that attacks immature stages of mosquitoes without harming the environment. In some countries, this treatment is routinely applied in rice fields and surrounding areas between April and October. Due to the economic and logistical challenges of controlling mosquito larvae, in large areas 500-metre wide perimeter barriers have been established, where this biological larvicide is sprayed only around urban areas to protect the population.

**Mikel A. González**, CSIC researcher at the Doñana Biological Station - CSIC, points out that this strategy is common in the major rice-growing areas in Europe, such as Greece, northern Italy and the Ebro Delta in Spain, and stresses the urgent need to apply similar measures in the rice fields of the Lower Guadalquivir. 'Due to the history of Nile virus circulation in the area, it would be necessary to implement measures comparable to those implemented, for example, in the Ebro Delta, and adapt them to the conditions of rice cultivation in the Lower Guadalquivir,' says González. Although it is not possible to eradicate the mosquitoes, these measures would contribute to significantly mitigate their population densities and thus reduce the impact of the Nile virus on humans.

### The costs of surveillance and treatment

This study also reviews the controversial issue of who should pay the costs of surveillance, management and treatments. In Europe, strategies vary significantly between rice-producing regions, ranging from centralised government-funded programmes to local interventions supported by public entities and implemented by companies, whether public or private. This diverse approach reflects the different economic and organisational realities of each region, which poses challenges for coordination and equity in the implementation of these measures.

The relationship between agricultural productivity and public health highlights the need for holistic approaches to rice cultivation and mosquito control. A One Health approach, involving farmers, vector control operators, public health professionals and the scientific community, say the researchers, is essential to optimise agricultural practices, implement sustainable interventions and develop new strategies, ensuring both food security and population health. Given the increasing risk of Nile virus in the European Mediterranean region and the impact of climate change, international cooperation, continuous surveillance and prevention are essential, the study concludes.

Mikel A. González, Alexandra Chaskopoulou, Loukas Georgiou, Eva Frontera, Francisco Cáceres, Montse Masia, Raquel Gutiérrez-Climente, Gregory L'Ambert, Hugo Osório, Gonçalo Seixas, Francesco Defilippo, Mattia Calzolari, Fabrizio Montarsi, Andrea Mosca, Jordi Figuerola. **Mosquito management strategies in European rice fields: Environmental and public health perspectives.** *Journal of Environmental Management*. DOI: [10.1016/j.jenvman.2024.122534](https://doi.org/10.1016/j.jenvman.2024.122534)

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