Bacillus thuringiensis Cry3Bb1 Protein and the Genetic Material Necessary for its Production (Vector ZMIR13L) in Event MON 863 Corn & Bacillus thuringiensis Cry1Ab Delta-Endotoxin and the Genetic Material Necessary for its Production in Corn (006430, 006484) Fact Sheet

I. Description of the Plant-Incorporated Protectant (PIP)

- **Pesticide Names:**

  Bacillus thuringiensis Cry3Bb1 Protein and the Genetic Material Necessary for its Production (Vector ZMIR13L) in Event MON 863 Corn Bacillus thuringiensis Cry1Ab Delta-Endotoxin and the Genetic Material Necessary for its Production in Corn

- **EPA Registration Number:** 524-545

- **Date Registered:** October 31, 2003

- **Trade and Other Names:** YieldGard® Plus Corn

- **OPP Chemical Codes:** 006484 and 006430

- **Basic Manufacturer:**

  Monsanto Company
  800 N. Lindbergh Blvd.
  St. Louis, MO 63167

- **Type of Pesticide:** Plant-Incorporated Protectant

- **Uses:** Field Corn

- **Pests Controlled or Suppressed**: European Corn Borer, Southwestern Corn Borer, Southwestern Cornstalk Borer, Southern Cornstalk Borer, Sugarcane Cornstalk Borer, Corn Earworm, Fall Armyworm, Stalk Borer, Western Corn Rootworm, Northern Corn Rootworm, and Mexican Corn Rootworm

II. Background

EPA has registered a stacked PIP product designed to provide control of two different kinds of insects. A stacked PIP contains separate plant-incorporated protectant active ingredients which target different kinds of pests. In the case of YieldGard® Plus corn, corn produces both the Cry1Ab and Cry3Bb1 proteins and controls leaf and stalk damage from insects such as the European corn borer (a moth) and root damage from corn rootworms (a beetle).

YieldGard® Plus corn was produced by conventional breeding of single PIP trait corn lines MON 810 (YieldGard® Corn Borer) and MON 863 (YieldGard® Rootworm). YieldGard® Plus corn produces proteins derived from a soil bacterium known as Bacillus thuringiensis or Bt. For many years, organic farmers have used Bt powders or sprays to control insects that attack plants. Now scientists can place Bt derived genes into plants, so that the plants can produce proteins thereby protecting the plant from the insect pests.

EPA evaluated data regarding the stacked product and has required non-target invertebrate field studies and Cry protein field degradation studies, as was required for the single PIP trait products from which YieldGard® Plus was bred. This is the first crop genetically engineered to target two different insect groups.

The refuge requirements for YieldGard® Plus combine those requirements already in place for the single PIP trait products MON 810 (YieldGard® Corn Borer and MON 863 (YieldGard® Rootworm) that provide corn borer and rootworm protection. The YieldGard® Plus refuges for corn borer and rootworm can either be combined or separated.

III. Science Assessment

Product characterization data demonstrated that YieldGard® Plus Corn, which resulted from the conventional cross of MON 810 and MON 863, contains the cry1Ab1 and cry3Bb1 genes and that there have been no major alterations or rearrangements in the conventional cross of these two events (lines) for these two gene inserts. The data generated for the Cry1Ab and Cry3Bb1 proteins individually support the food safety determination for the stacked trait corn since the mode of action for these proteins does not suggest an enhanced activity in combination for mammalian species. This lack of synergism is also suggested by the absence of enhanced responses in sensitive target species tested with the combination of Cry1Ab and Cry3Bb1 proteins. Studies were conducted and submitted to test the hypothesis that the Cry1Ab and Cry3Bb1 proteins do not interact when combined in YieldGard® Plus Corn. It was concluded from leaf disk, whole plant and in vitro studies with purified Bt protein that there are no interactive effects on susceptible insect pests when the

Cry1Ab and Cry3Bb1 proteins are combined in YieldGard® Plus Corn. Since combining these proteins in YieldGard® Plus Corn does not change the level of susceptibility of susceptible pests compared to single trait MON 810 and MON 863 corn, it can be concluded that there will not be a difference for non-target insects not susceptible to the Cry1Ab or Cry3Bb1 proteins.

IV. Terms and Conditions of the Registration

EPA Registration Number 524-545

Monsanto is required to do the following as terms and conditions of the registration.

1. The subject registration will automatically expire on midnight July 31, 2006.

2. The subject registration will be limited to the use of a) Bacillus thuringiensis Cry3Bb1 Protein and the Genetic Material Necessary for its Production (Vector ZMIR13L) in MON 863 corn and b) Bacillus thuringiensis Cry1Ab1 Protein and the Genetic Material Necessary for its Production in corn in YieldGard® Plus field corn produced via the conventional breeding of MON 810 and MON 863 corn.

3. Monsanto must submit/cite all data required for registration of their product under FIFRA § 3(c)(5) when the Agency requires registrants of similar products to submit such data.

4. Monsanto must submit production information for this product to the Office of Pesticide Programs for the fiscal year in which this product is conditionally registered, in accordance with FIFRA § 29. The fiscal year begins October 1 and ends September 30. Production information will be submitted to the Agency no later than December 15, following the end of the preceding fiscal year.

5. Monsanto must submit all data required to support the individual plant-incorporated protectants in YieldGard® Corn Borer (MON 810) and YieldGard® Rootworm (MON 863) corn, EPA Registration Nos. 524-489 & 524-528.

6. Monsanto must submit small and large-scale field studies conducted with YieldGard® Plus Corn with appropriate end points and statistical power to verify there are no adverse ecological effects to non-target invertebrate populations. Monsanto must submit annual reports each year of this registration every April 30th, beginning in 2005, provided the registration expiration date is extended.

7. Monsanto must submit field degradation studies evaluating accumulation and persistence of Cry1Ab and Cry3Bb1 from YieldGard® Plus Corn in several different soils in various strata. Representative fields must have been planted with YieldGard® Plus Corn for at least three consecutive years and include both conventional tillage and no-till samples and be harvested under typical agronomic conditions. Sampling must begin after three consecutive years of YieldGard® Plus Corn planting and continue until the limit of detection is reached. Studies should include soils with high levels of a variety of clays. Both ELISA and insect bioassays need to be conducted and compared to determine if Cry1Ab and Cry3Bb1 are accumulating or persisting in soil samples. A protocol is due within 120 days of the date of registration. Planting of YieldGard® Plus Corn for the study must begin in 2004, with sampling beginning after the 2006 growing season. Provided, the registration and tolerance exemption are amended to extend the expiration dates, a final report is due November 15, 2007.

8. Monsanto must do the following Insect Resistance Management Program:

The required IRM program for YieldGard Plus® Bt corn has the following elements:

1. Requirements relating to creation of either common or separate refuges for Cry3Bb1 and Cry1Ab in conjunction with the planting of any acreage of commercial YieldGard Plus® Bt corn;

2. Requirements for the registrant to prepare and require YieldGard Plus® Bt corn users to sign "grower agreements" which impose binding contractual obligations on the grower to comply with the refuge requirements;

3. Requirements for the registrant to develop, implement, and report to EPA on programs to educate growers about IRM requirements;

4. Requirements for the registrant to develop, implement, and report to EPA on programs to evaluate and promote growers' compliance with IRM requirements (the YieldGard Plus® Compliance Assurance Program (CAP) must integrate with the Cry1 and Cry3Bb1 CAPs);

5. Requirements for the registrant to develop, implement, and report to EPA on monitoring programs to evaluate whether there are statistically significant and biologically relevant changes in target insect susceptibility to Cry3Bb1 or Cry1Ab proteins in the target insects;

6. Requirements for the registrant to develop, and if triggered, to implement a "remedial action plan" which would contain measures the registrants would take in the event that any insect resistance was detected as well as to report on activity under the plan to EPA;

7. Submit annual reports on sales(by state and county), IRM grower agreements results, compliance, and educational program on or before January 31st each year beginning in 2005.

a. Refuge Requirements

These refuge requirements do not apply to seed increase/propagation of inbred and hybrid seed corn.

Grower agreements (also known as stewardship agreements) will specify that growers must adhere to the following refuge requirements as described in the grower guide/product use guide and/or in supplements to the grower guide/product use guide.

Corn Belt / Non-Cotton Growing Region Refuge Requirements

For corn grown in the US Corn Belt two options for deployment of the refuge are available to growers.

The first option is planting a common refuge for both corn borers and corn rootworms. The common refuge must be planted with corn hybrids that do not contain Bt technologies for the control of corn rootworms or corn borers. The refuge area must represent at least 20% of the grower's corn acres (i.e. sum of YieldGard Plus acres and refuge acres). It can be planted as a block adjacent to the YieldGard Plus field, perimeter strips, or in-field strips. If perimeter strips are implemented, the strips must be at least 6, and preferably 12 consecutive rows wide. If strips within the YieldGard Plus field are implemented, then at least 6, and preferably 12 consecutive rows should be planted. The common refuge can be treated with a soil-applied or seed-applied insecticide to control rootworm larvae and other soil pests. The refuge can also be treated with a non-Bt foliar insecticide for control of late season pests if pest pressure reaches an economic threshold for damage; however, if rootworm adults are present at the time of foliar applications then the YieldGard Plus field must be treated in a similar manner.

The second option is planting separate refuge areas for corn borers and corn rootworms. The corn borer refuge must be planted with a non-Bt/lepidoteran-protected hybrid, must represent at least 20% of the grower's corn acres (i.e. sum of YieldGard Plus acres and corn borer refuge

acres), and must be planted within ½ mile of the YieldGard Plus field. The corn borer refuge can be treated with a soil-applied or seed-applied insecticide for corn rootworm larval control, or a non-Bt foliar-applied insecticide for corn borer control if pest pressure reaches an economic threshold for damage. The corn rootworm refuge must be planted with a non-Bt/corn rootworm-protected hybrid, but can be planted with Bt corn hybrids that control corn borers. The corn rootworm refuge must represent at least 20% of the grower's corn acres (i.e. sum of YieldGard Plus acres and corn rootworm refuge acres) and can be planted as an adjacent block, perimeter strips, or in-field strips. The corn rootworm refuge can be treated with a soil-applied or seed-applied insecticide to control rootworm larvae and other soil pests. The refuge can also be treated with a non-Bt foliar insecticide for control of late season pests; however, if rootworm adults are present at the time of foliar applications then the YieldGard Plus field must be treated in a similar manner. Growers who fail to comply with the IRM requirements risk losing access to the product.

Cotton Growing Area Refuge Requirements

For YieldGard Plus corn grown in cotton-growing areas the common refuge and separate refuge options are also available, however, the refuge area is larger. Cotton-growing areas include the following states: Alabama, Arkansas, Florida, Georgia, Louisiana, North Carolina, Mississippi, South Carolina, Oklahoma (only the counties of Beckham, Caddo, Comanche, Custer, Greer, Harmon, Jackson, Kay, Kiowa, Tillman, and Washita), Tennessee (only the counties of Carroll, Chester, Crockett, Dyer, Fayette, Franklin, Gibson, Hardeman, Hardin, Haywood, Lake, Lauderdale, Lincoln, Madison, Obion, Rutherford, Shelby, and Tipton), Texas (except the counties of Carson, Dallam, Hansford, Hartley, Hutchinson, Lipscomb, Moore, Ochiltree, Roberts, and Sherman) Virginia (only the counties of Dinwiddie, Franklin City, Greensville, Isle of Wight, Northampton, Southampton, Suffolk City, Surrey, and Sussex), and Missouri (only the counties of Dunkin, New Madrid, Pemiscot, Scott, and Stoddard).

The first option is planting a common refuge for both corn borers and corn rootworms. The common refuge must be planted with corn hybrids that do not contain Bt technologies for the control of corn rootworms or corn borers. The refuge area must represent at least 50% of the grower's corn acres (i.e. sum of YieldGard Plus acres and refuge acres). It can be planted as a block adjacent to the YieldGard Plus field, perimeter strips, or in-field strips. If perimeter strips are implemented, the strips must be at least 6, and

preferably 12 consecutive rows wide. If strips within the YieldGard Plus field are implemented, then at least 6, and preferably 12 consecutive rows should be planted. The common refuge can be treated with a soil-applied or seed-applied insecticide to control rootworm larvae and other soil pests. The refuge can also be treated with a non-Bt foliar insecticide for control of late season pests if pest pressure reaches an economic threshold for damage; however, if rootworm adults are present at the time of foliar applications then the YieldGard Plus field must be treated in a similar manner.

The second option is planting separate refuge areas for corn borers and corn rootworms. The corn borer refuge must be planted with a non-Bt/lepidopteran-protected hybrid, must represent at least 50% of the grower's corn acres (i.e. sum of YieldGard Plus acres and corn borer refuge acres), and must be planted within ½ mile of the YieldGard Plus field. The corn borer refuge can be treated with a soil-applied or seed-applied insecticide for corn rootworm larval control, or a non-Bt foliar-applied insecticide for corn borer control if pest pressure reaches an economic threshold for damage. The corn rootworm refuge must be planted with a non-Bt corn/rootworm-protected hybrid, but can be planted with Bt corn hybrids that control corn borers. The corn rootworm refuge must represent at least 20% of the grower's corn acres (i.e. sum of YieldGard Plus acres and corn rootworm refuge acres) and be planted as an adjacent block, perimeter strips, or in-field strips. The corn rootworm refuge can be treated with a soil-applied or seed-applied insecticide to control rootworm larvae and other soil pests. The refuge can also be treated with a non-Bt foliar insecticide for control of late season pests; however, if rootworm adults are present at the time of foliar applications then the YieldGard Plus field must be treated in a similar manner. Growers who fail to comply with the IRM requirements risk losing access to the product.

b. Grower Agreements

1. Persons purchasing the Bt corn product must sign a grower agreement. The term "grower agreement" refers to any grower purchase contract, license agreement, or similar legal document.

2. The grower agreement and/or specific stewardship documents referenced in the grower agreement must clearly set forth the terms of the current IRM program. By signing the grower agreement, a grower must be contractually bound to comply with the requirements of the IRM program.

3. The registrant must develop a system (equivalent to what is already approved for MON 810, EPA Reg. No. 524-489) which is reasonably likely to assure that persons purchasing the Bt corn product will affirm annually that they are contractually bound to comply with the requirements of the IRM program. The proposed system will be submitted to EPA within 90 days from the date of registration.

4. The registrant must use grower agreements and submit to EPA within 90 days from the date of registration a copy of that agreement and any specific stewardship documents referenced in the grower agreement. If Monsanto wishes to change any part of the grower agreement or any specific stewardship documents referenced in the grower agreement that would affect either the content of the IRM program or the legal enforceability of the provisions of the agreement relating to the IRM program, thirty days prior to implementing a proposed change, the registrant must submit to EPA the text of such changes to ensure that it is consistent with the terms and conditions of the amendment.

5. The registrant must establish a system (equivalent to what is already approved for MON 810, EPA Reg. No. 524-489) which is reasonably likely to assure that persons purchasing the Bt corn sign grower agreement(s), and must provide within 90 days from the date of the registration a written description of that system.

6. The registrant shall maintain records of all Bt corn grower agreements for a period of three years from December 31st of the year in which the agreement was signed.

7. Beginning on January 31, 2005 and annually thereafter, the registrant shall provide EPA with a report showing the number of units of its YieldGard Plus® corn seeds sold or shipped and not returned, and the number of such units that were sold to persons who have signed grower agreements. The report shall cover the time frame of the twelve-month period covering the prior August through July.

8. The registrant must allow a review of the grower agreements and grower agreement records by EPA or by a State pesticide regulatory agency if the State agency can demonstrate that confidential business information, including names, personal information, and grower license number, will be protected.

c. IRM Education and IRM Compliance Monitoring Programs

1. Monsanto must design and implement a comprehensive, ongoing IRM education program designed to convey to YieldGard Plus corn users the importance of complying with the IRM program. The program shall include information encouraging YieldGard Plus corn users to pursue optional elements of the IRM program relating to refuge configuration and proximity to YieldGard Plus corn fields. The education program shall involve the use of multiple media, e.g. face-to-face meetings, mailing written materials, EPA reviewed language on IRM requirements on the bag or bag tag, and electronic communications such as by Internet, radio, or television commercials. Copies of the materials will be provided to EPA for its records. The program shall involve at least one written communication annually to each YieldGard Plus corn user separate from the grower technical guide. The communication shall inform the user of the current IRM requirements. Monsanto shall coordinate its education programs with educational efforts of other registrants and other organizations, such as the National Corn Grower Association and state extension programs.

2. Annually, the registrant shall revise, and expand as necessary, its education program to take into account the information collected through the compliance survey required under paragraph 6] and from other sources. The changes shall address aspects of grower compliance that are not sufficiently high.

3. Beginning January 31, 2005 and annually thereafter, the registrants must provide a report to EPA summarizing the activities carried out under the education program for the prior year and the plans for their education program during the current year. The registrant must either submit a separate report or contribute to the report from the industry working group (ABSTC).

4. The registrant must design and implement an ongoing IRM compliance assurance program designed to evaluate the extent to which growers purchasing its YieldGard® Plus Bt corn product are complying with the IRM program and that takes such actions as are reasonably needed to assure that growers who have not complied with the program either do so in the future or lose their access to the YieldGard® Plus Bt corn product. Monsanto shall ensure that the YieldGard® Plus compliance assurance program (CAP) will be consistent with and integrated with the CAPs for MON 863 and MON 810, EPA Registration Nos. 524-489 and 524-528. The registrant must prepare and submit within 90 days of the date of registration a written description of their compliance assurance program including a summary of the program to be implemented

in the 2004 growing season. Other required features of the program are described in paragraphs 5] - 15] below.

5. The registrant must establish and publicize a "phased compliance approach," i.e., a guidance document that indicates how the registrant will address instances of non-compliance with the terms of the IRM program and general criteria for choosing among options for responding to any non-compliant growers. The options shall include withdrawal of the right to purchase YieldGard Plus corn for an individual grower or for all growers in a specific region. An individual grower found to be significantly out of compliance two years in a row would be denied sales of the product the next year. Similarly, seed dealers who are not fulfilling their obligations to inform/educate growers of their IRM obligations will lose their opportunity to sell YieldGard Plus corn.

6. The IRM compliance assurance program shall include an annual survey of a statistically representative sample of Bt corn growers conducted by an independent third party. The survey shall measure the degree of compliance with the IRM program by growers in different regions of the country and consider the potential impact of non-response. The sample size and geographical resolution may be adjusted annually, based upon input from the independent marketing research firm and academic scientists, to allow analysis of compliance behavior within regions or between regions. The sample size must provide a reasonable sensitivity for comparing results across the U.S.

7. The survey shall be designed to provide an understanding of any difficulties growers encounter in implementing IRM requirements. An analysis of the survey results must include the reasons, extent, and potential biological significance of any implementation deviations.

8. The survey shall be designed to obtain grower feedback on the usefulness of specific educational tools and initiatives.

9. The registrant shall provide a preliminary summary of their findings by November 15 and a final written summary of the results of the prior year's survey (together with a description of the regions, the methodology used, and the supporting data) to EPA by January 31 of each year. The registrant shall confer with EPA on the design and content of the survey prior to its implementation.

10. Annually, the registrant shall revise, and expand as necessary, its compliance assurance program to take into account the information collected through the compliance survey required under paragraphs 6] through 8] and from other sources. The changes shall address aspects of grower compliance that are not sufficiently high. The registrant must confer with the Agency prior to adopting any changes.

11. The registrant shall train its representatives who make on-farm visits with YieldGard Plus corn growers to perform assessments of compliance with IRM requirements. In the event that any of these visits result in the identification of a grower who is not in compliance with the IRM program, the registrant shall take appropriate action, consistent with its "phased compliance approach," to promote compliance.

12. The registrant shall carry out a program for investigating legitimate "tips and complaints" that its growers are not in compliance with the IRM program. Whenever an investigation results in the identification of a grower who is not in compliance with the IRM program, the registrant shall take appropriate action, consistent with its "phased compliance approach."

13. If a grower, who purchases YieldGard Plus corn for planting, was specifically identified as not being in compliance during the previous year, the registrant shall visit with the grower and evaluate whether that the grower is in compliance with the IRM program for the current year.

14. Beginning January 31, 2005 and annually thereafter, Monsanto shall provide a report to EPA summarizing the activities carried out under their compliance assurance program for the prior year and the plans for the compliance assurance program during the current year. The report will include information regarding grower interactions (including, but not limited to, on-farm visits, verified tips and complaints, grower meetings and letters), the extent of non-compliance, corrective measures to address the non-compliance, and any follow-up actions taken.

15. The registrant and the seed corn dealers for the registrant must allow a review of the compliance records by EPA or by a State pesticide regulatory agency if the State agency can demonstrate that confidential business information, including the names, personal information, and grower license number of the growers will be protected.

d. Insect Resistance Monitoring

The Agency is imposing the following conditions for this product:

1. The registrant will monitor for resistance and/or trends in increased tolerance for corn rootworm, European corn borer, Southwestern corn borer, and corn earworm. Sampling should be focused in those areas in which there is the highest risk of resistance development. Monitoring must be carried out under the same protocols used for the individual trait products MON 810 and MON 863, EPA Registration Nos. 524-489 and 524-528.

2. The registrant shall provide to EPA a description of its resistance monitoring plan by January 31, 2005. The description shall include: sampling (number of locations and samples per locations), sampling methodology, bioassay methodology, standardization procedures, detection technique and sensitivity, and the statistical analysis of the probability of detecting resistance.

3. The registrant must follow up on grower, extension specialist or consultant reports of less than expected results or control failures for all pests listed on the label and/or grower guide. The registrant will instruct its customers (growers and seed distributors) to contact them (e.g., via a toll-free customer service number) if incidents of unexpected levels of damage occurs from these target pests. The registrant will investigate all damage reports submitted to the company or the company's representatives. See Remedial Action Plans section below.

4. A report on results of resistance monitoring and investigations of damage reports must be submitted to the Agency annually by April 30th each year for the duration of the conditional registration, beginning in 2005.

e. Remedial Action Plans

A Remedial Action Plan covering both suspected and confirmed resistance for corn rootworm, European corn borer, southwestern corn borer, and corn earworm must be submitted by 1/31/2005. If resistance is confirmed, all acres (YieldGard Plus and refuges) should be treated with insecticides targeted at CRW adults as well as larvae.

Annual Reports:

The registrant will provide annual reports to EPA on its YieldGard Plus PIP expressed in corn based on the following table.

Report	Description	Due Date
Annual Sales	Reported by county and state summed by state	January 31st each year beginning in 2005
Grower Agreement	Number of units of Bt corn seeds shipped or sold and not returned, and the number of such units that were sold to persons who have signed grower agreements	January 31st each year beginning in 2005
Grower Education	Education program completed previous year and plan for next year	January 31st each year beginning in 2005
Proposed Compliance Plan	Written description of Compliance Assurance Program	90 Days of the Date of Registration
Compliance Assurance Plan	Compliance Assurance Program Activities and Results	January 31st each year starting in 2005
Compliance	To include annual survey results and plans for the next year	Preliminary survey report November 15th each year (beginning 2004) and full report January 31st each year thereafter
Insect Resistance Monitoring	Description of the program including sampling (number of locations and samples per locations), sampling methodology, bioassay methodology, standardization procedures, detection technique and sensitivity, and the statistical analysis of the probability of detecting resistance.	January 31, 2005

Additional reports are due as described in the following table:

Report	Description	Due Date
IRM Grower Agreements	Proposed system to assure growers sign grower agreements	90 Days of the Date of Registration
IRM Affirmation	Plan System to assure annual affirmation by growers of their IRM obligations	90 Days of the Date of Registration
Changes to Grower Agreement and/or IRM documents;	Current grower agreement(s) and any specific stewardship documents	At least 30 days before any changes related to IRM are expected to be imposed.
Insect Resistance Monitoring Results	Results of monitoring and investigations of damage reports	April 30th each year, beginning 2005

Additional Contact Information:

Ombudsman, Biopesticides and Pollution Prevention Division (7511P)
Office of Pesticide Programs
Environmental Protection Agency

1200 Pennsylvania Avenue, NW
Washington, D.C. 20460