

**RISK ASSESSMENT REPORT  
OF THE GENETIC MODIFICATION  
ADVISORY COMMITTEE (GMAC)**

***FOR***

**AN APPLICATION FOR APPROVAL FOR  
RELEASE OF PRODUCTS OF  
MON15985 COTTON FOR SUPPLY OR  
OFFER TO SUPPLY**

**NBB REF NO: JBK(S) 600-2/1/15**

**APPLICANT: MONSANTO (MALAYSIA)  
SDN. BHD.**

**DATE: 12 JANUARY 2022**

## ***I - Summary of Assessment Process***

On 12 March 2021, the Genetic Modification Advisory Committee (GMAC) received from the Department of Biosafety an application for the approval for importation for release [sale/placing on the market for direct use as food, feed and for processing (FFP)] of a product of a Living Modified Organism, insect resistant MON15985 cotton. The application was filed by Monsanto (Malaysia) Sdn. Bhd. (hereafter referred to as “the applicant”). After an initial review, GMAC requested for additional information from the applicant.

A public consultation for this application was conducted from 26 November 2020 to 25 December 2020 via advertisements in the local newspapers, e-mail announcements and social media. Comments were received from Malaysian Palm Oil Board (MPOB), Consumers Association of Penang (CAP), Malaysia Demeter Association and many other individuals. GMAC took into considerations comments that were relevant to the risk assessment in the aspect of human health which includes the presence of novel protein in the processed oil, possible impact of Bt toxin, and analyte differences of the product. GMAC also took into consideration other comments which include unintended release of the product, the use of stronger chemicals in agriculture practices, and the requirement for labelling.

GMAC had five (5) meetings pertaining to this application and prepared the Risk Assessment Report and Risk Assessment Matrix along with its recommended decision, for consideration by the National Biosafety Board.

## ***II - Background of Application***

This application is for approval to import and release products of a Living Modified Organism insect resistant MON15985 cotton. The aim of the import and release is to supply or offer to supply for sale/placing on the market for direct use as food, feed and for processing (FFP). According to the applicant, MON15985 cotton has been fully approved in a number of countries for cultivation as well as for food, feed and for processing. MON15985 cotton is approved in many countries including Australia, Brazil, Columbia, European Union, Japan, Mexico, South Korea and United States of America. Processed oil and meal of MON15985 cotton may enter the food and feed chain.

The primary use of cotton is for the textile industry. Cottonseed is processed into four major by-products: oil, meal, hulls and linters. The primary human foods from cottonseed are highly processed refined, bleached and deodorized (RBD) oil and linters. Cottonseed oil is traded as premium quality oil that is used in a variety of food uses, including frying, salad and cooking oil, mayonnaise, salad dressing, shortening, margarine and packing oil. Linters, which are also highly processed and are nearly pure cellulose, are used as a fiber supplement, casings for processed meats, binder for solids in the pharmaceutical industry, and to improve viscosity in products such as toothpaste, ice cream and salad dressings. Cottonseed and cottonseed meal is primarily sold as feed for livestock, of which the major value is as a protein concentrate. The presence of gossypol and cyclopropenoid fatty acids in cottonseed does not prevent use in ruminant diets, but

does limit the cottonseed quantity utilized as a protein supplement in these diets, such as beef cattle, dairy cows and sheep. Most other farm animals (monogastric animals) are not fed cottonseed meal to any appreciable level. The hull is used as roughage for livestock. There is no difference in the use of products of MON15985 cotton compared to those of conventional cotton already in the market.

### **Information about MON15985 Cotton**

Genetically modified MON15985 cotton was produced by re-transformation of Bollgard® cotton event MON531, which produces the Cry1Ac protein and the NPTII selectable marker protein. MON 15985 was developed by using particle acceleration plant transformation procedures to insert *cry2Ab2* gene and *uidA* scorable marker gene to the plant genome of MON531 to produce Cry2Ab2 and GUS proteins. In addition, *aad* gene encodes AAD protein, which facilitates selection process is under the control of its own bacterial promoter, and therefore the encoded protein AAD is not expressed in the cotton plants. In summary, MON 15985 cotton produces Cry1Ac, Cry2Ab2, NPTII and GUS proteins. The Cry1Ac and Cry2Ab2 proteins produced in MON 15985 provide protection from feeding damage caused by targeted lepidopteran pests. The GUS and NPTII proteins presented in MON 15985 as selectable marker to facilitate transformation selection process, served no other purpose and have no known pesticidal properties.

Information and data from studies demonstrate that the Cry1Ac, Cry2Ab2, NPTII and GUS proteins are unlikely to be an allergen or toxin. This is based on the assessment of the donor organisms, *Bacillus thuringiensis* and *Escherichia coli*, which are not a known human or animal pathogen and have lack of reports of allergies derived from the organism. Additionally, there are no confirmed cases of allergic reactions to Cry proteins in microbial-derived *B. thuringiensis* products during more than 50 years of use. Bioinformatics was used to compare the Cry1Ac, Cry2Ab2, NPTII and GUS amino acid sequences against known allergens and pharmacologically active proteins and the results showed a lack of significant structural similarity between the Cry1Ac, Cry2Ab2, NPTII and GUS proteins and known allergens or pharmacologically active proteins. In addition, studies using the Cry1Ac, Cry2Ab2, NPTII and GUS proteins have demonstrated that the proteins were digested rapidly in simulated digestive fluids, and ingestion of the proteins did not cause acute toxicity in mice. These data support the safety for Cry1Ac, Cry2Ab2, NPTII and GUS proteins.

### **III - Risk Assessment and Risk Management Plan**

GMAC evaluated the application with reference to the following documents:

- (i) CODEX Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants.

- (ii) Roadmap for Risk Assessment of Living Modified Organisms, (according to Annex III of the Cartagena Protocol on Biosafety produced by the *Ad Hoc* Technical Expert Group (AHTEG) on Risk Assessment and Risk Management of the Convention on Biological Diversity).
- (iii) The risk assessment and risk management plan submitted by the applicant.

GMAC also referred to the following recommendations within the AHTEG guidelines:

- (i) That the risk assessment exercise be specific to the details of this particular application;
- (ii) That the risk assessment exercise be specific to the receiving environment in question; and
- (iii) That any risk identified be compared against that posed by the unmodified organism.

In conducting the risk assessment, GMAC identified potential hazards, and then added a value/rank for the likelihood of each hazard as well as its consequences. The likelihood of each hazard occurring was evaluated qualitatively on a scale of 1 to 4, with 1 for 'highly unlikely', and 4 for 'highly likely'. The consequences of each hazard, if it were to occur, were then evaluated on a scale of 1 to 4, with 1 for 'marginal' and 4 to denote a 'major consequence'. A value was finally assigned for the overall risk from the identified potential hazard. The general formula: Overall Risk = Likelihood x Consequence was employed. GMAC also proposed risk management strategies for potential hazards, where appropriate. This methodology of assessment follows the procedure of Risk Assessment in Annex III of the Cartagena Protocol on Biosafety.

The potential hazards were identified in three main areas:

(i) **Effects on human health**

Relevant scientific publications on the genetic modifications were reviewed for potential human health risks and issues pertaining to acute toxicity of novel protein/altering/interference of metabolic pathways, potential allergenicity of the novel protein, reproductive toxicity, potential transfer of antibiotic resistance genes in digestive tract, pathogenic potential of donor microorganisms, nutritional equivalence and anti-nutritional properties.

(ii) **Effects on animal health**

Relevant scientific publications on the genetic modifications were reviewed for potential animal health risks and issues pertaining to allergenicity, toxicity, anti-nutritional, survivability and animal product contamination.

(iii) **Effects on the environment**

Relevant scientific publications on the genetic modifications were reviewed for issues pertaining to accidental release of seeds, unintentional release and planting, potential of transgenes being transferred to bacteria (soil bacteria, bacterial flora of animal gut), increased fitness, weediness and invasiveness, accumulation of the protein in the environment via feces from animals fed with the GM plant/grain and cross pollination leading to transfer of transgenes were examined.

Based on the above, a final list of 20 potential hazards was identified. All of these hazards were rated as having an Overall Risk of 1 or “negligible”.

GMAC also took caution and discussed a few of the hazards that required further evaluation and data acquisition. Some of these risks are expected to be managed effectively with the risk management strategies proposed (please refer to section IV of this document).

Some of the potential hazards are highlighted below along with the appropriate management strategies:

a) **Accidental release of viable seeds**

Seeds may be accidentally released during transportation. These seeds can germinate and grow along transportation routes and in areas surrounding storage and processing facilities. Cotton is not grown as an economic crop in Malaysia, thus, there is no issue of outcrossing.

b) **Planting of seeds**

Plants may be grown by uninformed farmers and perpetuated through small scale cultivations. There should also be clear labeling of the product to state that it is only for the purpose of food, feed and processing, and is not to be used as planting material.

c) **Nutritional equivalence**

No major significant differences between MON15985 cotton and conventional cotton were observed from proximate analysis, analysis of fibre, amino acids, key nutrients and anti-nutrients present in cotton. The composition of MON15985 cotton is comparable to that of the conventional cotton control.

However, applicant is required to update the National Biosafety Board immediately if additional information indicate potential adverse effects from the MON15985 cotton.

#### **IV - Proposed Terms and Conditions for Certificate of Approval**

Based on the 20 potential hazards identified and assessed, GMAC has drawn up the following terms and conditions to be included in the certificate of approval for the release of this product:

- a) There shall be clear documentation by the exporter describing the product which shall be declared to the Royal Malaysian Customs.
- b) There shall be clear labeling of the product from importation to all levels of marketing stating that it is only for the purpose of food, feed and processing and is not to be used as planting material.
- c) Should the approved person receive any information that indicates any adverse effect of MON15985 cotton, the National Biosafety Board shall be informed immediately.
- d) Any spillage (during loading/unloading/transportation) shall be collected and cleaned up immediately.
- e) Transportation of the consignment from the port of entry to any destination within the country shall be in secured and closed conditions.

#### **V - Other Regulatory Considerations**

- a) Administrative regulatory procedures shall be arranged between the Department of Biosafety, Royal Malaysian Customs Department and relevant agencies to ensure accurate declaration of product information and clear labeling of the product is implemented.
- b) Administrative regulatory procedures shall be arranged between the Department of Biosafety and the Malaysian Quarantine and Inspection Services (MAQIS) to impose post entry requirements for accidental spillage involving the GM product.
- c) Administrative regulatory procedures shall be arranged between the Department of Biosafety and the Malaysian Quarantine and Inspection Services (MAQIS) and other competent agencies to impose post entry requirements for food safety compliance.
- d) Administrative regulatory arrangements shall be carried out between the Department of Biosafety and the Department of Veterinary Services (DVS) so that any unanticipated adverse effects in animals caused by any consumption of the GM products shall be reported immediately.
- e) Administrative regulatory arrangements shall be carried out by Food Safety and Quality of Ministry of Health to monitor compliance to the Food Act 1983 and Food Regulations 1985; and GM food labelling guidelines.

## ***VI - Identification of issues to be addressed for release and long term use of this product***

- a) Continuous monitoring is required from the approved person and any unanticipated adverse effect caused by the MON15985 cotton shall be reported to the National Biosafety Board.

## ***VII – Conclusion and Recommendation***

GMAC has conducted a thorough evaluation of the application for approval for importation for release [sale/placing on the market for direct use as food, feed and for processing (FFP)] of a product of a Living Modified Organism, insect resistant MON15985 cotton, and has determined that the release of this product does not endanger biological diversity or human, animal and plant health. GMAC recommends that the proposed application for release be **APPROVED WITH TERMS AND CONDITIONS** as listed in section IV - Proposed Terms and Conditions for Certificate of Approval.

## ***VIII – Bibliography***

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**GENETIC MODIFICATION ADVISORY COMMITTEE (GMAC) MEMBERS INVOLVED IN  
SPECIFIC RISK ASSESSMENT AREAS FOR THE APPROVAL FOR RELEASE OF  
PRODUCTS OF MON15985 COTTON FOR SUPPLY OR OFFER TO SUPPLY**

Genetic Modification Advisory Committee (GMAC) members divided the task of looking up more information for the Risk Assessment matrix based on three broad categories which were environment, human health and animal health. Each sub-committee had a nominated leader to coordinate the work and report back to the main GMAC. The GMAC members involved in the risk assessment are as below:

- **Prof. Dr. Mohd. Faiz Foong bin Abdullah (Universiti Teknologi MARA) (GMAC Chairman)**
- **Dr. Kodi Isparan Kandasamy (Industry Representative) (Environment sub-committee Leader)**
- **Madam T.S. Saraswathy (Institute of Medical Research - retired) (Human Health sub-committee Leader)**
- **Prof. Dr Jothi Malar Panandam (Universiti Putra Malaysia - retired) (Animal Health sub-committee Leader)**
- **Dr. Rahizan Issa (Institute of Medical Research - retired) (Notification Assessment sub-committee Leader)**
- Dato' Dr. Sim Soon Liang (Academy of Sciences Malaysia)
- Prof. Dr. Abd Rahman Milan (Universiti Malaysia Sabah - retired)
- Prof. Dr. Chan Kok Gan (Universiti Malaya)
- Assoc. Prof. Dr. Choong Chee Yen (Universiti Kebangsaan Malaysia)
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