PART II

SUMMARY

SUMMARY OF THE APPLICATION FOR AUTHORISATION OF GENETICALLY MODIFIED 98140 MAIZE AND DERIVED FOOD AND FEED IN ACCORDANCE WITH REGULATION (EC) 1829/2003

A. GENERAL INFORMATION

1. Details of application

a) Member State of application United Kingdom
b) Application number EFSA-GMO-UK-2008-53
c) Name of the product (commercial and other names) The product described in this application is 98140 maize for all food and feed uses, and for all food, feed and processed products derived from 98140 maize. The maize product described in this application also consists of maize products from progeny, containing the genetic modification, as derived from conventional breeding between 98140 maize and traditionally bred maize. The commercial name assigned to 98140 maize in the US market is Optimum™ GAT™ Corn[1]. In accordance with Commission Regulation (EC) 65/2004 and the OECD guidance for the designation of a unique identifier for transgenic plants (ENV/JM/MONO(2002)7), the unique identification code assigned to 98140 maize is DP-Ø9814Ø-6.
d) Date of acknowledgement of valid application [To be provided]

2. Applicant

a) Name of applicant Pioneer Hi-Bred International, Inc. as represented by Pioneer Overseas Corporation
b) Address of applicant Pioneer Hi-Bred International, Inc. 7100 NW 62nd Avenue P.O. Box 1014

[1] Optimum™ and GAT™ are trademarks of Pioneer Hi-Bred International, Inc.

Johnston, IA 50131-1014 (U.S.A.)

As represented by:

Pioneer Overseas Corporation
Avenue des Arts, 44
B-1040 Brussels
Belgium

c) Name and address of the person established in the Community who is responsible for the placing on the market, whether it be the manufacturer, the importer or the distributor, if different from the applicant

Same as applicant

3. Scope of the application

[x] GM plants for food use
[x] Food containing or consisting of GM plants
[x] Food produced from GM plants or containing ingredients produced from GM plants
[x] GM plants for feed use
[x] Feed containing or consisting of GM plants
[x] Feed produced from GM plants
[x] Import and processing (Part C of Directive 2001/18/EC)
[ ]Seeds and plant propagating material for cultivation in Europe (Part C of Directive 2001/18/EC)

4. Is the product being simultaneously notified within the framework of another regulation (e.g. Seed legislation)?

Yes [ ]	**No** [x]
If *yes*, specify	

5. Has the GM plant been notified under Part B of Directive 2001/18/EC and/or Directive 90/220/EEC?

Yes [x]

Year	Member State	Notification N°
2007	Spain	B/ES/07/21
2007	France	B/FR/06.12.02
2007	Romania	B/RO/07/08

No [ ]

6. Has the GM plant or derived products been previously notified for marketing in the Community under Part C of Directive 2001/18/EC or Regulation (EC) 258/97?

Yes [ ]	**No** [x]
If *yes*, specify	

7. Has the product been notified in a third country either previously or simultaneously?

Yes [x]	**No** [ ]
Notifications concerning all uses of 98140 maize, including cultivation of 98140 maize seed products, have been submitted in the US and Canada. Applications for authorisation to import for all uses of 98140 maize have also been submitted in Mexico and are being prepared for other countries around the world.	

8. General description of the product

a) Name of the recipient or parental plant and the intended function of the genetic modification

The recipient plant is maize (*Zea mays* L.), which is extensively cultivated and has a long history of safe use. The 98140 maize has been genetically modified to express the GAT4621 and ZM-HRA proteins[2].

The GAT4621 protein is a glyphosate acetyltransferase (GAT), encoded by an optimized form of the *gat* gene from *Bacillus licheniformis*, that confers tolerance to the herbicide glyphosate. The ZM-HRA protein is an acetolactate synthase (ALS), encoded by an optimized form of the endogenous *als* gene from *Zea mays*, that confers tolerance to ALS-inhibiting herbicides, such as chlorimuron and thifensulfuron.

b) Types of products planned to be placed on the market according to the authorisation applied for

The types of products planned to be placed on the market according to the authorisation applied for include 98140 maize for all food and feed uses, and for all food, feed and processed products derived from 98140 maize in accordance with Regulation (EC) 1829/2003. In addition, this application requests authorisation for import and processing of 98140 maize in accordance with Part C of Directive 2001/18/EC. However, this application does not include authorisation for the cultivation of 98140 maize seed products in the EU.

c) Intended use of the product and types of users

The 98140 maize products placed on the market will be used in a manner consistent with current uses of commercial maize grain and maize products. The 98140 maize will undergo existing methods of production and manufacturing used for commercial maize. No novel method of production and manufacturing is envisaged. The majority of commercial maize is used for animal feeds, and only

[2] Please note that *zm-hra* stands for *Zea mays hra* gene and ZM-HRA stands for *Zea mays* HRA protein.

about 8% of the grain is processed for human food products mainly by wet-milling or dry-milling. Maize grain is also processed into industrial products (11%), such as ethyl alcohol by fermentation and highly refined starch by wet-milling to produce starch and sweetener products. In addition to milling, the maize germ can be processed to obtain maize oil. There are multiple categories of users of 98140 maize, e.g. animal feed and milling industry, agriculture, skilled trades and consumer use by public at large.

d) Specific instructions and/or recommendations for use, storage and handling, including mandatory restrictions proposed as a condition of the authorisation applied for

Safety evaluation of 98140 maize has shown that no specific instructions and/or recommendations for use, storage and handling of 98140 maize are necessary. Therefore, 98140 maize can be used, stored and handled in the same way as is currently done for commercial maize. Labelling of 98140 maize products will be carried out in accordance with Community law. See Point **A.8.f)** below for labelling of 98140 maize.

e) Any proposed packaging requirements

The packaging, handling, and storage systems that are currently used for commercial maize will apply. The 98140 maize products will be packaged in the same manner as other commercial maize products. See Point **A.8.f)** below for labelling of 98140 maize.

f) A proposal for labelling in accordance with Article 13 and Article 25 of Regulation (EC) 1829/2003. In the case of GMOs, food and/or feed containing or consisting of GMOs, a proposal for labelling has to be included complying with the requirements of Article 4, B(6) of Regulation (EC) 1830/2003 and Annex IV of Directive 2001/18/EC

1.- PROPOSAL FOR THE LABELLING OF 98140 MAIZE FOOD PRODUCTS ACCORDING TO ARTICLES 12 AND 13 OF REGULATION (EC) 1829/2003

Proposal for the labelling of 98140 maize food products

In accordance with Article 12(2) of Regulation No (EC) 1829/2003, labelling will apply to foods containing material which contains, consists of or is produced from 98140 maize in a proportion at or higher than 0,9 per cent of the food ingredients considered individually or food consisting of a single ingredient.

In accordance with Article 13 of Regulation (EC) 1829/2003, and without prejudice to the other requirements of Community law concerning the labelling of foodstuffs, foods containing, consisting of, produced from, or containing ingredients produced from 98140 maize should be labelled as follows:

(a) where the food consists of more than one ingredient, the words ‘genetically modified’ or ‘produced from genetically modified maize’ will appear in the list of ingredients provided for in Article 6 of Directive 2000/13/EC in parentheses immediately following the ingredient concerned;

(b) where the ingredient is designated by the name of a category, the words ‘contains genetically modified maize’ or ‘contains (name of ingredient) produced from genetically modified maize’ will appear in the list of ingredients;

(c) where there is no list of ingredients, the words 'genetically modified' or 'produced from genetically modified maize' will appear clearly on the labelling;

(d) the indications referred to in (a) and (b) may appear in a footnote to the list of ingredients. In this case they shall be printed in a font of at least the same size as the list of ingredients. Where there is no list of ingredients, they will appear clearly on the labelling;

(e) where the food is offered for sale to the final consumer as non-pre-packaged food, or as pre-packaged food in small containers of which the largest surface has an area of less than 10 cm^2, the information referred to above will be permanently and visibly displayed either on the food display or immediately next to it, or on the packaging material, in a font sufficiently large for it to be easily identified and read.

No other particulars such as those referred to in Article 13(2)(a) and (b) and Article 13(3) of Regulation No (EC) 1829/2003 would need to be specified on the label of 98140 maize food products as 98140 maize has been shown to be equivalent to non-GM control maize in composition; nutritional value and nutritional effects; intended use; health characteristics; and, the genetic modification in 98140 maize does not give rise to any ethical or religious concerns.

2.- PROPOSAL FOR THE LABELLING OF 98140 MAIZE FEED PRODUCTS ACCORDING TO ARTICLES 24 AND 25 OF REGULATION (EC) 1829/2003

Proposal for the labelling of 98140 maize feed products

In accordance with Article 24(2) of Regulation No (EC) 1829/2003, labelling will apply to feed containing material which contains, consists of or is produced from 98140 maize in a proportion at or higher than 0,9 per cent of the feed and of each feed of which it is composed.

In accordance with Article 25 of Regulation (EC) 1829/2003, and without prejudice to the other requirements of Community law concerning the labelling of feed, feed referred to in Article 15(1) of Regulation (EC) 1829/2003, *i.e.* 98140 maize for feed use, and feed containing, consisting of or produced from 98140 maize, should be labelled as follows:

(a) where the feed contains or consists of 98140 maize, or where 98140 maize is used for the purpose of feed use, the words 'genetically modified maize' will appear in parentheses immediately following the specific name of the feed.

Alternatively, these words may appear in a footnote to the list of the feed. It should be printed in a font of at least the same size as the list of feed;

(b) where the feed is produced from 98140 maize, the words 'produced from genetically modified maize' will appear in parentheses immediately following the specific name of the feed;

Alternatively, these words may appear in a footnote to the list of the feed. It should be printed in a font of at least the same size as the list of feed;

No other particulars such as those referred to in Article 25(2)(c) and Article 25(3) of Regulation No (EC) 1829/2003 would need to be specified on the label of 98140 maize feed products as 98140 maize has been shown to be equivalent to non-GM control maize in composition; nutritional value and nutritional effects; intended use; health characteristics; and, the genetic modification in 98140 maize does not give rise to any ethical or religious concerns.

3.- PROPOSAL FOR THE LABELLING OF PRODUCTS CONSISTING OF, OR CONTAINING, 98140 MAIZE ACCORDING TO ARTICLE 4, B(6) OF REGULATION (EC) 1830/2003 AND ANNEX IV OF DIRECTIVE 2001/18/EC

As specified in Point **A.8** of Annex IV of Directive 2001/18/EC, the information provided on a label or in an accompanying document for the purpose of satisfying the labelling requirements regarding placing on the market of 98140 maize will include the following:

i) Commercial name of the product and the statement that 'this product contains genetically modified organisms';

ii) Name of the GMO;

iii) Information referred to in Point **A.2.** of Annex IV of Directive 2001/18/EC (name and full address of the notifier established in the Community who is responsible for the placing on the market);

iv) An indication on how to access the information in the publicly accessible part of the register.

g) Unique identifier for the GM plant (Regulation (EC) 65/2004; does not apply to applications concerning only food and feed produced from GM plants, or containing ingredients produced from GM plants)

In accordance with Commission Regulation (EC) 65/2004 and the OECD guidance for the designation of a unique identifier for transgenic plants (ENV/JM/MONO(2002)7), the unique identifier assigned to 98140 maize is DP-Ø9814Ø-6.

h) If applicable, geographical areas within the EU to which the product is intended to be confined under the terms of the authorisation applied for. Any type of environment to which the product is unsuited

Not applicable

9. Measures suggested by the applicant to take in case of unintended release or misuse as well as measures for disposal and treatment

Based on the conclusions from the environmental risk assessment of 98140 maize (**Part I** of this application), no specific measures need to be taken in case of unintended release or misuse or for disposal and treatment.

In case of unintended release of 98140 maize, current agronomic measures taken to control other commercially available maize can be applied, such as use of mechanical means and selective use of herbicides (with the exception of glyphosate and ALS-inhibiting herbicides).

B. INFORMATION RELATING TO THE RECIPIENT OR (WHERE APPROPRIATE) PARENTAL PLANTS

1. Complete name

a) Family name

Poaceae (Gramineae)

b) Genus

Zea

c) Species

Z. mays L.

d) Subspecies

None

e) Cultivar/breeding line

Proprietary inbred line PHWVZ

f) Common name

Maize, corn

2 a. Information concerning reproduction

(i) Mode(s) of reproduction

Maize (*Zea mays* L.) is the only species usually included in the genus *Zea*, of the family Gramineae. It is a highly domesticated agricultural crop with well-characterised phenotypic and genetic traits. It reproduces sexually by wind-pollination and being a monoecious species has separate male staminate (tassels) and female pistillate (silk) flowers. This allows natural outcrossing between maize plants but also enables the control of pollination in the production of hybrid seed. Typical for wind-pollinated plants, a large amount of excess maize pollen is produced for each successful fertilisation of an ovule on the ear. Wind movements across the maize field cause pollen from the tassel to fall on the silks of the same or adjoining plants. Measuring about 0.1 mm in diameter, maize pollen is the largest of any pollen normally disseminated by wind from a comparably low level of elevation.

(ii) Specific factors affecting reproduction

As a wind-pollinated, monoecious species, reproduction takes place by self pollination and fertilisation and, cross-pollination and fertilisation, with frequencies of each normally determined by proximity and other physical influences on pollen dispersal. Reproductive factors such as tasselling (pollen production), silking, and pollination are the most critical stages of maize development. Repeated cycles of self-pollination leads to homogeneity of the genetic characteristics within a single maize plant (inbred). Controlled cross-pollination of inbred lines from chosen genetic pools combines desired genetic traits resulting in a hybrid with improved agronomic performance and yield increase. This inbred-hybrid concept and improved yield response is the basis of the modern maize seed

industry.

(iii) Generation time

Maize is an annual crop with a cultural cycle ranging from as short as 10 weeks to as long as 48 weeks covering the period of seedling emergence to maturity.

2 b. Sexual compatibility with other cultivated or wild plant species

In the EU, there are no other cultivated or wild plant species that are sexually compatible with maize. Maize plants intra-pollinate and transfer genetic material between maize except for certain popcorn varieties. The extent of pollination between maize depends upon wind patterns, humidity and temperature. Low humidity and high temperatures cause the pollen to become dessicated and unviable.

3. Survivability

a) Ability to form structures for survival or dormancy

During the domestication of maize, many significant agronomic attributes for cultivation have been gained, whilst maize has lost the ability to survive in the wild. Maize is a non-dormant annual crop and seeds are the only survival structures. Natural regeneration of maize from vegetative tissue is not known to occur.

b) Specific factors affecting survivability

Survival of maize seed is dependant upon temperature, moisture of seed, genotype, husk protection and stage of development. Maize seed can only survive under favourable climatic conditions. Freezing temperatures have an adverse effect on germination of maize seed and they have been identified as a major risk in limiting production of maize seed. Furthermore, maize is a C_4 plant and therefore its vegetative growth is sensitive to low temperatures. Chlorosis will occur at temperatures below 15°C. The generative phase of maize is supported by short day conditions. The minimum temperature for germination of 8 to 10°C restrict maize survival and reproduction capabilities mainly to the Southern European geographical zones.

4. Dissemination

a) Ways and extent of dissemination

Maize dissemination occurs via kernel (seed/grain) and pollen. Maize has been domesticated for thousands of years and as a result, maize dispersal of individual kernels does not occur naturally.

Pollen shedding from the tassels takes place over a period of 10 to 15 days. Pollen grains are round, heavy and contain a large amount of water, characteristics that limit their dispersal and attachment to plant surfaces, such as leaves. Generally, viability of shed pollen is 10 to 30 minutes, although it can remain viable for longer time under favourable conditions. However, dispersal of maize pollen tends to be limited as it is influenced by the large size and rapid settling rate of the pollen. Deposition of maize pollen has been found to rapidly decline from 2.3×10^7 grains m^{-2} at a 1 m offset from the field edge to 7.1×10^3 grains m^{-2} at 60 m: this represents a decline in pollen concentrations of over four orders magnitude extending from radial distances of 1 m to 60 m from the field edge.

b) Specific factors affecting dissemination

Mechanical harvesting and transport are ways of disseminating grain and insect or wind damage may cause mature ears to fall to the ground and avoid harvest. Regardless of these routes of dissemination, maize cannot survive without human assistance in non-agricultural habitats in the EU. Because of its highly domesticated nature, maize seed requires the semi-uniform soil conditions resulting from cultivation in order to germinate and establish in agricultural habitats.

5. Geographical distribution and cultivation of the plant, including the distribution in Europe of the compatible species

Because of its many available cultivars, maize can grow in a wide range of climatic conditions. However, survival and reproduction in maize is limited by cool conditions. Practically no maize can be cultivated where the mean mid-summer temperature is <19°C or where the average night temperature is <13°C. The majority of maize is produced between latitudes 30 and 55 degrees, with a relatively small amount grown at latitudes higher than 47 degrees anywhere in the world. The greatest maize production occurs where the warmest month isotherms range between 21 and 27°C and the freeze-free season lasts 120 to 180 days. Summer rainfall of 15 cm is the lower limit for maize production without irrigation. There is no upper limit of rainfall for growing maize, although excess rainfall will decrease yields. Maize has been cultivated in Europe starting in Spain since the 16th century.

There are no wild plant species that are sexually compatible with maize in the EU.

6. In the case of plant species not normally grown in the Member State(s), description of the natural habitat of the plant, including information on natural predators, parasites, competitors and symbionts

Not applicable as maize is normally grown in the EU and its natural habitat consists of the relatively well characterised agricultural environment.

7. Other potential interactions, relevant to the GM plant, of the plant with organisms in the ecosystem where it is usually grown, or used elsewhere, including information on toxic effects on humans, animals and other organisms

Maize is extensively cultivated in the EU and has a long history of safe use. Maize is known to interact with other organisms in the environment including insects, birds, and mammals. It is susceptible to a range of fungal diseases and insect pests, as well as competition from surrounding weeds.

Maize or derived products of maize, are not considered to have toxic effects on humans, animals and other organisms.

C. INFORMATION RELATING TO THE GENETIC MODIFICATION

1. Description of the methods used for the genetic modification

The 98140 maize was produced by means of *Agrobacterium*-mediated transformation. Transformation of 98140 maize resulted in the stable insertion of the T-DNA region of binary vector PHP24279 in the maize genome. The T-DNA region contains the *gat4621* and *zm-hra* expression cassettes. The plant regenerated from these maize cells expresses the GAT4621 and ZM-HRA proteins and is referred to as 98140 maize.

2. Nature and source of the vector used

For transformation of 98140 maize, binary vector PHP24279 was used.

3. Source of donor DNA, size and intended function of each constituent fragment of the region intended for insertion

The T-DNA intended for insertion is a 7440 bp sequence containing:

i) The left T-DNA border;
ii) The *gat4621* gene, an optimized form of the *gat* gene from *Bacillus licheniformis*, with transcription regulated by the promoter from the maize ubiquitin gene, including a 5' untranslated region and an intron, and with transcription terminated by the proteinase inhibitor II (*pin*II) terminator from *Solanum tuberosum*;
iii) Three copies of the CaMV 35S enhancer region from cauliflower mosaic virus which contribute to enhance expression of both the *gat4621* and *zm-hra* genes;
iv) The *zm-hra* gene, an optimized form of the endogenous *als* gene from *Zea mays*, with transcription regulated by the promoter of the endogenous *als* gene, and with transcription terminated by the proteinase inhibitor II (*pin*II) terminator from *Solanum tuberosum*; and,
v) The right T-DNA border.

D. INFORMATION RELATING TO THE GM PLANT

1. Description of the trait(s) and characteristics which have been introduced or modified

The 98140 maize has been genetically modified (GM) to express the GAT4621 and ZM-HRA proteins. The GAT4621 protein is a glyphosate acetyltransferase (GAT), encoded by an optimized form of the *gat* gene from *Bacillus licheniformis*. When cultivated, expression of the GAT4621 protein in 98140 maize confers tolerance to the herbicide glyphosate. The ZM-HRA protein is an acetolactate synthase (ALS) encoded by the *zm-hra* gene, an optimized form of the endogenous *als* gene from *Zea mays*. When cultivated, expression of the ZM-HRA protein in 98140 maize confers tolerance to ALS-inhibiting herbicides, such as chlorimuron and thifensulfuron.

No other new traits have been introduced into 98140 maize and, in particular, no trait for antibiotic resistance is present in 98140 maize. As discussed in detail throughout the application, these characteristics of 98140 maize have been confirmed by molecular characterization, protein expression analysis, agronomic performance and comparison of 98140 maize composition data to non-GM control maize.

2. Information on the sequences actually inserted or deleted

a) The copy number of all detectable inserts, both complete and partial

The results of the molecular characterization described in this application support the conclusion that 98140 maize contains a single and full-length copy of the T-DNA region from binary vector PHP24279. Southern blot analysis demonstrated that 98140 maize does not contain fragments from the vector backbone portion of binary vector PHP24279.

b) In case of deletion(s), size and function of the deleted region(s)

Not applicable

c) Chromosomal location(s) of insert(s) (nucleus, chloroplasts, mitochondria, or maintained in a non-integrated form), and methods for its determination

The 98140 maize insert is integrated into the maize nuclear genome as confirmed by the molecular characterization of 98140 maize by Southern blot and sequence analyses.

d) The organisation of the inserted genetic material at the insertion site

The genetic material inserted in 98140 maize can be divided into three separate major sections:

i) the 5’ border sequence, comprising the flanking region of maize genomic DNA;
ii) the full-length, single copy PHP24279 T-DNA insert;
iii) the 3’ border sequence, comprising the flanking region of maize genomic DNA.

In particular, 98140 maize does not contain sequences derived from the PHP24279 vector backbone region outside of the left and right T-DNA borders. The genetic material inserted in 98140 maize and the 5’ and 3’ borders of maize genomic DNA flanking the 98140 maize insert have been sequenced and characterised in detail. In addition, analysis by PCR amplification has confirmed that the 5’ and 3’ regions flanking the 98140 maize insert are of maize genomic origin.

3. Information on the expression of the insert

a) Information on developmental expression of the insert during the life cycle of the plant

The expression level of the GAT4621 and ZM-HRA proteins has been determined in a range of 98140 maize tissues representing key developmental stages of a typical maize plant. Expression was characterised using a specific Enzyme Linked Immunosorbent Assay (ELISA) system developed for each protein. Results of these tests confirm that 98140 maize expresses the proteins GAT4621 and ZM-HRA throughout the different developmental stages of the maize plant.

b) Parts of the plant where the insert is expressed

Please, see Point **D.3. a)**

4. Information on how the GM plant differs from the recipient plant in

a) Reproduction

No unexpected changes in pollen production, seed production, seed viability or germination have been observed in field trials of 98140 maize compared to non-GM control maize.

b) Dissemination

Maize hybrids have been domesticated to the extent that the seeds cannot be disseminated without human intervention. The 98140 maize plants show no difference in dissemination compared to non-GM control maize.

c) Survivability

Cultivated maize has been domesticated to the extent that it cannot survive outside managed agricultural environments. Lack of dormancy prevents maize seed survival from one growing season to the next. The genetic modification in 98140 maize results in expression of the GAT4621 and ZM-HRA proteins conferring tolerance to glyphosate and ALS-inhibiting herbicides. The survival characteristics of 98140 maize in the environment remain comparable to those of non-GM control maize.

d) Other differences

Except for the tolerance to glyphosate and ALS-inhibiting herbicides, 98140 maize did not show any unexpected changes in reproduction, dissemination and survivability when compared to non-GM control maize in field trials.

5. Genetic stability of the insert and phenotypic stability of the GM plant

Genetic stability of the 98140 maize could be demonstrated by studying the pattern of inheritance and segregation of the introduced genetic material in different generations of 98140 maize. These studies confirm that the 98140 maize insert is genetically stable, following a typical pattern of Mendelian inheritance.

6. Any change to the ability of the GM plant to transfer genetic material to other organisms

a) Plant to bacteria gene transfer

The genetic modification in 98140 maize does not change the inability of maize to transfer genetic material to bacteria. In particular, there are no sequences present on the T-DNA region from plasmid PHP24279 that could potentially be involved in transfer of genetic material between maize and bacteria.

b) Plant to plant gene transfer

As discussed in Point **B.2.b)**, there are no other cultivated or wild plant species sexually compatible with maize in the EU. Maize plants will intra-pollinate and transfer genetic material between maize except for certain popcorn varieties. The extent of pollination between maize will depend upon wind patterns, humidity and temperature. Potential for gene transfer is therefore limited to other maize grown in culture. In addition, the genetic modification in 98140 maize does not introduce any selective advantages to maize plants outside the agricultural environment.

It should be noted that this application is for authorisation of 98140 maize for all food and feed uses, and for all food, feed and processed products derived from 98140 maize, and not for cultivation of 98140 maize seed products.

7. Information on any toxic, allergenic or other harmful effects on human or animal health arising from the GM food/feed

7.1 Comparative assessment

Choice of the comparator

The comparator chosen for the safety evaluation of 98140 maize consists of a non-GM control maize with comparable genetic background. Wherever possible, data on other commercial non-GM maize and data from a set of commercial Pioneer® Brand maize hybrids have also been used in the comparisons with 98140 maize.

7.2 Field trials

a) number of locations, growing seasons, geographical spread and replicates

Field trials were conducted at 6 separate locations in North America. Each location included a randomised block design containing 4 blocks (or replicates). Each block contained the 98140 maize and a non-GM control maize for comparison.

b) the baseline used for consideration of natural variations

As discussed in Point **D.7.1**, publicly available data on commercial non-GM maize, compiled from the literature, as well as data from a set of commercial Pioneer® Brand maize hybrids has been used as the baseline in the comparison with 98140 maize. In addition, a comparative assessment with non-GM control maize of comparable genetic background has been carried out.

7.3 Selection of materials and compounds for analysis

The nutritional analysis was undertaken on a broad range of compounds such as protein, fiber, carbohydrates, fat, ash, minerals, fatty acids, amino acids, vitamins, secondary metabolites and anti-nutrients in accordance with OECD guidelines for assessment of genetically modified maize.

7.4 Agronomic traits

As discussed in Point **D.7.2**, 98140 maize has been tested at different locations across key maize growing regions of North America. The agronomic data obtained support the conclusion that there are no unexpected agronomic differences between 98140 maize and non-GM control maize with comparable genetic background.

It should be noted that this application is for authorisation of 98140 maize for all food and feed uses, and for all food, feed and processed products derived from 98140 maize, and not for cultivation of 98140 maize seed products.

7.5 Product specification

As discussed in this application, food and animal feed products derived from 98140 maize can be considered to be as safe as and nutritionally equivalent to food and animal feed products derived from commercial maize. Therefore, the specification of food and animal feed products from 98140 maize is equivalent to that of food and animal feed products derived from commercial maize.

7.6 Effect of processing

The production processes applied to maize are well known and have a long history of safe use. The 98140 maize will undergo existing production processes used for commercial maize. No novel production process is envisaged. In the EU, most of the maize is used for animal feed, and only about 8% is processed into human food products such as highly refined starch by the wet-milling process and maize flour by the dry-milling process. The majority of the starch is used for sweeteners and fermentation including high fructose maize syrup and ethanol. In addition to milling, the maize germ can be processed to obtain maize oil. These processed products of maize are used in a variety of food products. The genetic modification in 98140 maize will not impact the existing production processes used for maize.

As discussed in Point **D.7.8.1**, the GAT4621 and ZM-HRA proteins expressed in 98140 maize are highly susceptible to proteolytic digestion and are rapidly degraded when heated. Therefore, the technologies applied in the production and processing of processed foods and feeds derived from maize will lead to the denaturation and degradation of the GAT4621 and ZM-HRA proteins expressed in 98140 maize.

7.7 Anticipated intake/extent of use

The 98140 maize food products are expected to replace a portion of maize products in existing food products with total consumption of maize products remaining unchanged. In particular, human consumption of maize products in the developed world is in the form of high fructose maize syrup, starch, and oil, *i.e.* products that contain only negligible amounts of protein. Furthermore, during food and feed processing the GAT4621 and ZM-HRA proteins will be degraded. Moreover, we should consider that maize products in Europe represent blended products, and actual occurrence of the GAT4621 and ZM-HRA proteins originating from 98140 maize will be a minor fraction of total dietary maize and maize products.

The comparative and nutritional assessments of 98140 maize together with the absence of any adverse effects to human and animal health from the GAT4621 and ZM-HRA proteins confirm that there are no concerns related to the anticipated intake/extent of use of 98140 maize.

7.8 Toxicology

7.8.1 Safety evaluation of newly expressed proteins

The safety assessment of the GAT4621 and ZM-HRA proteins expressed in 98140 maize has been based on a very broad body of evidence. It includes history of safety of the GNAT (GCN5-related N-acetyltransferases) and ALS (acetolactate synthase) families of proteins to which the GAT4621 and ZM-HRA proteins expressed in 98140 maize respectively belong; detailed knowledge of their mode of action; and, absence of toxicity to mammals.

As a result, the safety assessment of the GAT4621 and ZM-HRA proteins has concluded that expression of these proteins in 98140 maize is safe to human and animal health.

7.8.2 Testing of new constituents other than proteins

Not applicable as the genetic modification in 98140 maize does not give rise to the expression of any new constituents other than the GAT4621 and ZM-HRA proteins.

7.8.3 Information on natural food and feed constituents

Detailed compositional analyses of 98140 maize have demonstrated that the composition of natural food and feed constituents of 98140 maize is nutritionally equivalent to that of control maize.

In addition, the results obtained from a thirteen-week (90-day) oral toxicity feeding study in rats and a 42-day poultry feeding study provide further confirmation of the safety of the natural food and feed constituents of 98140 maize and nutritional equivalence between 98140 maize and commercial maize.

7.8.4 Testing of the whole GM food/feed

As described throughout this application, the evaluation of the nutrient composition of 98140 maize has confirmed that it is equivalent to non-GM control maize with comparable genetic background.

A poultry feeding study over a period of 42 days has been carried out confirming that there are no biologically significant, diet-related differences on mortality, body weight gain, feed efficiency, carcass yield and organ yield between chickens fed a diet containing grain from 98140 maize or a diet containing grain from non-GM control maize. The OECD considers that poultry studies are very useful because they utilize a fast growing organism that consumes a relatively high percentage of maize in the diet, and that is very sensitive to potentially toxic effects of dietary components.

Furthermore, a thirteen-week (90-day) oral toxicity feeding study in rats has been carried out with

98140 maize grain in order to confirm the absence of toxicity of the GAT4621 and ZM-HRA proteins expressed in 98140 maize. Body weights, food consumption, food efficiency and clinical signs were evaluated weekly. Neurobehavioural and ophthalmological evaluations were carried out at the start and near the end of the study. Clinical, gross and microscopic pathological evaluations were also conducted at the end of the study. The results confirm that exposure of male and female rats to diets containing grain from 98140 maize produced no toxicologically significant differences, compared to rats fed diets containing grain from non-GM control maize with comparable genetic background or grain from commercial non-GM maize.

7.9 Allergenicity

7.9.1 Assessment of allergenicity of the newly expressed protein

In accordance with a weight-of-evidence approach, which accounts for a variety of factors and experimental approaches for an overall assessment of the allergenic potential of the new proteins, the GAT4621 and ZM-HRA proteins were assessed for their allergenic potential through: (i) assessing the allergenicity potential of the source of the gene, (ii) homology searches with common allergens, (iii) *in vitro* simulated digestibility studies, (iv) evaluation of protein glycosylation and (v) assessment of heat stability. The results obtained confirm that the GAT4621 and ZM-HRA proteins do not pose any significant risk of being a potential allergen.

7.9.2 Assessment of allergenicity of the whole GM plant or crop

Maize has a long history of safe use as food and feed in the EU and constitutes a traditional counterpart to 98140 maize that can be used as a baseline to facilitate the assessment of potential toxicity and allergenicity of 98140 maize. Maize is not considered to be an allergenic food crop and 98140 maize does not express any new proteins with allergenic characteristics.

7.10 Nutritional assessment of GM food/feed

7.10.1 Nutritional assessment of GM food

Composition analysis of grain from 98140 maize has shown that the content of protein, fiber, carbohydrates, fat, ash, minerals, fatty acids, amino acids, vitamins, secondary metabolites and anti-nutrients is equivalent to that found in grain from non-GM control maize with comparable genetic background. As a consequence, 98140 maize can be considered nutritionally equivalent to non-GM control maize. Nutritional equivalence between 98140 maize and non-GM control maize with comparable genetics has also been shown in a poultry feeding study where chickens were fed over a 42-day period.

In conclusion and taking into account the anticipated dietary intake of 98140 maize products, consumption of 98140 maize foods will not give rise to any adverse nutritional impact.

7.10.2 Nutritional assessment of GM feed

As summarised in Point **D.7.10.1** above, consumption of 98140 maize feed will not give rise to any adverse nutritional impact.

7.11 Post-market monitoring of GM food/feed

As summarised in Point **D.7.**, the nutritional assessment has concluded that 98140 maize is nutritionally equivalent to control maize. In addition, the use of 98140 maize food and feed will not be different from that of commercially available maize food and feed.

Therefore, post-market monitoring of GM food and GM feed products containing, consisting of or derived from 98140 maize is not necessary.

8. Mechanism of interaction between the GM plant and target organisms (if applicable)

Not applicable as there are no target organisms for the GAT4621 and ZM-HRA proteins expressed in 98140 maize. The 98140 maize is tolerant to the application of glyphosate and ALS-inhibiting herbicides.

9. Potential changes in the interactions of the GM plant with the biotic environment resulting from the genetic modification

9.1 Persistence and invasiveness

There is negligible likelihood for 98140 maize to become environmentally persistent or invasive giving rise to any weediness. Cultivated maize does not possess any trait for weediness and the expression of the GAT4621 and ZM-HRA proteins in 98140 maize does not introduce new traits for weediness.

9.2 Selective advantage or disadvantage

As discussed in Point **D.9.1**, maize is highly domesticated to the extent that it cannot become established as a feral species outside the agricultural environment. The specific advantages introduced by the genetic modification in 98140 maize do not confer any selective advantage to the plants in the natural environment, *i.e.* outside the agricultural environment. In addition, application of broad spectrum herbicides, such as glyphosate and ALS-inhibiting herbicides, does not commonly occur in the natural environment.

In conclusion, expression of the GAT4621 and ZM-HRA proteins in 98140 maize does not confer any selective advantage outside the agricultural environment.

9.3 Potential for gene transfer

There are no sexually compatible wild or weedy relatives of *Zea mays* known to exist in the EU, which eliminates any potential for gene transfer to such species. Potential for gene transfer is therefore limited to other maize grown in culture. In addition, there is negligible likelihood for 98140 maize to become environmentally persistent or invasive giving rise to weediness. Furthermore, expression of the GAT4621 and ZM-HRA proteins in 98140 maize does not present any selective advantage to maize plants outside the agricultural environment.

9.4 Interactions between the GM plant and target organisms

Not applicable as there are no target organisms for the GAT4621 and ZM-HRA proteins expressed in 98140 maize. The 98140 maize is tolerant to the application of glyphosate and ALS-inhibiting herbicides.

9.5 Interactions of the GM plant with non-target organisms

The natural ubiquity of the *gat* and *als* genes and of the GAT and ALS proteins in the environment, together with the absence of toxicity and the specific biochemical activity of the GAT4621 and ZM-

HRA proteins expressed in 98140 maize confirms that there will be no adverse effects on non-target organisms arising from the proposed uses of 98140 maize.

9.6 Effects on human health

Maize has a long history of safe use in human food and animal feed. A very detailed evaluation of the potential toxicity and allergenicity to humans of the GAT4621 and ZM-HRA proteins as expressed in 98140 maize, has been carried out. As a result and in conclusion, 98140 maize does not express any known toxic or allergenic proteins. Therefore, consumption of 98140 maize or derived food products will result in no adverse effects on human health.

9.7 Effects on animal health

As discussed in Points **D.7.8** and **D.7.9**, consumption of 98140 maize or any derived food, feed and processed products will result in no adverse effects on human or animal health. Therefore, use of 98140 maize as feed and consumption of any food, feed and processed products derived from 98140 maize will result in no adverse effects on animal health or the food/feed chain.

9.8 Effects on biogeochemical processes

The natural ubiquity of the *gat* and *als* genes and of the GAT and ALS proteins in the soil environment, and the specific biochemical activity of the GAT4621 and ZM-HRA proteins confirm that expression of the GAT4621 and ZM-HRA proteins in 98140 maize will not cause any significant immediate and/or delayed effects on biogeochemical processes.

9.9 Impacts of the specific cultivation, management and harvesting techniques

Not applicable. The scope of this application does not include authorisation for the cultivation of 98140 maize seed products in the EU.

10. Potential interactions with the abiotic environment

The scope of this application does not include authorisation for the cultivation of 98140 maize seed products in the EU. Exposure to the environment from the import of 98140 maize will be limited to unintended release of 98140 maize which can be controlled with current measures used to control unintended release of commercially available maize, such as use of mechanical means and selective use of herbicides (with the exception of glyphosate and ALS-inhibiting herbicides). Therefore, the likelihood of adverse interactions with the abiotic environment is negligible.

11. Environmental monitoring plan

11.1 General (risk assessment, background information)

The scope of this application does not include authorisation for the cultivation of 98140 maize seed products in the EU. Exposure to the environment from the import of 98140 maize will be limited to unintended release of 98140 maize which can be controlled with current measures used to control unintended release of commercially available maize, such as use of mechanical means and selective use of herbicides (with the exception of glyphosate and ALS-inhibiting herbicides).

The proposal for an environmental monitoring plan for 98140 maize has been developed according to the principles and objectives outlined in Annex VII of Directive 2001/18/EC and Council Decision

2002/811/EC establishing guidance notes supplementing Annex VII to Directive 2001/18/EC.

11.2 Interplay between environmental risk assessment and monitoring

The design of the environmental monitoring plan is based on the conclusions of the environmental risk assessment (e.r.a.) carried out for this application for authorisation of genetically modified 98140 maize and derived food and feed in accordance with Regulation (EC) 1829/2003.

The e.r.a. has been carried out in accordance with Annex II of Directive 2001/18/EC and Commission Decision 2002/623/EC establishing guidance notes supplementing Annex II to Directive 2001/18/EC. The overall conclusion obtained from the e.r.a. confirms that there are no identified adverse effects to human and animal health or the environment arising from 98140 maize. Therefore, the risk to human and animal health or the environment from 98140 maize and any derived products is as negligible as for any commercial maize and any derived products.

11.3 Case-specific GM plant monitoring (approach, strategy, method and analysis)

In accordance with Annex VII of Directive 2001/18/EC and Council Decision 2002/811/EC establishing guidance notes supplementing Annex VII to Directive 2001/18/EC, case-specific monitoring should only be carried out in those cases where potential adverse effects have been identified in the e.r.a.

The e.r.a. concluded that the risk to human and animal health or the environment from 98140 maize and any derived products is as negligible as for any commercial maize and any derived products. As a result, case-specific monitoring is not applicable for the use of 98140 maize for all food and feed purposes and the import and processing of 98140 maize.

11.4 General surveillance of the impact of the GM plant (approach, strategy, method and analysis)

In accordance with Council Decision 2002/811/EC, general surveillance is not based on a particular hypothesis and it should be used to identify the occurrence of unanticipated adverse effects of the GMO or its use for human and animal health and the environment that were not predicted in the risk assessment.

The scope of this application is for the authorisation of 98140 maize for all food and feed uses in accordance with Articles 3(1) and 15(1) of Regulation (EC) 1829/2003 and for import and processing of 98140 maize in accordance with Part C of Directive 2001/18/EC. In this application we are not seeking approval for cultivation of 98140 maize seed products in the EU.

As discussed in detail in the e.r.a., exposure to the environment will be limited to unintended release of 98140 maize. However, such limited exposure is highly unlikely to give rise to any adverse effect and, if necessary, can be controlled with current measures used to control unintended release of commercially available maize, such as use of mechanical means and selective use of herbicides (with the exception of glyphosate and ALS-inhibiting herbicides).

However, since the majority of imported maize is used for animal feed purposes, general surveillance might assist in confirming the safety of animal feed use of 98140 maize and any derived feed products with a view to safeguarding against any unanticipated effects.

11.5 Reporting the results of monitoring

As discussed in Points **11.1** to **11.4**, case-specific monitoring is not applicable for the use of 98140

maize for all food and feed purposes and the import and processing of 98140 maize. As a result, no case-specific monitoring is proposed for this application for authorisation of 98140 maize.

The applicant will inform the European Commission, without delay, of any adverse effects arising from the handling and use of imported 98140 maize reported to him. Furthermore, the applicant will investigate such reports and communicate the outcome to the European Commission.

12. Detection and event-specific identification techniques for the GM plant

A PCR-based quantitative event-specific detection method for 98140 maize has been developed and submitted to the EC Joint Research Centre (Community Reference Laboratory) in Ispra (Italy) for validation.

E. INFORMATION RELATING TO PREVIOUS RELEASES OF THE GM PLANT AND/OR DERIVED PRODUCTS

1. History of previous releases of the GM plant notified under Part B of the Directive 2001/18/EC and under Part B of Directive 90/220/EEC by the same notifier

a) Notification number

B/FR/06.12.02

b) Conclusions of post-release monitoring

During the release of the 98140 maize, plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.

c) Results of the release in respect to any risk to human health and the environment (submitted to the Competent Authority according to Article 10 of Directive 2001/18/EC)

No adverse effects on human and animal health and the environment observed.

a) Notification number

B/ES/07/21

b) Conclusions of post-release monitoring

During the release of the 98140 maize, the plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.

c) Results of the release in respect to any risk to human and animal health and the environment (submitted to the Competent Authority according to Article 10 of Directive 2001/18/EC)

No adverse effects on human health and the environment observed.

a) Notification number B/RO/07/08
b) Conclusions of post-release monitoring During the release of the 98140 maize, the plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.
c) Results of the release in respect to any risk to human health and the environment (submitted to the Competent Authority according to Article 10 of Directive 2001/18/EC) No adverse effects on human health and the environment observed.

2. History of previous releases of the GM plant carried out outside the Community by the same notifier

a) Release country USA
b) Authority overseeing the release USDA
c) Release site Multiple sites
d) Aim of the release Research and/or regulatory
e) Duration of the release Multiple seasons
f) Aim of post-releases monitoring Control of potential volunteers
g) Duration of post-releases monitoring One season
h) Conclusions of post-release monitoring The 98140 maize plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.
i) Results of the release in respect to any risk to human health and the environment No adverse effects on human health and the environment observed

a) Release country Argentina
b) Authority overseeing the release Secretary of Agriculture
c) Release site Multiple sites
d) Aim of the release Research and/or regulatory
e) Duration of the release Multiple seasons
f) Aim of post-releases monitoring Control of potential volunteers
g) Duration of post-releases monitoring One season
h) Conclusions of post-release monitoring The 98140 maize plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.
i) Results of the release in respect to any risk to human health and the environment No adverse effects on human health and the environment observed

a) Release country Canada
b) Authority overseeing the release Canadian Food Inspection Agency
c) Release site Multiple sites
d) Aim of the release Research and/or regulatory
e) Duration of the release Multiple seasons

f) Aim of post-releases monitoring Control of potential volunteers
g) Duration of post-releases monitoring One season
h) Conclusions of post-release monitoring The 98140 maize plants performed as expected, with no evidence of any unintentional morphological or phenotypical characteristics.
i) Results of the release in respect to any risk to human health and the environment No adverse effects on human health and the environment observed

3. Links (some of these links may be accessible only to the competent authorities of the Member States, to the Commission and to EFSA):

a) Status/process of approval [to be provided]
b) Assessment Report of the Competent Authority (Directive 2001/18/EC) [to be provided]
c) EFSA opinion [to be provided]
d) Commission Register (Commission Decision 2004/204/EC) [to be provided]
e) Molecular Register of the Community Reference Laboratory/Joint Research Centre [to be provided]
f) Biosafety Clearing-House (Council Decision 2002/628/EC) [to be provided]
g) Summary Notification Information Format (SNIF) (Council Decision 2002/812/EC) [to be provided]