The Domaine de Vassal vine collection near Montpellier holds 2,300 different grape varieties.

VITICULTURE

Grapevine gene bank under threat

Scientists raise concerns about relocation of premier French research vineyard dubbed the 'Louvre of vines'.

BY DECLAN BUTLER

Uncertainty hangs over one of the world's largest and most important grapevine collections. The Domaine de Vassal vineyard, on France's Mediterranean coast, houses a vast sweep of grape biodiversity that is essential to research and winegrowers in France and around the world.

The 138-year-old collection, managed by the French National Institute for Agricultural Research (INRA), has been threatened with eviction, prompting a decision to relocate it.

That is raising concerns among scientists and winegrowers, because money to pay for the prospective move — costing an estimated €4 million (US\$5.4 million) — has yet to be found. Even then, the sheer logistical complexity is such that relocation is likely to take years to complete, says INRA, and means that much of its research may be put on hold.

Dubbed the 'Louvre of grapevines' by the local press, the vineyard near Marseillan, southwest of Montpellier, contains thousands of unique grape varieties. As well as having a conservation role in preserving genetic diversity, the collection is used for research and for breeding qualities such as flavour, colour, adaptation to specific regions and pathogen resistance. Several hundred samples from the

Domaine de Vassal are used annually, mainly by other French labs, but also internationally.

"The collection is of utmost value to the international grapevine genetics community," says Carole Meredith, an emeritus geneticist at the University of California, Davis. "Although many countries have established collections of their own heritage grape varieties, the Vassal collection is among the oldest and best curated."

Meredith notes that much of her own research would have been "impossible" without this "living library". Her lab's previous studies of the vineyard's specimens revealed Chardonnay's somewhat undistinguished heritage — one of its parent varieties is a noble Pinot, but the other is a Gouais, a grape long shunned as mediocre (J. Bowers *et al. Science* **285**, 1562–1565; 1999).

The collection was started in 1876 by French researchers in response to a pest outbreak that saw the near-destruction of Europe's vineyards. The outbreak was caused by accidental introduction of phylloxera — an aphid that infests roots and kills the vine.

The vineyard was initially located near Montpellier, but moved to the Domaine de Vassal in 1949, where it expanded greatly. It now houses some 7,500 accessions from 47 countries, representing 2,300 different grape varieties, including wild species, rootstocks, hybrids and mutants.

But negotiations with the vineyard's

landowner, wine company Domaines Listel in Sète, near Montpellier, have broken down over the renewal of the 30-year lease on the 27-hectare site. In 2011, Domaines Listel issued an eviction notice; in 2012, INRA took the dispute to the agricultural land tribunal in Béziers, which is scheduled to hear the case this June.

Yves Barsalou, president of Domaines Listel, says that the company remains "open to all discussions" to find a solution that allows INRA to remain at the nearshore site.

In December, INRA announced its intention to relocate the collection, probably to a site alongside Pech Rouge, an INRA viticulture and oenology research station in Gruissan, about 70 kilometres southwest of Domaine de Vassal.

Olivier Le Gall, INRA's deputy director-general in charge of scientific affairs, says that the agency is "extremely committed" to preserving the collection, and is likely to have to find most of the moving costs itself. Other possible funding sources, he says, may include the French Vine and Wine Institute in Grau de Roi, which does applied viticulture and wine research.

The relocation, which should get under way this year, will be technically complex, says Jean-Michel Boursiquot, a vine taxonomist at Domaine de Vassal. Many specimens were collected as urgent rescue cases and carry diseases, but are protected from full-blown infections at the Domaine de Vassal because they are grown in beach sand. The sand shields against root infestations of phylloxera and nematode worms that can spread devastating viral vine diseases.

INRA has decided against a similar nearshore location for the vineyard, fearing that rising sea levels caused by climate change would make the site vulnerable to high salinity and flooding, says Boursiquot. At Pech Rouge, the plants will grow on higher ground in limestone soils. This will leave diseased plants susceptible to root infestations, so INRA intends to render the collection disease-free, a laborious process that involves repeated culturing and then propagating each plant until it is without pathogens. "It's an enormous job, which to our knowledge has never been done on such a scale," says Boursiquot. He thinks that this cleaning process — equating to half the move costs — will take 5–10 years.

Mark Thomas, a grapevine researcher at the Commonwealth Scientific and Industrial Research Organisation's Waite campus in Urrbrae, Australia, says that the Domaine de Vassal is one of the few grapevine germplasm collections to have been extensively characterized genetically, using DNA fingerprinting. This makes it an international reference source, and allows researchers to explore the genetic relationships between varieties, and their origins.

"This foundation of information is of great use for those around the world seeking to breed improved grape varieties," adds Bruce Reisch, who develops such new strains at Cornell University's research station in Geneva, New York. "It's extremely important that this collection be preserved well into the future." ■

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