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CIMMYT Moves Forward on Transgene Detection Issues

CIMMYT is taking a lead role in the CGIAR system in developing protocols that ensure that transgenes (genes introduced into a species through genetic engineering) are not inadvertently introduced into its genebank accessions or breeding materials.

A workshop entitled "Technical Issues Related to Sampling and Detection of Adventitious Transgenic DNA Sequences" was conducted at CIMMYT headquarters in El Batán, Mexico on October 6 and 7, 2003. Prominent scientists from universities, government agencies, and advanced research institutes in Mexico, USA, Canada, and Switzerland participated together with CIMMYT scientists. Their objectives were to review, analyze, and synthesize "state of the art" knowledge and techniques related to sampling and detection of transgenes in wheat and maize, and to identify which methods are most appropriate for meeting CIMMYT's needs in this area.

Specific topics covered were:

- What strategy should CIMMYT use to test for GE traits in seed introductions? In seed shipments? In gene bank accessions?
- What level of transgene incidence should CIMMYT choose for estimating the statistical probability of detection? What sample size should be used? Should this vary between introductions, seed shipments, and gene bank collections?
- What genes should CIMMYT test for?
- What detection techniques should CIMMYT use?
- What monitoring protocol should CIMMYT use?
- Who should do the screening?
- Should CIMMYT adopt different policies for maize and wheat, given the biology of the crops and the transgenes that may be present?

The steadily increasing use of genetically modified crop varieties around the world has strong implications for organizations like CIMMYT that send and receive large numbers of maize and wheat seed samples from trials and genebanks located in other countries. The adoption of GM detection protocols that can screen such large-scale exchanges in a cost efficient and effective manner is a daunting challenge. In September 2002, CIMMYT announced a range of actions it was implementing to better guard against the inadvertent introduction of transgenes into breeding and regeneration materials (see "[The CIMMYT Maize Program and Transgenic Maize](#)"). This latest workshop moves the process forward considerably.

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Key points of the procedures and workshop recommendations include the following:

- Workshop participants concluded that the most appropriate technique to meet CIMMYT's monitoring objectives is the use of immunological tests (ELISA) that are commercially produced and extensively used by the seed industry. Rationale for using this technique includes ease of use, rapid results, inexpensive, portable, usability in regional offices and national programs, and overall sensitivity.
- Workshop participants recommended that tests initially be conducted for the presence of CP4/EPSPS (Roundup Ready™), PAT/BAR which detects a herbicide resistance found in LibertyLink™ and StarLink™ products, *cry1Ab/cry1Ac* found in YieldGard™, Naturegard™ and Knockout™ products, and *cry3Bb1* found in the YieldGard Rootworm™ product. This represents the majority of commercial GM maize products presently in the market. Samples that test positive should be validated using PCR methods. It was also advised that CIMMYT monitor the commercial release of new transgenes in maize and wheat and take decisions on a regular basis whether these new transgenes should be added to the list screened.
- The acceptable adventitious presence of transgenes for commercial grain currently ranges from as high as 5% for Japan to as low as 0.9% for the EU. The working group recommended that CIMMYT consider a conservative level of 0.5%, as is currently being considered in Switzerland for seed. The probability to detect this level of presence depends on sample size available for testing. CIMMYT will strive to have a probability above 99%.
- For its maize genebank, CIMMYT will continue to collect and maintain genetic resources without modifying their genetic structure. It was recommended that all introductions and regenerations introduced into the bank after 1996 (the year commercial transgenic maize was brought into the market) be analyzed for the presence of the transgenes mentioned earlier, based on a bulked sampling at the time of regeneration.
- Workshop participants recommended that CIMMYT screen all maize introductions, regardless of the country of origin, to ensure that transgenes are not inadvertently incorporated into its breeding program.
- Finally, it was recommended that CIMMYT's experiment stations be monitored routinely by planting sentinel plots, taking into consideration the nearest potential pollen sources coming from outside the station and the prevailing wind direction.

The protocol developed during the workshop is being thoroughly reviewed by CIMMYT management. Following necessary revisions and approval, it will be field tested for validity and implemented.