GM Crop Database

Database Product Description

TC1507 (DAS-Ø15Ø7-1)

Host Organism *Zea mays* (Maize)

Trade Name Herculex® I

Trait Resistance to European corn borer (*Ostrinia nubilalis*); phosphinothricin (PPT) herbicide tolerance, specifically glufosinate ammonium.

Trait Introduction Microparticle bombardment of plant cells or tissue

Proposed Use Production for human consumption and livestock feed.

Product Developer Mycogen (c/o Dow AgroSciences); Pioneer (c/o Dupont)

Summary of Regulatory Approvals

Country	Food	Feed	Env	Notes
Argentina	2005	2005	2005	
Australia	2003			
Brazil	2008	2008	2008	
Canada	2002	2002	2002	
China	2004	2004		Approval renewed on 20 December 2006, valid until 20 December 2009.
Colombia	2006	2006	2007	
El Salvador	2009	2009		
European Union	2006	2006		
Honduras			2009	
Japan	2002	2002	2002	
Korea	2002	2004		
Malaysia	2013	2013		
Mexico	2003	2003		
Paraguay			2012	
Philippines	2003	2003	2013	
Singapore	2011			
South Africa	2002	2002	2012	
Switzerland		2014		
Taiwan	2003			
United States	2001	2001	2001	
Uruguay	2011	2011	2011	

Introduction

Maize line TC1507 was genetically modified to contain two novel genes, *cry1Fa2* and *pat*, for insect resistance and herbicide tolerance respectively. Both genes were introduced into the parental maize hybrid line Hi-II by particle acceleration (biolistic) transformation.

The *cry1Fa2* gene, isolated from the common soil bacterium *Bacillus thuringiensis* (*Bt*) var. *aizawai*, produces the insect control protein Cry1F, a delta-endotoxin. Cry proteins, of which Cry1F is only one, act by selectively binding to specific sites localized on the lining of the midgut of susceptible insect species. Following binding, pores are formed that disrupt midgut ion flow, causing gut paralysis and eventual death due to bacterial sepsis. Cry1F is lethal only when eaten by the

larvae of lepidopteran insects (moths and butterflies), and its specificity of action is directly attributable to the presence of specific binding sites in the target insects. There are no binding sites for the delta-endotoxins of *B. thuringiensis* on the surface of mammalian intestinal cells, therefore, livestock animals and humans are not susceptible to these proteins.

The Cry1F protein expressed in TC1507 provides protection against European corn borer (ECB), southwestern corn borer (SWCB), fall armyworm (FAW), black cutworm (BCW), and some control of corn earworm (CEW).

In addition to the *cry1Fa2* gene, TC1507 was developed to allow for the use of glufosinate ammonium, the active ingredient in phosphinothricin herbicides (Basta®, Rely®, Liberty®, and Finale®), as a weed control option, and as a breeding tool for selecting plants that have the insect-tolerant *cry1F* gene. Glufosinate chemically resembles the amino acid glutamate and acts to inhibit an enzyme, called glutamine synthetase, which is involved in the synthesis of glutamine. Essentially, glufosinate acts enough like glutamate, the molecule used by glutamine synthetase to make glutamine, that it blocks the enzyme's usual activity. Glutamine synthetase is also involved in ammonia detoxification. The action of glufosinate results in reduced glutamine levels and a corresponding increase in concentrations of ammonia in plant tissues, leading to cell membrane disruption and cessation of photosynthesis resulting in plant withering and death.

Glufosinate tolerance in TC1507 maize is the result of introducing a gene encoding the enzyme phosphinothricin-N-acetyltransferase (PAT) isolated from the common aerobic soil actinomycete, *Streptomyces viridochromogenes*, the same organism from which glufosinate was originally isolated. The PAT enzyme catalyzes the acetylation of phosphinothricin, detoxifying it into an inactive compound.

Summary of Introduced Genetic Elements

Code	Name	Type	Promoter, other	Terminator	Copies	Form
cry1Fa2	cry1F delta-endotoxin	IR	ubiquitin (ubi) ZM (*Zea mays*) promoter and the first exon and intron	3' polyadenylation signal from ORF25 (*Agrobacterium tumefaciens*)	1 functional; 1-2 partial;	Altered coding sequence for optimal expression in plant cells.
pat	phosphinothricin N-acetyltransferase	HT	CaMV 35S	CaMV 35S 3' polyadenylation signal	1 functional;	

Characteristics of *Zea mays* L. (Maize)

Center of Origin	Reproduction	Toxins	Allergenicity
Mesoamerican region, now Mexico and Central America	Cross-pollination via wind-borne pollen is limited, pollen viability is about 30 minutes. Hybridization reported with teosinte species and rarely with members of the genus *Tripsacum*.	No endogenous toxins or significant levels of antinutritional factors.	Although some reported cases of maize allergy, protein(s) responsible have not been identified.

Donor Organism Characteristics

Latin Name	Gene	Pathogenicity
Bacillus thuringiensis var. aizawai	cry1F	While target insects are susceptible to oral doses of *Bt* proteins, no evidence of toxic effects in laboratory mammals or birds.

Latin Name	Gene	Pathogenicity
Streptomyces viridochromogenes	pat	*S. viridochromogenes* is ubiquitous in the soil. It exhibits very slight antimicrobial activity, is inhibited by streptomycin, and there have been no reports of adverse affects on humans, animals, or plants.

Modification Method

Transgenic TC1507 maize was produced by biolistic (microprojectile bombardment) transformation of the hybrid maize line Hi-II (Hi-II is a cross between A188 and B73 inbred lines of maize) with plasmid DNA containing sequences corresponding to a modified (synthetic, less than full-length) form of the *cry1Fa2* gene from *Bacillus thuringiensis* var. *aizawai* strain PS811 and the phosphinothricin N-acetyltransferase (PAT) encoding gene from *Streptomyces viridochromogenes*.

In order to optimize expression of the Cry1F protein, the nucleotide sequence of the *cry1Fa2* gene was modified via *in vitro* mutagenesis to contain plant-preferred codons. Transcription of the *cr1Fa2* gene was directed by the promoter and a 5' untranslated region from the maize ubiquitin (*ubi*) gene including the first exon and intron. The 3' termination/polyadenylation sequences were derived from the *Agrobacterium tumefaciens* open reading frame 25 (ORF25 PolyA). The *ubi* exon and intron included in this construct (PHI8999) have no effect on the structure of the Cry1F product, only on the expression of the gene.

Transcriptional regulation of the *pat* gene was via promter and terminator sequences derived from the 35S transcript of cauliflower mosaic virus (CaMV).

Characteristics of the Modification

The Introduced DNA

Southern blot analysis of genomic DNA isolated from seed of different generations of progeny plants demonstrated that the parental transgenic line, TC1507, contained a single copy of an intact fragment containing both the *cry1Fa2* and *pat* gene constructs with their associated noncoding regulatory regions and a second copy of the *cry1Fa2* coding region lacking the majority of the associated ubiquitin regulatory sequences; and (2) these genetic constructs were stably inherited and cosegregated over four generations of backcrossing.

Genetic Stability of the Introduced Trait

The expression of Cry1F protein in hybrid progeny derived from TC1507 was measured using enzyme linked immunosorbent assay (ELISA). Using a chi square analysis with a 95% confidence interval, a Mendelian ratio of 1:1 was observed for first generation progeny. This pattern of segregation was consistent with the integration of a single functional copy of the *cry1Fa2* gene in the original transformation event.

Expressed Material

Levels of expression of Cry1F protein from TC1507 pollen, grain, and grain-derived feeds were measured using quantitative ELISA or Western immunoblotting, and biological activity was determined using insect bioassays with either tobacco budworm or European corn borer larvae.

Cry1F protein was detectable in whole plants (minus the roots) collected at four weeks prior to pollination and following senescence and in

leaves, pollen, silk, stalk, and mature grain; whereas PAT was only detectable in leaf tissue. Levels of Cry1F protein expressed in TC1507 ranged from an average of 32 ng/mg in pollen to an average of 110.9 ng/mg total protein in leaf tissue and 89.8 ng/mg total protein in grain samples. Western immunoblotting of sodium dodecylsulfate (SDS) polyacrylamide gel electrophoresis (PAGE) separated proteins in trypsinized plant extracts prepared from TC1507 leaf tissue revealed the presence of a 65 kDa moiety corresponding to the trypsin-resistant core of the Cry1F delta-endotoxin.

The amounts of detectable PAT protein in TC1507 leaf tissue ranged up to 40.8 ng/mg total protein but were undetectable in other tissues, such as pollen, silk, stalk, and grain.

Based on a bioassay with the tobacco budworm (*Heliothis virescens*), a target species, purified Cry1F proteins incorporated into test soils biodegraded with a half-life of approximately 3.13 days. This half-life is very comparable with the 4-7 days in published reports for other Cry proteins.

Environmental Safety Considerations

Outcrossing

Since pollen production and viability were unchanged by the genetic modification resulting in TC1507, pollen dispersal by wind and outcropping frequency should be no different than for other maize varieties. Gene exchange between TC1507 maize and other cultivated maize varieties will be similar to that which occurs naturally between cultivated maize varieties at the present time. In Canada and the United States, where there are no plant species closely-related to maize in the wild, the risk of gene flow to other species appears remote. Feral species related to corn, as found within Canada or the United States, cannot be pollinated due to differences in chromosome number, phenology (periodicity or timing of events within an organism’s life cycle as related to climate, *e.g.*, flowering time) and habitat.
Maize (*Zea mays* ssp. mays) freely hybridizes with annual teosinte (*Zea mays* ssp. mexicana) when in close proximity. These wild maize relatives are native to Central America and are not present in Canada and the United States, except for special plantings. Tripsacum, another genus related to Zea, contains sixteen species, of which twelve are native to Mexico and Guatemala. Three species of Tripsacum have been reported in the continental United States: *T. dactyloides, T. floridanum* and *T. lanceolatum*. Of these, *T. dactyloides*, Eastern Gama Grass, is the only species of widespread occurrence and of any agricultural importance. It is commonly grown as a forage grass and has been the subject of some agronomic improvement (*i.e.*, selection and classical breeding). *T. floridanum* is known from southern Florida and *T. lanceolatum* is present in the Mule Mountains of Arizona and possibly southern New Mexico. Even though some Tripsacum species occur in areas where maize is cultivated, gene introgression from maize under natural conditions is highly unlikely, if not impossible. Hybrids of Tripsacum species with *Zea mays* are difficult to obtain outside of the controlled conditions of laboratory and greenhouse. Seed obtained from such crosses are often sterile or progeny have greatly reduced fertility.

Weediness Potential

No competitive advantage was conferred to TC1507 that would render maize weedy or invasive of natural habitats, since none of the reproductive or growth characteristics were modified. Cultivated maize is unlikely to

establish in non-cropped habitats and there have been no reports of maize surviving as a weed. *Zea mays* is not invasive and is a weak competitor with very limited seed dispersal.

Secondary and Non-Target Adverse Effects

The history of use and literature suggest that *Bt* proteins are not toxic to humans, other vertebrates, and beneficial insects.

Maize inbreds and hybrids expressing the Cry1F protein were compared to their non-transformed counterpart for relative abundance of beneficial arthropods, including: lady beetles (*Cycloneda munda* & *Coleomegilla maculata*), predacious Carabids, brown lacewings (Hemerobiidae), green lacewings (*Chrysoperla plorabunda*), minute pirate bugs (*Orius insidiosus*), assassin bugs (Reduviidae), damsel bugs (Nabidae), Ichneumonid and Braconids (parasitic wasps), damselflies and dragonflies, and spiders. Visual counts showed no significant differences between the number of arthropods collected in TC1507 maize and the non-transgenic isolines with two exceptions. There was a significantly greater number of lady beetles in the 1507 line (1.2 per test plant vs. 0.6 per control plant), and significantly more Orius were found in the 1507 line then the non-transgenic line on two of the three sample dates. In summary, these field studies demonstrated that Cry1F had neither a direct nor an indirect effect on the beneficial arthropod populations.

Specific feeding trials were also carried out with a number of non-target species, including honeybee larvae and adults, green lacewing, parasitic hymenopterans, ladybird beetles, daphnia (aquatic invertebrates), earthworm, and collembola (soil dwelling invertebrates). In all cases there were no observable adverse effects.
An additional study was conducted on the effect of Cry1F on neonate monarch butterfly larvae when fed a 10,000 ng/mL diet dose. First instar larval weight and mortality were recorded after seven days of feeding. Although there was some growth inhibition, there was no mortality to monarchs fed the 10,000 ng/mL diet, the highest rate tested. Since pollen doses equivalent to 10,000 ng/mL diet are not likely to occur on milkweed leaves in nature, it can be concluded that Cry1F protein will not pose a risk to monarchs.

Impact on Biodiversity

TC1507 has no novel phenotypic characteristics that would extend its use beyond the current geographic range of maize production. Since the risk of outcrossing with wild relatives in Canada and the United States is remote, it was determined that risk of transferring genetic traits from TC1507 maize to species in unmanaged environments was insignificant.

Other Considerations

In order to prolong the effectiveness of plant-expressed *Bt* toxins, and the microbial spray formulations of these same toxins, regulatory authorities in Canada and United States have required developers to implement specific Insect Resistant Management (IRM) Programs. These programs are mandatory for all transgenic *Bt*-expressing plants, including TC1507 maize, and require that growers plant a certain percentage of their acreage to non-transgenic varieties in order to reduce the potential for selecting *Bt*-resistant insect populations. Details on the specific design and requirements of individual IRM programs are published by the relevant regulatory authority.

Food and/or Feed Safety Considerations

Nutritional Data

Forage and grain from TC1507 maize were analyzed for nutritional composition and compared to the nutritional composition of non-transgenic versions of the same maize hybrids. With respect to forage, there were no significant differences in the respective levels of protein, fat, neutral detergent fibre (NDF), or ash between the transgenic or non-transgenic control lines. The level of acid detergent fibre (ADF) in TC1507 was lower than the control line, but remained within the range of values reported in the scientific literature. Analyses of calcium and phosphorus in forage from TC1507 and the control non-transgenic line were determined to be 0.22 and 0.23 per cent, and 0.25 and 0.24 per cent, respectively.

Grain from TC1507 was found to have similar levels of protein, ADF, NDF and ash as grain from non-transgenic maize hybrids, however, the level of fat was significantly lower. This lower fat content was not considered biologically significant as it was still within the range of values reported for other commercial maize varieties. In examining the fatty acid profile, it was determined that the transgenic line had lower levels of stearic and oleic acid but higher levels of linoleic and linolenic acids than the non-transgenic control. Although differences were noted, they remained within the normal range of variation reported for maize grain. The levels of calcium, phosphorus, copper, iron, magnesium, manganese, and zinc in TC1507 grain were similar to levels measured in grain from the non-transgenic control line. The levels of essential amino acids in TC1507 grain were within the norms reported in the literature. With respect to vitamins, TC1507 had lower levels of vitamin B1 but higher levels of total tocopherols than the non-transgenic control. Although different, these values were within published ranges.

There were no differences in the levels of phytic acid between the transgenic and non-transgenic lines, and the level of trypsin inhibitor in both TC1507 and the non-transgenic control was below the threshold of detection (2000 TIU/g).

Abstract

Maize is grown primarily for its kernel, which is largely refined into products used in a wide range of food, medical, and industrial goods. Only a small amount of whole maize kernel is consumed by humans. Maize oil is extracted from the germ of the maize kernel and maize is also a raw material in the manufacture of starch. A complex refining process converts the majority of this starch into sweeteners, syrups and fermentation products, including ethanol. Refined maize products, sweeteners, starch, and oil are abundant in processed foods such as breakfast cereals, dairy goods, and chewing gum.

In the United States and Canada maize is typically used as animal feed, with roughly 70% of the crop fed to livestock, although an increasing amount is being used for the production of ethanol. The entire maize plant, the kernels, and several refined products such as glutens and steep liquor, are used in animal feeds. Silage made from the whole maize plant makes up 10-12% of the annual corn acreage, and is a major ruminant feedstuff. Livestock that feed on maize include cattle, pigs, poultry, sheep, goats, fish and companion animals.

Industrial uses for maize products include recycled paper, paints, cosmetics, car parts and pharmaceuticals.

The European corn borer (ECB), *Ostrinia nubilalis*, is the most damaging insect pest of maize in the United States and Canada; losses resulting from ECB damage and control costs exceed $1 billion each year. An average of one ECB cavity per maize stalk across an entire field can reduce yield by as much as 5% when caused by first generation larvae, and 2.5% when caused by second generation larvae, with annual yield losses estimated at 5 to 10 %.

Despite consistent losses to ECB, chemical insecticides are utilized on a relatively small acreage (less than 20%). Historically, this reluctance stems from the difficulties in identifying and managing ECB in maize crops: ECB larval damage is hidden, heavy infestations are unpredictable, insecticides are costly, timing of insecticide application is difficult and multiple applications may be required to guarantee ECB control.

Weeds are also a major production problem in maize cultivation. Even a light infestation of weeds can reduce yields by 10 to 15%; severe infestations can reduce yields by 50% or more. Typically, weeds are managed using a combination of cultural (*e.g.*, seed bed preparation, clean seed, variety selection) and chemical controls. Depending on the production area and the prevalent weed species, herbicides may be incorporated into the soil before planting (pre-plant), applied after planting but before emergence (pre-emergence), or applied after the maize plants emerge (post-emergence). Ideally, for maize production, weeds should be controlled for the full season. However, the most critical period for weed control is usually about six to eight weeks after crop emergence, during the 4th to 10th leaf stages. This critical period in the life cycle of maize must be kept weed free in order to prevent yield loss.

The transgenic maize line TC1507 was genetically engineered to resist ECB, Southwestern corn borer, fall armyworm, and black cutworm by producing its own insecticide. Two novel genes, *cry1Fa2* and *pat* were introduced into the maize hybrid line Hi-II using a microprojectile bombardment (biolistic) transformation technique.

The *cry1Fa2* gene, isolated from the common soil bacterium *Bacillus thuringiensis* (*Bt*) var. *aizawai*, produces the insect control protein Cry1F, a delta-endotoxin. Cry proteins, of which Cry1F is only one, act by selectively binding to specific sites localized on the lining of the midgut of susceptible insect species. Following binding, pores are formed that disrupt midgut ion flow, causing gut paralysis and eventual death due to bacterial sepsis. Cry1F is lethal only when eaten by the larvae of lepidopteran insects (moths and butterflies), and its specificity of action is directly attributable to the presence of specific binding sites in the target insects. There are no binding sites for the delta-endotoxins of *B. thuringiensis* on the surface of mammalian intestinal cells, therefore, livestock animals and humans are not susceptible to these proteins.

In addition to the *cry1Fa2* gene, TC1507 was developed to allow for the use of glufosinate ammonium, the active ingredient in phosphinothricin herbicides (Basta®, Rely®, Liberty®, and Finale®), as a weed control option, and as a breeding tool for selecting plants containing the *cry1Fa2* gene. Glufosinate chemically resembles the amino acid glutamate and acts to inhibit an enzyme, called glutamine synthetase, which is involved in the synthesis of glutamine. Essentially, glufosinate acts enough like glutamate, the molecule used by glutamine synthetase to make glutamine, that it blocks the enzyme's usual activity. Glutamine synthetase is also involved in ammonia detoxification. The action of

glufosinate results in reduced glutamine levels and a corresponding increase in concentrations of ammonia in plant tissues, leading to cell membrane disruption and cessation of photosynthesis resulting in plant withering and death.

Glufosinate tolerance in TC1507 maize is the result of introducing a gene encoding the enzyme phosphinothricin-N-acetyltransferase (PAT) isolated from the common aerobic soil actinomycete, *Streptomyces viridochromogenes*, the same organism from which glufosinate was originally isolated. The PAT enzyme catalyzes the acetylation of phosphinothricin, detoxifying it into an inactive compound. The PAT enzyme is not known to have any toxic properties.

Links to Further Information

Canadian Food Inspection Agency, Plant Biosafety Office

Decision Document DD2002-41: Determination of the Safety of Dow AgroSciences Canada Inc. and Pioneer Hi-Bred International's Insect Resistant and Glufosinate - Ammonium Tolerant Corn (Zea mays L.) Line 1507. (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/02-325-001.pdf) [PDF Size: 42.05K bytes]

Comissão Técnica Nacional de Biossegurança - CTNBio (Brazil)

Risk Assessment of Insect Resistant Maize (TC 1507) (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/09-060-001.pdf) [PDF Size: 611.16K bytes]

European Commission

COMMISSION DECISION of 3 March 2006 authorising the placing on the market of food containing, consisting of, or produced from genetically modified maize line 1507 (DAS-Ø15Ø7-1) pursuant to Regulation (EC) No 1829/2003 of the European Parliament and of the Council. (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/06-286-006.pdf) [PDF Size: 50.72K bytes]

European Commission: Community Register of GM Food and Feed

Notification of the placing on the Community Register of DAS-Ø15Ø7-1 (TC1507). (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/06-286-007.pdf) [PDF Size: 11.76K bytes]

European Food Safety Authority

Opinion of the Scientific Panel on Genetically Modified Organisms on an application (reference EFSA-GMO-NL-2004-02) for the placing on the market of insect-tolerant genetically modified maize 1507, for food use, under Regulation (EC) No 1829/2003 from Pioneer Hi-Bred International/Mycogen Seeds (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/06-066-001.pdf) [PDF Size: 132.66K bytes]

Food Standards Australia New Zealand

Draft assessment report, application A446: food derived from insect-protected and glufosinate ammonium-tolerant corn line 1507. (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/03-120-001.pdf)
[PDF Size: 445.24K bytes]
Final Assessment Report: Application A446 - Insect / glufosinate resistant corn line 1507 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/05-246-003.pdf)
[PDF Size: 425.97K bytes]

Impact of Bt corn pollen on monarch butterfly populations: A risk assessment

Mark K. Sears, Richard L. Hellmich, Diane E. Stanley-Horn, Karen S. Oberhauser, John M. Pleasants, Heather R. Mattila, Blair D. Siegfried, and Galen P. Dively (2001). Proc. Natl. Acad. Sci. USA Early Edition (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/articles/pnas-01-261A.pdf)
[PDF Size: 162.67K bytes]

Instituto Colombiano Agropecuario ICA

Resolution 3745 : By which states that the corn with Herculex I® technology, TC 1507 event is suitable for use as pet food in Colombia (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Columbia_fee
[PDF Size: 43.35K bytes]
Resolution 464 : In the cornfields which are authorized to Herculex I technology (TC- 1507) (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Columbia_env
[PDF Size: 19.53K bytes]

Japanese Biosafety Clearing House, Ministry of Environment

Outline of the biological diversity risk assessment report: Type 1 use approval for DAS-Ø15Ø7-1 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/06-291-006.pdf)
[PDF Size: 173.86K bytes]

MINISTRY OF SOCIAL PROTECTION NATIONAL INSTITUTE OF SURVEILLANCE FOOD AND DRUG INVIMA

Act 5 of the October 17, 2006 - section 2 (maize DAS- 01507-1) (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Columbia_foo
[PDF Size: 44.35K bytes]

Malaysian National Biosafety Board (NBB)

APPLICATION FOR APPROVAL FOR IMPORT FOR RELEASE OF PRODUCTS OF TC1507 CORN FOR SUPPLY OR OFFER TO SUPPLY FOR SALE OR PLACING IN THE MARKET NBB REF. NO: JBK(S) 602-1/1/11 (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Malasia_Food

Mexican Health Secretary, Federal Commission for the Protection against Sanitary Risk

Summary Assessment for Corn (Zea mays L.) resistant to lepidopteran insects and tolerant to the herbicide glufosinate ammonium line Bt Cry 1F 1507. OECD identifier : DAS-1507-1 (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Mexico_Food%

Office of Food Biotechnology, Health Canada

NOVEL FOOD INFORMATION– FOOD BIOTECHNOLOGY Cry1F INSECT-RESISTANT/GLUFOSINATE-TOLERANT MAIZE LINE 1507 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/03-062-002.pdf) [PDF Size: 141.53K bytes]

People's Republic of China Ministry of Agriculture System

Agriculture transgenic biological safety evaluation Shen newspaper book Transgenic Bt insect-resistant corn TC1507 Cry1F as the processing of raw materials imports (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_China.pdf) [PDF Size: 4.92M bytes]

Philippines Department of Agriculture, Bureau of Plant Industry

Determination of the Safety of Pioneer Hi-Bred’s And Dow Agro Sciences’ Corn 1507 (Insect resistant, herbicide tolerant Corn) for Direct Use as Food, Feed and For Processing (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/09-131-003.pdf) [PDF Size: 24.67K bytes]

Secretaria de Agricultura, Ganaderia, Pesca y Alimentos: Republica Argentina

Noticias de la SAGPyA: La SAGPyA autorizo el uso de maiz TC1507 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/06-340-005.pdf) [PDF Size: 440.21K bytes]

Swiss Federal Office of Public Health

Information to the Swiss authorities on the potential environmental impact of genetically modified plants in accordance with Annexes IIB and III of Directive 90/220/EEC (August 14, 2001) (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/02-268-012.pdf) [PDF Size: 97.90K bytes]

U.S. Department of Agriculture, Animal and Plant Health Inspection Service

Petition for Determination of Nonregulated Status for Cry1F Insect-Resistant and Glufosinate-Tolerant Maize Line 1507 (CBI-deleted) (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/04-225-004.pdf)

[PDF Size: 3.09M bytes]

US Environmental Protection Agency

Biopesticide Registration Action Document: Bacillus thuringiensis Cry1F Corn. (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/brad_006481.pdf) [PDF Size: 653.67K bytes]

US Food and Drug Administration

Memorandum to file concerning insect resistant and herbicide tolerant maize line 1507 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/bnfM073.pdf) [PDF Size: 87.15K bytes]

USDA-APHIS Environmental Assessment

USDA/APHIS Decision on Mycogen Seeds c/o Dow AgroSciences LLC and Pioneer Hi-Bred International, Inc. Petition 00-136-01P Seeking a Determination of Nonregulated Status for Bt Cry1F Insect Resistant, Glufosinate Tolerant Corn Line 1507 (http://www.cera-gmc.org/files/cera/GmCropDatabase/docs/decdocs/02122001.pdf) [PDF Size: 439.14K bytes]

Uruguay National Biosafety Cabinet

Resolution No. 27 Case No 2009/7/1/1/3823 (TC1507) (http://www.cera-gmc.org/files/cera/GmCropDatabase/decdocs/TC1507/TC1507_maize_Uruguay_cult
[PDF Size: 219.99K bytes]