Australian Government
Department of Health and Ageing
Office of the Gene Technology Regulator

11 September 2007

TECHNICAL SUMMARY OF THE RISK ASSESSMENT AND RISK MANAGEMENT PLAN
for
APPLICATION NO. DIR 073/2007
from
DELTAPINE AUSTRALIA PTY LTD

INTRODUCTION

The Gene Technology Regulator (the Regulator) has decided to issue a licence (DIR 073/2007) to Deltapine Australia Pty Ltd (Deltapine) for dealings involving the intentional release of genetically modified (GM) cotton lines into the environment, on a limited scale and under controlled conditions.

The *Gene Technology Act 2000*[1] (the Act), *the Gene Technology Regulations 2001* (the Regulations) and corresponding State and Territory law govern the comprehensive and highly consultative process undertaken by the Regulator before making a decision whether or not to issue a licence to deal with a GMO.

The Regulator's *Risk Analysis Framework* explains the approach used to evaluate licence applications and to develop the Risk Assessment and Risk Management Plans (RARMPs) that form the basis of her decisions[2].

This RARMP for DIR 073/2007 has been finalised in accordance with the gene technology legislation. Matters raised in the consultation process regarding risks to health and safety of people or the environment from the proposed dealings were taken into account by the Regulator in deciding to issue a licence and the licence conditions that have imposed.

[1] None of the amendments arising from a recent statutory review of the Act that came into effect on 1 July 2007 apply directly to the processing of this application which commenced prior to this date.
[2] More information on the assessment of licence applications and copies of the *Risk Analysis Framework* are available from the Office of the Gene Technology Regulator (OGTR). Free call 1800 181 030 or at <http://www.ogtr.gov.au/ir/process.htm> and <http://www.ogtr.gov.au/pdf/public/ raffinal2.2.pdf > respectively.

APPLICATION

*TITLE:	Limited and controlled release of GM insect resistant and insect resistant/herbicide tolerant cotton
APPLICANT:	Deltapine Australia Pty Ltd
COMMON NAME OF THE PARENT ORGANISM:	Cotton
SCIENTIFIC NAME OF THE PARENT ORGANISM:	*Gossypium hirsutum* L.
MODIFIED TRAIT(S):	Insect resistance, herbicide tolerance, antibiotic resistance
IDENTITY OF THE GENE(S) RESPONSIBLE FOR THE MODIFIED TRAIT(S):	• *vip3A* gene from the bacterium *Bacillus thuringiensis* (insect resistance) • modified *cry1Ab* gene from the bacterium *Bacillus thuringiensis* (insect resistance) • *cp4 epsps* gene from the bacterium *Escherichia coli* (herbicide tolerance) • *aph4* gene from the bacterium *Escherichia coli* (antibiotic resistance)
PROPOSED LOCATION(S):	Up to 50 sites in New South Wales (NSW) shires of Bourke, Brewarrina, Gwydir, Liverpool Plains, Moree Plains, Narrabri, Narromine, Walgett and Warren, and/or the Queensland (QLD) shires of Balonne, Banana, Chinchilla, Dalby, Emerald, Jondaryan, Millmerran, Pittsworth, Waggamba, Wambo and Wondai.
PROPOSED RELEASE SIZE:	Up to 500 hectares
PROPOSED TIME OF RELEASE:	Summer 2007/08, 2008/09, 2009/10

*The title of the licence application submitted by Deltapine was *Cotton field trials of insect resistant cotton expressing the VIP3A and Cry1Ab genes, either alone or in combination, and both insect resistance genes together with the Roundup Ready Flex herbicide tolerance trait (Cry1Ab alone, VIP3A alone, Cry1Ab + VIP3A, Cry1Ab + VIP3A + Roundup Ready Flex).*

Deltapine applied for a licence for the intentional release of GM cotton lines[3] into the environment on a limited scale and under controlled conditions. The release is authorised to take place at up to 50 sites of no more than 10 hectares each (ie maximum total area of 500 hectares) over 3 summer growing seasons (2007/08, 2008/09 and 2009/10). The approved sites are located in twenty shires in NSW and QLD.

Four GM cotton lines are approved for release. The VIP3A GM cotton line (sometimes described by its event transformation number, COT102) contains an insect resistance gene, *vip3A*, derived from a common soil bacterium *Bacillus thuringiensis*. The modified Cry1Ab GM cotton line contains a different insect resistance gene, modified *cry1Ab*, based on the *cry1Ab* gene derived from *B. thuringiensis*. This gene is modified relative to *cry1Ab* by the addition of a sequence coding for 26 amino acids derived from the *cry1Aa* gene. The insect resistance genes encode proteins that are selectively toxic to the major lepidopteran caterpillar pests of cotton (*Helicoverpa armigera* and *H. punctigera*). The VIP3A/modified Cry1Ab GM cotton line contains both insect resistance genes (*vip3A* and modified *cry1Ab*).

The VIP3A/modified Cry1Ab/Roundup Ready Flex® GM cotton line will contain both insect resistance genes (*vip3A* and modified *cry1Ab*) and two copies of the herbicide tolerance gene, *cp4 epsps*, which is commercially known as the Roundup Ready Flex® herbicide tolerance trait. The *cp4 epsps* gene is derived from another common soil bacterium, *Agrobacterium tumefaciens*. Roundup Ready Flex® GM cotton is currently approved for commercial release in Australia (see below).

Unlike the plant *cp4 epsps* gene, the CP4 EPSPS protein encoded by the bacterial gene can function in the presence of glyphosate, the active constituent in Roundup Ready® Herbicide. Expression of two copies of the herbicide tolerance gene present in Roundup Ready Flex® GM cotton confers tolerance to glyphosate throughout the growing season, so herbicide can be applied to the crop to kill weeds without damaging the cotton plants.

In addition, the GM cotton lines containing the *vip3A* gene also contain a commonly used selectable marker gene, *aph4*, from the gut bacterium *Escherichia coli*, which confers

[3] The GM cotton lines proposed for release are all cotton species with the scientific name *Gossypium hirsutum.*

resistance to the antibiotic, hygromycin B. The marker gene enabled identification of GM plant tissues during the initial laboratory stage of development of the GMOs.

The aims of the trial are to conduct early stage research to evaluate the agronomic performance of the GM cotton lines; collect data for future applications to the OGTR and other regulators (including investigating the impact of the GM cotton on non-target organisms and the efficacy of the introduced traits); breed, select and test new cotton lines; and produce seed for use in further studies or future trials, subject to additional approvals.

The applicant proposed measures to limit the spread and persistence of the GM cotton lines in the environment. These were taken into account in establishing the risk assessment context for the proposed release. The suitability of these measures for limiting the release to the size, duration and locations proposed by the applicant was considered as part of the risk assessment process. The GM plant material is not permitted for use for human food or animal feed. However, the applicant has approval to sell lint from the release.

Some details of the gene construct, including the plasmid map and regulatory sequences, for the modified Cry1Ab line were previously declared as Confidential Commercial Information (CCI) under DIR 065/2006. However, this CCI has now been revoked at the request of the applicant. The previously declared CCI information was contained in the application and was considered in the assessment process.

RISK ASSESSMENT

The risk assessment considered information contained in the application, current scientific knowledge, and issues relating to risks to human health and safety and the environment raised in submissions received during consultation with a wide range of prescribed experts, agencies and authorities on the application (summarised in Appendix B of the RARMP). No new risks to people or the environment were identified from the advice received on the consultation RARMP.

Advice received from a member of the public on both the application and consultation RARMP, and how it was considered, is summarised in Appendices C and D, respectively.

A reference document, *The Biology and Ecology of Cotton* (*Gossypium hirsutum* L.) in Australia, was produced to inform the risk assessment process for licence applications involving GM cotton plants. The document is available from the OGTR or from the website <http://www.ogtr.gov.au>.

The hazard identification process considered the circumstances or events by which people or the environment may be exposed to the GMOs, GM plant materials, GM plant by-products, the introduced genes, or products of the introduced genes.

A hazard (source of potential harm) may be an event, substance or organism. A risk is identified when a hazard is considered to have some chance of causing harm. Those events that do not lead to an adverse outcome, or could not reasonably occur, do not advance in the risk assessment process.

Seventeen events were identified and assessed whereby the proposed release of the GM cotton lines might give rise to harm to people or the environment.

These 17 events included consideration of whether expression of the introduced genes could result in products that are toxic or allergenic to people, or toxic to other organisms; alter characteristics that may impact on the spread and persistence of the GM plants; or produce

unintended changes in biochemistry or physiology. In addition, consideration was given to the potential for gene flow to other organisms, and its effect if this occurred.

All events were characterised in relation to both the magnitude and probability of harm in the context of controls proposed by the applicant to limit the spread and persistence of the GMOs in time and space. This detailed consideration concluded that none of the 17 events gave rise to an identified risk that required further assessment. The principal reasons comprise:

- the scale of the release is limited in both area and duration
- containment, monitoring and disposal measures proposed by the applicant will limit the spread and persistence of the GM cotton plants
- none of the GM plant materials or products will be used in human food or animal feed
- widespread presence of the same or similar proteins encoded by the introduced genes in the environment and lack of known toxicity or allergenicity from these proteins
- limited capacity of the GM cotton plants to spread and persist outside the release sites
- limited ability and opportunity for the GM cotton lines to transfer the introduced genes to commercial cotton crops or other sexually compatible species.

Therefore, as no risks to the health and safety of people, or the environment were identified from the limited and controlled release of the GM cotton lines into the environment, the level of risk is considered to be **negligible**.

RISK MANAGEMENT

The risk management plan builds upon the risk assessment to determine whether measures are required to protect the health and safety of people and the environment.

As none of the 17 events characterised in the risk assessment process are considered to give rise to an identified risk that requires further assessment, the level of risk to human health and safety and the environment from the proposed release of GM cotton lines is considered to be **negligible**.

The Regulator's *Risk Analysis Framework* defines negligible as insubstantial with no present need to invoke actions for their mitigation. However, containment measures have been imposed in the licence to restrict the release to the size, duration and locations requested by the applicant, as these were an important consideration in establishing the context for assessing the risks.

Licence conditions to manage this limited and controlled release

A number of licence conditions have been imposed to limit and control the release, including:

- locating the sites 50 m away from natural waterways
- surrounding sites with a 20 m pollen trap of non-GM or commercially released GM cotton (Roundup Ready Flex®) and treating all plants in this area in the same way as the GM cotton plants approved for release

- destruction of all GM cotton plant materials (excluding lint, seed and plant material required for further study) by burning and destruction of excess seed by burial

- storage of GM cotton seed and plant materials (excluding lint) required for further study or future release in certified physical containment level 2 facilities

- after harvest, monitor each site for at least 12 months and destroy any GM cotton plants that emerge until no volunteers are detected for a 6 month period.

The Regulator has issued guidelines and policies for the transport and supply of GMOs (*Guidelines for the transport of GMOs, July 2007; Policy on transport and supply of GMOs, July 2005*). Licence conditions based on these guidelines and policies have also been imposed, to control possession, use or disposal of the GMOs for the purposes of, or in the course of, the authorised dealings.

OTHER REGULATORY CONSIDERATIONS

The Regulator is responsible for assessing and managing risks to the health and safety of people and/or the environment associated with the use and development of gene technology. However, additional approvals from other regulators with complimentary responsibilities including issues outside the scope of the *Gene Technology Act 2000* may be required[4]. For this application the relevant regulatory agencies are Food Standard Australia New Zealand (FSANZ) and the Australian Pesticides and Veterinary Medicines Authority (APVMA).

FSANZ is responsible for human food safety assessment, including GM food. FSANZ has approved oil and linters derived from the VIP3A insect resistant GM cotton line (COT102) and Roundup Ready Flex® cotton for use in food. The applicant does not intend to use materials from any of the GM cotton lines (including those containing VIP3A or the Roundup Ready Flex® herbicide tolerance trait) in food and therefore has not applied to FSANZ for approval. FSANZ approval would need to be obtained before such materials could be used for human food.

The GM cotton lines approved for release meet the definition of an agricultural chemical product under the *Agricultural and Veterinary Chemicals Code Act 1994*, due to their production of insecticidal substances, and are therefore subject to regulation by the APVMA. Deltapine will need to obtain an APVMA research permit for the proposed release. The use of Roundup Ready® Herbicide is currently registered by the APVMA for use on Roundup Ready Flex® cotton.

Identification of issues to be addressed for future releases

The risk assessment identified additional information that may be required to assess an application for a large scale or a commercial release of any of these GM cotton lines or to justify a reduction in the containment conditions. This may include:

- specificity of the insecticidal activity of GM cotton lines containing modified *cry1Ab* alone, and in combination with *vip3A*

- toxicity of the VIP3A and modified Cry1Ab proteins alone, and in combination, for non-target (including predators and beneficial insects) organisms in Australia

[4] More information on Australia's integrated regulatory framework for gene technology is contained in the *Risk Analysis Framework* available from the Office of the Gene Technology Regulator (OGTR). Free call 1800 181 030 or at <http://www.ogtr.gov.au/pdf/public/ raffinal2.2.pdf >.

- data on the expression level of the proteins encoded by the introduced insecticidal genes (*vip3A* and modified *cry1Ab*) alone, in combination, and together with the herbicide tolerance gene (*cp4 epsps*), in various parts of the GM cotton plants (including pollen grains), under Australian field conditions

- genotype stability and molecular characterisation of the VIP3A/modified Cry1Ab and VIP3A/modified Cry1Ab/Roundup Ready Flex® GM cotton lines

- the effect of VIP3A and modified Cry1Ab alone, or in combination, on lepidopteran herbivory which may contribute to increased weediness if the GM cotton lines were released in northern Australia (north of latitude 22° South).

CONCLUSIONS OF THE RARMP

The risk assessment concluded that this limited and controlled release of GM cotton lines with insect resistance and insect resistance in combination with herbicide tolerance in up to 20 shires in NSW and QLD, poses **negligible** risks to the health and safety of people and the environment posed by or as a result of gene technology.

The risk management plan concluded that these **negligible** risks do not require specific risk treatment measures. However, licence conditions have been imposed to contain the release to the size, duration and locations requested by the applicant, as these were important considerations in establishing the context for assessing the risks.