Biosecurity Update - Blowing in the wind

Agencies are joining forces to reduce the threat of airborne pests establishing in New Zealand

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NEW ZEALAND has long grappled with the challenge of windborne insects and pathogens slipping past our borders and establishing themselves. This is a significant vulnerability in our biosecurity system that will likely worsen with climate change. The five-year Protecting Aotearoa from Wind-Dispersed Pests research programme (running until September 2028) aims to close critical knowledge gaps about how these organisms move and survive. The research is funded by the Ministry of Business, Innovation and Employment with co-funding from Te Uru Kahika/Regional and Unitary Councils Aotearoa and The Foundation for Arable Research. New Zealand Winegrowers sits on the programme advisory committee.

Researchers on the programme are updating wind trajectory models and studying pest biology to help develop an early-warning system, known as the Aerobiological Surveillance and Prediction Model, which will predict likely arrivals and help us respond rapidly and effectively.

The wind-dispersed pathway model outlines the key conditions that must align for a pest to successfully travel to and establish in New Zealand. First, there must be a source population of the pest in a neighbouring landmass, creating what is known as “source pressure”. From there, the pest must be lifted into the atmosphere, and weather conditions must be favourable for covering long distances. Once airborne, the pest must survive often harsh conditions, including exposure to UV radiation and extreme temperatures. Crucially, the journey must end with the pest being deposited on to land in New Zealand rather than lost over the ocean. Finally, for the pest to establish and reproduce, it must find a suitable climate and habitat. Understanding these steps is critical to predicting and managing the risks posed by windborne biosecurity threats.

Fall armyworm and myrtle rust are two significant pests that arrived in New Zealand on the wind. Fall armyworm, a highly mobile moth native to the Americas, was first detected in New Zealand in 2022 and is believed to have been carried across the Tasman Sea from Australia by strong wind systems over the summer. Myrtle rust, a fungal disease that affects plants including manuka, kanuka, pōhutukawa and eucalyptus, was first detected on Raoul Island in 2017 and later on the New Zealand mainland. Its arrival is also attributed to wind dispersal from Australia, with spores likely carried by atmospheric currents over long distances. Both pests highlight the increasing biosecurity risk of windborne incursions and the need for early warning systems to detect and manage such arrivals before they become established.

MOTH SURVEILLANCE

Lepidoptera (moth) surveillance on Taranaki Maunga is helping researchers better understand how windborne moths migrate from Australia to New Zealand. As part of a broader research programme focused on long-distance insect dispersal, the team has been monitoring moths in the region to study the atmospheric conditions that enable these journeys. Moth surveys use light traps to attract and identify larger moth species (macro-moths), distinguishing between native and exotic arrivals. The research is being carried out with the support of iwi and a Department of Conservation permit.

By December 2024, researchers had intercepted 546 macro-moths, releasing 340 of them back to the forest after identification. With help from the iNaturalist citizen science platform, 62 species have been identified – about 20% of the North Island’s known macro-moth diversity. Noteworthy finds include the green marked owlet, grey-brown cutworm, and two carpet moths previously only found in the South Island.

Only one exotic species, the Australian pug moth, was identified.

Light trap to attract insects

Another significant observation was the greasy cutworm, a species thought to have established in New Zealand via windborne migration from Australia. Historical records support this, with past detections on offshore platforms during strong westerlies. It is also evidence of how airborne arrivals continue to shape our biodiversity.

Understanding how fungal pathogens survive long-distance travel through the atmosphere is key to predicting future incursions. Researchers are studying the survival of poplar rust spores during transit, focusing on how environmental factors especially UV radiation, temperature and humidity affect their viability. Using a custom-built machine to simulate airborne conditions, the team has found that high UV exposure reduces spore germination. This research will help build survival curves and simulate past journeys of fungal pathogens such as poplar rust and myrtle rust and offer new insights into how these pests reach and establish in New Zealand.

New methods for detecting windborne pests are also being trialled offshore, providing exciting opportunities to strengthen air surveillance. Workers on offshore oil and gas platforms will carry out high-volume air sampling during key wind events that form part of long distance migrations between Australia and New Zealand. The platforms will be equipped with passive flight intercept traps, and sweep nets will be used when insects are present. Samples containing microbes from the air will be subjected to molecular analyses to identify which species were present on the wind. Onshore, complementary methods such as light traps, fall armyworm sticky traps and air microbe samplers are being deployed to detect arrivals and support early warning systems. Together, these tools provide a more comprehensive surveillance network for identifying and responding to aerial pest incursions.

The research project's latest newsletter is on scionresearch.com

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