

Spain: Gene that delays the ripening of strawberries identified

Scientists from the research group 'Improvement and Biotechnology of Fruit and Vegetable Species' of the University of Malaga have applied biotechnological techniques to delay the ripening of strawberries and have managed to grow plants whose fruits have a longer-lasting texture in the post-harvest.

Experts have managed to extend the post-harvest shelf life of this delicate and perishable fruit. To this end, they have carried out in vitro tests based on the modification of the plant's genome, identifying the gene associated with the loss of firmness of the fruit's cell walls, called FaPG1. After its identification, they have silenced it in order to delay the ripening process without this affecting the size, colour or flavour of the fruit, as well as the sugar content or acidity.

The results of this project, entitled "Unraveling the nanostructure of strawberry fruit pectins by endopolygalacturonase digestion and atomic force microscopy" and published in the journal Food Chemistry, entail a new way to improve the ripening process of strawberries. According to the experts responsible, the deterioration of the strawberries in the post-harvest period causes the loss of between 5 and 25% of the production.

Scientists have observed that during the ripening of strawberries, the fruit weakens and quickly becomes soft, until it acquires a semiliquid texture at the end of the process. "Strawberries gradually become soft and deteriorate while they are harvested and go through the packaging chain," explains the researcher at the University of Málaga and responsible for this study, José Ángel Mercado.

This loss of firmness of the fruit is mainly due to changes in the composition of the cell walls. "The pectins; that is, one of the main components of the cell wall in plant organisms, gradually break down in this stage, so the wall structure weakens and the growth of pathogens in the fruit causes its deterioration," clarifies the expert.

"Off" genes, more resistant plants

In order to extend their shelf life, researchers have carried out nanometric scale tests in the laboratory to analyse the structure of pectins and have also used in vitro culture techniques with the Chandler and Camarosa strawberry varieties.

Working in partnership with the group of the researcher Juan Muñoz, of the University of Córdoba, they first carried out genomic analyses to identify the genes that are expressed in the stage where the texture changes occur. "We found that the variations in firmness in strawberries depended on genes that break the cell wall, which has an impact on the texture of the fruit, so we concluded that if we silenced those genes, we would manage to extend the post-harvest shelf life of strawberries," affirms Mercado.

To do this, they tested several genes and verified that the FaPG1 gene is the one responsible for the degradation function of pectins during the ripening process. Once located, they used molecular techniques to isolate that gene and reintroduce it back into the plant's genome. "To inhibit the function of any gene, it is first extracted and then placed back into the genomic sequence in reverse. In this way, the gene shuts off and is no longer expressed. In this specific case, it stops sending the order to break the cell wall and this means that the strawberry has a longer shelf life," explains the scientist.

The reintroduction of the gene is done with a bacterium called agrobacterium. This pathogen integrates it into the plant's genome and once the genetic change has been made, it is eliminated with antibiotics. "This process requires a sterile and small-scale environment, for which we use culture jars containing a special medium with mineral salts and carbon sources. We then regenerate the plant and obtain more resistant fruits," outlines the head of the study.

Those responsible for this project, funded by the Ministry of Economy, Industry and Competitiveness, have been working for 15 years on this same line of research and intend to expand their improvement studies to other crops with a high production in Andalusia, such as avocados and olives.

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