MONSANTO TECHNICAL PUBLICATIONS

AGRICULTURE AND BIOTECHNOLOGY

2000-2017

(PLUS SELECTED PRE – 2000 PUBLICATIONS)

ABOUT THIS DOCUMENT

Monsanto has pledged to share safety and benefits information related to our products with the scientific community and the public. This compilation is intended to highlight the role that Monsanto scientists play in contributing to the extensive and expanding body of knowledge surrounding agricultural biotechnology. Our research covers a range of topics from early research and development to product safety and impacts. Plant biotechnology products are more extensively studied than any other plant products, which provide equal or greater assurance of the safety of these products compared to conventional plant varieties. Our hope is that the growing knowledge base will help to substantiate and reinforce the safety and important human, animal, and environmental benefits of biotech crops.

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GENERAL

Monsanto scientists are active researchers and share the same commitment to publish original research data and scholarly reviews as their colleagues in public universities and institutions. Monsanto researchers collaborate with leading experts in the public arena to expand the scientific knowledge base. Often these public-private partnerships produce pioneering science and data that lays the foundation for more in-depth discovery and exploration by the broader scientific community. Above all, Monsanto scientists feel a responsibility to publish the supporting data and other information that support the safety and benefits of Monsanto products and biotechnology.

Topics in this section include:

- The benefits and safety of Monsanto products
- Enhancing global food security and nutrition
- Product sustainability
- Regulatory considerations and safety assessments

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RESEARCH AND DEVELOPMENT

Monsanto employees focus on delivering innovative and sustainable products to farmers around the world to provide better harvests, protect from pests and manage weeds and diseases while using fewer inputs. These products get their start in our research and development pipeline, where our researchers look to bring the best seeds to farmers' fields. Our robust pipeline spans more than a dozen crops and technologies in different phases of development. These products find a place in one of six areas within the pipeline- our core platforms of breeding, biotechnology, crop protection and our new platforms of The Climate Corporation, microbials and BioDirect™ Technology.

Monsanto published scientific studies in this section include:

- Research for ongoing product stewardship
- Development of new methodologies for current product improvement
- Basic and discovery research for future products

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FOOD SAFETY

Since their introduction in the 1990s, GM crops have been tested and reviewed more than any other crops in the history of agriculture and have been shown to be as safe as conventional crops. After 30 years of research and assessments, the safety of GM crops is strongly supported by the global scientific community.
In many countries there are multiple regulatory authorities (up to seven in one country) with the responsibility of assessing a particular aspect of safety. In the United States, there can be as many as three agencies involved in reviewing food safety (FDA), crop safety (USDA) and environmental safety (EPA). Thus, GM crops are routinely subjected to review by hundreds of independent risk assessors and scientists across a wide range of disciplines.
A rigorous and comprehensive set of data are generated on every plant biotechnology product. These data are the result of years of extensive field and safety testing and demonstrate that:

- Genetically enhanced crops are nutritionally equivalent and as safe as comparable conventional crops
- The introduced genes and expressed proteins have been extensively investigated and pose no signifcant health or allergy problems
- Animals and non-target organisms were unharmed when expressed proteins were consumed or part of their diet

This section includes research by Monsanto scientists in the areas of compositional equivalence, protein safety, food allergy, and product safety assessment.

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ANIMAL FEED SAFETY

Biotech crops are evaluated for animal feed safety and nutritional value. A broad array of comprehensive broiler, dairy cattle, beef cattle, sheep and swine nutritional performance studies have been conducted using biotech crops. Extensive research demonstrates that animal feeds derived from biotech crops are as safe and nutritious as feeds derived from conventional crops. Farm animal productivity, quality, and meat, milk, and egg products are comparable when animals are fed either biotech or conventional crops.

This section includes a large number of studies that demonstrate the safety and nutritional equivalence of feeds derived from Monsanto biotech crops.

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ENVIRONMENTAL SAFETY

Biotech crops are rigorously tested and assessed prior to commercialization to ensure they can be used safely within an agricultural system. This assessment examines the potential for environmental or ecological risks across a range of diverse geographic and environmental conditions to ensure that any potential risks are insignificant or can be kept to a minimum with appropriate management practices. The GE plant is evaluated with a comparable non-GE conventional plant that is genetically similar but lacks the introduced trait. Specific phenotypic, agronomic, and ecological characteristics are measured in the GE plant and non-GE plant to determine whether the introduction of the trait has resulted in any changes that might cause ecological harm. Specific studies examine altered weed characteristics, susceptibility to pests, and the potential for adverse environmental impact. The breadth of data generated and reviewed by regulatory authorities prior to authorization provides strong evidence that planting of the new GE crop by farmers will not harm the environment.

This section features studies by Monsanto scientists that help to establish the safety of Monsanto biotech crops in agriculture and in society.

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GENERAL IMPACTS

Since GE crops were commercially introduced in 1996, farmers around the world have rapidly adopted the products and realized a broad range of on-the-farm benefits from their application. Extensive field studies demonstrate that GE crops coupled with ecologically sound practices help farmers to make food production more sustainable. GE crops increase productivity, protect biodiversity, reduce the environmental and human health impacts of insecticides and herbicides, facilitate the adoption of no-till and conservation tillage systems with their environmental and ecological benefits, and enable farmers to adapt to the effects of climate change. These efficiencies help farmers of all sizes to grow crops more profitably.

This section includes a number of studies or reviews by Monsanto scientists that reinforce the broader knowledge base contributed by public scientists around the world.

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PRODUCT SPECIFIC IMPACTS

Glyphosate-tolerant (Roundup Ready®) soybean, cotton and corn, and insect-resistant Bollgard® cotton and Yieldgard® corn have provided environmental and socioeconomic benefits in many countries around the world. While these benefits have been documented by public researchers for all biotech cropping systems, this section focuses on the research of Monsanto scientists for specific products, including:

- Facilitating the adoption of no-till or reduced tillage farming practices
- Decreased insecticide usage
- Greater flexibility in farm management and crop production
- Positive impact on the numbers and diversity of beneficial insects
- Savings on time, labor and equipment costs for farmers
- Reducing the amount of fumonisins found in corn
- Increased yields
- Decreasing CO2 emissions from production agriculture

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