Application for authorization of MIR162 maize in the European Union under Regulation (EC) No 1829/2003

PART II: SUMMARY

For MIR162 maize

SUMMARY

This document is complete as of July 2010. Since it is submitted as one part of a regulatory application, which is subject to an on-going regulatory review, it may be subject to later amendment or replacement. The information may also be supplemented with additional material requested by regulatory authorities. As such, it may only be considered properly with reference to those later amendments or supplementary materials and in the context of the dossier as a whole.

A. GENERAL INFORMATION

1. Details of application

a) **Member State of application** Germany
b) **Application number** Not available at time of submission
c) **Name of the products (commercial and other names)** MIR162 maize
d) **Date of acknowledgement of valid application** Not available at the time of submission

2. Applicant

a) **Name of applicant** Syngenta Crop Protection AG, Basel, Switzerland acting on its behalf and through its affiliated companies
b) **Address of applicant** Syngenta Crop Protection AG, Basel Switzerland acting on its behalf and through its affiliated companies Schwarzwaldallee 215 CH 4058 Basle Switzerland
c) **Name and address of the person established in the Community who is responsible for the placing in the market, whether it be the manufacturer, the importer or the distributor, if different from the applicant (Commission Decision 2004/204/EC Art 3(a)(ii))** Event MIR162 maize (MIR162 maize) will be imported and used as any other maize in the EU by operators currently involved in these processes.

3. Scope of the application

☒ GM plants for food use

☒ Food containing or consisting of GM plants

☒Food produced from GM plants or containing ingredients produced from GM plants

☒GM plants for feed use

☒ Feed containing or consisting of GM plants

☒ Feed produced from GM plants

☒ 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 ☒
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	No ☐
If *no*, refer to risk analysis data on the basis of the elements of Part B of Directive 2001/18/EC A risk assessment has been performed according to the Directive 2001/18/EC and forms part of this application.	

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 ☒
If *yes*, specify	

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

Yes ☒	No ☐

If *yes*, specify

MIR162 maize is approved for commercial cultivation in the USA, Canada and Brazil. MIR162 maize is also approved for import in Japan, Australia/New Zealand, Mexico, Philippines and Taiwan. A number of other submissions have been made in other countries around the world and these are at different stages in the approval process.

8. General description of the product

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

Event MIR162 maize (MIR162 maize) is a genetically modified (GM) product which expresses a Vip3Aa20 protein for control of certain lepidopteran pests and a phosphomannose isomerase (PMI) protein, which acts as a selectable marker enabling transformed plant cells to utilize mannose as the only primary carbon source.

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

The scope of the application includes all food and feed products containing, consisting or produced from MIR162 maize including products from inbreds and hybrids obtained by conventional breeding of this maize product. The application also covers the import and industrial processing of MIR162 maize for all potential uses as any other maize.

c) Intended use of the product and types of users

It is intended that MIR162 maize will be used as any other conventional maize which is cultivated or imported for all food, feed and industrial purposes.

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

The characteristics of MIR162 maize and products derived from them are not different from those of their conventional counterparts, apart from the introduced trait of insect tolerance. MIR162 maize has been shown to be as safe and as wholesome as existing varieties of maize. Therefore there are no specific instructions or recommendations for use, storage and handling of MIR162 maize.

e) Any proposed packaging requirements

The characteristics of MIR162 maize and products derived from them are not different to those of their conventional counterparts. MIR162 maize has been shown to be as safe and as wholesome as existing varieties of maize. Therefore there are no specific instructions for packaging.

f) A proposal for labelling in accordance with Articles 13 and Articles 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

A proposal for labelling has been included in the application following the guidance provided by EFSA. This includes the labelling requirements outlined by Regulation (EC) No 1829/2003 and Annex IV of Directive 2001/18/EC. MIR162 maize grain will therefore be labelled as "genetically modified maize" and products derived from them will be labelled as "containing (or produced from) genetically modified maize". Since MIR162 maize and products derived from them are not different from those of their conventional counterparts, no additional labelling is required.

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)

A unique identifier for MIR162 maize has been assigned in accordance with Commission Regulation (EC) 65/2004: SYN-IR162-4.

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

MIR162 maize is suitable for use as any other maize under the terms of the authorisation applied for.

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

Maize is incapable of sustained reproduction outside domestic cultivation and is non-invasive of natural habitats. The characteristics of MIR162 maize and products derived from them are not different from those of their conventional counterparts, apart from the intended effect of tolerance to certain lepidopteran pests. Cultivation of MIR162 maize in the EU is not within the scope of this application. In the unlikely event that small amounts of MIR162 grain accidentally found their way into the environment, this would represent extremely low levels of exposure and the survival of this grain to produce flowering plants would be very unlikely. In addition, volunteers could be easily controlled using any of the current agronomic measures taken to control other commercially available maize.

MIR162 maize has been shown to be as safe and as wholesome as existing varieties of maize. Any unintended releases or misuse can be dealt with in the same way as any other conventional maize.

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

1. Complete name

a) Family name Poaceae (formerly Gramineae)
b) Genus *Zea*
c) Species *mays*
d) Subspecies *mays*
e) Cultivar/breeding line or strain A Syngenta proprietary line of maize
f) Common name Maize; corn

2 a. Information concerning reproduction

(i) Mode(s) of reproduction Sexual reproduction: *Zea mays* is an allogamous plant that propagates through seed produced predominantly by cross-pollination and depends mainly on wind borne cross-fertilisation. *Z. mays* is a plant with protandrous inflorescence; however, decades of conventional selection and improvement have produced varieties of maize with protogynous traits. *Z. mays* has staminate flowers in the tassels and pistillate flowers on the ear shoots. Asexual reproduction: there is no asexually reproductive maize.
(ii) Specific factors affecting reproduction The key critical stages of maize reproduction are tasselling, silking, pollination and fertilization. Climatic and drought stress affect pollen viability and silk longevity thus potentially limiting the period of possible cross-pollination. Maize pollen is very sensitive to dehydration as it loses water rapidly. Other factors like rainfall or irrigation inhibit pollen emission because the anther dehiscence is limited by the mechanical layer. In general, maize pollen is only viable for a few hours after emission. As maize pollen is large and heavy it tends to be deposited close to the source plant and studies have indicated that most maize pollen falls within 5m of the field's edge. In general, such studies have shown that over 98%

of maize pollen remains within a radius of 25-50m of the source, although some grains can travel several hundred meters. Climatic conditions also affect grain and seed production, especially under drought conditions during flowering, tasseling and silking. If severe drought occurs during these phenological stages, the grain yield is reduced.

(iii) Generation time

Maize is an annual crop. The generation time from sowing to harvesting varies according to the genetic background and the climate, it can range from as short as 60 to 70 days to as long as 43 to 48 weeks from seedling emergence to maturity.

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

Other cultivated plant species: The sexual compatibility of maize with other cultivated plant species is limited to *Zea* species.

Wild plant species*:* No wild relatives of maize are present in Europe. Therefore, maize cannot exchange genes with any other wild species in the EU.

3. Survivability

a) Ability to form structures for survival or dormancy

Maize is an annual crop. Seeds are the only survival structures; they cannot be dispersed without mechanical disruption of the cobs and show little or no dormancy. Natural regeneration from vegetative tissue is not known to occur.

b) Specific factors affecting survivability

Survival of maize is dependent upon temperature, seed moisture, genotype, husk protection and stage of development. Maize cannot persist as a weed. Maize seed can only survive under a narrow range of climatic conditions. Volunteers are killed by frost or easily controlled by current agronomic practices including cultivation and the use of selective herbicides. Maize is incapable of sustained reproduction outside of domestic cultivation and is non-invasive of natural habitats.

4. Dissemination

a) Ways and extent of dissemination

Maize dissemination could occur through seed or pollen dispersal. Seed dispersal does not occur naturally due to the structure of the maize ear.

b) Specific factors affecting dissemination

Compared to other wind-pollinated species, maize pollen grains are relatively large and therefore settle to the ground rapidly and have usually a short flight range. Although vertical wind movements or gusts during pollen shedding can lift pollen up high in the atmosphere and distribute it over significant distances, concentrations of viable pollen considerably decrease with height and distance from the source. Hence, only low levels of cross-pollination could occur over longer distances under suitable climatic conditions.

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

Maize is the world's most widespread cereal with very diverse morphological and physiological traits; it is grown on approximately 161 million hectares worldwide (2008). Maize is distributed over a wide range of conditions: from latitudes 50º North to 50º South, below sea level of the Caspian plains up to 3000m in the Andes Mountains and from semi-arid regions to arid regions. The greatest maize production occurs where the warmest month isotherms range between 21º and 27º C and the freeze-free season lasts 120-180 days.

The EU is the fourth largest grain maize producer in the world, after the USA, China and Brazil. In the EU-27, grain maize was cultivated on about 8.4 million hectares (2009) with a production of 57 million tonnes (2009). Another major maize product is silage maize produced on about 5.1 million hectares (2008).

There are no wild relatives of maize in Europe.

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

Maize was introduced into Europe in the 15th century by Columbus and is widely grown in the European Union Member States.

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 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 to competition from surrounding weeds. Maize is extensively cultivated and has a history of safe use for human food and animal feed. No significant native toxins are reported to be associated with the genus *Zea*.

C. INFORMATION RELATING TO THE GENETIC MODIFICATION

1. Description of the methods used for the genetic modification

MIR162 maize was produced by transformation of immature maize embryos derived from a proprietary *Zea mays* line *via Agrobacterium tumefaciens*-mediated transformation.

2. Nature and source of the vector used

The plasmid pNOV1300 was used for transformation. The size, function and donor organism of each element of pNOV1300 have been provided with the application.

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

MIR162 maize is a genetically modified maize that expresses a Vip3Aa20 protein for control of certain lepidopteran pests and a phosphomannose isomerase protein, which acts as a selectable marker enabling transformed plant cells to utilize mannose as a primary carbon source.

The region intended for insertion in MIR162 maize contains *a vip3Aa19* gene from *Bacillus thuringiensis*; this gene is under the control of the maize ZmUbiInt promoter and the nopaline synthase (NOS) terminator from *Agrobacterium tumefaciens*. It also contains the *pmi* gene (also known as *manA*) from *E.coli* encoding a phosphomannose isomerase; this gene is under the control of the maize polyubiquitin promoter and the NOS terminator from *A. tumefaciens*.

Vector component	Size (bp)	Description
Active Ingredient cassette		
ZmUbiInt	1993	Promoter derived from the maize (*Zea mays*) polyubiquitin gene
vip3Aa19	2370	A modified version of the native *vip3Aa1* gene from *Bacillus thuringiensis* that confers resistance to certain lepidopteran pest species.
iPEPC9	108	Intron from the phosphoenolpyruvate carboxylase gene from maize *(Zea mays).*
35S 3' nontranslated region	70	3' nontranslated region sequence from the 35S DNA from the cauliflower mosaic virus (CaMV).
Selectable marker cassette		
ZmUbiInt	1993	Promoter from the maize (*Zea mays*) polyubiquitin gene
pmi	1176	*E. coli pmi* gene encoding the enzyme phosphomannose isomerase (PMI). This gene is also known as *manA.*
NOS	253	Polyadenylation region from the nopaline synthase gene from *Agrobacterium tumefaciens.*

After insertion in the plant, the *vip3Aa19* gene was designated *vip3Aa20*; the encoded protein was designated Vip3Aa20.

D. INFORMATION RELATING TO THE GM PLANT

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

MIR162 maize is a genetically modified maize that expresses a Vip3Aa20 protein which confers protection against certain lepidopteran pests of the Noctuidae insect family. MIR162 maize also expresses a phosphomannose isomerase (PMI) protein as a selectable marker that allows transformed maize cells to utilize mannose as a sole carbon source while maize cells lacking this protein fail to grow.

2. Information on the sequences actually inserted or deleted

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

MIR162 maize contains one single insert present at one single locus; each insert contains one functional copy of the fragment introduced.

In addition to sequencing, southern analysis performed demonstrates the absence of further copies of the insert or vector backbone sequence elsewhere in the genome.

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 inheritance pattern of the inserts in MIR162 maize was analysed and the results showed that insertions had taken place in the nucleus.

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

Sequencing and southern data have demonstrated that MIR162 maize contains a single DNA insertion with one copy of both the *vip3Aa20* and the *pmi* genes. The sequence analysis confirmed that the insert is intact and that the contiguousness of the functional elements within the insert as intended in pNOV1300 has been maintained.

3. Information on the expression of the insert

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

Tissues from maize plants derived from MIR162 maize were analyzed by ELISA to compare the concentrations of Vip3Aa20 and PMI.

The analyses were performed on key plant tissues collected from transgenic hybrid plants at different sampling times across the growing season. To control for background effects, the corresponding tissues from a non-transgenic, near-isogenic control maize were also analyzed.

Vip3Aa20 protein was quantifiable in all tissues of MIR162 plants analyzed. Concentrations of PMI were quantifiable in leaves, roots, pollen, and kernels of MIR162 maize plants.

b) Parts of the plant where the insert is expressed

- Quantifiable concentrations of Vip3Aa20 protein were detected in leaves, roots, whole plants, kernels and pollen derived from MIR162 maize.
- Quantifiable concentrations of PMI were detected in all plant tissues analysed in MIR162 maize derived plant tissue.

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

a) Reproduction

No changes in the reproduction compared to non-GM maize has been observed in the agronomic assessments conducted for MIR162 maize.

b) Dissemination

No changes in the dissemination compared to non-GM maize has been observed in the agronomic assessments conducted for MIR162 maize.

c) Survivability

No changes in the survivability compared to non-GM maize has been observed in the agronomic assessments conducted for MIR162 maize.

d) Other differences

No changes in the reproduction, dissemination or survivability compared to non-GM maize has been observed in the agronomic assessments conducted for MIR162 maize.

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

Analyses showed that the traits have been stably integrated into MIR162 maize.

MIR162 maize F_1 seed once planted by growers produces grain (F_2) which is harvested for food, feed or industrial use. Such grain or products entering the commodity chain are not kept for further sowing.

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

a) Plant to bacteria gene transfer

The horizontal gene transfer from GM plants to bacteria with subsequent expression of the transgene is regarded as a highly unlikely event under natural conditions, especially in the absence of selective pressure. No changes in the ability of the MIR162 maize to transfer genetic material to other organism are expected compared to conventional maize since no sequences have been introduced to allow this to occur.

b) Plant to plant gene transfer

The genetic modification in MIR162 maize is not intended to change any of the typical crop characteristics of maize (except for the intended traits). Observations from field trials have confirmed that the agronomic and phenotypic characteristics of MIR162 maize have not changed in comparison with near-isogenic controls, and therefore, there is no increase or decrease in the potential for plant-to-plant gene transfer compared to traditional maize. Gene transfer from MIR162 maize to other sexually compatible plant species is not possible since maize has no wild relatives in the EU.

In addition, since the scope of this application does not include authorisation for the cultivation, the likelihood of dissemination of pollen to other plants (including cultivated maize plants) is considered to be negligible.

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

MIR162 maize plants were compared with relevant control maize lines that had not been genetically modified. Commercial varieties were also included in the comparison where possible.

7.2 Production of material for comparative assessment

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

To confirm that the maize plants are equivalent in composition to the non-transgenic, near-isogenic lines, replicate trials of transgenic and corresponding isogenic controls were conducted. The locations of the trial sites were selected to be representative of the range of environmental conditions under which the hybrid varieties are expected to be grown. At each location, three replicate plots of each genotype were planted.

b) the baseline used for consideration of natural variations

The levels of multiple nutritive components were compared in maize kernels (grain) or whole plants (forage) from MIR162 maize and near-isogenic conventional maize plants grown concurrently. The mean values were also compared with the range of data published in the literature, where data was available.

7.3 Selection of materials and compounds for analysis

Based on guidance of the OECD, grain from transgenic plants and non-transgenic, near-isogenic control plants were analysed for proximates (including starch), minerals, amino acids and selected fatty acids, vitamins, anti-nutrients and secondary metabolites. Forage (whole plants) from transgenic maize plants and isogenic control plants were analysed for proximates and minerals.

No consistent pattern has emerged to suggest that biologically significant changes in composition or nutritive value of the grain or forage had occurred as an unintended result of transformation or expression of the transgenes in MIR162 maize.

These data support the conclusion that MIR162 maize is compositionally equivalent to conventional maize, apart from the intended traits.

7.4 Agronomic traits

MIR162 maize plants were grown concurrently with near-isogenic conventional maize plants in a series of trials across the USA. Selected agronomic and phenotypic traits were assessed and compared. The results of these trials showed that MIR162 maize is agronomically and phenotypically equivalent to conventional maize, apart from the introduced traits.

7.5 Product specification

Maize as a product has a history of safe use for human food and animal feed. No significant native toxins are reported to be associated with the genus *Zea*. The information presented in this application confirms that MIR162 maize and products derived from them are not different from those of their conventional counterpart.

7.6 Effect of processing

MIR162 maize will be produced and processed in the same way as any non-GM maize and there is no evidence to suggest that the expression of the proteins produced by this maize (Vip3Aa20 and PMI) will influence this processing in any way.

7.7 Anticipated intake/extent of use

There are no anticipated changes to the intake/extent of use of maize as a result of the introduction of MIR162 maize to the conventional maize supply. It is anticipated that the introduction of MIR162 maize will replace some of the maize in existing food and feed products. However, the genetic modification was not intended to change any of the compositional parameters in food and feed as confirmed by the results obtained from the extensive compositional assessment.

7.8 Toxicology

7.8.1 Safety assessment of newly expressed proteins

MIR162 maize produces two newly expressed proteins: Vip3Aa20 and PMI. Potential adverse effects to human and animal health arising from Vip3Aa20 and PMI have previously been assessed and it was concluded that the potential toxic effects to humans and animals of these proteins could be considered negligible. A summary is provided below:

- The recipient organism, maize, has a history of safe use throughout the world.
- None of the gene sequences or their donors are known to be pathogenic to humans and no pathogenic sequences have been introduced.
- Vip3Aa20 and PMI have no significant amino acid homology to known mammalian protein toxins.
- Vip3Aa20 and PMI are unlikely to be allergenic
- Vip3Aa20 and PMI are readily degraded in *in vitro* digestibility assays.
- Vip3Aa20 and PMI show no acute oral toxicity in mammalian studies.

7.8.2 Testing of new constituents other than proteins

Maize is a common source of food and feed and has a long history of safe use. MIR162 maize has been modified to produce Vip3Aa20 and PMI. No other new constituents apart from these proteins are expected to be produced in MIR162 maize and compositional analyses have confirmed the compositional equivalence of MIR162 to conventional maize. Therefore no testing of any other constituent is considered necessary.

7.8.3 Information on natural food and feed constituents

The presence and levels of natural food and feed constituents such as macro- and micronutrients, secondary plant metabolites as well as natural toxins and anti-nutritional factors have been analysed and compared with non-GM isolines and data from the literature.

These analyses showed that the levels of the components measured had not changed beyond the natural variation in maize. No consistent patterns emerged to suggest that biologically significant changes in composition or nutritive value of the grain or forage had occurred as an unintended result of the expression of the transgenes.

7.8.4 Testing of the whole GM food/feed

In addition to the compositional analysis, the wholesomeness and safety of MIR162 maize was confirmed in rat and poultry feeding studies.

7.9 Allergenicity

7.9.1 Assessment of allergenicity of the newly expressed protein

The allergenic potential arising from Vip3Aa20 and PMI have previously been assessed and it was concluded that the allergenic potential to humans and animals of these proteins could be considered negligible. In summary:

- None of the transgenic proteins produced by MIR162 (Vip3Aa20 and PMI) come from donors known to be a significant cause of food allergy.
- Vip3Aa20 and PMI have no biologically significant amino acid homology to known allergens
- Vip3Aa20 and PMI are readily degraded in *in vitro* digestibility assays.

From these data, it can be concluded that Vip3Aa20 and PMI produced by MIR162 maize plants are highly unlikely to be allergenic.

7.9.2 Assessment of allergenicity of the whole GM plant or crop

Maize has been extensively cultivated and has a history of safe use for human food and animal feed. Maize is not considered to be a food crop which causes significant food allergy and the newly expressed proteins in MIR162 maize are very unlikely to be allergenic.

7.10 Nutritional assessment of GM food/feed

7.10.1 Nutritional assessment of GM food

MIR162 maize is not intended to change the nutritional status of individuals of populations or to be processed in products with enhanced functionality. Compositional analysis and whole food safety tests have demonstrated that no unexpected alterations in nutrients and other food components have occurred and that no nutritional imbalances were introduced.

7.10.2 Nutritional assessment of GM feed

MIR162 maize is not intended to change the nutritional status of livestock animals. Compositional analysis and whole food safety tests have demonstrated that no unexpected alterations in nutrients and other food components have occurred and that no nutritional imbalances were introduced.

7.11 Post-market monitoring of GM food/feed

As described in sections 7.1 to 7.10 above, the presence of MIR162 maize in food and feed will not result in any nutritional changes, therefore post-market monitoring is not considered necessary.

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

MIR162 maize confers protection against certain lepidopteran pests of the Noctuidae insect family and is known for the specificity to insects from the order Lepidoptera. Protection against these pests is achieved through the expression of Vip3Aa20, an insecticidal protein with specific activity to insects from the order Lepidoptera. The other transgenic protein produced by MIR162 maize, PMI, is not known to have any effects on organisms. Therefore the target organisms for MIR162 maize are limited to certain species of Lepidoptera.

The cultivation of MIR162 maize is not within the scope of this application, therefore plant interactions with target organisms are highly unlikely in the EU. In the unlikely event that small amounts of MIR162 maize grain could accidentally find their way into the environment this would represent extremely low levels of exposure and the survival of this grain would be very unlikely. Any plants germinating from this grain could be easily controlled using any of the current agronomic measures taken to control other commercially available maize. Therefore MIR162 maize is extremely unlikely to germinate and survive outside agricultural environments and its potential to interact with target species is very low.

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

9.1 Persistence and invasiveness

Cultivation of MIR162 maize in the EU is not within the scope of this application. In the unlikely event that small amounts of grain of MIR162 maize accidentally found their way into the environment their survival would be very unlikely as maize is highly domesticated and cannot survive without human intervention, especially under normal European climatic conditions. The expression of the Vip3Aa20 and PMI does not affect the agronomic characteristics or weediness potential of MIR162 maize, as demonstrated in field trials conducted to evaluate the agronomic performance in comparison with the isogenic control. In the unlikely event that these maize plants were to survive they could be easily controlled using any of the current agronomic measures taken to control other commercially available maize.

In summary, the likelihood that MIR162 maize becoming more persistent than the recipient or parental plants in agricultural habitats or more invasive in natural habitats as a result of importing maize kernels of this maize into the EU can be considered negligible.

9.2 Selective advantage or disadvantage

MIR162 maize expresses the proteins Vip3Aa20 and PMI. Expression of Vip3Aa20, conferring resistance to certain pest species of Lepidoptera, in areas of Europe where these are important maize pests, could be considered an advantage over conventional maize. However, maize is a highly domesticated plant and cannot survive without human intervention, even in areas without pressure from these target pests. Therefore, expression of Vip3Aa20 will not increase the chances of maize survival under European conditions and would not confer any selective advantage.

Expression of PMI could only confer an advantage to maize plants growing under conditions where mannose was the only source of carbon, conditions that are highly unlikely in normal soils. Therefore, expression of PMI cannot be considered a factor that would confer selective advantage to maize.

In summary, the likelihood that the expression of the Lepidoptera pest protection trait, or the selectable marker in MIR162 maize will result in a selective advantage or disadvantage compared with conventional maize can be considered negligible

9.3 Potential for gene transfer

MIR162 maize expresses the proteins Vip3Aa20 and PMI. Given the characteristics of the genes inserted and the constructs used, the likelihood that genes from MIR162 maize would become established in the genome of microorganisms in the environment or human and animal digestive tract is very low. In the very unlikely event that such a horizontal gene transfer would take place, no adverse effects on human and animal health or the environment are expected.

Gene transfer from MIR162 maize to other sexually compatible plant species is not possible since there are no wild relatives of maize in the EU.

9.4 Interactions between the GM plant and target organisms

The scope of this application does not include cultivation of MIR162 maize in the EU, therefore interactions between MIR162 maize and target organisms are highly unlikely.

As described in Section D.8 interactions of the target pests with MIR162 maize have been described in the application.

9.5 Interactions of the GM plant with non-target organisms

The scope of this application does not include the cultivation of MIR162 maize in the EU, therefore interactions between MIR162 maize and non-target organisms are highly unlikely.

MIR162 maize expresses the proteins Vip3Aa20 and PMI. Vip3Aa20 is a protein which displays insecticidal activity against certain lepidopteran species.

In the unlikely event that small amounts of MIR162 maize grain accidentally found their way into the environment this would represent extremely low levels of exposure and the survival of this grain would be very unlikely. Any plants germinating from this grain could be easily controlled using any of the current agronomic measures taken to control other commercially available maize. Therefore MIR162 maize are extremely unlikely to germinate and survive outside agricultural environments and its potential to interact with non-target species is very low.

In summary, immediate or delayed effects in the environment due to direct or indirect interactions between MIR162 maize plants and non-target organisms can be considered highly unlikely under the scope of this application.

9.6 Effects on human health

The scope of this application does not include cultivation of MIR162 maize in the EU, therefore exposure to this maize is most likely to occur through ingestion of food containing MIR162 maize.

In addition, compositional analysis and broiler feeding studies with MIR162 maize have confirmed that the MIR162 maize is equivalent in composition to conventional maize and as safe and nutritious as conventional maize.

There is no reason to anticipate that MIR162 maize would result in product that differs in toxicity or allergenic potential to humans. None of the proteins produced by MIR162 maize are known to be toxic or allergenic to humans and there are no known precedents where interactions between non-toxic proteins lead to toxic effects.

In summary, no adverse effects on human health or adverse consequences for the food chain are expected following consumption of food consisting or containing MIR162 maize.

9.7 Effects on animal health

The scope of this application does not include cultivation of MIR162 maize in the EU, therefore exposure to these maize is most likely to occur through ingestion of feed containing MIR162 maize. The potential for adverse effects on animal health of each of MIR162maize has been assessed in risk assessments and it has been concluded that the potential for adverse effects on animal health from consumption of MIR162 maize is negligible.

In addition, compositional analysis and broiler feeding studies with MIR162 maize have confirmed that the MIR162 maize is equivalent in composition to conventional maize and as safe and nutritious as conventional maize.

There is no reason to anticipate that MIR162 maize would result in product that differs in toxicity or allergenic potential to humans. None of the proteins produced by MIR162 maize are known to be toxic or allergenic to humans and there are no known precedents where interactions between non-toxic proteins lead to toxic effects.

In summary, no adverse effects on animal health or adverse consequences for the feed chain are expected following consumption of feed consisting or containing MIR162 maize.

9.8 Effects on biogeochemical processes

The scope of this application does not include cultivation of MIR162 maize in the EU. Interactions with target or non-target organisms that could lead to effects on biogeochemical processes are therefore highly unlikely.

In the unlikely event that small amounts of grain of MIR162 maize accidentally found their way into the EU environment, their survival would be very unlikely, as maize is a highly domesticated plant and cannot survive without human intervention, especially under normal

European climatic conditions. Moreover, these plants could be easily controlled using any of the current agronomic measures taken to control other commercially available maize. In the unlikely event that some MIR162 maize plants survived, the potential effects on biogeochemical processes as a result of interactions with target and non-target organisms are likely to be the same as those effects resulting from cultivation of non-modified maize.

In summary, the risk of adverse effects on biogeochemical processes resulting from interactions of MIR162 maize and target or non-target organisms can be considered negligible under the scope of this application.

9.9 Impacts of the specific cultivation, management and harvesting techniques

The scope of this application does not include cultivation of MIR162 maize plants in the EU; therefore there are no specific cultivation, management and harvesting techniques for the use of MIR162 maize in the EU.

10. Potential interactions with the abiotic environment

The scope of this application does not include cultivation of MIR162 maize in the EU; therefore interactions of MIR162 maize with the abiotic environment are highly unlikely. In the unlikely event that small amounts of grain of MIR162 maize accidentally found their way into the EU environment, their survival would be very unlikely, as maize is a highly domesticated plant and cannot survive without human intervention, especially under normal European climatic conditions. Moreover, these plants could be easily controlled using any of the current agronomic measures taken to control other commercially available maize. In the unlikely event that some MIR162 maize plants survive, the potential effects on the abiotic environment are likely to be the same as those effects resulting from cultivation of non-modified maize.

In summary, environmental impacts as a result of interactions between MIR162 maize and the abiotic environment can be considered negligible within the scope of this application.

11. Environmental monitoring plan (not if application concerns only food and feed produced from GM plants, or containing ingredients produced from GM plants and if the applicant has clearly shown that environmental exposure is absent or will be at levels or in a form that does not present a risk to other living organisms or the abiotic environment)

11.1 General (risk assessment, background information)

As required by Article 5(5)(b) and 17(5)(b) of Regulation (EC) No. 1829/2003 the proposed monitoring plan for MIR162 maize has been developed according to the principles and objectives outlined in Annex VII of Directive 2001/18/EC and Decision 2002/811/EC establishing guidance notes supplementing Annex VII to Directive 2001/18/EC. The structure of the monitoring plan also takes into account the guidance on presentation of applications

provided in the Guidance Document of the Scientific Panel on Genetically Modified Organisms for the risk assessment of genetically modified plants and derived food and feed.

An environmental risk assessment (ERA) for MIR162 maize has been conducted. These risk assessment was conducted as recommended by the Guidance document of the Scientific Panel of Genetically Modified Organisms for the risk assessment of GM plants and derived food and feed. The conclusion of this risk assessment was that the adverse effects to the environment arising from the import and use of MIR162 maize could be considered as negligible as those from any other commercial maize.

A risk assessment for MIR162 maize has also been conducted following the same Guidance document and taking into account the recent Guidance Document of the Scientific Panel on Genetically Modified Organisms for the risk assessment of GM plants containing the respective transformation events. Risk assessment concepts described in recent publications have also been used.

The conclusions of the ERA confirm that the effects to the environment arising from the use of MIR162 maize will be no different to those from any other commercial maize.

11.2 Interplay between environmental risk assessment and monitoring

In general two types of environmental monitoring can be described:

a. case-specific monitoring, designed to evaluate potential adverse effects linked to the genetic modification, identified in the environmental risk assessment (ERA)
b. general surveillance, which is aimed to identify adverse unforeseen effects that were not anticipated in the environmental risk assessment.

An ERA has been conducted in accordance with Annex II of Directive 2001/18/EC and takes into account the Guidance Document of the Scientific Panel on Genetically Modified Organisms for the risk assessment of GM plants containing transformation events to evaluate potential adverse effects of MIR162 maize on human and animal health and the environment. The conclusions of this ERA confirmed that the potential risks to human and animal health or the environment arising from the placing on the market of MIR162 maize can be considered negligible. Therefore, a case-specific monitoring plan is not considered necessary under the scope of this application. However, a general surveillance plan based on Annex II of the Directive 2001/18/EC has been developed by EuropaBio and is outlined below.

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

An environmental risk assessment (ERA) has been conducted in accordance with Annex II of Directive 2001/18/EC to evaluate potential adverse effects of MIR162 maize on human and animal health and the environment. The conclusions of this ERA confirm that the potential risks to human and animal health or the environment arising from the placing on the market of MIR162 maize can be considered negligible, under the scope of this application. Therefore, a case-specific monitoring plan is not considered necessary under the scope of this application. However, a general surveillance plan based on Annex II of the Directive 2001/18/EC has

been developed by EuropaBio and is outlined below.

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

The objective of general surveillance is to identify unforeseen adverse effects of the GM plant or its use, on human health and the environment, which were not predicted in the risk assessment. The scope of this application does not include cultivation of MIR162 maize in the EU.

Exposure to the environment will be limited to unintended release of MIR162 maize, which could occur for example via substantial losses during loading/unloading of the viable commodity including MIR162 maize destined for processing into animal feed or human food products. However, such exposure is highly unlikely to give rise to an adverse effect and can be easily controlled by clean up measures and the application of current practices used for the control of any adventitious maize plants, such as manual or mechanical removal and the application of herbicides. Furthermore, unintended environmental effects due to the unintended release of MIR162 maize will be no different than that of other commercial maize.

However and in order to safeguard against any adverse effects on human and animal health or the environment that were not anticipated in the ERA, general surveillance on MIR162 maize will be undertaken for the duration of the authorisation. The general surveillance will take into consideration, and be proportionate to, the extent of imports of MIR162 maize and use thereof in the Member States.

In order to increase the possibility of detecting any unanticipated adverse effects, a monitoring system will be used, which involves the authorisation holder and operators handling and using viable MIR162 maize. The operators will be provided with guidance to facilitate reporting of any unanticipated adverse effect from handling and use of viable MIR162 maize.

11.5 Reporting the results of monitoring

The applicant/consent holder is responsible, under Regulation (EC) No 1829/2003, to inform the Commission of the results of the surveillance. Consistent with the EFSA guidance, the applicant will submit a General Surveillance Report containing information related to the monitoring on an annual basis.

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

Methods for detection of MIR162 maize have been developed by Syngenta. The proposed methods are real-time quantitative TaqMan® PCR based on specific detection of the genomic DNA of these events. A method for detection of MIR162 maize has been submitted to the DG JRC-CRL 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

Syngenta has previously carried out field trials of MIR162 maize in the EU.
a) Notification number Spain: B/ES/09/41 Czech Republic: B/CZ/09/01 Romania: B/RO/09/04
b) Conclusions of post-release monitoring No unexpected effects or observations have been detected to date. No adverse effects on human health or the environmental have been observed or reported during these releases The results of these field trials confirm the safety of the deliberate release of MIR162 maize into the environment in the E.U.
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 unexpected effects or observations have been detected. No adverse effects on human health or the environmental have been observed or reported during these releases Final reports of the releases can be found at the JRC web page http://gmoinfo.jrc.ec.europa.eu/gmp_browse.aspx

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

a) **Release country**
MIR162 maize is approved for commercial cultivation in the USA, Canada and Brazil. Syngenta has conducted research field trials with this maize in the Argentina, Brazil, Canada and USA
b) **Authority overseeing the release**
Argentina: Conabia; Brazil: CTNBio; Canada: CFIA; US: EPA, USDA
c) **Release site**
Various release sites across Argentina, Brazil, Canada and USA.
d) **Aim of the release**
Research and development.
e) **Duration of the release**
Varied depending on the aim of the trial.
f) **Aim of post-releases monitoring**
To confirm the management procedures for example in the control of volunteers.
g) **Duration of post-releases monitoring**
Varied depending on the aim of the trial, typically one year.
h) **Conclusions of post-release monitoring**
The occurrence of volunteers after planting MIR162 field trials was no different to other maize.
i) **Results of the release in respect to any risk to human health and the environment**
No evidence of adverse effects to human health or the environment has been found.

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

The status and process of approval can be found on the EFSA website:

http://www.efsa.europa.eu/en/gmo/gmoapplications.htm

b) Assessment Report of the Competent Authority (Directive 2001/18/EC)

An application for approval of MIR162 maize under the Directive 2001/18/EC has not been made by Syngenta.

c) EFSA opinion

An EFSA opinion on MIR162 maize was not available at the time of submission. EFSA opinions, once available can be found at

http://www.efsa.europa.eu/en/scdocs.htm

d) Commission Register (Commission Decision 2004/204/EC

The Commission register of GM Food and Feed can be found at

http://ec.europa.eu/food/food/biotechnology/authorisation/index_en.htm

e) Molecular Register of the Community Reference Laboratory/Joint Research Centre

The Community Reference Laboratory webpage is

http://gmo-crl.jrc.ec.europa.eu/

f) Biosafety Clearing-House (Council Decision 2002/628/EC)

Information relating to the Biosafety clearing house can be found at:

http://bch.biodiv.org/

g) Summary Notification Information Format (SNIF) (Council Decision 2002/812/EC)

An application for approval of MIR162 maize under the Directive 2001/18/EC has not been made by Syngenta, however a link to this Summary under Regulation (EC) No 1829/2003, should be found at:

http://gmoinfo.jrc.ec.europa.eu/