



Biotechnology Research and Policy Activities of ABSP In Kenya

1991-2002



The Agricultural Biotechnology Support Project

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Screening for insect resistance in Kenyan maize

Kenya Agricultural Research Institute (KARI), Kenya
CIMMYT, Kenya

1997-2000

Project Goals

1. To collect local and exotic maize germplasm for use in screening for resistance to Lepidopterous stemborers
2. To elucidate the genetic basis of host plant resistance against *Busseola fusca* and *Chilo partellus* by use of artificial infestation
3. To develop a heterotic population with adequate levels of resistance to stemborers

Lepidopterous stemborers constitute the most widely distributed and serious group of insects attacking maize in Kenya. About 23 stemborer species have been recorded. Amongst them, the most common stemborers are in the spotted stemborer family (SSB), including *Chilo partellus*, *C. orichalcillielus* and *Eldana sacharina*, Walker. In the *Noctuodae* family are the maize stemborer (MSB) *Busseola fusca* Fuller and *Sesamia calamists* (pink stemborer).

Many strategies to reduce losses due to stemborers, estimated at 23-53%, have been practiced. These include chemical pesticides, cultural and other management practices, including early planting. However, chemical control is not very effective and development of maize varieties with host plant resistance (HPR) is generally considered the most cost-effective method for controlling insect damage in a sustainable agricultural systems. Development of multigenic resistance to stem borer was the main goal of this study.

Project Impacts

Since 1997, 51 local and exotic lines have been collected and planted during the long rainy season. In addition, lines have been obtained from CIMMYT and Cape Town. Of the lines screened for resistance to infestation by *Busseola* and *Chilo*, only two inbred lines showed good tolerance against both *Chilo* and *Busseola* infestation.

In 1998, new sources of resistance were examined in 127 maize lines planted at the Embu main station. Two inbred lines showed acceptable tolerance to both SSB and MSB under artificial infestation.

In 1999, 28 maize accession lines were evaluated. Six lines showed high tolerance to *Busseola* and *Chilo*, while other lines showed moderate tolerance. Days to flowering were not affected.

Data suggest that most of the materials tested could be selected for foliar damage tolerance mainly due to the decrease in tunnel length – a tolerance attribute. Continued work in collaboration with CIMMYT and support from other donors will elucidate the genetic basis of the tolerance.

Development of insect and virus resistance in sweetpotato

Monsanto Co., USA

Michigan State University, USA

Kenya Agriculture Research Institute (KARI), Kenya

Central Research Institute for Food Crops (CRIFC), Indonesia

International Service for the Acquisition of Agri-Biotech Applications (ISAAA), USA

International Potato Center (CIP), Peru

1992-2000

Project Goal

In Kenya the most important root and tuber crops are potato, cassava and sweetpotato, which is the most widely distributed, and as elsewhere in Africa, sweetpotato is mainly grown by women small-scale farmers. Despite the importance of sweetpotato for smallholder farmers in Kenya, there are serious production problems facing the crop, including pests and diseases and inadequate quantities of good quality planting materials. The major pests include sweetpotato weevils and vertebrate pests. Sweetpotato virus disease (SPVD) is the most important disease of sweet potato in Africa, infected plants yielding less than 50% compared to virus free plants. SPVD is caused by a dual infection with sweetpotato chlorotic stunt virus (SPCSV) and sweet potato feathery mottle virus (SPFMV). SPCSV is transmitted semi-persistently by the whitefly *Bemisia tabaci* and SPFMV is transmitted non-persistently by aphids. Many of the important early maturing and high yielding sweetpotato varieties are highly susceptible to this virus. The overall goal of the project was to develop transformed Kenyan sweetpotato varieties with resistance to Sweetpotato Feathery Mottle Virus (SPFMV) in collaboration with Monsanto, and to transfer the improved varieties to Kenya.

Specific project objectives included the following:

- i. To develop suitable assay systems for virus challenge and protection of coat protein gene transformed sweetpotato,
- ii. To train KARI scientists and technical staff in all aspects of technology development, biosafety evaluation and Intellectual Property Rights (IPR),
- iii. To prepare biosafety application and evaluation structures to enhance the transfer and field evaluation of transgenic sweetpotato in Kenya, and
- iv. To improve production of sweetpotato in Kenya through tissue culture.

Project Impacts

- ▶▶ One sweetpotato variety was successfully transformed using the SPFMV coat protein gene and has shown good levels of virus resistance in laboratory and glasshouse trials.
- ▶▶ Regulatory approvals for the field-testing of the sweet potatoes were developed and passed by the national Biosafety Committee. The transgenic sweet potatoes were one of the first products to be reviewed by the Kenyan National Biosafety Committee.
- ▶▶ Field trials were planted in late 2000.

- ▶▶ Several Kenyan scientists were trained in tissue culture techniques and in transformation technologies
- ▶▶ Kenyans researchers and policy makers were trained in the area of IPR and biosafety.
- ▶▶ Kenyan research capacity was improved, and facilities for laboratory/glasshouse and field biosafety containment were developed and/or upgraded.

This informal arrangement involving ABSP illustrates an example of research and policy collaboration, between Monsanto and the Kenyan Agricultural Research Institute (KARI). Monsanto donated the technology royalty-free for use in sweet potatoes in Africa, effectively removing any intellectual property constraints to transferring the technology to Kenya. ABSP had identified Kenya as a focus country for Africa and identified sweet potato as an important crop for both Kenya and Indonesia. ABSP also supplied Monsanto with information about technology transfer to developing countries. In the process, ABSP supported a postdoctoral researcher at Monsanto and short-term visits of Kenyan and Indonesian scientists to Monsanto. It also funded a biosafety consultant to assist Kenyan scientists in developing a proposal for review by the Kenyan Biosafety Committee and USAID's Biosafety Committee and supported a direct subagreement with KARI to assist in in-country capacity development and technology transfer. At the end of the initial grant, Monsanto continued to support the project from its own resources and from funds provided by several other organizations. ABSP also provided support and training in the setting up of 'mock' field trials in preparation for the actual trials. These biosafety capacity building activities of ABSP and other organizations, including the International Service for the Acquisition of Agri-biotech Applications (ISAAA) have contributed substantially to Kenya's leading position in sub-Saharan Africa in moving forward in the application of biotechnology.

Kenya Biosafety

Activities

➤➤ Biosafety Internship Program: Guidelines Development, MSU, May-July 1993.

ABSP organized an eight week internship program in the US with the goal of assisting collaborating countries in the development of biosafety guidelines that would allow them to exchange and test biotechnology products. Seven scientists from Egypt, Kenya and Indonesia participated in the ABSP Biosafety Intern Program, May-June 1993. The Indonesian scientists then participated in a *hands-on* biosafety training program at ICI Seeds, Iowa, while the Egyptian and Kenyan Scientists participated in a program at Michigan State University. The scientists then reconvened in Washington DC where they had the opportunity to interact with federal personnel at USDA/APHIS, FDA and EPA responsible for various aspects of biosafety.

➤➤ Biosafety Workshop at AGERI, Egypt, January 1994.

The goal of this workshop was to create a greater awareness and strengthen the biosafety regulatory framework in Egypt and the Middle East. The workshop involved international experts on in biosafety, and scientists and regulatory personnel from Egypt and selected countries in Africa. The workshop addressed policy, risk assessment and field-testing issues surrounding the management and safe handling of transgenic plants. The proceedings were published [*Biosafety/Intellectual Property Rights Project Evaluation, Proceedings from the AGERI & ABSP Workshop Series January 24 - 31, 1994, Cairo, Egypt.*]

➤➤ Development of Biotechnology Initiative with ASARECA, East and Central Africa, 1999-2000.

ABSP has entered into a formal, contractual collaboration with the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). As part of the process to develop a regional initiative in biotechnology and biosafety, ASARECA established a working group (WG) to examine issues and pragmatic approaches for integration of biotechnology through the existing regional networks and for the expansion of regional biosafety regulatory policy development.

➤➤ ABSP Technical Support. In order to assist ASARECA, ABSP will provide technical support to the WG throughout the planning process. This will ensure that the WG members have access to international expertise in agricultural biotechnology and biosafety.

➤➤ Biotechnology Inventory. As part of the technical support process, ABSP has developed *An Inventory of Agricultural Biotechnology for the Eastern and Central Africa Region*. The draft report highlights the current status of biotechnology applied to crops within ASARECA networks in order to give the working group an indication of the future potential of biotechnology tools for the improvement of crops that are important to Africa.

Impacts

Kenya received less financial support for policy and research efforts compared to Egypt and Indonesia, primarily because USAID/Nairobi did not commit additional funds to the program. However, USAID/Africa Bureau did provide a small amount of additional funding for research and policy efforts that assisted the ABSP in providing training and support to Kenya for biosafety regulatory development. Even so, Kenya has made significant progress in the development of its regulatory system. Kenya has:

➤➤ Instituted a National Biosafety Committee in 1996.

The Kenyan NBC began implementation of biosafety review processes in 1997.

➤➤ **Field-tested transgenic sweet potatoes in early 2001.**

This is the first field test of a transgenic crop developed in collaboration with the public sector in Sub-Saharan Africa (excluding South Africa).

Kenya IPR/Technology Transfer

Activities

➤➤ **Intellectual Property/Patent Internship Program, Stanford University, April 1993.**

An IPR internship program was designed and implemented by Professor John Barton of Stanford Law School from April 1-30, 1993. Seven interns from Egypt, Kenya and Indonesia participated in the program, the goal of which was to provide hands-on experience to legal and scientific personnel from developing countries in various issues related to intellectual property rights. In addition the internship enhanced communication between those involved in the sciences and those with responsibilities in the legal issues surrounding biotechnology. The program encouraged the assessment of current intellectual property structures within the participants' home countries, provided access to literature and expertise regarding IPR in both the public and private sectors.

➤➤ **IPR Workshop, Washington DC, July 1994.**

ABSP sponsored this workshop in Washington DC from July 11-14, 1994 as a follow up to the Egypt workshop. Forty-four participants attended from Egypt, Kenya, Indonesia and Costa Rica, Thailand, Sri Lanka as well as a number of institutions and agencies such as USAID and the World Bank. The purpose of the workshop was to present intellectual property rights in biotechnology as an important issue to institutions and individuals. Proceedings of this workshop were published: *Intellectual Property Rights, Proceedings from the ABSP Workshop Series July 11 - 14, 1994, Washington, D.C.*

➤➤ **East Africa IPR Workshop, Uganda, 1999.**

ABSP held a workshop on *The Impact of Intellectual Property Rights on International Trade and Agriculture in East Africa* in Kampala, Uganda from January 18-20, 1999. The Ugandan Council for Science and Technology (UNCST) assisted ABSP in the local organization of the workshop. Additional funds for the support of regional participants to attend the meeting were obtained from the Technical Center for Agricultural and Rural Cooperation (CTA, Netherlands), the Rockefeller foundation and Monsanto. Over 70 participants attended the workshop from Ethiopia, Kenya, Nigeria, Tanzania, Uganda, Zambia, Zimbabwe, Switzerland, United Kingdom, France, United States, Costa Rica, South Africa, and the Netherlands.

Impacts

Kenya has also received support in IPR and Technology Management, primarily through support of Kenyan scientists to the MSU IPR course. Impacts include:

➤➤ **Development of trained staff within the Kenyan Plant Breeders' Rights Registration Office (PBRR)**

➤➤ **The Plant Breeder's Rights Registration Office (PBRO) was established in 1997 and has received over 300 applications, of which 15 have been provisionally granted. Three-quarters of the applications are in cut flowers, but a few are on local varieties of crops.**