

BIOCONTROL-A

THE FIGHT AGAINST AFLATOXINS, THE DANGEROUS TOXIC THAT CONTAMINATES CROPS

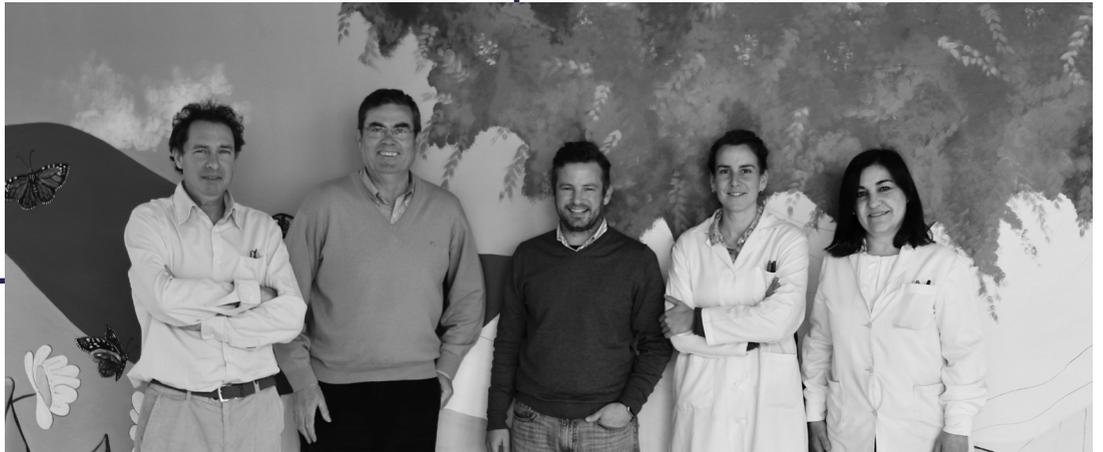
PROJECT CODE: H2020-MSCA-IF-2014-655232

CALL: H2020-MSCA-IF-2014

PERIOD: 36 MONTHS

BUDGET: 235,674.90€

PRINCIPAL INVESTIGATOR: JUAN MORAL MORAL



The cultivation of almonds and pistachios is as old as agriculture itself and, although for some centuries they were considered delicacies at banquets, their consumption has increased considerably in recent decades due to recognition of their healthy properties.

Almonds and pistachios are rich in protein, healthy fats, calcium, and vitamins, which is why their consumption is part of a balanced diet. Spain is the world's third producer of almonds, after California and Australia, and first in surface area cultivated. There is currently a transformation in the sector, from a crop based on traditional rainfed varieties to an intensive system with new varieties and irrigation.

Despite the benefits of their consumption and the profitability of both crops, their commercialisation has been threatened by an emerging problem: contamination by aflatoxins, a compound produced by several species of fungi –especially *Aspergillus flavus* and *A. parasiticus*– that exist in the soil and spread in crops, feeding on decaying plant tissues.

The process is as follows: the fungus releases the spores, which travel through the air until making contact with the fruit. If it has some kind of opening, they reach the seed and contaminate it. Due to the danger they pose, the presence of aflatoxins is highly regulated in foods for human and animal consumption, as it can lead to liver cancer. Although contamination by this toxin in almonds and pistachios is rare, its toxicity can

be lethal. In fact, in Kenya, about 200 people died between 2004 and 2006 from eating corn infected by these fungi.

Identifying isolates of these non-toxic fungi that can be used as biocontrol agents, and understanding the competition mechanisms between toxic and non-toxic spores, are the main objectives of the BIOCONTROL-A research project, an international initiative in which the Agroforestry Pathology group at the University of Cordoba participates. According to the principal investigator, Juan Moral, the key is to isolate the strains of fungi that do not produce the toxic component due to a mutation and select them based on their ability to compete with the toxic ones. Once isolated, they are applied, massively, in the field using seeds. In this way, they compete with the fungi that do generate crop toxicity. If the non-toxic strains win the fight for the environment where they are applied, it can be said that the contamination of the crop has been reduced biologically, and science has prevailed.

The first phase of the project was carried out in California, where, according to the researcher, one of the main advances has been to register a biological control strain, which had already been registered for the pistachio, for almond, fig, and walnut trees too. It has also been demonstrated that this strain

does not affect bees, one of the major concerns for farmers, as these insects are one of the keys to the pollination of the almond tree.

The next step is to use all this new knowledge to fight against the problem in Spain. According to Moral, “we already have a battery of endemic strains that do not produce toxins, and would be potential candidates for use in our country, since it is expected that the native strains are better adapted to our conditions, and more effective.”

The BIOCONTROL-A project seeks to prevent the contamination of almonds and pistachios by toxins produced by several species of fungus

The project, in any case, opens up several research fronts. Mixing several genetically distinct strains is another possibility that is being considered. In addition, in the coming months a mathematical model will be devised to identify the optimal times to apply the biological control strains. Understanding how these fungi would behave under different circumstances is key to increasing their effectiveness and eradicating these dangerous toxins.

