

FACT SHEET
APPLICATION FOR APPROVAL FOR RELEASE OF PRODUCT OF
GHB811 COTTON
FOR SUPPLY OR OFFER TO SUPPLY FOR SALE OR PLACING IN THE MARKET

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

The objective of the Biosafety Act is to protect human, plant and animal health, the environment and biological diversity. Under the Biosafety Act 2007, the National Biosafety Board (NBB) is currently assessing an application for approval submitted by BASF (Malaysia) Sdn. Bhd.

1. What is the application for?

The application is for import and release of genetically modified GHB811 cotton and its products.

2. What is the purpose of the import and release?

The aim of the import and release is to supply or offer for sale/ placing on the market for direct use as food, feed and processing (FFP) of GHB811 cotton and its products. This means that GHB811 cotton may enter Malaysia as seeds/food ingredients for processing or packaging, as finished products ready for distribution, or as feed meal for animals. The GHB811 cotton is not intended for cultivation in Malaysia.

3. How has the GHB811 cotton been modified?

Herbicide tolerant GHB811 cotton (*Gossypium hirsutum*) was developed through genetic modification of the Coker 312 cotton variety to allow for the use of isoxaflutole and glyphosate herbicides as weed control options in cotton crops. GHB811 cotton was transformed with the insertion of the *hppdPfw336* gene (a mutated version of the wild type *hppd* gene derived from *Pseudomonas fluorescens*) and the *2mepsps* gene (a mutated version of the wild type *epsps* gene derived from *Zea mays*), conferring the GHB811 cotton tolerance to HPPD inhibitors and glyphosate herbicide. These genes were transferred into the Coker 312 cotton variety via *Agrobacterium tumefaciens*-mediated transformation method.

4. Characteristics of GHB811 cotton

(a) Details of the parent organism

The recipient of the genes or parental plant is *Gossypium hirsutum*, commonly known as cotton.

Cotton is a plant of tropical origin, believed to originate in Meso-America (Peruvian-Ecuadorian-Bolivian region) but presently more than 50% of world-wide production is grown in temperate zones. The four major producers of cotton are India, United States of America, China and Pakistan. Cotton is primarily grown as a fibre crop for its lint. A few countries have developed commercial uses for the seed. Raw unprocessed cottonseed may be fed to ruminants in the form of cotton seed meal and the hulls or the seed can be processed for human consumption in the form of oil. Cotton is not considered harmful or pathogenic to humans, however the natural plant does produce gossypol and cyclopropenoid fatty acids which are natural toxicants.

Cotton is predominately a self-pollinated crop though varying degree of cross-pollination has been reported. The amount of cross pollination depends upon the abundance of pollen-carrying insects (bees).

(b) Details of the donor organisms

Pseudomonas fluorescens is the source of the *hppdPf W336* gene. It is a gram-negative bacterium commonly found in soil and water. *P. fluorescens* is used as biopesticide on certain crops and fruits to prevent the growth of frost-forming bacterial on leaves and blossoms. It is also used as seed treatment agent for damping off diseases caused by fungi and nematodes. *P. fluorescens* strains are generally classified as a non-pathogenic bacteria.

Zea mays (maize/corn) is the source of the *2mepsps* gene. Corn is one of the few major crops grown in nearly all areas of the world over a wide range of climatic conditions. Many food/feed and industrial products depend on corn-based ingredients. Because of its high levels of starch, protein, oil and other nutritionally valuable substances, corn is an important crop in human and animal nutrition.

(c) Description of the trait(s) and characteristic which have been introduced or modified

The *hppdPfW336* gene encoding the HPPDW336 protein confers tolerance to HPPD inhibitors such as isoxaflutole herbicides and the *2mepsps* gene encoding the 2mEPSPS protein confers tolerance to glyphosate herbicides.

(d) Safety of the expressed protein

An amino acid sequence homology comparison of the HPPDW336 and 2mEPSPS proteins with known toxins and allergens using bioinformatics databases showed no significant similarities between the two proteins with any known toxicological or allergenic protein.

The human consumption of cotton products is limited to the refined oil. As virtually no protein is present in the oil extracted from the seeds, the potential for human exposure is exceedingly low. As the introduced genes were not detectable in the refined oil produced from the genetically modified cotton, there will be no human exposure to this protein based on normal consumption patterns. Furthermore, the amounts of HPPD W336 and 2mEPSPS proteins present in seed meal fed to animals would be too low to cause concern.

(e) Utilization of cotton

Cotton is primarily used worldwide for its lint. Cottonseed oil is the main cotton product used for human consumption. About 56% of the oil is used for salad or cooking oil, 36% is used for baking and frying fats, and the remaining 8% goes into margarine and other uses.

Cottonseed meal, hulls and linters are by-products of the cottonseed oil processing with cottonseed meal being the most abundant. Cottonseed meal is used in animal feeds as a high protein supplement. The protein from cottonseed meal can also be used to form fibrous material for use by the textile industry. Cottonseed hulls are commonly used as roughage in livestock feed products in combination with limited amounts of corn silage or hay. It can also be used as fuel for oil mills, insulation material, soil conditioner, filler for phenolic plastics, cellulose for regenerated fiber production and a source of xylose and furfural. Cottonseed linters are a major source of cellulose for chemical and food use and can be used in packaging products, preparation of regenerated fibers, films, lacquers, plastics and papers to name a few.

5. Assessment of risks to human health

(a) Nutritional data

Data obtained from compositional analyses of nutrients and anti-nutrient levels in GHB811 cotton fuzzy seed with conventional cotton seed revealed statistically significant differences for 11 of the 54 analytes. However, the means of all 11 analytes were within the range of the reference varieties and the tolerance intervals. Therefore, the statistically significant differences are not considered biologically relevant. Based on the comparative assessment, nutrient and anti-nutrient levels in GHB811 cotton fuzzy seed are comparable to that of a conventional cotton.

(b) Toxicology

Since only the processed oil from GHB811 cotton are available for human consumption, and the processing removes proteinaceous material, there are no toxicity concerns regarding this product. Bioinformatics studies have

confirmed the absence of any significant amino acid sequence similarity to known protein toxins. Furthermore, in the study conducted with HPPD W336 and 2mEPSPS proteins, no oral toxicity were demonstrated in mice at a very high dose of 2000 mg/kg bodyweight, showing that the proteins are not toxic to humans.

(c) Allergenicity

The low potential for allergenicity of HPPD W336 and 2mEPSPS proteins has been established through amino acid sequence comparisons to known allergens, digestibility in simulated gastric and intestinal fluids and presence of glycosylation. HPPD W336 and 2mEPSPS proteins share no epitopes with known allergens, are not glycosylated, and degrade rapidly in simulated gastric and intestinal fluids.

Since only the processed oil from GHB811 cotton are available for human consumption, and the processing removes proteinaceous material, there are no additional allergenicity concerns regarding this product.

6. Assessment of risks to the environment

The application does not cover an environment release. The application is intended only to cover the import of GHB811 cotton products from countries where the said cotton event is already approved and commercially grown, and that may enter Malaysia as foodstuffs or as feed or for further food processing.

7. What is the emergency response plan?

The seed derived from GHB811 cotton may be imported for processing. However, the GHB811 cotton products that likely enter into Malaysia are in highly processed forms like refined oil or cottonseed meal. As with conventional cotton, the plants from GHB811 cotton are sensitive to herbicides other than isoxaflutole and glyphosate and can be controlled or eradicated either by herbicides other than isoxaflutole and glyphosate or by mechanical destruction.

Seed derived from GHB811 cotton is compositionally equivalent to those from conventional cotton. The plants behave agronomically in the same way as conventional cotton except showing the intended herbicide tolerance. Should adverse effects be reported and verified, appropriate follow up action would be taken to investigate these and if verified appropriate action taken.

(a) First aid measures

No special first aid measures are required with exposure to this product.

(b) Accidental release measures

No special measures are required in response to an accidental release. Spilled seed should be swept, scooped or vacuumed in a manner that avoids dust generation and dust-related hazards.

(c) Handling and storage

No special handling or storage procedures are required. GHB811 cotton and its products may be handled and stored as any conventional cotton.

(d) Disposal considerations

The same measures for waste disposal and treatment as for conventional cotton are valid for seed derived from GHB811 cotton.

8. How can I comment on this application?

Any member of the public may submit their comment or queries on publicly notified information about the application. Before submission of comments or queries, the person should review the information provided. Your comments and queries on any possible impacts/risks to the health and safety of the people and the environment that may be posed by the proposed release are appreciated. The submission of the comments or queries should be prepared carefully as it will be given the same scrutiny as the application by the National Biosafety Board (NBB). The submission of comments and clarifications of queries should contribute to the NBB's assessment. Even if the submission is not science-based, and focuses on cultural or other values, it should still be developed in the form of a well-founded argument.

Please note that the consultation period closes on **17 August 2019** and written submissions are required before/by that date. Submissions must be addressed to:

Director General
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Ministry of Water, Land and Natural Resources
Level 1, Podium 2, Wisma Sumber Asli
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Please include your full name, address and contact details in your submission.