

04 February 2014

**MEMORANDUM CIRCULAR**

No. 02

Series of 2014

**SUBJECT: Enhancing the Insect Resistance Management (IRM) Strategy for *Bt* Corn Targeting Asian Corn Borer (ACB)**

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This Memorandum Circular updates the Insect Resistance Management strategy for *Bt* Corn and takes into account:

1. The expert recommendation of the DA's Insect Resistance Management Advisory Team (IRMAT) for *Bt* corn submitted to Bureau of Plant Industry on 29 July 2013;
2. The regulatory experience of the Department of Agriculture in the implementation of policy directives and procedural guidelines on insect resistance management (IRM) since 2003 to the present, pursuant to the following regulations:
  - a. MC 17s2003 (*Additional Requirements for the IRM Strategy in Bt Corn*),
  - b. MC 08 s2005 (*Strengthening the DA's Science-Based IRM for Bt Corn and Amending MC 17 s2003*),
  - c. MC 01 s2006 (*Procedural Guidelines and Formats for Bt Corn IRM Monitoring*),
  - d. MC 04 s2007 (*Revised Procedural Guidelines and Templates for Bt Corn IRM Monitoring and Reporting*), and
  - e. MC 03 s2012 (*New Directive on IRM in Bt Corn*);
3. New knowledge and recent developments in crop biotechnology and biosafety, including new products, new modes of action, pyramids, seed blends, and better understanding of pest biology, while taking into consideration the Philippine farming systems and the presence of natural refuges in the country's farming landscape;
4. The need to respond to the concerns of the small-scale corn farmers regarding the appropriateness of the 20% refuge requirement.

## I. General Policy on Insect Resistance Management (IRM)

The combined high-dose/refuge strategy constitutes the core of the IRM system prescribed for *Bt* corn in the country and provides the condition by which the number of resistant individuals is maintained at a very low level. The high-dose guarantees not less than 99% mortality of ACB, while the refuge serves as source of *Bt*-susceptible insects that can mate with rare resistant individuals that may emerge from *Bt* corn. Thus, the high-dose plus refuge strategy keeps the rare status of resistant individuals in the field.

## II. High-Dose Component of the IRM Strategy

It is recognized that the deployment of *Bt* insecticidal protein as a whole with different modes of action contributes significantly to the development of a resistance management strategy for the long term.

For transformation events conferring insect resistance which are claimed as high-dose, the following data should be provided:

1. Results of bioassay of 2<sup>nd</sup> instar ACB larvae on *Bt* corn at (a) vegetative stage and (b) using leaf disk assay causing not less than 99% mortality; and
2. Results of the multi-location field trials showing not less than 99% field efficacy based on reduction in ACB tunnels (length and/or number of tunnels) vs. the non-*Bt* control.

## III. Refuge Requirements for *Bt* Corn with Single or Multiple *Bt* insecticidal proteins

### Corn with Single *Bt* Insecticidal Protein

A locally developed simulation model for ACB (Benigno, 2013) showed that the current high-dose single *Bt* insecticidal protein efficacy can be maintained for as long as 20 years with 0.01% alternate host and 0.001 initial proportion of resistant allele for a 10% structured refuge. A reduction in refuge size is compensated by the availability of natural refuges, i.e. non-*Bt* corn hybrids, open pollinated corn varieties, and alternate hosts (crops and weeds) present in the area and surrounding environment. Fallow period and crop rotation also provide a temporal refuge for susceptible insects.

For high-dose *Bt* corn with a single *Bt* insecticidal protein, the required structured refuge is hereby reduced from 20% to 10% which shall be implemented through the bag-in-a-bag (BIB) mode of deployment in all corn-producing regions in the country. The compliance with the BIB refuge requirement will be enhanced through education of corn farmers and compliance monitoring.

## Corn with Multiple *Bt* Insecticidal Proteins

Pyramided products are corn products having multiple *Bt* insecticidal proteins with different modes of action against ACB. The deployment of high-dose pyramided *Bt* corn products (molecular and/or breeding) targeting ACB is one of the ways to delay resistance development, provided that:

1. Each protein provides at least 90% mortality of the target insect and the pyramided product provides at least 99% mortality ; and
2. The proteins expressed in the pyramided product show low potential for cross-resistance indicated by certain parameters such as differences in protein structure and binding sites.

For such high-dose pyramided *Bt* corn products (molecular and/or breeding), the required refuge is 5%, which shall be implemented either through seed blend or as BIB in all corn-producing regions in the country. The option to deploy either through seed blend or BIB for pyramided events shall be implemented with justifications that are based on scientific and technical data.

The BPI shall undertake a technical review upon consultation with IRMAT based on relevant local technical data generated by technology developers in support of the above schemes.

### IV. Implementation of New Refuge Schemes

Implementation of the (a) 90:10 BIB scheme for corn with single *Bt* insecticidal proteins targeting ACB and (b) 95:5 BIB or 95:5 seed blend for *Bt* corn with pyramided *Bt* insecticidal proteins targeting ACB shall take effect in March 2014.

### V. Required Scientific and Technical Data Generated under Local Conditions

The following scientific and technical studies are hereby required to generate local data:

- A. General ACB data
  1. Adult dispersal
  2. Mating behavior
  3. Oviposition behavior
- B. Product-specific data to demonstrate dose/efficacy
  1. Bioassay of 2nd instar ACB larvae on *Bt* corn plant at vegetative stage
  2. Bioassay of 2nd instar ACB larvae on *Bt* corn using leaf disk
  3. Field efficacy based on reduction in ACB tunnels (length and number of tunnels) vs. the non-*Bt* control

4. Evidence that each protein provides at least 90% mortality of the target insect and the pyramided product provides at least 99% mortality ; and
  5. Evidence that the proteins expressed in the pyramided product show low potential for cross-resistance indicated by certain parameters such as differences in protein structure and binding sites.
- C. Required data to support seed blending for pyramids
1. Basic studies on larval movement (instar, rate, distance)
  2. Movement and survival
    - a. ACB production on refuge plant (block vs blend)
    - b. ACB survival in *Bt* plants after movement from refuge plants

Except for the product-specific data referred to in items B and C.2 above, which are to be generated by technology developers, the above-mentioned studies shall be a collaborative undertaking of all technology developers concerned. Moreover, technology developers are not prevented from generating additional data deemed relevant to IRM. Proposals for the required studies shall be submitted to BPI for review and approval.

Non-compliance resulting from failure to submit the required data for 90:10 and 95:5 schemes as specified above within 2 years shall require the developers to implement the 80:20 BIB scheme.

## VI. Monitoring Requirements

The BPI shall continue with its general function of conducting compliance monitoring by random checks of seed lots to monitor implementation of the IRM strategy. Any non-compliance will be appropriately dealt with by BPI.

The BPI-BCT-Post Approval Monitoring Group and DA regional counterparts shall conduct random field inspection to verify the submitted adoption report. The technology developers are responsible for strict farmer compliance with these requirements. When non-compliance by an individual farmer has been verified by technology developer and BPI, the concerned technology developer shall conduct dedicated training to the non-compliant farmer and submit report to BPI accordingly.

Monitoring of adoption rates per season shall continue in order to identify high-risk areas of possible ACB resistance development. Likewise, monitoring for resistance development in ACB against each approved transformation event, including (a) annual susceptibility monitoring with bioassay and (b) field scouting in sentinel sites, shall be implemented by each technology developer. Monitoring and adoption data shall be submitted to BPI every end of March and August for dry and wet seasons, respectively.

Non-compliance shall be subject to sanctions deemed appropriate by the BPI.

#### VII. Role of Technology Developers

To facilitate the effective implementation of the IRM strategy, the technology developers shall have primary responsibility over the following functions:

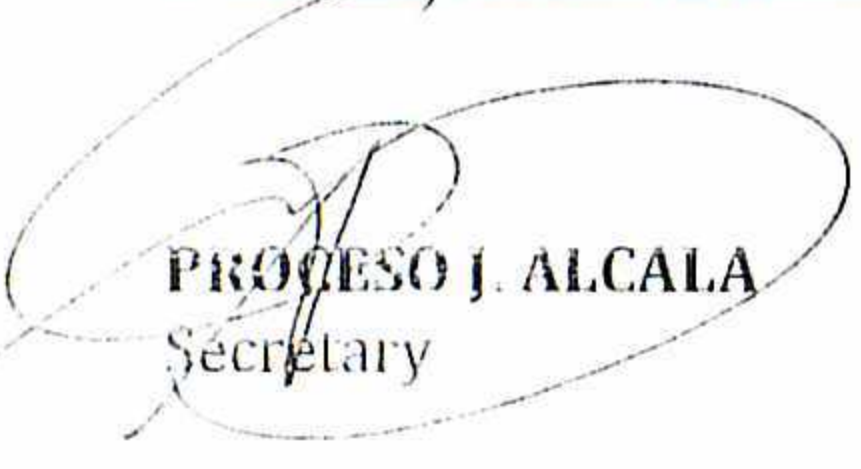
1. Conduct seminars, trainings, briefings and other IRM awareness and educational activities for farmers and other relevant stakeholders. Technology developer shall provide stakeholders materials for IRM, technical bulletin for the specific *Bt* product and instruction on how to monitor and report unexpected damage and/or control failure.
2. Collaborate with BPI and DA-Regional Field Offices, other DA relevant agencies and other local government units such as the Municipal Agricultural Office (MAO) where appropriate, for the conduct of IRM information, education and communication activities of farmers and relevant stakeholders or provide resource speakers during annual government meetings or conferences.
3. Conduct a nationwide survey every two years by scientific sampling on farmer knowledge, attitudes and practices on *Bt* corn farming to monitor compliance with IRM. The plan and design on the survey must be approved by BPI.
4. For future *Bt* corn events for propagation, submit to BPI its proposed IRM plan that shall be specific for each product based on this general policy on IRM. The IRM plan shall be supported by scientific information to help BPI and IRMAT evaluate the proposal.

#### VIII. Role of Bureau of Plant Industry (BPI) and DA-Regional Field Offices (RFOs)

The BPI and DA-Regional Field Offices shall play an active role in coordination and monitoring the various aspects of IRM implementation as embodied in this Circular.

#### IX. Effectivity

This Memorandum Circular shall take effect immediately.

  
**PROCESO J. ALCALA**  
Secretary

DEPARTMENT OF AGRICULTURE  
  
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