INVASIVE PESTS IN CITRUS CROPS

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The Mediterranean citrus sector is constantly threatened by the arrival of new invasive pests, as well as the increased incidence of pests that were already present in the region and pose a danger to the crops in smaller numbers. At the same time, the globalisation of the fruit trade, imports of plant material, climate change and the reduction in the efficacy of phytosanitary products make it increasingly difficult to control phytophagous pests in citrus fields. The application of integrated production systems where the use of auxiliary fauna-friendly products prevails is a strategy that may not be effective in southern European countries, where the climatic variables increase the severity of attacks by new pests.

WHAT ARE THE CAUSES OF THE ARRIVAL OF NEW PESTS?

The presence of new invasive pests has increased in the Mediterranean region, favoured by the growth of international trade in plant material and food products that cross continents with very lax control given the risk involved. Europe is an importing continent that imports fruit from different parts of the world throughout the year to meet consumer demands. These imports are subject to a series of controls that only allow for monitoring a small part of all fruit entering the European Union. This fruit may have inoculums of different pests that are well controlled in its area of origin, but may pose a real risk in other climatic conditions. Moreover, countries at other latitudes have active substances and phytosanitary products available to control these pests, while legislation in Europe greatly limits the use of phytosanitary products. This means the arrival of a new pest may completely alter the citrus ecosystem.

HOW DOES CLIMATE CHANGE INFLUENCE THE INSTALLATION OF NEW PESTS?

In general, pests exhibit zonal behaviour; they are acclimatised to a particular area. When a new pest enters a region from a different climatic zone, its establishment and survival largely depend on the similarity of the climatic conditions between the regions of origin and destination. In this sense, climate change is favouring the establishment of tropical and subtropical pests that, a few years ago, were limited by cold winters. In general, the current winters do not interrupt the development of pests such as the South African cotonet (*Delottococcus aberiae)* or citrus thrips, which would have been much more restricted under the climatic conditions of two decades ago. Another example is the oriental mite, a pest that affects citrus late in the cycle and slows down its development when temperatures are lower. However, winter temperatures above 18 degrees Celsius mean the pest continues to reproduce in the middle of the citrus harvesting period, and the active substances used to control it are very scarce. The same problem is encountered with the spread of the worst citrus disease, HLB. One of its vectors, *Diaphorina citri*, is acclimatised to temperate zones typical of the Mediterranean region. It has already been found in Israel and Cyprus, and the Mediterranean parts of producer countries such as Spain, Italy and Morocco are seriously threatened.

WHAT CAN BIOLOGICAL CONTROL BRING US?

Biological pest control is defined as the action generated by the natural predators and parasitoids of the pest to prevent it from exceeding the threshold of economic damage. It should be noted that many of the invasive pests that have appeared in recent years do not have effective biological control agents in the Mediterranean citrus region, contrary to what happens in their places of origin. This results in the need to find such agents in the pests' areas of origin and import them to try to establish a new balance in our citrus fields. This process involves some problems and risks, the main one being the legal impediments to such introductions, which sometimes go far beyond the principles of proportionality and prudence in an exercise of self-protection on the part of those responsible for the administration. One example is the introduction of the parasitoid *Tamarixia dryi* in the Iberian Peninsula for the control of *Trioza erytreae*: the parasitoid was released experimentally in three locations in northern Spain in autumn 2019 and spring 2020. Sampling showed that *T. dryi* has become established, shows high levels of parasitism at the release sites and is dispersing without affecting other psyllid species present in Galicia.

WHAT ARE THE CURRENT PESTS PRESENT IN CITRUS CULTIVATION?

In general, citrus crops are affected by pests such as thrips, spider mites, coccinellids and diaspids. Although with marked differences between varieties (lemons, oranges and mandarins) and climatic zones throughout the Mediterranean region, the pests described in this paragraph represent a widespread problem in terms of plant health:

- ***Eutetranychus banksi*** (McGregor): It was detected in 2013, and since then has invaded the entire citrus growing area, becoming the most frequent mite species in citrus cultivation in the Valencian Community as it does not have good biological control, even displacing *Panonychus citri* and *Eutetranychus orientalis*, with which it can be confused. It causes relatively significant damage to leaves and fruit and prefers the upper side of the leaves, unlike other tetranychids. It can only be found in fruits with very high populations. The most effective natural enemies are the phytoseiids *Neoseiulus californicus* and *Euseius stipulatus*.

- ***Delottococcus aberiae*** (De Lotto): This type of mealybug, also nicknamed in spanish 'the South African cotonet' was detected for the first time in citrus in Benifairó de les Valls (Valencia) in 2009 and has proved to be one of the most damaging invasive pests due to the serious deformations it causes in the fruit, which completely depreciate its commercial value. The identification of the sexual pheromone of this pseudococcidian has allowed the monitoring of the pest and the use of the attract-and-kill technique for its control. As natural enemies of this pest, the introduction of the exotic parasitoid *Anagyrus aberiae* and the predator *Cryptolaemus montrouzieri* contribute to its control.
- ***Scirtothrips aurantii*** (Faure): Belonging to the order Thysanoptera, the South African citrus thirps is native to Africa and Yemen. It is a very polyphagous species that can be found on more than 50 species of plants, both cultivated and wild. In Spain, it became established in southwestern Andalusia in 2020, invading new areas along the Mediterranean until being declared in the Valencian Community, where, in addition to citrus, it is seriously affecting persimmon and pomegranate crops. It is considered a quarantine pest of the European Union. In fruit, a superficial grey scar appears on the rind, often forming a ring around the peduncle. Unlike other Thysanoptera, it needs to survive in young plant tissues, so its potential for natural spread is relatively limited.

NEW THREATS TO CITRUS MANAGEMENT

In addition to the pests presented in the previous section, several pests are present in countries with which we have commercial relations and can enter our region, thus affecting citrus crops. Among them, the following stand out:

- ***Paracoccus burnerae*** (Brain): Native to the Afrotropical Region, the oleander mealybug is a pseudococcid that has been detected since the 2010s in citrus plots in Andalusia, Murcia and the Valencian Community, although only occasionally. Apart from the typical mealybug damage, the symptoms of its presence appear as deformations in leaves, in the form of pinching, and in fruit, where cracks are formed. Parasitoids of the genus *Anagyrus* (the main predator of *D. aberiae*) are not reported to be effective biological control agents against this mealybug.
- ***Thaumatotibia leucotetra*** (Meyrick): The false apple moth is a pest regulated by the EU as a priority quarantine pest. The importance of this tortricid is that it can attack numerous fruit species, both cultivated and wild, including citrus, but also avocado, peach, persimmon and pomegranate, and horticultural species. It is established in Israel, although it has been detected 562 times in other European countries. In Spain, 67 interceptions have been carried out from 2009 to 2020, on orange, grapefruit and mandarin trees from South Africa, Swaziland and Zimbabwe. According to the Spanish Ministry of Agriculture, 'fruit may only be imported from pest-free areas or fruit that has undergone an effective cold treatment to ensure freedom from *T. leucotreta* or other post-harvest treatment'. Due to its dangerousness, the Ministry has published an eradication plan for this pest that includes the delimitation of areas where its presence is confirmed and a series of control measures.

HOW TO PREVENT THE ENTRY OF NEW PESTS INTO OUR CROP?

To effectively prevent and manage pests in citrus crops, it is essential to combine early detection strategies, preventive measures and specific control methods. The following are the key actions:

- Regular visual inspections: Check leaves, shoots and fruit for signs such as curled leaves, galleries in leaf tissue, presence of adult insects or larvae, and sticky substances (honeydew).
- Use of traps and monitoring: Implement chromatic traps (yellow or blue) to capture insects such as fruit flies (*Ceratitis capitata*) or thrips.
- Place specific 'attract and kill' devices to control invasive pests without damaging auxiliary fauna.

Preventive measures

- Cultural practices: Maintain a water balance in the soil to avoid stress in the trees, which makes them more vulnerable to pests. Conversely, excessive irrigation or nitrogen fertilisation can increase sprouting, making them more susceptible to pests that attack young shoots.
- Use resistant varieties and prune to promote foliage aeration.

Application of integrated pest management

- Use specific insecticides/acaricides against the target pest only when the economic damage threshold has been exceeded.
- Introduce natural predators such as *Euseius stipulatus* (against mites) or *Cryptolaemus montrouzieri* (against mealybugs).
- Avoid broad-spectrum pesticides that harm beneficial fauna.
- Conduct weekly monitoring to detect early outbreaks and act before the pest spreads.
- Apply entomopathogenic fungi (e.g., *Beauveria bassiana*) to control insect populations without chemicals.
- Prune and destroy branches affected by highly localised pests or outbreaks.

TO FIND OUT MORE

- Las nuevas plagas obligan a actualizar el programa de Gestión Integrada en cítricos: https://www.phytoma.com/noticias/noticias-de-actualidad/las-nuevas-plagas-obligan-a-actualizar-el-programa-de-gestion-integrada-en-citricos
- Cítricos: plagas y enfermedades (junio 2024) https://www.phytoma.com/sanidad-vegetal/avisos-de-plagas/citricos-plagas-y-enfermedades-junio-2024
- PHYTOMA MEETS. La explosión de plagas en la citricultura mediterránea https://www.youtube.com/watch?v=YLhuXpyYiYI
- Aumento de la resiliencia frente a plagas y enfermedades en cítricos: Gestión de los recursos naturales https://hdl.handle.net/20.500.11939/8569
- Delottococcus aberiae, nueva plaga de cítricos http://hdl.handle.net/20.500.11939/4028
- Revalorización del complejo de depredadores polífagos en cítricos http://hdl.handle.net/20.500.11939/6658

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