Notices

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This section of the FEDERAL REGISTER contains documents other than rules or proposed rules that are applicable to the public. Notices of hearings and investigations, committee meetings, agency decisions and rulings, delegations of authority, filing of petitions and applications and agency statements of organization and functions are examples of documents appearing in this section.

DEPARTMENT OF AGRICULTURE

Animal and Plant Health Inspection Service

[Docket No. 96-079-2]

Dekalb Genetics Corp.; Availability of Determination of Nonregulated Status for Genetically Engineered Corn

AGENCY: Animal and Plant Health Inspection Service, USDA.

ACTION: Notice.

SUMMARY: We are advising the public of our determination that the Dekalb Genetics Corporation's corn line designated as DBT418 that has been genetically engineered for lepidopteran insect resistance is no longer considered a regulated article under our regulations governing the introduction of certain genetically engineered organisms. Our determination is based on our evaluation of data submitted by the Dekalb Genetics Corporation in its petition for a determination of nonregulated status, an analysis of other scientific data, and our review of comments received from the public in response to a previous notice announcing our receipt of the Dekalb Genetics Corporation's petition. This notice also announces the availability of our written determination document and its associated environmental assessment and finding of no significant impact.

EFFECTIVE DATE: March 28, 1997.

ADDRESSES: The determination, an environmental assessment and finding of no significant impact, the petition, and all written comments received regarding the petition may be inspected at USDA, room 1141, South Building, 14th Street and Independence Avenue SW., Washington, DC, between 8 a.m. and 4:30 p.m., Monday through Friday, except holidays. Persons wishing to inspect those documents are asked to call in advance of visiting at (202) 690-2817.

FOR FURTHER INFORMATION CONTACT: Dr. Subhash Gupta, Biotechnologist, BSS, PPQ, APHIS, 4700 River Road Unit 147, Riverdale, MD 20737-1236; (301) 734-8761. To obtain a copy of the determination or the environmental assessment and finding of no significant impact, contact Ms. Kay Peterson at (301) 734-4885; e-mail: mkpeterson@aphis.usda.gov.

SUPPLEMENTARY INFORMATION:

Background

On October 17, 1996, the Animal and Plant Health Inspection Service (APHIS) received a petition (APHIS Petition No. 96-291-01p) from the Dekalb Genetics Corporation (Dekalb) of Mystic, CT, seeking a determination that a corn line designated as DBT418 that has been genetically engineered for lepidopteran insect resistance does not present a plant pest risk and, therefore, is not a regulated article under APHIS' regulations in 7 CFR part 340.

On November 27, 1996, APHIS published a notice in the **Federal Register** (61 FR 60257-60258, Docket No. 96-079-1) announcing that the Dekalb petition had been received and was available for public review. The notice also discussed the role of APHIS, the Environmental Protection Agency, and the Food and Drug Administration in regulating the subject corn line and food products derived from it. In the notice, APHIS solicited written comments from the public as to whether this corn line posed a plant pest risk. The comments were to have been received by APHIS on or before January 27, 1997. During the designated 60-day comment period, APHIS received one comment on the subject petition from a university. The comment was favorable to the petition.

Analysis

Corn line DBT418 has been genetically engineered to express a CryIA(c) insect control protein derived from the common soil bacterium *Bacillus thuringiensis* subsp. *kurstaki* (Bt). The petitioner states that the Bt delta-endotoxin protein is effective in controlling the European corn borer throughout the growing season. The subject corn line also expresses the *bar* gene derived from *Streptomyces hygroscopicus* that encodes the enzyme phosphinothricin-N-acetyltransferase (PAT), which, when introduced into the plant cell, confers tolerance to the herbicide glufosinate. The microprojectile bombardment method was used to transfer the added genes into the parental corn line, and their expression is controlled in part by gene sequences from the plant pathogens *Agrobacterium tumefaciens* and cauliflower mosaic virus (CaMV).

The subject corn line has been considered a regulated article under APHIS' regulations in 7 CFR part 340 because it contains gene sequences derived from plant pathogens. However, evaluation of field data reports from field tests of the corn line conducted under APHIS notifications since 1993 indicates that there were no deleterious effects on plants, nontarget organisms, or the environment as a result of the environmental release of corn line DBT418.

Determination

Based on its analysis of the data submitted by Dekalb and a review of other scientific data, comment received, and field tests of the subject corn line, APHIS has determined that corn line DBT418: (1) Exhibits no plant pathogenic properties; (2) is no more likely to become a weed than insect resistant corn lines developed by traditional breeding techniques; (3) is unlikely to increase the weediness potential for any other cultivated or wild species with which it can interbreed; (4) will not cause damage to raw or processed agricultural commodities; (5) will not harm threatened or endangered species or other organisms, such as bees, that are beneficial to agriculture; and (6) should not reduce the ability to control insects in corn or other crops when cultivated. Therefore, APHIS has concluded that the subject corn line and any progeny derived from hybrid crosses with other nontransformed corn varieties will be as safe to grow as corn in traditional breeding programs that are not subject to regulation under 7 CFR part 340.

The effect of this determination is that Dekalb's corn line DBT418 is no longer considered a regulated article under APHIS' regulations in 7 CFR part 340. Therefore, the requirements pertaining to regulated articles under those regulations no longer apply to the field testing, importation, or interstate

movement of the subject corn line or its progeny. However, importation of corn line DBT418 or seeds capable of propagation are still subject to the restrictions found in APHIS' foreign quarantine notices in 7 CFR part 319.

National Environmental Policy Act

An environmental assessment (EA) has been prepared to examine the potential environmental impacts associated with this determination. The EA was prepared in accordance with: (1) The National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq.*), (2) Regulations of the Council on Environmental Quality for implementing the procedural provisions of NEPA (40 CFR parts 1500–1508), (3) USDA regulations implementing NEPA (7 CFR part 1b), and (4) APHIS' NEPA Implementing Procedures (7 CFR part 372). Based on that EA, APHIS has reached a finding of no significant impact (FONSI) with regard to its determination that Dekalb's corn line DBT418 and lines developed from it are no longer regulated articles under its regulations in 7 CFR part 340. Copies of the EA and the FONSI are available upon request from the individual listed under **FOR FURTHER INFORMATION CONTACT.**

Done in Washington, DC, this 3rd day of April 1997.

Terry L. Medley,

Administrator, Animal and Plant Health Inspection Service.

[FR Doc. 97-9066 Filed 4-8-97; 8:45 am]

BILLING CODE 3410-34-P

USDA/APHIS Petition 96-291-01p for Determination of Nonregulated Status for Insect-Protected Corn Line DBT418

Environmental Assessment and Finding of No Significant Impact

March 1997

The Animal and Plant Health Inspection Service (APHIS) of the U. S. Department of Agriculture has prepared an environmental assessment before issuing a determination of nonregulated status for a genetically engineered corn line called DBT418 corn. APHIS received a petition from the Dekalb Genetics Corporation regarding the status of DBT418 corn as a regulated article under APHIS regulations at 7 CFR Part 340. APHIS has conducted an extensive review of the petition, supporting documentation, and other relevant scientific information. Based upon the analysis documented in this environmental assessment, APHIS has reached a finding of no significant impact on the environment from its determination that lepidopteran insect resistant DBT418 corn shall no longer be a regulated article.

Arnold S. Foudin for John Payne

John H. Payne, Ph.D.
Director
Biotechnology and Scientific Services
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
Date: MAR 28 1997

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Registrations of pesticides are under constant review by the U.S. Environmental Protection Agency (EPA). Use only pesticides that bear the EPA registration number and carry the appropriate directions.

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I. SUMMARY

The Animal and Plant Health Inspection Service (APHIS), United States Department of Agriculture (USDA), has prepared an Environmental Assessment (EA) before deciding on the regulatory status of a genetically engineered line of lepidopteran insect resistant corn designated hereafter as DBT418 corn. The developer of DBT418 corn, the Dekalb Genetics Corporation (Dekalb), petitioned APHIS requesting a determination on the regulated status of DBT418 corn. This corn line is currently a regulated article under USDA regulations. Interstate movements, importations, and field tests of DBT418 corn have been conducted under permits issued or notifications acknowledged by APHIS. Dekalb has petitioned APHIS for a determination that DBT418 corn does not present a plant pest risk and should therefore no longer be a regulated article under the APHIS regulations found at 7 CFR Part 340.

The DBT418 corn has been developed in an effort to protect corn plants against the feeding damage of larvae of the European corn borer (*Ostrinia nubilalis* (Hubner)). DBT418 corn is genetically modified to contain four different genes, two of which are expressed in the plant: the *cryIA(c)* gene from *Bacillus thuringiensis* subsp. *kurstaki*, which encodes an insecticidal protein, and the *bar* gene derived from *Streptomyces hygroscopicus*, which encodes a phosphinothricin-N-acetyltransferase (PAT) enzyme. PAT detoxifies glufosinate and thereby confers resistance or tolerance to herbicides based on this active ingredient. A partial protease inhibitor gene (*pinII*) from potato and an ampicillin resistance gene, *β-lactamase* (*bla*) from *Escherichia coli* have also been introduced into the corn line. Protease inhibitors, if produced in sufficient concentrations, have been shown to have insecticidal activity against specific insects (Ryan 1990). Neither the *bla* gene nor the *pinII* gene are expressed in DBT418 corn. The genes were introduced into corn via the particle bombardment technique that results in direct introduction of genes into the plant genome.

In accordance with APHIS procedures for implementing the National Environmental Policy Act (NEPA) (7 CFR Part 372), EAs were not prepared before granting permission for individual DBT418 corn field trials because DBT418 corn met the eligibility criteria under the notification procedure and the trials met the performance standards (7 CFR Part 340.3). This EA addresses issues that are of relevance to the unconfined planting of DBT418 corn, and APHIS concludes the following:

1. DBT418 corn exhibits no plant pathogenic properties. Although DNA from pathogenic organisms were used in their development, these corn plants are not infected by these organisms nor can these plants incite disease in other plants.

2. DBT418 corn is no more likely to become a weed than insect-resistant corn which has been developed by traditional breeding techniques. Corn is not a

Act, (7 U.S.C. 150aa-150jj) as amended, and the Plant Quarantine Act, (7 U.S.C. 151-164a, 166-167) as amended, regulate the introduction (importation, interstate movement, or release into the environment) of certain genetically engineered organisms and products. A genetically engineered organism is considered a regulated article if the donor organism, recipient organism, vector or vector agent used in engineering the organism belongs to one of the taxa listed in the regulation and is also a plant pest, or if there is reason to believe that it is a plant pest. DBT418 corn described in the Dekalb petition has been considered a regulated article because some noncoding DNA regulatory sequences were derived from plant pathogens.

Section 340.6 of the regulations, entitled "Petition Process for Determination of Nonregulated Status", provides that a person may petition the Agency to evaluate submitted data and determine that a particular regulated article does not present a plant pest risk and should no longer be regulated. If APHIS determines that the regulated article is unlikely to pose a greater plant pest risk than the unmodified organism from which it is derived, the Agency can grant the petition in whole or in part. Therefore, APHIS permits or notifications would no longer be required for field testing, importation, or interstate movement of that article or its progeny.

Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) Regulatory Authority. DBT418 corn is also subject to regulation by other agencies. The EPA is responsible for the regulation of pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 136 *et seq.*). FIFRA requires that all pesticides be registered before distribution or sale, unless exempt by EPA regulation. Accordingly, Dekalb has submitted to EPA an application to register the product corn borer-resistant corn containing insecticidal Bt protein II which contains the plant pesticide active ingredient Cry IA(c) delta endotoxin and the genetic material necessary for its production in corn. On July 31, 1996, EPA announced receipt of this application (EPA File Symbol 69575- E) in the Federal Register (61 *FR* 39959). The EPA has not yet announced its final decision on this registration application. Before a product may be registered as a pesticide under FIFRA, it must be shown that when used in accordance with widespread and commonly recognized practices, it will not cause unreasonable adverse effects on the environment.

Under the Federal Food, Drug, and Cosmetic Act (FFDCA) (21 U.S.C. 301 *et seq.*), pesticides added to (or contained in) raw agricultural commodities generally are considered to be unsafe unless a tolerance or exemption from tolerance has been established. Residue tolerances for pesticides are established by EPA under the FFDCA; and the FDA enforces the tolerances set by the EPA. On January 24, 1997, EPA announced receipt of this petition in the Federal Register (62 *FR* 3682). The EPA has not yet announced its decision on this petition.

FDA's policy statement concerning regulation of products derived from new plant varieties, including those genetically engineered, was published in the Federal Register on May 29, 1992, and appears at 57 *FR* 22984-23005.

III. PURPOSE AND NEED

APHIS has prepared this EA before making a determination on the status of DBT418 corn as a regulated article under APHIS regulations. The developer of DBT418 corn, Dekalb Genetics Corporation, submitted a petition to APHIS requesting that APHIS make a determination that DBT418 corn no longer be considered a regulated article under 7 CFR Part 340.

This EA was prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 *et seq.*) and the pursuant implementing regulations published by the Council on Environmental Quality (40 CFR 1500-1508; 7 CFR Part 1b; 7 CFR Part 372).

IV. ALTERNATIVES

A. No Action.

Under the Federal "no action" alternative, APHIS would not come to a determination that DBT418 corn is no longer a regulated article under the regulations at 7 CFR Part 340. Permits or acknowledgement of notifications from APHIS would still be required for introductions of DBT418 corn. APHIS might choose this alternative if there were insufficient evidence to demonstrate the lack of plant pest risk from uncontained cultivation of DBT418 corn.

B. Determination that DBT418 corn is no longer a regulated article.

Under this alternative, DBT418 corn would no longer be a regulated article under the regulations at 7 CFR Part 340. Permits or acknowledgment of notifications from APHIS would no longer be required for introductions of DBT418 corn. A basis for this determination would include a "Finding of No Significant Impact" under the National Environmental Policy Act of 1969 (42 USC 4321 *et seq.*; 40 CFR 1500-1508; 7 CFR Part 1b; 7 CFR Part 372).

V. AFFECTED ENVIRONMENT AND POTENTIAL ENVIRONMENTAL IMPACTS

This EA addresses potential environmental impacts from a determination that DBT418 corn should no longer be considered a regulated article under APHIS regulations at 7 CFR Part 340. This EA considers the genotypic and phenotypic

substantially reduced reproductive capacity which acts as a significant constraint on introgression. Seed from the F_1 hybrids does not disseminate well, and the F_1 hybrids do not produce seed of a quality that farmers find particularly useful for either human or animal consumption. Therefore, in spite of occasional gene flow over historical time, maize and teosinte have maintained separate identities in Mesoamerica for thousands of years, with modern corn being entirely dependent on human intervention for its persistence. During the transformation of cultivated corn from teosinte, corn gained several valuable agronomic traits, but lost the ability to survive in the wild. Furthermore, although corn can produce hybrids with teosinte, teosinte is not present in the U. S. Corn Belt where the risk of introgression is thus zero.

The closest relative to *Zea* is *Tripsacum*, a genus of seven species, three of which occur in the United States (Gould, 1968). *Tripsacum* differs from *Zea* in many respects, including chromosome number (N=9 for *Tripsacum*, N=10 for *Zea*). All species of *Tripsacum* can cross with *Zea*, but only with difficulty, and the resulting hybrids are often sterile (Galinat 1988).

Our analysis of the biology of cultivated lepidopteran insect-resistant corn and its relatives leads us to predict that the environmental impacts of cultivation of DBT418 corn would be no different from such impacts attributable to similar varieties produced by traditional breeding techniques. Non-cultivated varieties of *Zea* sp. have coexisted and co-evolved in the Americas over millennia. Even if DBT418 corn were to be cultivated in agricultural regions around centers of *Zea* diversity, there is no reason to expect impacts from DBT418 corn to be significantly different from those arising from the cultivation of any other variety of insect resistant corn.

International traffic of DBT418 corn would be fully subject to national and regional phytosanitary standards promulgated under the International Plant Protection Convention (IPPC). The IPPC has set a standard for the reciprocal acceptance of phytosanitary certification among the nations that have signed or acceded to the Convention (105 countries as of October 1996). The treaty, administered by a Secretariat housed with the United Nations Food and Agriculture Organization in Rome, came into force on April 3, 1952. It establishes standards to facilitate the safe movement of plant materials across international boundaries. The IPPC has also led to the creation of Regional Plant Protection Organizations such as the North American Plant Protection Organization (NAPPO). Trading partners of the United States will be kept informed of USDA's regulatory decisions through NAPPO and other fora. Mexico possesses many wild *Zea* populations and thus may be concerned with the potential for introgression of genes from domesticated *Zea mays* into these wild populations where such genes may reasonably be expected to have a negative impact. However, Mexico's regulatory process requires a full evaluation of transgenic plants before they can be introduced into their environment.

It should be noted that all the existing national and international regulatory authorities and phytosanitary protocols that currently apply to introductions of new corn varieties internationally will apply to DBT418 corn.

There has been some concern that the *bla* gene may be nonsexually (horizontally) transmitted from transgenic corn to bacteria that cause diseases. But a conference of fourteen scientists and international food policy experts (including representatives of the World Health Organization and the Food and Agricultural Organization) have concurred that the use of the ampicillin marker gene in corn constitutes an insignificant to near zero risk of causing ampicillin resistance complications in either animals or humans (Foundation for Nutritional Advancement, 1996).

C. Potential impacts on nontarget organisms, including beneficial organisms such as bees and earthworms, and threatened or endangered organisms.

Consistent with its statutory authority and requirements under NEPA, APHIS evaluated the potential for DBT418 corn plants and plant products to have damaging or toxic effects directly or indirectly on nontarget organisms. This includes those that are recognized as beneficial to agriculture and to those that are recognized as threatened or endangered in the United States. APHIS also considered potential impacts on other "nontarget" pests (pests other than lepidopteran insects that feed on corn), since such impacts could have an impact on the potential for changes in agricultural practices. Field data reports, and results of field studies and laboratory studies submitted by Dekalb (petition Appendix IV) indicate that no differences were observed for the control of insects other than certain lepidopteran pests. The impact of such effects on agricultural practices will be discussed in the subsequent section.

There is no reason to believe that deleterious effects or significant impacts on nontarget organisms, including beneficial organisms, would result from the *bar* gene introduced into corn line DBT418. The PAT enzyme encoded by the *bar* gene is highly substrate specific, has no homology to known toxins or allergens and has no known insecticidal activity. Furthermore, APHIS analysis of data and literature supporting the nonregulated status of corn line B16, which contains the same *bar* gene construct, did not reveal any nontarget effects associated with the expression of similar levels of PAT in corn tissue (USDA, APHIS, 1995a).

1) Potential impact on beneficial and other nontarget organisms.

APHIS evaluated the results of several studies designed to compare the impact on nontarget organisms of DBT418 corn and CryIA(c) as reported in Section VIII of the petition (Environmental Consequences of the Introduction of DBT418). Data provided with the petition and the scientific literature and our review of data

submitted by the Monsanto Company in support of a determination of nonregulated status for cotton lines engineered to express an engineered *cryIA(c)* gene (USDA/APHIS Petition 94-308-01p, USDA, APHIS, 1995b; Serdy et al., 1994) indicate that DBT418 corn, which expresses a nearly identical CryIA(c) protein, should not have a significant potential to harm organisms beneficial to agricultural ecosystems.

Most of the *B. thuringiensis* subspecies *kurstaki* insecticidal protein toxins, including CryIA(c), have been shown to be very selective for lepidopteran insects (MacInstosh et al., 1990; Aronson et al., 1986; Whitely and Schnepf, 1986; Klausner, 1984: Dulmage, 1981). They bind specifically to the mid-gut of lepidopteran insects (Van Rie et al., 1990; Van Rie et al., 1989; Hofmann et al., 1988a and 1988b: and Wolfersberger et al., 1986). As such, they are not expected to adversely effect other invertebrates and all vertebrate organisms, including non-target birds, mammals and humans, because they would not be expected to contain the receptor protein found in the midgut of target insects. These organisms are also not expected to be affected by the *bar*, *pinII* or *bla* genes, the latter two of which are not expressed in DBT418 plants. Results of studies summarized by Dekalb in the petition (described in more detail in the Determination) further support that no significant nontarget effects are expected as a result of exposure to pollen from DBT418 corn, or as a result of exposure to DBT418 leaf material or CryIA(c) on detritus and soil-dwelling organisms (collembola and earthworms) or birds (quail). Studies cited by Dekalb also support the mammalian safety of the CryIA(c) and PAT protein as determined by acute toxicity tests in mice and digestibility studies using simulated gastric fluid.

2) Potential impact on threatened and endangered arthropods

No endangered or threatened lepidopteran insect, as listed in 50 CFR 17.11 and 17.12, feeds on corn plants.

APHIS concludes that DBT418 corn will not have a significant adverse impact on organisms beneficial to plants or agriculture or other nontarget organisms, and will not affect threatened or endangered species.

D. Potential impacts on agricultural and cultivation practices.

No direct plant pest effects on agricultural and cultivation practices are expected as the result of the use of the DBT418 corn and its progeny. Indirect plant pest effects on agricultural practices such as the potential development of insect populations resistant to Cry IA(c) protein will be addressed by the EPA during the registration of the plant pesticide (please see the Determination for further discussion).

E. DBT418 corn will not cause damage to raw or processed agricultural commodities.

In APHIS' opinion, characteristics of DBT418 corn reveal no difference in any component that could have an indirect plant pest effect on any agricultural commodity.

VI. CONCLUSION

APHIS has evaluated information from the scientific literature as well as data submitted by Dekalb that characterized DBT418 corn. After careful analysis, APHIS has identified no significant impact to the environment from a determination that DBT418 corn should no longer be a regulated article under APHIS regulations at 7 CFR Part 340. That finding is supported by the following conclusions:

1. DBT418 corn exhibits no plant pathogenic properties. Although DNA from pathogenic organisms were used in their development, these corn plants are not infected by these organisms nor can these plants incite disease in other plants.

2. DBT418 corn is no more likely to become a weed than insect-resistant corn which has been developed by traditional breeding techniques. Corn is not a weed, and there is no reason to believe that the introduced genes would enable corn to become a weed pest.

3. Multiple factors ensure that introgression from DBT418 corn into wild plants in the United States and its territories is extremely unlikely. Potential introgression from DBT418 corn into wild relatives is not likely to increase the weediness potential of any resulting progeny nor adversely effect genetic diversity of related plants any more than would introgression from traditional corn hybrids.

4. DBT418 corn is substantially equivalent in composition, quality and other characteristics to nontransgenic corn and should have no adverse impact on raw or processed agricultural commodities.

5. DBT418 corn will not have a significant adverse impact on organisms beneficial to plants or agriculture, or other nontarget organisms, and will not affect threatened or endangered species.

6. Cultivation of DBT418 corn should not reduce the ability to control insects in corn or other crops.

Therefore, APHIS concludes that DBT418 corn will be just as safe to grow as nontransgenic corn that are not subject to regulation under 7 CFR Part 340, and that there should be no significant impact on the human environment if DBT418 corn were no longer a considered a regulated article under its regulations (7 CFR Part 340).

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Determination of Nonregulated Status for Insect-Protected Corn Line DBT418

Petitioner: Dekalb Genetics Corporation, Dekalb, Illinois
Petition Number: 96-291-01p

United States Department of Agriculture
Animal and Plant Health Inspection Service
Biotechnology and Scientific Services
Riverdale, Maryland

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I. SUMMARY

APHIS regulations at 7 CFR Part 340, which were promulgated pursuant to authority granted by the Federal Plant Pest Act (FPPA), (7 U.S.C. 150aa-150jj) as amended, and the Plant Quarantine Act (PQA), (7 U.S.C. 151-164a, 166-167) as amended, regulate the introduction (importation, interstate movement, or release into the environment) of certain genetically engineered organisms and products. An organism is no longer subject to the regulatory requirements of 7 CFR Part 340 when it is demonstrated not to present a plant pest risk. Section 340.6 of the regulations, entitled, "Petition for Determination of Nonregulated Status," provides that a person may petition the agency to evaluate submitted data and determine that a particular regulated article does not present a plant pest risk and should no longer be regulated.

On October 17, 1996, the Animal and Plant Health Inspection Service (APHIS) received a petition from the Dekalb Genetics Corporation requesting a determination that insect resistant corn (hereafter referred to as DBT418 corn) does not pose a plant pest risk and therefore, should no longer be considered a regulated article. On November 27, 1996, APHIS announced receipt of the petition in the *Federal Register* (61 *FR* 60257-60258) and stated that the petition was available for public review. APHIS invited written comments on this proposed action, to be submitted on or before January 27, 1997. Based on a review of scientific data and literature, APHIS has determined that DBT418 corn does not present a plant pest risk and is therefore no longer a regulated article under the regulations found at 7 CFR Part 340. As a result of this determination, oversight by APHIS under 7 CFR Part 340 will no longer be required for field testing, importation, or interstate movement of DBT418 corn or its progeny.

This determination has been made based on an analyses that revealed that DBT418 corn plants: 1) exhibit no plant pathogenic properties, 2) are no more likely to become a weed than genetically engineered insect resistant corn developed by traditional breeding, 3) are unlikely to increase the weediness potential of any other plant with which they can interbreed, 4) are not likely to cause damage to processed agricultural commodities, 5) are unlikely to harm threatened or endangered species and organisms that are beneficial to agriculture, and 6) are unlikely to reduce the ability to control insect pests in corn and other crops. APHIS has also concluded that there is no reason to believe that new corn varieties derived from DBT418 corn progeny will exhibit new plant pest properties; i.e., properties substantially different from any observed for the corn line DBT418 already field tested, or those observed for corn in traditional breeding programs.

DBT418 corn is genetically engineered with a *cryIA(c)* gene that encodes an insecticidal protein produced by the soil bacterium, *Bacillus thuringiensis* subsp. *kurstaki (B.t.k.)*, and a *bar* gene encoding the enzyme phosphinothricin-N-acetyltransferase (PAT) from

the soil bacterium *Streptomyces hygroscopicus* which confers tolerance to glufosinate herbicides. A partial protease inhibitor gene (*pinII*) from potato, and an ampicillin resistance gene *β-lactamase* (*bla*) from *Escherichia coli* have also been introduced into the corn line. The genes were introduced into corn via particle bombardment, a technique that results in direct incorporation of genes into the plant genome. These genes also have accompanying DNA regulatory sequences that modulate their expression. The DNA regulatory sequences were derived from corn and the plant pathogens cauliflower mosaic virus (CaMV) and *Agrobacterium tumefaciens*.

The potential environmental impacts associated with this determination have been examined in accordance with regulations and guidelines implementing the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*; 40 CFR 1500-1508; 7 CFR Part 1b; 7 CFR Part 372). An environmental assessment (EA) was prepared and a Finding of No Significant Impact (FONSI) was reached by APHIS for the determination that DBT418 corn is no longer a regulated article under its regulations at 7 CFR Part 340. This decision does not release DBT418 corn from regulations administered by the Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 136 *et seq.*) and the Federal Food, Drug, and Cosmetic Act (FFDCA) (21 U.S.C. 301 *et seq.*).

The body of this document consists of three parts: (1) background information that provides the legal framework under which APHIS has regulated the field testing, interstate movement, and importation of insect-resistant corn; (2) a summary of, and response to, comments provided to APHIS on its proposed action during the public comment period; and (3) analysis of the key factors relevant to APHIS' decision that insect-resistant corn does not present a plant pest risk.

II. BACKGROUND

A. APHIS Regulatory Authority

APHIS regulations at 7 CFR 340, which were promulgated pursuant to authority granted by the Federal Plant Pest Act (FPPA), (7 U.S.C. 150aa-150jj) as amended, and the Plant Quarantine Act (PQA), (7 U.S.C. 151-164a, 166-167) as amended, regulate the introduction (importation, interstate movement, or release into the environment) of certain genetically engineered organisms and products. Under these regulations, a genetically engineered organism is deemed a regulated article if either the donor organism, recipient organism, vector or vector agent used in engineering the organism belongs to one of the taxa listed in the regulation and is also a plant pest; or if APHIS has reason to believe that the genetically engineered organism presents a plant pest risk. The FPPA gives the U.S. Department of Agriculture (USDA) the authority to regulate plant pests and other articles to prevent direct or indirect injury, disease, or damage to

plants and plant products. In addition, the PQA provides an additional level of protection by enabling USDA to regulate the importation and movement of nursery stock and other plants that may harbor injurious pests.

Before the introduction of a regulated article, a person is required under Section 340.0 of the regulations to either (1) notify APHIS in accordance with Section 340.3 or (2) obtain a permit in accordance with Section 340.4. Introduction under notification (Section 340.3) requires that the introduction meets specified eligibility criteria and performance standards. The eligibility criteria impose limitations on the types of genetic modifications that qualify for notification, and the performance standards impose limitations on how the introduction may be conducted. Under Section 340.4, a permit is granted for a field trial when APHIS has determined that the conduct of the field trial, under the conditions specified by the applicant or stipulated by APHIS, does not pose a plant pest risk.

An organism is not subject to the regulatory requirements of 7 CFR Part 340 when it is demonstrated not to present a plant pest risk. Section 340.6 of the regulations, entitled "Petition for Determination of Nonregulated Status," provides that a person may petition the agency to evaluate submitted data and determine that a particular regulated article does not present a plant pest risk and should no longer be regulated. If the agency determines that the regulated article does not present a risk of introduction or dissemination of a plant pest, the petition will be granted, thereby allowing for unregulated introduction of the article in question. A petition may be granted in whole or in part.

The DBT418 corn has been considered a "regulated article" for field testing under Part 340 of the regulations in part because certain noncoding regulatory sequences were derived from CaMV and *A. tumefaciens*, known plant pests. APHIS believes it prudent to provide assurance before commercialization that organisms such as DBT418 corn, which are derived at least in part from plant pests, do not pose any potential plant pest risk. Such assurance may aid the entry of new plant varieties into commerce or into breeding and development programs. The decision by APHIS that DBT418 corn is no longer a regulated article is based in part on evidence provided by Dekalb concerning the biological properties of DBT418 corn and their similarity to other varieties of corn grown using standard agricultural practices for commercial sale or private use.

The fact that APHIS regulates genetically engineered organisms having plant pest components does not carry with it the presumption that the presence of part of a plant pest makes a whole plant a pest or that the plants or genes are pathogenic (McCammon and Medley, 1990). APHIS' approach to plant pest risk is considerably broader than a narrow definition that encompasses only plant pathogens. Other traits, such as increased weediness, and harmful effects on beneficial organisms, such as earthworms and bees, are clearly subsumed within what is meant by direct or indirect plant pest risk.

In APHIS' regulations at 7 CFR Part 340, a "plant pest" is defined as: "Any living stage (including active and dormant forms) of insects, mites, nematodes, slugs, snails, protozoa, or other invertebrate animals, bacteria, fungi, other parasitic plants or reproductive parts thereof; viruses; or any organisms similar to or allied with any of the foregoing; or any infectious agents or substances, which can directly or indirectly injure or cause disease or damage in or to any plants or parts thereof, or any processed, manufactured, or other products of plants."

A determination that such insect-resistant plants do not present a plant pest risk can be made under this definition, especially when there is evidence that the plants under consideration: 1) exhibit no plant pathogenic properties; 2) are no more likely to become a weed than insect resistant corn developed by traditional breeding; 3) are unlikely to increase the weediness potential of any other cultivated plant; 4) are not likely to cause damage to processed agricultural commodities; 5) are unlikely to harm organisms that are beneficial to agriculture or threatened and endangered species, or to adversely impact the ability to control nontarget insect pests; and 6) are unlikely to reduce the ability to control insects in corn and other crops. Evidence has been presented by Dekalb that bears on these topics. In addition, it should be established that there is no reason to believe that any new corn varieties bred from DBT418 corn will exhibit plant pest properties substantially different from any observed for corn in traditional breeding programs, or as seen in the development of DBT418 corn already field tested.

B. EPA and FDA Regulatory Authority

The corn line DBT418 is currently subject to regulations administered by the EPA and the FDA (described in Section II. C. of the Environmental Assessment) that require registration of pesticides prior to their distribution and sale and establish tolerances for pesticide residues in raw agricultural products. APHIS' decision on the regulatory status of the DBT418 corn under APHIS' regulations at 7 CFR 340, in no way releases this corn and its progeny from EPA and FDA regulatory oversight.

III. COMMENTS

APHIS received only one comment on Dekalb's petition during the designated 60- day comment period. It came from a university scientist, and it supported the petition.

IV. ANALYSIS OF THE PROPERTIES OF DBT418 CORN

A brief discussion of corn biology follows in the next paragraph to help inform the subsequent analysis. This information is expanded in subsequent sections when it is relevant in addressing particular risk assessment issues.

Zea mays Linnaeus, known as maize throughout most of the world, and as corn in the United States, is a large, annual, monoecious grass, that is grown for human consumption, animal feed, silage, vegetable oil, sugar syrups, and other miscellaneous uses. Corn is grown commercially throughout the United States (Jewell, 1989). Corn has been cultivated since the earliest historic times from Peru to central North America. The origin is presumed to be Mexico (Gould, 1968). *Zea* is a genus of the family Gramineae (the grass family) containing four described species: *Z. mays*, cultivated corn and teosinte; *Z. diploperennis*, diploperennial teosinte; *Z. luxurians*; and *Z. perennis*, a perennial teosinte. Annual teosinte and corn are genetically compatible, and in areas of Mexico and Guatemala where they coexist, they have been reported to produce hybrids. Indeed, corn was derived from teosinte (*Zea mays* subsp. *mexicana*), probably more than 8,000 years ago. During the transformation process of teosinte to cultivated corn, the latter gained several valuable agronomic traits that were not expressed in teosinte, but it lost the ability to survive in the wild. Cultivated corn and wild diploid and tetraploid members of *Zea* can be crossed to produce fertile F_1 hybrids. Nonetheless, in the wild, introgressive hybridization currently is limited, in part, by several factors including differences in flowering time, block inheritance, developmental morphology and timing of the reproductive structures, dissemination, and dormancy (Galinat, 1988), although research suggests introgression has occured in the past (Doebley, 1990; Giddings et al., 1990). First-generation hybrids are less fit and show substantially reduced reproductive capacity which acts as a significant constraint on introgression. Seed from the F_1 hybrids does not disseminate well, and they do not produce seed of a quality that farmers find particularly useful for either human or animal consumption. Therefore, in spite of occasional gene flow over historical time, maize and teosinte have maintained separate identities in Mesoamerica for thousands of years, with modern corn being entirely dependent on human intervention for its persistence. Although corn easily crosses with teosinte, teosinte is not present in the U. S. Corn Belt.

The closest generic relative to *Zea* is *Tripsacum*, a genus of seven species, three of which occur in the United States (Gould, 1968). *Tripsacum* differs from corn in many respects, including chromosome number (n=9), in contrast to *Zea* (n=10). All species of *Tripsacum* can cross with *Zea*, but only with difficulty and the resulting hybrids are sterile (Galinat, 1988).

A. The introduced genes, their products, and the added regulatory sequences do not present a plant pest risk in DBT418 corn.

DBT418 corn was obtained by transforming elite inbred corn line AT824, with three plasmids pDPG699, pDPG165, and pDPG320 that together contain the *cryIA(c)*, *bar*, *pinII* and *bla* genes. The *cryIA(c)* gene was cloned from the common soil bacterium *Bacillus thuringiensis* subsp. *kurstaki* (Btk) and it encodes an insecticidal protein. The *bar* gene was cloned from the soil microorganism *Streptomyces hygroscopicus*. It

encodes the enzyme phosphinothricin-N-acetyltransferase (PAT) which inactivates phosphinothricin, the active component in the herbicide glufosinate. Expression of this enzyme allows for selection of transformed plant cells on selective medium, as well as whole-plant tolerance to glufosinate. The *pinII* gene was cloned from potato, and it encodes a protease inhibitor. Protease inhibitors, if produced in sufficient concentrations in plants, have been shown to have insecticidal activity against specific insects due to their ability to inhibit both trypsin and chymotrypsin (Ryan 1990). The β-lactamase (*bla*) gene is from *E. coli*, but it does not express in plant tissues. The genes were introduced into corn via particle bombardment, a technique that results in direct introduction of genes into the plant genome.

Noncoding DNA regulatory sequences were attached to the *cryIA(c)*, *bar*, and *pinII* genes in the plasmids to facilitate their expression in plants. These sequences include some which were derived from plant pathogens; i.e., the constitutive promoter from the 35S transcript of the CaMV and the enhancer element from the octopine synthase (OCS) gene from *A. tumefaciens* both of which act to promote gene transcription, and the 3' untranslated region from the T-DNA transcript number 7 (Tr7) from *A. tumefaciens* which contains transcription termination and polyadenylation sequences. The remaining regulatory regions were derived from plants. These include the maize alcohol dehydrogenase (*adh1*) gene introns I and VI, which promote stability of the transcript, and the potato *pinII* gene 3' sequence which facilitates transcription termination and polyadenylation. Specifically, the regulatory regions were attached as follows for each gene: the *cryIA(c)* gene contruct contains the 35S promoter, OCS double enhancers, *adh1* intron VI, and *pinII* 3' region; the *bar* gene constuct contains the 35S promoter and Tr7 3' region; and the *pinII* gene contruct contains the 35S promoter, *adhI* intron I, native *pinII* 3' region, and Tr7 3' region. Although some of these regulatory regions were derived from plant pathogens, the regulatory sequences cannot cause plant disease by themselves or with the genes that they are designed to regulate.

Southern blot analysis was performed on DBT418 corn DNA using probes for *cryIA(c)*, *bar*, *pinII*, *and bla*. The results indicated that hemizygous DBT418 transgenic lines contain two copies of the *cryIA(c)* gene, two copies of the *bar* gene (one intact and one rearranged), one incomplete, nonfunctional copy of the potato *pinII* gene, and four copies of the *bla* gene. The *bla* gene does not contain the proper DNA sequences to promote its expression in plants. The *bla* gene was present on the plasmid vectors only as a selectable marker for plasmid DNA in the bacterial hosts. Consistent with the Southern blot analysis, western blot analysis of protein submitted in the petition demonstrated that proteinase inhibitor II and β-lactamase expression in leaf, stalk, roots, pollen, and kernels of DBT418 lines was less than the limits of detection of the assays. Enzyme-linked immunosorbent assays (ELISA) and western analysis submitted in the petition confirm that the complete copies of the *cryIA(c)* and *bar* genes are expressed as expected in leaf, stalk, root, kernels, silk, and whole plants, with at least 10-fold higher

protein levels detected in leaf tissue (1198 ng/g dry weight and 1099 µg/g dry weight, respectively for CryIA(c) and PAT proteins). Both proteins were below the limit of detection for each assay in pollen. Neither CryIA(c) nor PAT are associated with disease or injury in plants.

B. Expression of the transgenes in the DBT418 corn will not provide a competitive advantage sufficient to cause these plants to become any more "weedy" than other corn.

APHIS evaluated whether the DBT418 corn is any more likely to become a weed than nontransgenic control corn line AT824. Most definitions of weediness stress the undesirable nature of weeds from the point of view of humans; individual definitions differ in approach and emphasis (Baker, 1965). Baker (1965) defines a plant as a weed if, in any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated). He also described the ideal characteristics of weeds as including the following: discontinuous germination and long-lived seeds; rapid seedling growth; rapid growth to reproductive stage; long continuous seed production; self-compatibility, but not obligatory self-pollination or apomixis; if outcrossing, use of wind or an unspecialized pollinator; high seed number under favorable conditions; high germination rates, and seed production under a wide range of environmental conditions; high tolerance or plasticity of climatic and edaphic variation; special adaptations for dispersal; good competitiveness achieved through, for example, allelochemicals or choking growth; and, if perennial, then exhibiting vigorous vegetative reproduction, brittleness either at the lower nodes or of rhizomes or rootstocks, and having the ability to regenerate from severed rootstocks. Although Baker's characteristics have been criticized by some ecologists as nonpredictive, no more broadly accepted suite of characteristics has been defined by ecologists (Williamson, 1994). In our view, there is no formulation that is clearly superior at this time. Keeler (1989) and Tiedje et al. (1989) have adapted and analyzed Baker's list to develop admittedly imperfect guides to the weediness potential of transgenic plants. Both authors emphasize the importance of looking at the parent plant and the nature of the specific genetic changes. Cultivated corn, particularly the elite inbred line AT824, lacks most of Baker's "weedy" characteristics (Keeler, 1989). Corn is not listed as a common, serious or principal weed or a weed of current or potential importance in the United States or Canada in most weed literature (Holm et al., 1991; Muenscher, 1955; USDA, 1971; Weed Science Society of America, 1992).

Expression of the insect control protein in the DBT418 corn will not likely provide a competitive advantage sufficient to cause these to be any more "weedy" than other corn cultivars. Field data and other data submitted with the petition indicate that DBT418 corn exhibited good control of European corn borer, and provided significant protection from Southwestern corn borer and growth inhibition of corn earworm. However, this

line does not control fall armyworm. None of the characteristics of weeds described by Baker involve resistance or susceptibility to insects, and there is no reason to expect that the protection against insects provided by this new corn line would release it from any constraint that would result in increased weediness.

The *bar* gene provides tolerance to phosphinothricin-based herbicides. L-phosphinothricin (L-PPT) is a structural analogue of glutamate, the substrate of the enzyme glutamine synthetase. L-PPT exerts its herbicidal effect through the inhibition of glutamine synthetase (Bayer et al., 1972). L-PPT is the active ingredient in the commercial herbicide formulations Basta® (Hoechst AG, Germany), Ignite®, Rely®, Liberty® (North America), Finale™ (Hoechst Holland N.V., The Netherlands) and RadicaleX (Imex-Hulst B.V., The Netherlands). The L-PPT in these formulations is synthesized as an ammonium ion salt (common name, glufosinate ammonium [GA]). GA herbicides are used for post-emergence control of many broadleaf and grassy weeds. In the United States, corn that is grown in rotation with soybeans may volunteer on occasion. Volunteers of line DBT418 can be controlled using physical methods or with the use of other herbicides that are not based on GA as the only active ingredient and which are registered for use on the crop, as appropriate.

Since the partial *pinII* gene and the *bla* gene introduced into corn line DBT418 are not expressed in the plant, they are not expected to contribute to the plant's phenotype, including the plant's ability to become a weed.

APHIS considered data and observations provided in the petition on the agronomic performance and disease and insect susceptibility of DBT418 lines evaluated in field tests conducted from 1993 to 1996 in twenty U.S. states. Field data reports and data on agronomic traits (Table VII.2 of the petition), including those traits which might effect the plant's ability to compete or persist as a weed (e.g., seedling vigor, final stand count, percent dropped ears, percent stalk lodged, and percent barren plants) do not indicate that DBT418 lines exhibit traits which would cause them to pose any greater threat as weeds than conventional hybrid corn lines. With regards to weediness potential, APHIS has also considered information submitted in support of a determination of nonregulated status for another glufosinate-tolerant corn line, Dekalb's corn line B16 (USDA/APHIS petition 95-145-01p) (USDA, APHIS, 1995a). B16 was genetically-engineered by Dekalb with the same plasmid, pDPG165, that was used to introduce the *bar* gene in the development of corn line DBT418. Corn line B16 also contains one functional copy of the *bar* gene as well as the *bla* gene, and the PAT protein levels expressed in line B16 leaves are similar to those expressed in leaves of corn line DBT418. As part of its analysis and determination of nonregulated status for corn line B16, APHIS determined that B16 has no significant potential to become a weed.

Based on this analysis, APHIS concludes that, with the exception of resistance to certain lepidopteran insects and tolerance to GA herbicides, DBT418 corn has

agronomic traits similar to those of traditionally bred corn, and it does not exhibit traits that would cause increased weediness.

C. Gene introgression from DBT418 corn into cultivated corn or its sexually compatible relatives should not increase the weediness potential of resulting progeny or impact genetic diversity any more than gene introgression from other traditional corn hybrids.

APHIS evaluated the potential for gene flow from DBT418 corn to other cultivated corn and wild relatives. Then two potential impacts that might result from this sexual transfer of genes were evaluated: first, that the traits from DBT418 corn might cause free-living relatives to become "weedier", and second, that the transfer of genes might cause population changes that would lead to reduced genetic diversity.

The reproductive biology of corn and the distribution and sexual compatibility of its closest relatives was discussed previously (section IV, page 5 of the Determination). While cultivated corn is sexually compatible with and has been shown to form fertile hybrids with teosinte in areas of Mexico and Guatemala where they co-exist, teosinte is not present in the U.S. While hybridization and introgression could occur in Mexico or Guatemala if transgenic corn were to cross with native teosinte, several factors in combination effectively reduce the probability of introgression. Corn and teosinte have maintained separate identities for hundreds of years in Mesoamerica, in spite of occasional introgression (Giddings et al., 1990). Other relatives of corn in the genus *Tripsacum* occur in the U.S., but hybrids with *Zea* are difficult to obtain and are often sterile or have greatly reduced fertility. Furthermore, none of the sexually compatible relatives of corn in the U.S. are considered to be serious, principal, or common weeds in the U.S. (Holm et al., 1991); therefore it is unlikely that introgression of the *bar* gene would have any impact on their populations as they would not be routinely subject to herbicide treatments. Our analysis of the biology of cultivated lepidopteran insect resistant corn and its relatives leads us to predict that the environmental impacts of cultivation of DBT418 corn would be no different from such impacts attributable to similar varieties produced by traditional breeding techniques. Non-cultivated varieties of *Zea* sp. have coexisted and co-evolved in the Americas over millennia. There is no reason to expect impacts from DBT418 corn to be significantly different from those arising from the cultivation of any other variety of insect resistant corn.

Gene introgression into other corn cultivars via cross pollination is possible. If pollen of the DBT418 corn were transferred to any receptive corn stigma within the period of pollen viability, cross-pollination would occur. This potential transfer becomes more unlikely as distance increases from the transgenic plants, and from a practical standpoint becomes increasingly unlikely at a distance much greater than the foundation seed isolation distance of 660 feet. In the U.S., farmers generally purchase hybrid corn seed

for planting from a commercial source. If pollen of DBT418 corn were to fertilize the corn in a farmer's field, this corn will likely be harvested for products or other uses and would not likely be used as seed. Therefore, fertilization of nontransgenic corn by pollen from DBT418 corn grown for sale as food or feed should not result in dissemination of the trait to seed populations used for planting.

Dekalb reported no differences in the flowering of DBT418 corn compared to the nontransgenic control plants. There is no reason to believe that the genetic construct introduced during the transformation event would have any effect on the reproductive biology of the DBT418 corn, unless the insertion event interrupted a genetic locus critical for the normal reproductive function.

Breeder seed is usually derived from self-pollinated seed at the F_8 to F_{10} generation of inbreeding (Wych, 1988). A high degree of self-pollination is ensured by planting well isolated blocks that virtually guarantee natural random sib mating. The minimum isolation distance to obtain foundation seed is one-eighth mile (660 feet) from the nearest potentially contaminating source. Other safeguards, such as natural or physical barriers or pollen donor border rows and differences in flowering dates can further reduce the probability of contamination from unwanted pollen. Fields that have not been recently planted in corn are preferred in order to minimize the appearance of volunteer corn from the previous season. Corn appears as a volunteer in some fields and roadsides, but it never has been able to establish itself outside of cultivation (Gould et al., 1994).

There has been some concern that the *bla* gene may be transmitted horizontally (nonsexually, for example through gene exchange in the food chain) to bacteria that cause diseases. But the general sense among scientists was empathically endorsed by a conference of fourteen scientists and international food policy experts (including representatives of the World Health Organization and the Food and Agricultural Organization) which concurred that the use of the ampicillin marker gene in corn constitutes an insignificant to near zero risk of causing ampicillin resistance complications in either animals or humans (Foundation for Nutritional Advancement, 1996).

D. Use of DBT418 corn should have no more adverse impacts on raw or processed agricultural commodities than the parent corn.

During field testing, the DBT418 corn exhibited the typical agronomic characteristics of the recipient plant, with the exception of the desired phenotype conferred by the *B.t.k.* insect control protein. APHIS examined data provided on the compositional analysis of the grains from transgenic and nontransgenic corn (Tables VII.3 and VII.4 of the petition) and field observation of disease and pest susceptibilities. Based on this

analysis, characteristics of DBT418 corn reveal no differences that could have an indirect plant pest effect on any raw or processed plant commodity.

E. DBT418 corn exhibits no significant potential to either harm organisms beneficial to the agricultural ecosystem, to harm threatened or endangered organisms or to have an adverse impact on the ability to control nontarget insect pests.

Consistent with its statutory authority and requirements under NEPA, APHIS evaluated the potential for DBT418 corn plants and plant products to have damaging or toxic effects directly or indirectly on nontarget organisms. This includes those that are recognized as beneficial to agriculture and those that are recognized as threatened or endangered in the United States. APHIS also considered potential impacts on other "nontarget" pests, since such impacts could have an impact on the potential for changes in agricultural practices. Target pests of the engineered CryIA(c) protein expressed in DBT418 corn lines are lepidopteran pests of corn, particularly the European corn borer. Field data reports, and results of field studies and laboratory studies submitted by Dekalb (petition Appendix IV) indicate that no differences were observed for the control of insects other than certain lepidopteran pests (summarized on page 1 of Appendix IVof the petition). The impact of such effects on agricultural practices will be discussed in the subsequent section.

There is no reason to believe that expression of the *bar* gene in the DBT418 corn plants, which was used as a selectable marker for transformation and to provide tolerance to glufosinate herbicides, would have deleterious effects or significant impacts on nontarget organisms, including beneficial organisms. APHIS analysis of data and literature supporting the nonregulated status of corn line B16, which contains the same *bar* gene construct, did not reveal any nontarget effects associated with the expression of similar levels of PAT in corn tissue (USDA, APHIS, 1995a). There is also no reason to believe that the partial *pinII* or *bla* genes in DBT418 corn would have any impact on non-target organisms since these genes do not encode infectious agents and the genes are not expressed in the plant.

1). Potential impact on beneficial and other nontarget organisms.

APHIS evaluated the results of several studies designed to compare the impact on nontarget organisms of DBT418 corn and CryIA(c) as reported in Section VIII of the petition (Environmental Consequences of the Introduction of DBT418). Data provided with the petition and the scientific literature and our review of data submitted by the Monsanto Company in support of a determination of nonregulated status for cotton lines engineered to express an engineered *cryIA(c)* gene (USDA/APHIS Petition 94-308-01p)(USDA, APHIS, 1995b; Serdy et al., 1994) indicate that DBT418 corn, which

expresses a nearly identical CryIA(c) protein, should not have a significant potential to harm organisms beneficial to agricultural ecosystems.

Most of the *B. thuringiensis* subspecies *kurstaki* insecticidal protein toxins, including CryIA(c), have been shown to be very selective for lepidopteran insects (MacInstosh et al., 1990; Aronson et al., 1986; Whitely and Schnepf, 1986; Klausner, 1984: Dulmage, 1981). They bind specifically to the mid-gut of lepidopteran insects (Van Rie et al., 1990; Van Rie et al., 1989; Hofmann et al., 1988a and 1988b: and Wolfersberger et al., 1986). As such, they are not expected to adversely effect other invertebrates and all vertebrate organisms, including non-target birds, mammals and humans, because they would not be expected to contain the receptor protein found in the midgut of target insects.

Dekalb has referenced extensive literature that indicates that *B.t.k.* proteins have no deleterious effects on beneficial insects. In addition, Monsanto demonstrated the lack of effect of the CryIA(c) protein identical to that produced in their deregulated Bollgard™ cotton on beneficial insects including honey bee larvae and adults, lady beetle, green lacewing, and parasitic wasp. Dekalb notes that the exposure levels in studies referenced by Monsanto greatly exceed any potential exposure to CryIA(c) based on exposure to DBT418 pollen. CryIA(c) protein in pollen from DBT418 corn plants was below the limit of detection for the ELISA assay (6.7 ng/g dry weight). The absence of bioactive levels of the protein in pollen were further confirmed by bioassays on a CryIA(c)-sensitive pest, the tobacco hornworm. Therefore, bioactive levels of the insecticidal protein are not expected to be widely dispersed from the area of cultivation of DBT418 corn via pollen.

Birds could be exposed to the CryIA(c) protein indirectly by feeding on pests of DBT418 corn or directly by eating the kernels. An avian toxicity study demonstrated that the no observed effect level for lyophilized DBT418 leaf (chosen as a substrate because of the higher CryIA(c) concentration) was considered to be greater than 20% w/w. DBT418 corn may release pesticidal proteins into the soil when the plant tissue is left on the soil. Results of toxicity tests on two soil inhabiting organisms: collembola (springtails) and earthworms indicated no effect on these organisms resulting from exposure to lyophilized DBT418 leaf tissue and/or excessive levels of microbially-produced CryIA(c) protein incorporated into soil as compared to similar control treatments. Dekalb also summarized data supporting the mammalian safety of the CryIA(c) and PAT protein as determined by acute toxicity tests of the proteins in mice and digestibility studies using simulated gastric fluid.

2). Potential impact on threatened and endangered arthropods.

No endangered or threatened lepidopteran insects, as listed in 50 CFR 17.11 and 17.12, feed on corn plants.

Therefore, APHIS concludes that DBT418 corn will not have a significant adverse impact on organisms beneficial to plants or agriculture or nontarget organisms, and it will not affect threatened or endangered species.

F. Cultivation of DBT418 corn should not reduce the ability to control insects in corn and other crops.

APHIS considered potential impacts associated with the cultivation of DBT418 corn on the current agricultural practices used to control insects. Dekalb claims that the transgenic line provided significant protection from European corn borer and that growers planting DBT418 insect protected corn lines will not require insecticide applications to control this insect. DBT418 insect protected corn also provides significant control of Southwestern corn borer. Growth inhibition of corn earworm has also been observed as the result of silk and ear feeding on DBT418 plants. Resistant populations of previously sensitive insects may eventually develop as a result of feeding on DBT418 plants or from exposure to other formulations of B.t.k.-based insecticides containing the CryIA(c) protein. However, Dekalb is aware of the possibility of insect resistance to this transgenic corn. The Pest Resistance Management Workgroup set up by EPA in 1992 has identified seven elements that need to be addressed to develop an adequate resistance management plan (Matten and Lewis, 1995). These include:

1. Knowledge of pest biology and ecology
2. Appropriate gene deployment strategy
3. Refuges to support the development of *B.t.* susceptible insects
4. Monitoring and reporting of incidents of pesticide resistance development
5. Employment of integrated pest management (IPM) practices that encourage ecosystem diversity and provide multiple tactics for insect control
6. Communication and education strategies on the use of the product
7. Development and deployment of products with alternative modes of action

Insect resistance management strategies for primary and secondary lepidopteran pests are being developed. Dekalb has submitted an extensive resistance management plan to the U.S. EPA, and they have stated that they will implement a resistance management plan prior to commercial release of insect protected corn line DBT418.

A reduction in applications of nonselective insecticides (such as organophosphates and synthetic pyrethroids) used to provide some control of the sensitive pests could potentially enhance biological control options for the control of these pests as well as for pests that are not controlled by the CryIA(c) protein in these plants. A reduction in insecticide use should also reduce the risks associated with the application of some of these insecticides including risks from exposure to field workers' and consumers, adverse effects on nontarget species, and ground water contamination by insecticides. DBT418 corn plants are not likely to eliminate completely the use of chemical insecticides, particularly when they may be needed to control other serious pests, e.g.,

DBT418 does not control fall armyworm. But perhaps they may encourage more selective use of insecticides against these pests.

APHIS concludes that development of resistance to insecticides is a potential risk associated with their use; but in this respect, cultivation of DBT418 corn should pose no greater effects on the control of insects in corn and other crops, than the widely practiced method of applying insecticides.

V. CONCLUSION

APHIS has determined that DBT418 corn that has been field tested under APHIS authority, will no longer be considered regulated articles under regulations at 7 CFR Part 340. Permits or notifications acknowledged under those regulations will no longer be required from APHIS for field testing, importation, or interstate movement of DBT418 corn or their progeny. Importation of DBT418 corn seeds is still, however, subject to the restrictions found in the Foreign Quarantine Notice regulations at 7 CFR Part 319 just as applies to any other importation of corn seeds. This determination has been made based on data collected from these approved field trials, laboratory analyses and literature references presented herein which demonstrate the following:

1. DBT418 corn exhibits no plant pathogenic properties. Although pathogenic organisms were used in their development, these corn plants are not infected by these organisms nor can these plants incite disease in other plants.

2. DBT418 corn is no more likely to become a weed than insect resistant corn which could potentially be developed by traditional breeding techniques. Corn is not a serious, principal or common weed pest in the U.S., and there is no reason to believe that resistance to certain lepidopteran insects and tolerance to glufosinate herbicides would enable corn to become weed a pest.

3. Multiple barriers insure that gene introgression from DBT418 corn into wild plants in the United States and its territories is extremely unlikely, and such rare events should not increase the weediness potential of any resulting progeny.

4. Seeds of DBT418 corn are substantially equivalent in composition, quality and other characteristics to nontransgenic corn and should have no adverse impacts on raw or processed agricultural commodities.

5. DBT418 corn exhibits no significant potential to harm organisms beneficial to the agricultural ecosystem and will not affect threatened or endangered species.

6. Compared to current corn cultivation practices, cultivation of corn line DBT418 should not reduce the ability to control insects in corn or other crops.

APHIS has also concluded that there may be new varieties bred from DBT418 corn; however, if such varieties are developed they are unlikely to exhibit new plant pest properties, i.e., properties substantially different from any observed for DBT418 corn already field tested, or those observed for corn developed from traditional breeding.

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