

Fungi spores: *Alternaria* / *Cladosporium* / *Penicillium* / *Aspergillus*

Botanical information:

Fungi are microscopic living things that form filamentous networks. They live in the soil and on vegetation but also colonize and degrade numerous substrates such as paper, paints, leather, wood, straw, fresh and processed foods such as fruits, vegetables, nuts, flour, etc. They are part of the outdoor air as well as house dust.

Fungi reproduce by spores: microscopic particles capable of being carried by air currents and penetrating the airways, where they cause symptoms if the person inhaling them is allergic. Certain spores require free water (rain, flooding) to spread; others are spread by wind - these are the ones that cause allergy.

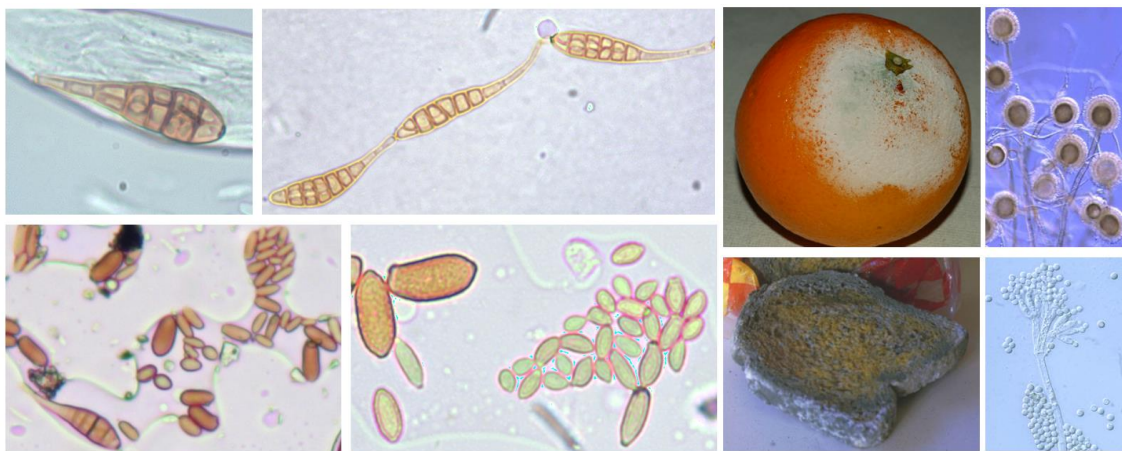


Fig. 1. Optical microscopic view of *Alternaria* spores (top, the two images on the left), *Cladosporium* spores (bottom, the two images on the left), *Aspergillus* spores (top right), and *Penicillium* spores (bottom right). Also shown are substrates (orange and bread) where *Aspergillus* and *Penicillium* grow.

Aerobiological information:

Spores are much more abundant in the atmosphere than large plant pollen, although their allergenicity is lower and/or more unknown. Although *Alternaria* and *Cladosporium* spores are found throughout the year, in Catalonia *Alternaria* is more abundant in summer and autumn and *Cladosporium* is more abundant in spring, summer, and autumn.

The more rural and/or forested the environment, the more spores are present, and the colder (mountain stations) the fewer spores are in the atmosphere.

The information presented here corresponds to outdoor environments. It should be considered that indoor spores contribute significantly to fungal allergies, which depend on each particular environment.

The pollen calendar is shown below, with information on the distribution of *Alternaria* spores throughout the year in each of the stations of the Aerobiological Network of Catalonia (*Xarxa Aerobiològica de Catalunya*, XAC). For more information, please visit <https://aerobiologia.cat>.

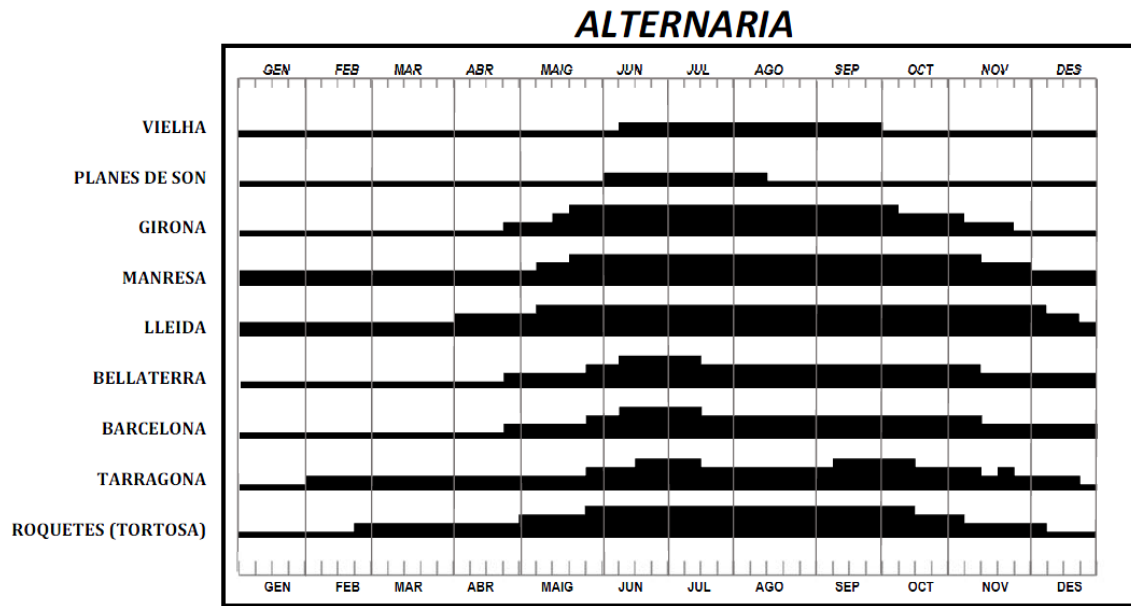


Fig. 2. Comparative dynamics of *Alternaria* spore levels in Catalonia and allergy risk

Levels	Concentrations	Allergies
1. Low	Little important	Rare
2. Medium	Medium	Possible risk
3. High	Very high	Important risk
4. Very high	Maximal	Maximal risks

Remark: Near the fungi, the levels may be higher than indicated.

Medical information:

The fungi that most often cause allergy are *Alternaria* and *Cladosporium* (mainly outdoors), *Aspergillus*, and *Penicillium* (mainly indoors).

The worst times of the year for allergy sufferers are summer and autumn, although 80% of allergy sufferers have symptoms throughout the year.

The treatment of fungal allergy will be based on avoiding proximity to the allergen as much as possible, symptomatic treatment, and, when necessary, specific immunotherapy. In some cases, on a personalized basis, the use of biological therapies with monoclonal antibodies may be of interest.

About 3 million species of fungi are known. Only thermo-tolerant fungi that are airborne and grow at body temperature are associated with potential respiratory diseases. Only 22 species have demonstrated this ability. Fungi are widely distributed in nature and the urban environment, and their spores are inhaled on a daily basis in a significant way. Every day we take about 20,000 breaths, and inhale between 10-15,000 liters of air containing a large number of particles, including a significant number of spores. The immune system has to decide between tolerating their presence and reacting immunologically to them. While most are eliminated, depending on personal predisposition and immune response, there may be intermittent colonization, chronic colonization or development of allergic disease or severe respiratory infection.

Tips for people with fungal spore allergy

- Be aware of (with a medical diagnosis) which fungal spore is causing the allergy.
- Be informed of the levels of allergenic fungal spores in your usual area and of the levels in areas where you plan to go. It is advisable to adapt voluntary trips (weekends, vacations, etc.) to areas where the allergen that affects us is not present. The website <https://aerobiologia.cat> shows updated information on pollen levels in Catalonia and explains how to access data from other geographical areas. You can sign up (and unsubscribe) to receive the weekly newsletter at: <https://aerobiologia.cat/pia/en/subscribe#newsletter>
- If you notice "problems" outside the usual season, consult with allergists to see if there has been sensitization to other allergens.
- Indoors, stay preferably in bright, sunny rooms that are ventilated daily, also in winter, and where no condensation is generated (wet glass inside).
- Avoid places infested with fungi such as rooms with blackened damp spots, cellars, cellars, haystacks, places with leaf litter, etc., and activities such as mowing the lawn, handling plants and soil, etc.
- Prevent damp stains from forming on walls or windows, behind pictures or furniture, inside cupboards or drawers, etc., and correct them if present by using, for example, antifungal paints or fungicide sprays in areas prone to dampness.
- Vacuum the bedroom and the places where you usually stay every day to avoid the presence and accumulation of dust.
- Regularly clean areas that get damp more frequently, such as bathtubs, sinks, bathroom and kitchen tiles, etc., with bleach and dry areas that have become damp.
- Avoid indoor spaces with humidity above 40-50% (it is advisable to control it with a hygrometer) using, if necessary, dehumidifiers or air conditioning - in this case, do the appropriate maintenance to keep it clean).
- Do not leave food that can spoil due to fungal growth (grain, flour, fruit, vegetables, nuts, dried fruits, potatoes, etc.) outside the refrigerator for a long period.
- Take out garbage bags daily.
- If you have indoor plants, make sure that the leaves and soil are in good condition and check for signs of rot or fungal contamination.
- As for textile products (carpets, curtains, bedding and staff) give preference to the use of synthetic fibers over cotton.