ADAPTINCROPS

Investigating adaptive introgression in African crops

ABSTRACT

In the coming years, global agriculture is likely to be severely weakened by climate change. This is especially true for semi-arid regions such as sub-Saharan Africa. From a sustainable development perspective, the valorisation of genetic resources at the level of both species and local varieties seems to be a solution for the future.

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Project leader : Cecile Berthouly-Salazar
Project leader's institution : IRD
Project leader's RU : DIADE

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Total budget allocated (including co-financing) : 180000 €
Funding : Labex

GOAL

The ADAPTINCROPS project aims to identify wild genes in three plants traditionally cultivated in sub-Saharan Africa: millet, yam and fonio. Wild relatives often evolve in more extreme environmental conditions than cultivated species. The wild genes present in cultivated species may therefore represent a significant adaptive potential that could be exploited in the light of future climate change.

ACTION

MIL:
We used genomic data from 31 wild and 190 cultivated millets:
a 'unique' diversity exists in millet in the western and eastern Sahel, resulting from gene flow between wild and cultivated populations in these regions.
Of the 93 and 39 regions identified under selection in cultivated millet in the West and East Sahel, 13 and 5 regions respectively appear to be introgressions from wild to cultivated.
Socio-anthropological surveys of farmers show recognition of different forms. Hybrid or wild forms can be used or eliminated, and practices vary according to the village. Nevertheless, the evolution of agricultural practices (dissemination of improved varieties, pastoralism) could in the future strongly influence the flows between wild and cultivated.

IGNAME :
We analysed 167 yam accessions including the two wild relatives:
we validated the existence of significant gene flow between cultivated and wild yams suggesting the possibility of adaptive introgressions from wild to cultivated

FONIO:
During the study we were able to validate its status as a recent tetraploid and self-pollinating species. Looking at the chloroplast genome, the cultivated genome seems to be genetically closer to the wild fonio from East Africa. Analysis of the nuclear genome shows very little genetic differentiation between cultivated and wild fonio making it difficult to detect introgression.

PERSPECTIVES

Wild relatives therefore play a significant role in the current diversity of varieties. This role is likely to change as agricultural practices evolve.
The evidence of adaptive introgressions raises new questions about their specific role in adaptive processes, e.g. are they favoured in response to rapid changes or over longer time steps?