

## Africans demand biotechnology help now

**B**iotecnology is not just about genetically-modified organisms (GMOs). And biotechnology is not just a tool for scientists to play around with; it is the hope of many African farmers for a future free from the apparently never-ending struggle against low yields and consequent poverty.

Rice grower Abdoulaye Daou made that clear when he attended the inaugural workshop for the USAID-sponsored project on marker-assisted selection (MAS).

Mr Daou, who farms in the Office du Niger in Mali, says he and his fellow growers are counting on scientific research to find solutions to the rice yellow mottle virus infection, known colloquially as ‘Riz SIDA’ (Rice AIDS), which can cause up to a total loss of their crops. “The solution proposed by research will allow the diminution of the incidence of this disease even if it is still present.”

Four West African countries have been selected for the MAS project. Symptoms of RYMV were seen in several of the four participating countries as early as 1980, well before confirmation came through on what was causing the losses and devastation in some crops. WARDA responded in the late 1990s by sending genetic material known to have resistance for testing in badly-hit countries such as Guinea where local scientists evaluated 165 potential lines and eventually selected 10 varieties producing yields of between 2-4 t/ha despite the presence of RYMV or blast.

Mr Jorge Oliveira of USAID says that investment in new technologies is one of the key areas which USAID wants to grow sustainably. “Biotechnology is of particular interest, not just because of genetic transformation, but also because of the molecular techniques for which new legislation is not necessary,” he adds.

RYMV is unique to Africa and in irrigated rice, in particular, it is responsible for 90% of all yield losses. Resistant lines have been obtained through backcrossing but marker-assisted selection is a biotechnological tool that can speed up the process of pyramiding useful genes into elite rice varieties to improve their disease resistance.

The MAS project led by WARDA’s Dr Marie-Noëlle Ndjiondjop training plant breeders and NARS technicians involved in breeding programs in Burkina Faso, Guinea, Mali and The Gambia with molecular tools and helping set up new biotechnology labs in each of those countries.



*Africa Rice Center plant pathologist Dr Yacouba Séré monitors RYMV-resistant crosses in an experimental field at Niono, Mali.*



*Thanks to the MAS project, biotechnology laboratories will be established in four countries in West Africa.*

The population structure of RYMV in each country will be characterized and two elite varieties of rice have been chosen by each country so that the resulting resistant varieties are tailored to conditions specific to each country's rice ecology. Participatory varietal selection (PVS) will be used to introduce improved and resistant varieties to farmers in each country so they can contribute to the final selection of the most appropriate varieties for their fields. The use of parent varieties already familiar to growers should assist in gaining their acceptance of similar varieties with the benefit of resistance to RYMV.

However, Dr Ndjiondjop explains that a key legacy of this three-year project will be the establishment of molecular biology laboratories and trained staff who can work across many different crop plants. As well as training NARS staff and farmers in PVS techniques, the project is supporting several PhD students from West Africa to undertake their research studies in biotechnology. Without the support available under the project, it is highly unlikely that these students would be able to complete their theses in the near future. In the words of one student, the project is allowing him to fulfill a dream of becoming a biotechnology specialist. "Completing my thesis will give me the required research skills. It will help me make a contribution to universal knowledge in general and particularly to Africa, a less developed continent, since there is no true development without research."

While key scientists in each country are working with WARDA as designated partners within the project, an open invitation has been extended to other interested scientists to collaborate with the project where there is crossover between their research and the project workplan.

WARDA pathologist Dr Yacouba Séré explains that several pathogen variants and some isolates are capable of overcoming the recessive resistance gene *rymv1*, partial multigene resistance and, depending on the concentration of the virus, even transgenic resistance.

*For some African crops, it is not lack of water that is the major constraint but the presence of indigenous and sometimes unique biotic stresses such as RYMV in rice.*



However, Dr Ndjondjop points out the resistance breaking is highly dependent on the amount of virus inoculated and on the mode of transmission. Only 5% of isolates (3 of 58) induced symptoms in the resistant cultivar Gigante compared to the 30-50% of isolates that induced symptoms in the partially resistant cultivars, and some lines with natural resistance still showed only weak mottling six weeks after inoculation compared to the stunting/necrosis observed with transgenic resistance four weeks after inoculation. This suggests that the lines with natural resistance can still be used in future breeding programs.

As well as developing varieties with genetic resistance with the help of marker-assisted technology, integrated methods of control will be needed to obtain best results in the presence of virus. Varietal resistance will have to be reinforced with cultural practices such as the destruction of infected field residues, control of insect vectors, removal and destruction of infected plants.

More research is also needed into understanding virus spread in the field, alongside the characterization of the pathogen variants, before it can be safely claimed that new plant material with durable resistance is winning the struggle against RYMV.

*Scientists from all four countries participating in the USAID-funded project on marker-assisted selection joined WARDA staff and USAID experts for a preliminary workshop in Bamako.*

