O.65 - Evolution and adaptation of Magnaporthe grisea populations in upland rice in Madagascar

Andriantsimialona, R.D., Tharreau, D.

In Vakinankaratra , where irrigated rice has been cultivated for several hundred years, blast damages increased heavily in the newly developed upland rice. Using epidemiological records, pathogen population genetic data, and pathogenicity test, we studied blast pathogen colonization of the new upland agrosystem. Genotyping with microsattelite markers, showed a significant differentiation between upland and irrigated isolates. Comparison of populations from 3 irrigated valleys (Antsirabe, Manandona, Mangalaza) showed the first two having no differentiation while Mangalaza showed slight differentiation with the two others. That is probably due to selection by the host since Mangalaza had more diversified varieties than the 2 first locations. There is no differentiation between the early isolates causing leaf blast and those causing neck blast In upland agrosystem, differentiation was observed in Mangalaza between 2004 and 2005, and in Andranomanelatra between 2005 and 2006 isolates. Differentiation from one season to the next could be observed during the study for upland isolates. However for each location, ie in Mangalaza, in Manandona and in Antsirabe, differentiation could not be observed between the 2004 and 2005 irrigated isolates. The 99 isolates selected from different branches of the genetic dendrogram formed two distinct groups according to their pathogenicity. The first group brings together irrigated isolates. They have narrow virulence spectrum, ie they could not attack most of the upland cultivars. Even irrigated isolates collected from geographically distant areas like Antananarivo, Lac Alaotra or Vakinankaratra exhibited narrow virulence spectrum. The second gathers upland isolates of Vakinankaratra region. They have a broader virulence spectrum than the irrigated ones. Among the upland isolates, those collected in 2001 showed narrower virulence spectrum than isolates collected in 2005 or 2006, suggesting that the virulence spectrum enlarged with time. Such increase of virulence was observed during surveys.The genotypic and pathotypic structure of populations for the blast fungus in the Vakinankaratra region of Madagascar suggests local adaptation of isolates from irrigated agrosystem to upland agrosystem. In the absence of recombination, and because of short distance migrations, selection for an increased virulence spectrum to attack upland cultivars led to differentiation between populations from the two rice agrosystems and also led to a specialized pathogen population highly virulent to the widely cultivated varieties in this new upland rice agrosystem.