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AFLATOXIN-RESISTANT MAIZE LINES DEVELOPED THROUGH A U.S. - AFRICA COLLABORATION ARE RELEASED TO THE PUBLIC

Aflatoxins are toxic and highly carcinogenic secondary metabolites produced by fungi, *Aspergillus flavus* and *A. parasiticus*. They pose serious health hazards to humans and domestic animals because of their frequent contamination of agricultural commodities, such as cottonseed, peanuts, tree nuts and, of course, maize. Due to these potential hazards, aflatoxin levels in food and feed are regulated by a large number of nations worldwide; in the U.S., aflatoxin levels are regulated by the FDA. Towards controlling this problem, six maize inbred lines bred and selected for resistance to aflatoxin contamination, have been released to the public (Journal of Plant Registrations 2:246-250, 2008) and will be available for testing in the U.S. by late 2009. They are already being used as parents to accelerate breeding efforts aimed at minimizing contamination in West and Central African national programs.

These maize lines are the product of a research collaboration between the Southern Regional Research Center (SRRC) of the Agricultural Research Service - USDA in New Orleans and the International Institute of Tropical Agriculture (IITA), a CGIAR institute, in Ibadan, Nigeria. Principal investigators on the project are Dr. Abebe Menkir, a maize geneticist with IITA and Dr. Robert L. Brown, a plant pathologist with ARS. The U.S. - Africa project is an attempt to use an international collaboration to attack a worldwide problem.

The collaboration began in 1998 when Dr. Menkir sent a number of maize lines to SRRC which had been selected in West and Central Africa for moderate to high resistance to maize ear rot under conditions of severe natural infection. At SRRC, several of these lines were determined to be potentially resistant by the laboratory-based kernel screening assay (KSA). A formal collaboration was then established with the objectives of: 1) breeding aflatoxin-resistant inbreds in commercially useful agronomic backgrounds from crosses between U.S. resistant and African resistant maize lines (heretofore U.S. lines were in poor agronomic backgrounds and displaying less resistance than desired); and 2) developing markers that will assist breeders in transferring this resistance to desirable backgrounds using marker-assisted breeding strategies.

The project was originally funded by competitive grants from the USDA-Foreign Agricultural Service, and later by an ARS-USAID collaborative grant and a USAID linkage grant. In Nigeria, initial crosses were made which generated two populations: one with a 50% tropical background and the second with a 75% temperate background. Materials were then selfed and selected based on resistance to various foliar diseases and ear rots and on agronomic traits. Starting at the S4 generation, seed were sent to SRRC for KSA determination of aflatoxin levels. KSA results along with field results in Nigeria determined which breeding materials would be selfed and carried forth to the next generation.

Aside from resistance to aflatoxin accumulation, the six new lines can be useful to breeders in that they have acceptable yield potential, good husk cover, desirable plant and ear aspect scores, and good levels of resistance to ear rot, southern corn leaf blight, and southern corn rust. These lines involve parents of both tropical and temperate origin and are likely to contain new combinations of complimentary alleles imparting resistance to aflatoxin contamination. More lines are being generated through this project with expected releases over the next few years. Also, genetic traits in these lines are being investigated as to their potential as breeding markers through the use of comparative proteomics and microarray analysis of near-isogenic lines generated through the project. It is hoped that this U.S. - Africa collaboration will exert a profound and positive impact on a serious global problem.

Dr. Robert L. Brown
Research Plant Pathologist
USDA-ARS-SRRC
1100 Robert E. Lee Blvd.
New Orleans, LA 70124
E-mail: robert.brown@ars.usda.gov

NEW PROJECT ON IPM FOR CASHEW IN AFRICA

Sponsored by the German Federal Ministry for Economic Cooperation and Development (BMZ), a new project to develop and implement IPM technologies in Benin and Tanzania was officially launched at the International Center for

Insect Physiology and Ecology *icipe* at Nairobi, Kenya, on April 15, 2009.

In the opening speech, Dr. Finan (representing the DG of *icipe* Prof. Borgemeister) noted that cashew is one of the most important export commodities in Africa, supporting the livelihoods of more than 5 million households and worth over US$400 million annually. The share of cashew production from Africa crashed from 70% in 1970 to 17% in 1990 due to a combination of biological, agronomic and socio-economic factors. Initiatives by several governmental and non-governmental agencies to improved crop management, processing and marketing efforts and other favorable policies has partly revived this crop in Africa, but still far behind its global competitors.

Among the biological constraints, damage by mirid bugs (*Helopeltis schoutedeni* and *H. anachardii*), coconut bug (*Pseudotheraptus wayi*) and powdery mildew (PMD) (*Oidium anacardii*) can lead to 70-100% yield losses depending on the variety, location and season. In Benin, in addition to the mirid pests, a complex of stem borers also severely hampers production and greatly reduces the income of smallholder farmers. The most frequently used control options by the growers are large-scale application of chemical pesticides often at doses beyond the recommended rate with obvious ecological consequences. Hence there is an urgent need to develop ecologically sustainable and economically viable integrated pest management (IPM) for these key pests and diseases on cashew to increase production for income generation and improvement of livelihood. Policy constraints also impede cashew production and marketing in Africa and are crucial for successful trading.

icipe in close collaboration with IITA, Georg-August-University of Göttingen, and NARS in Tanzania and Benin (see below picture of workshop participants) therefore propose to develop, validate and implement sustainable cashew IPM technologies that minimizes the use of hazardous pesticides and enhances productivity and quality of cashew apple and nuts. Strategic research will focus on understanding the bio-ecology of the key insect pest complex and their natural enemies in diverse habitats and landscapes. Potential natural biological control agents will be identified and methods for conservation and augmentation of such natural enemies will be developed. Strategies that minimize or eliminate negative use of excessive sulphur dust for disease management based on eco-friendly alternatives will be pursued and the effects of such alternatives on the beneficial insects like pollinators, natural enemies and productivity of the crop will be developed and evaluated. This is the first project specifically dealing with pest and diseases of cashew ever developed for Africa. During the three-day inaugural workshop, participants from the different institutions presented an update on the phyotsanitary situation of cashew, and went on discussing details of workplans and budget.

On behalf of the whole team, *icipe* as the project coordinator would like to express its profound gratitude to BMZ for supporting this project.

Dr. Jean Nguya Maniania
Cashew IPM project coordinator
icipe
Duduville, Nairobi, Kenya
E-mail: nmaniania@icipe.org
www.icipe.org

PESTICIDES IN IPM

Views on pesticide use in agriculture are often polarised - between those who think 'crops are drenched with poison' to those who over-promote pesticide use, particularly in developing countries. Similar views exist for alternative 'silver bullets' such as GM crops and bio-pesticides, but these can likewise be called into question. Nor is organic farming the answer if sufficient food is to be produced for an increasing world population. In reality, pesticides often provide a valuable tool in integrated pest management (IPM). Their use is restricted to the dose legally recommended, and by the economic costs and benefits of pesticide use. Overuse can lead to pesticide residue in the crop which can restrict its sale, to human and environmental exposure and to the development of pesticide resistance.

Therefore, like learning to drive a potentially dangerous vehicle like a car, good pesticide application practice requires effective training and clear information on the appropriate equipment and dosage required. Unfortunately in many countries trainers and farmers have not received adequate practical training and gaining information that is needed is not easy: information on a product label is only part of what farmers need. However for those with internet access, there are now web pages which do give some help. Environmental management of pesticides and other agricultural information is available on the EMA web page **http://www.adlib.ac.uk/ema/info.asp** developed at the University of Hertfordshire UK and on pesticide application at **http://www.dropdata.org** - that links with the International Pesticide Application Research Consortium. Other useful international sites are the US EPA site - **http://www.epa.gov/pesticides/**, and the Pesticide Management web page at FAO with additional useful links to different topics related to safe and effective use of agricultural pesticides **http://www.fao.org/agriculture/crops/core-themes/theme/pests/pm/en/**.

Prof. Graham Matthews

IPARC
Imperial College
Ascot. SL5 7PY, UK
E-mail: g.matthews@imperial.ac.uk

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IAPPS Mission: to provide a global forum for the purpose of identifying, evaluating, integrating, and promoting plant protection concepts, technologies, and policies that are economically, environmentally, and socially acceptable.

It seeks to provide a global umbrella for the plant protection sciences to facilitate and promote the application of the Integrated Pest Management (IPM) approach to a the world's crop and forest ecosystems.

Membership Information: IAPPS has four classes of membership (individual, affiliate, associate, and corporate) which are described **here**.

The *IAPPS Newsletter* welcomes news, letters, and other items of interest from individuals and organizations. Address correspondence and information to:

Dr. Manuele Tamo, Editor
IAPPS Newsletter
Biological Control Center for Africa, IITA-Benin
08 B.P. 0932 Tri Postal, Cotonou, Republic of Benin
E-mail: m.tamo@cgiar.org