University of Zurich[UZH]

Summary of the Application for a Permit to Release GMPs for Experimental Purposes

A. General Information

Application number
B/CH/13/01 (B13001)

Date of publication of application in the Swiss Federal Gazette
26. February 2013

Title of the project
Investigation of Genetically Modified Wheat with Improved Powdery Mildew Resistance

Proposed period of release
2014-2018, March to August in each year

Name of the institute
Institute of Plant Biology, University of Zurich

Is the same genetically modified plant (GMP) release planned elsewhere?
No

Has/Have the Applicant(s) already applied for a permit to release the same GMP? If so, what were the Application numbers?
The transgenic *Pm3a*, *Pm3b*, *Pm3c*, *Pm3d*, *Pm3f* and *Pm3g* wheat lines have already been approved for experimental release (Applications B/CH/07/02 (B07002) and B/CH/07/04 (B7004)).

B.1 Genetically Modified Plant (GMP)

1. Complete name of the recipient or (if applicable) parental plant(s)

Common name	Family name	Genus	Species	Subspecies	Cultivar/breeding line
Bread wheat, common wheat	*Poaceae* (*Gramineae*)	*Triticum* (LINNAEUS)	*Triticum aestivum* (LINNAEUS)	Spring wheat	Bobwhite SH 98 26

2. Description of the traits and characteristics which have been introduced or modified, including marker genes and previous modifications
The GM wheat lines each carry a *Pm3* allele which codes for a resistance protein with the CC-NB-ARC-LRR domains and confers resistance to various strains of wheat powdery mildew (*Blumeria graminis* f. sp. *tritici*).
Four GM wheat lines were produced by the crossing of GM *Pm3a*, *Pm3b*, *Pm3d* and *Pm3f* wheat lines and subsequent self-pollination of the offspring, followed by the selection of the offspring carrying two *Pm3* alleles (*Pm3axPm3b*, *Pm3axPm3d*, *Pm3bxPm3d* and *Pm3bxPm3f*).

All GM wheat lines carry the gene *manA* from *E. coli* as a selection marker, which codes for a phosphomannose isomerase (PMI) and allows the regenerating plants in the tissue culture to use mannose from the media as a carbon source.

B.2 Genetic Modification

3. Type of genetic modification
Insertion

4. In case of insertion of genetic material, give the source and intended function of each constituent fragment of the region to be inserted
Target-gene cassettes (6.8 kb)
- Promoter: Ubiquitin promoter from maize (*Zea mays*); (2.0 kb)
- Powdery mildew-resistance gene: a *Pm3* allele from wheat (*Triticum aestivum*); a 27 bp long DNA sequence, which encodes the HA epitope tag (YPYDVPDYA), was inserted before the stop codon of all alleles but *Pm3b*; (4.5 kb)
- Terminator: termination sequence of the nopaline synthase gene from *Agrobacterium tumefaciens*; (0.3 kb)

Marker-gene cassette (3.5 kb)
- Promoter: Ubiquitin promoter from maize (*Zea mays*); (2.0 kb)
- Selection-marker gene: *manA* from *Escherichia coli*; (1.2 kb)
- Terminator: termination sequence of the nopaline synthase gene from *Agrobacterium tumefaciens*; (0.3 kb)

6. Brief description of the method used for the genetic modification
Immature wheat embryos were bombarded with gold particles coated with a target gene cassette and the marker-gene cassette. Afterwards, callus formation was induced and entire plants were regenerated from callus cultures, with mannose being added to the tissue-culture media as a positive selection agent.

C. Experimental Release

1. Purpose of the release
Studies on the function of plant disease-resistance genes.

2. Geographical location of the release site
‚Protected Site' of Agroscope at Zurich, Reckenholz, Reckenholzstrasse 191, 8046 Zurich

3. Size of the site (m^2)
Less than 34,000 m^2 (3.4 ha)

4. Relevant data regarding previous releases carried out with the same GMP, if any, specifically related to the potential environmental and human-health impacts from the release
No negative effects on either the environment or on human health were noted in the previous experiments (see www.konsortium-weizen.ch under 'Results').

D. Environmental Impact and Risk Management

1. Summary of the potential environmental impact from the release of the GMPs

The examination of the GM *Pm3* plants showed that the risk of possible harmful effects on the environment is negligible:

- The risk of the GM plants having a significant selective advantage in the natural environments and of persistence therein is negligible.
- The risk of the GM plants outcrossing is negligible, given that wheat is a self-pollinator and that isolation distances to potential outcrossing partners are respected.
- Since *Pm3* occurs naturally in wheat and previous studies have given no indications of significant effects on non-target organisms, the risk of such effects is to be gauged as negligible. Nor did studies with *manA* give any indications of negative effects.
- The influence on the environment from the sowing, management of the trials and harvesting of the GM plants is regarded as not differing from that of other wheat trials.
- There are no indications of nutrient cycles being at risk, nor of the development of resistance. The risk is negligible.

2. Brief description of any measures taken for the management of risks

General measures:

- Perimeter fencing around the test field
- Training of all persons who enter the field
- Cleaning of the machines after sowing
- Transport of seeds from GM plants in closed, double-walled and labelled containers/bags
- An emergency plan governs the measures in case of special events

Culture-specific measures:

- Protection from consumption by birds if necessary
- Distance requirements (i.e. isolation distances) to wheat, rye and triticale, as well as a border crop to prevent outcrossing with cultivated species. The wild species *Aegilops cylindrica* is not present in the area of the experimental site.
- Volunteer plants are controlled, and the success of both these control measures and of those for preventing seed carry-over is investigated (experimental field, area surrounding the gates and direct traffic routes are inspected).

Final Report

(Not yet available)

Decision of the Swiss Federal Office for the Environment (FOEN) on the granting of the permit

Authorised on 15 August 2013.

Version: 19 November 2014