

Science for Environment Policy

Harmful levels of fungal spores released by crop harvesting

Danish researchers have recently revealed that crop harvesting can release high levels of *Alternaria* fungal spores, affecting air quality locally and, occasionally, over long distances. The fungus is known to trigger human allergic reactions, and the study calls for improved monitoring and forecasting of airborne fungal spores.

Whilst it is well known that plants can release large amounts of pollen into the atmosphere, triggering allergies, the release of *Alternaria* fungal spores from agriculture, and their impacts, is often overlooked. This family of fungi, found across Europe, is also of agricultural and health importance, as the spores cause plant diseases, including potato blight, and can induce allergic reactions, including hayfever and asthma symptoms, among sensitive individuals. However, very little is known about the sources of *Alternaria* spores and how far they travel.

Decomposing plants, such as forest and agricultural vegetation, have been found to be key sources of airborne *Alternaria* spores. However, the researchers of this study investigated whether crop harvesting could be the main source in Denmark. At four rural locations near Roskilde, spore levels were estimated during the wheat and barley harvest season. The exhaust air stream from harvest machines was captured and examined microscopically to calculate the average *Alternaria* spore emission per hectare of harvested field.

When the crops were not being harvested, no spores could be detected. However, during harvest the study revealed a uniformly high level (5×10^{10}) of spores produced per hectare of field harvested. This is despite fields being treated with fungicides, and no signs of infection on the crops. At this level of spore release, only 2% of land would need to be harvested to exceed 100 spores per m^3 - the level at which concentrations can become harmful to health. This demonstrates that harvesting can release harmful amounts of *Alternaria* spores into the atmosphere.

In addition, airborne spores were trapped and counted every two hours for ten years (2001 – 2010) to give urban daily spore level averages in Copenhagen. A total of 232 days had spore levels above the warning level of 100 spores per m^3 . Spore levels were high from the beginning of July and peaked in early August, corresponding to harvest time. A daily pattern also emerged, as spore levels increased in the afternoon and decreased in the early morning. It is suggested that these spores originated from rural areas surrounding Copenhagen.

Occasionally high levels of *Alternaria* spores (of over $700 m^{-3}$) were counted in the mornings, rather than the afternoons, and this was noticed every year during harvest season. On such days, air masses had arrived from distant agricultural areas, including in southern Sweden, Denmark, Poland or Germany. In all these cases the weather had been dry for several days in the source regions, which is the standard requirement for farmers to harvest crops such as barley and wheat.

The findings indicate that the main source of *Alternaria* spores in Copenhagen is indeed crop harvesting. The spores are predominately transported from local rural areas, but, under favourable conditions, they can also travel long distances from other countries.

This study calls for the mapping and monitoring of *Alternaria* sources across European countries. Combining this with information on weather conditions, harvesting times and travelling air masses should help predict the spores' dispersal. This forecasting could be used to provide early warning alerts of up to several days for people with *Alternaria* allergies, to allow them to plan their activities and medication.



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