

Title

**Summary of the Literature Review for GMB151 soybean  
March 31, 2022 – June 30, 2022**

**Final Report**

Data or guideline requirement

Explanatory note on literature searching  
conducted in the context of GMO applications for (renewed) market authorization  
and annual post-market environmental monitoring reports on GMOs authorised in the EU market.  
EFSA supporting publications 2019:EN-1614

Completion date

October 19, 2022

Principal author

  
BASF Belgium Coordination Center Comm. V.,  
Technologiepark-Zwijnaarde 101  
9052 Gent  
Belgium

Report number  
**22-RSSB0767**

Activity ID  
**RSSB0767**

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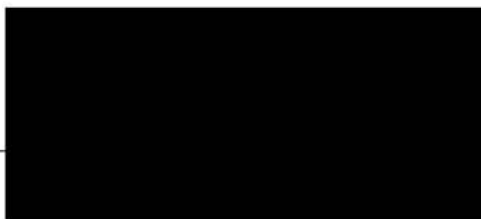
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Principal author:



Date

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Product Safety Manager  
Regulatory Science Seeds & Traits  
BASF Belgium Coordination Center Comm. V

## STUDY PERSONNEL

Electronic database search	████████████████████ PhD. More than 20 years of expertise in plant molecular biology and plant biotechnology. Has performed professional-level database searches since 2013.
Agency website search	████████████████████ PhD. More than 10 years of expertise in Regulatory Affairs to register GMOs.
Manual search (reference list from review articles)	████████████████████ PhD in Food Science and Technology. Twenty years of expertise in food chemistry, food allergy and safety assessment of GMOs.
Stage 1 assessment	████████████████████ ████████████████████
Stage 2 assessment	<p><u>Food and Feed safety</u></p> <p>████████████████████ PhD in Toxicology. Regulatory Toxicologist for plant biotechnology since 2013.</p> <p>██ PhD in Pathology with focus in Toxicology. Experience in regulatory toxicology for crop protection products. Regulatory Product Safety Manager for Environmental and Human Health for biotechnology products since 2021.</p> <p><u>Molecular characterization</u></p> <p>████████████████████ Bachelor Pharmaceutical and Biological Techniques. Expert in molecular characterization and plant biotechnology since 1999 and protein characterization since 2010.</p> <p>████████████████████ PhD in Plant Molecular Genetics. Ten years of expertise in molecular characterization and detection methods of GMOs.</p> <p><u>Environmental safety</u></p> <p>██ Agronomist Engineer, PhD in Agronomy (Vegetable Production/Integrated Pest Management). Ten years of expertise in field entomology and environmental safety assessment of GM crops.</p> <p>██</p>
Report	<p>████████████████████</p> <p>██</p> <p>████████████████████</p>

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## SUMMARY

GMB151 soybean was developed through *Agrobacterium*-mediated transformation using the vector pSZ8832 containing the *cry14Ab.1b* and *hppdPf-4Pa* gene cassettes. GMB151 soybean produces the Cry14Ab-1 protein, a crystal protein derived from *Bacillus thuringiensis*, which confers resistance to soybean cyst nematode. GMB151 also produces a modified 4-hydroxyphenylpyruvate dioxygenase (HPPD-4), derived from *Pseudomonas fluorescens*, which confers tolerance to HPPD inhibitor herbicides such as isoxaflutole. The OECD identifier of GMB151 soybean is BCS-GM151-6.

A scoping review was performed for the GMB151 soybean and its newly expressed proteins, HPPD-4 and Cry14Ab-1. The objective of this scoping review was to determine if there were studies about the molecular characterization of GMB151 soybean, its effect on food and feed safety or environmental safety, that might require in-depth examination. A set of broad literature searches was performed using several bibliographic databases covering scientific literature from March 31, 2022 to June 30, 2022. Additional sources of information, such as web pages of food safety, agriculture, and biotechnology-related authorities were searched for the same time window, along with the bibliographies of relevant reviews. The references identified were evaluated for potential relevance to the scoping review questions according to pre-defined criteria.

These literature searches identified a total of 57 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. None of them were progressed for detailed assessment.

In summary, these literature searches and review of the retrieved articles did not identify publications relevant to the existing safety assessment of GMB151 soybean.

## 1. INTRODUCTION

GMB151 soybean was developed through *Agrobacterium*-mediated transformation using the vector pSZ8832 containing the *cry14Ab.1b* and *hppdPf-4Pa* gene cassettes. GMB151 soybean produces the Cry14Ab-1 protein, a crystal protein derived from *Bacillus thuringiensis*, which confers resistance to soybean cyst nematode. GMB151 also produces a modified 4-hydroxyphenylpyruvate dioxygenase (HPPD-4), derived from *Pseudomonas fluorescens*, which confers tolerance to HPPD inhibitor herbicides such as isoxaflutole. The OECD identifier of GMB151 soybean is BCS-GM151-6.

The objective of the literature searches described here was to determine if there were studies published between March 31, 2022 and June 30, 2022 that mention the molecular characterization of the GMB151 soybean, and/or any adverse effect of GMB151 soybean in food, feed or the environment. In that context, a broad and inclusive literature search was performed, and the articles retrieved were reviewed in a comprehensive and transparent manner. This was intended as a scoping review. The literature review was performed as recommended in the European Food Safety Authority (EFSA) explanatory note on literature searching conducted in the context of Genetically Modified Organisms (GMO)<sup>1</sup> applications and post-market environmental monitoring activities (2019).

The literature searches were performed for the GMB151 soybean and its newly expressed proteins, HPPD-4 and Cry14Ab-1. The search terms also included relevant synonyms, and intended traits, plant species and general GMO terms.

## 2. OVERALL METHODS

### 2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the GMB151 soybean and its newly expressed proteins, HPPD-4 and Cry14Ab-1, in order to identify any specific issues related to food or feed safety, molecular characterization or environmental safety that might require in-depth examination.

### 2.2. Review questions

Review questions were formulated to conform to PE(I)CO structure (Population, Exposure (Intervention), Comparators, Outcome) if possible, and to address data requirements. They were modeled after the review question examples provided in the EFSA 2019 explanatory note<sup>1</sup>.

**Question 1:** Were any studies published during the reporting period that describe adverse effects on human or animal health or the environment of the GMB151 soybean and its newly expressed proteins HPPD-4 and Cry14Ab-1?

**Key elements:**

**Population:** Human health; animal health; environmental safety

**Exposure:** GMB151 soybean, derived food/feed products, newly expressed proteins in GMB151 soybean

**Comparators:** When applicable, comparable populations or subjects exposed to appropriate controls (e.g., vehicle only, innocuous control protein, non-GM comparator) or conventional counterpart used for comparative analysis of plant material

**Outcome:** Adverse effects

**Question 2:** Were any studies published during the reporting period that focus on molecular characterization of the GMB151 soybean and its newly expressed proteins HPPD-4 and Cry14Ab-1 in soybean?



**Key elements:**

Population: GMB151 soybean and newly expressed proteins in GMB151 soybean

Outcome: Molecular characterization (which would indicate the information/data requirement for molecular characteristics)

**2.3. Criteria for relevance**

Criteria for establishing the relevance of retrieved publications were defined prior to conduct of the search. These criteria were modeled after those given in the EFSA 2019 explanatory note<sup>1</sup> and are described in [Table 1](#).

**Table 1: Eligibility/inclusion criteria to establish the relevance of retrieved publications**

Concepts	Criteria	Comment
Key elements of review questions with PECO structure		
Population	The publication addresses human and animal health, and/or the environment (including biodiversity, ecosystem services, service providing units, and endangered species) as general protection goals	From the publications that address the GMO under consideration, those that address protection goals relevant to the risk assessment of the GMO are eligible
Exposure (Intervention)	The publication addresses the GMO, derived food/feed products, and/or the intended trait(s) (e.g., newly expressed proteins(s)) that are identical or like those under regulatory review	This enables the selection of publications that address the GMO, derived food/feed products, and/or the intended trait(s) under consideration
Comparator	If the publication reports a comparative study that uses plant material as test material, eligible publications must report a non-GM variety as comparator	In those cases where the publication addresses the GMO under consideration, reports a comparative analysis study and uses plant material as test material, eligible publications also need to include an appropriate non-GM line as comparator
Outcome	The publication addresses effects/impacts on human and animal health, and/or the environment	Publications that address the GMO under consideration also need to address effects/impacts on entities of concern, and potential determinants of exposure that place these entities at risk, in order to be relevant to the risk assessment of the GMO

Concepts	Criteria	Comment
Additional concepts		
Information/data requirements	The publication reports information pertaining to one or more information/data requirement(s) outlined in Appendix A for the GMO and derived food/feed products under consideration, including the intended trait(s)	Publications that potentially contribute to the knowledge informing the risk assessment of the GMO under consideration, and thus the risk hypotheses addressed, taking account of both hazard and exposure, can be considered relevant according to this eligibility/inclusion criterion. Publications addressing other issues such as benefits, socio-economics, ethics, crop protection, detection methods, efficacy, public perception and risk communication can be excluded, as they are not necessarily relevant to the risk assessment of GMOs
Plant species	The publication addresses the same plant species as the GMO under consideration	This eligibility/inclusion criterion permits the exclusion of publications on GMOs that contain the same intended trait(s) as the GMO under consideration, but which are introduced in another plant species
Scope of GMO application	The publication addresses pathways and levels of exposure to the GMO, derived food/feed products, and the intended trait(s) that are relevant for the intended uses of the GMO and derived food/feed products under regulatory review	From the publications that address the GMO under consideration, those that consider pathways and levels of exposure relevant to the scope of the GMO application (i.e., import and processing for food/feed uses, cultivation) are eligible
Target pests/organisms	The publication addresses target pests/organisms that are established in the EU	This permits the exclusion of publications that address interactions between the GMO and target pests/organisms that do not occur in the EU

Concepts	Criteria	Comment
Stacked events obtained by conventional crosses/ subcombinations	The publication addresses the higher stacked event and/or a subcombination or subcombinations of the single events of the higher stacked event, independently of its/their origin	This permits the selection of publications on the higher stacked event and/or subcombinations of the single events of the higher stacked event that are in the scope of the GMO application(s), independently of their origin. This permits the exclusion of publications on the single events of the higher stacked event, because the risk assessment of GMO applications for stacked events covers only the products in the scope of the GMO application – i.e., the higher stacked event and subcombinations of the singles involved, independently of their origin
Molecular stacks	The publication addresses: the molecular stack; all newly expressed proteins in the molecular stack; and/or one or several of the newly expressed proteins in the molecular stack that has/have not been previously risk assessed by EFSA and/or its GMO Panel and for which no safe use has been determined yet by EFSA and/or its GMO Panel	This permits the exclusion of publications that address one or several (not all) of the newly expressed proteins in the molecular stack that has/have been previously risk assessed by EFSA and/or its GMO Panel and for which the safe use has been determined by EFSA and/or its GMO Panel
Previously risk assessed publications	The publication has not been previously risk assessed by EFSA and/or its GMO Panel and is not cited/referenced in an EFSA/GMO Panel output	This permits the exclusion of publications that have been previously risk assessed by EFSA and/or its GMO Panel and cited/referenced in an EFSA/GMO Panel output
Access	Full-text document is accessible	If potentially relevant full-text documents cannot be obtained, they should be listed in a table with a description of the (unsuccessful) methods that have been used to try to obtain a copy



Concepts	Criteria	Comment
Reporting format	The publication presents original/primary data, or it is a risk assessment from a relevant key organisation (such as regulatory agencies and risk assessment bodies involved in the risk assessment of GMOs)	This permits the exclusion of publications that do not present original/primary data (e.g., editorials, position papers), and the inclusion of relevant risk assessments performed and reported by relevant key organisations. Reviews should only be included if they present data that are not available from a primary research study
Reporting format	A study in a publication should only be presented once, but if it is presented in more than one publication, all publications should be listed and grouped	Duplicate publications should be excluded at the screening stage. Only one copy of a study is required even if it is reported in different publications, and identified in more than one database

Table adapted from EFSA, 2019: Explanatory note on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market.

## 2.4. Reference publication

Two publications were used to test and validate the search profile:

- Dreesen R, Capt A, Oberdoerfer R, Coats I, Pallett KE. Characterization and safety evaluation of HPPD W336, a modified 4-hydroxyphenylpyruvate dioxygenase protein, and the impact of its expression on plant metabolism in herbicide-tolerant MST-FGØ72-2 soybean; *Regulatory Toxicology and Pharmacology* **97** (2018) 170 – 185
- Dreesen R, Capt A, Oberdoerfer R, Coats I, Pallett KE. Supplementary data on the characterization and safety evaluation of HPPD W336, a modified 4-hydroxyphenylpyruvate dioxygenase protein, which confers herbicide tolerance, and on the compositional assessment of field grown MST-FGO72-2 soybean expressing HPPD W336; *Data in Brief* **21** (2018) 111 – 121

Although these articles are not directly relevant for GMB151 soybean, they were selected as reference publications because they mention a closely related protein (HPPD W336), the crop (soybean) and one of the intended traits (herbicide tolerance). Since these references were published before the current search period, the search profile was tested without applying the time limit used in the final search profile (UP>=20220331 and UP<=20220630).

## 3. SEARCH METHODS AND OUTCOMES

The search strategies used here followed the 2019 EFSA explanatory note on literature searching conducted in the context of GMO applications and post-market environmental monitoring activities<sup>1</sup>. The search strategies were designed to be broad and sensitive enough to capture any relevant publications, if available.



An information specialist with background in plant biotechnology selected the databases, identified relevant search terms, developed search profiles, designed search strategies, and conducted the searches.

### 3.1. Time window and date of the literature search

The database searches were performed on July 12, 2022. Only documents updated between March 31, 2022 and June 30, 2022, were considered in the search. The dates of most recent database updates are provided in [Table 3](#).

### 3.2. Databases used in the literature search

All searches were performed in the host STN (Scientific and Technical Information Network), an online database service operated jointly by CAS and FIZ Karlsruhe. STN provides access to a broad range of databases from the most renowned database producers worldwide.

The searches described here were performed in five databases: three multidisciplinary/large databases (Biosis, Medline and CA-Plus) and two subject-specific databases focused on agriculture-related topics (Agricola and CABA).

See [Appendix 1](#) for detailed database descriptions.

### 3.3. Search strategy

The search profiles were designed to cover event name, newly expressed proteins and intended traits. The reference publication ([Section 2.4](#)) was identified by the search profiles confirming the validity of the applied search strategy. Since the 'newly expressed proteins' profiles and the 'intended trait' profiles produced too many results when used on their own, they were combined with additional profiles: the 'newly expressed proteins' profiles were combined with a 'plant species' profile while the 'intended trait' profiles were combined with a 'general GMO' profile as well as with the 'plant species' profile. See [Table 2](#) for a detailed search profile.

**Table 2: Search profile for database search**

Set	Profile	Concept/key element
1	GMB151 or GMB(w)151 or BCS(w)GM151(w)6 or BCS-GM151-6 or BCS(w)GMB151?	Event
2	None	Trade name
3	HPPD(w)4 or HPPD4 or hppd(w)Pf(w)4Pa or hppdPf(w)4Pa or ((hydroxyphenylpyruvate or hydroxy(w)phenylpyruvate or hydroxyphenyl(w)pyruvate or hydroxy(w)phenyl(w)pyruvate)(w)(dehydrogenase or dioxygenase) or hppd(s)(modif? or MUTANT# OR MUTAT?) or Cry14Ab-1 or Cry14Ab(w)1 or Cry(w)14Ab(w)1 or Cry(w)14(w)Ab(w)1 or Cry14(w)Ab1 or Cry(w)14Ab1 or Cry14Ab1 or Cry14Ab-1 or Cry14Ab(w)1 or Cry(w)14Ab(w)1 or Cry(w)14(w)Ab(w)1 or Cry14(w)Ab1 or Cry(w)14Ab1 or Cry14Ab1 or Cry14Ab-I or Cry14Ab(w)I or Cry(w)14Ab(w)I or Cry(w)14(w)Ab(w)I or Cry14(w)AbI or Cry(w)14AbI or Cry14AbI or cry14Ab-1.b or cry14Ab(w)1(w)b or cry14Ab(w)1b or cry(w)14Ab(w)1(w)b or cry(w)14Ab(w)1(w)b or cry(w)14(w)Ab(w)1(w)b or cry(w)14Ab(w)1b or cry(w)14Ab1(w)b or cry14Ab1b or cry14Ab-1.b or cry14Ab(w)1(w)b or cry14Ab(w)1b or cry(w)14Ab(w)1(w)b or cry(w)14Ab(w)1(w)b or cry(w)14(w)Ab(w)1(w)b or cry(w)14Ab(w)1b or cry(w)14Ab1(w)b or cry14Ab1b or cry14Ab-I.b or cry14Ab(w)I(w)b or cry14Ab(w)Ib or	Newly expressed proteins

Set	Profile	Concept/key element
	cry(w)14Ab(w)I(w)b or cry(w)14Ab(w)I(w)b or cry(w)14(w)Ab(w)I(w)b or cry(w)14Ab(w)Ib or cry(w)14AbI(w)b or cry14AbIb	
4	((herbicid? or HPPD(w)inhibitor# or diketonitrile# or pyrazolone# or triketone# or isoxaflutol## or IFT) (5a) (resist? or toleran? or protect?)) or ((nematode# or soybean(w)cyst(w)nematode# or SCN or Heterodera(w)glycines or H(w)glycines) (5a) (resist? or toleran? or protect? or control))	Intended traits
5	soy or soya or soja or soybean# or soyabean# or sojabean# or glycine(w)max or g(w)max	Plant species
6	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3w)(modif? OR transform? OR manipulat? OR improv? OR engineer?))	GMO general
7	4 and 5 and 6	Intended trait AND Plant species AND GMO general
8	1 or 3 or 7	Event name OR Newly expressed proteins OR (Intended trait AND Plant species AND GMO general)

All searches were performed in the Basic Index (BI) field, which includes the following subject headings/field names:

- **Agricola:** title (TI), controlled term (CT), supplementary term (ST), abstract (AB), named person (NA), corporate name (CO), note (NTE), geographic term, CABA and other fields (GT)
- **Biosis:** title (TI), abstract (AB), biosystematic codes (BC), chemical name (CN), controlled term (CT), gene name (GEN), geographic term (GT), organism (ORGN) and supplementary term (ST); as well as CAS Registry Numbers (RN)
- **CA-Plus:** title (TI), supplementary term (ST), index term (IT) and abstract (AB); as well as CAS Registry Numbers
- **CABA:** title (TI), controlled term (CT), supplementary term (ST), broader term (BT), abstract (AB), organism name (ORGN) and geographic term (GT); as well as CAS Registry Numbers
- **Medline:** title (TI), chemical name (CN), gene name (GEN), controlled term (excluding MeSH numbers) (CT), supplementary term (ST), named person (NA), other source (OS), and abstract (AB), as well as CAS Registry Numbers and GenBank Numbers

Relevant controlled terms ([Table 3](#)) were not searched separately because they are included in the Basic Index and were captured by the free-text searches.



**Table 3: Relevant controlled terms (CT) and index terms (IT) in each database**

Database	Event (GMB151)	New proteins (HPPD-4 and Cry14Ab-1)	Traits (herbicide resistance and nematode resistance)	Plant species (soybean)	GM plants (general terms)
Agricola	no CT	no CT	"HERBICIDE RESISTANCE"/CT "NEMATODE CONTROL"/CT	"GLYCINE MAX"/CT	"TRANSGENIC PLANTS"/CT
Biosis	no CT	no CT	no CT	no CT	no CT
CABA	no CT	no CT	"HERBICIDE RESISTANCE"/CT "NEMATODE CONTROL"/CT	SOYABEANS/CT	"TRANSGENIC PLANTS"/CT
CAS	no CT	no CT	"HERBICIDE RESISTANCE"/CT No CT for nematode resistance	"GLYCINE MAX"/CT	"GENETICALLY MODIFIED PLANTS"/CT
Medline	no CT	no CT	"HERBICIDE RESISTANCE"/CT No CT for nematode resistance	SOYBEANS/CT	"PLANTS, GENETICALLY MODIFIED"/CT

The search results were limited to documents updated between March 31, 2022 and June 30, 2022 (UP>=20220331 and UP<=20220630), and to non-patent documents (not P/DT). To ensure that documents with indexing errors where two document types (DTs) (one eligible and one ineligible) were attached to a single record were not missed, documents with both 'journal' and 'patent' as document type were also kept. These putative documents would be identified with (P/DT AND J/DT) in CABA and CAPLUS.

[Table 4](#) summarizes the number of results obtained from each of the databases searched.

See [Appendix 2](#) for a complete search history.

**Table 4: Overview of the selected databases and summary of search results from each database**

Database	AGRICOLA	BIOSIS	CAB Abstracts	CAPLUS	MEDLINE
Database Provider	STN International	STN International	STN International	STN International	STN International
Coverage	1970-present	1926-present	1973-present	1907-present	1946-present
Date of search	12 July 2022	12 July 2022	12 July 2022	12 July 2022	12 July 2022
Datespan of the search	31 Mar 2022 – 30 Jun 2022	31 Mar 2022 – 30 Jun 2022	31 Mar 2022 – 30 Jun 2022	31 Mar 2022 – 30 Jun 2022	31 Mar 2022 – 30 Jun 2022
Latest database update	8 July 2022	6 July 2022	5 July 2022	11 July 2022	11 July 2022
Number of records retrieved	6	11	16	14	21
Number of records after duplicate removal	6	9	12	9	21
Number of relevant records after rapid assessment	0	0	0	0	0

#### 4. INTERNET and MANUAL SEARCHES

##### 4.1. Internet Searches of food safety, agriculture, and biotechnology-related authority webpages

A search of the web pages of food safety, agriculture, and biotechnology-related authorities was conducted. Search results were manually examined for relevant records that were either published during the time period under consideration (date span of search: March 31, 2022 to June 30, 2022) or refer to relevant records published during this time frame. Relevance of results were determined based on the criteria listed in [Table 1](#) and they were summarized in [Table 5](#). All web pages searched were justified by their recommendation in the EFSA 2019 explanatory note<sup>1</sup>. Of the 13 key organisations cited in the EFSA 2019 explanatory note<sup>1</sup>, Environment and Climate Change Canada and Intersecretarial Commission on Biosafety of GMOs (CIBIOGEM) were excluded, since they are not involved in the risk assessment of GM plants. The GEAC website was excluded, since this agency has only regulated GM cotton products. Therefore, the internet search was limited to 11 key organisations relevant for GMB151 soybean. Search terms consisted of GMB151 or BCS-GM151-6 or Cry14Ab-1 or HPPD-4 OR HPPDPF-4Pa OR modified-(w)hydroxyphenylpyruvate (all searched singly, with no search limits applied).

**Table 5: Results of search of food safety, agriculture, and biotechnology-related authority websites**

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
US Environmental Protection Agency (EPA)	<a href="https://www.epa.gov/">https://www.epa.gov/</a>	9/16/2022	9/16/2022	0
US Department of Agriculture (USDA)	<a href="https://www.usda.gov/">https://www.usda.gov/</a>	Sept 5 2022	Sept 5 2022	0
US Food and Drug Administration (FDA)	<a href="https://www.fda.gov/">https://www.fda.gov/</a>	Sept 7 2022	Sept 7 2022	0
Health Canada	<a href="https://www.canada.ca/en/health-canada.html">https://www.canada.ca/en/health-canada.html</a>	Aug 1 2022	Aug 31 2022 – Sept 1, 2022	0
Canadian Food Inspection Agency (CFIA)	<a href="https://www.canada.ca/en/food-inspection-agency.html">https://www.canada.ca/en/food-inspection-agency.html</a>	Aug 1 2022	Sept 2-7 2022	0
Food Standards Australia New Zealand (FSANZ)	<a href="http://www.foodstandards.gov.au/Pages/default.aspx">http://www.foodstandards.gov.au/Pages/default.aspx</a>	Aug 12, 2022	Aug 24, 2022	0
Office of the Gene Technology Regulator (OGTR) Australia	<a href="http://www.ogtr.gov.au/">http://www.ogtr.gov.au/</a>	Aug 1, 2022	Aug 29, 2022	0
National Technical Commission on Biosafety (CTNBio) Brazil	<a href="http://ctnbio.mcti.gov.br/en">http://ctnbio.mcti.gov.br/en</a>	Aug 1, 2022	Aug 29, 2022	0



Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
National Advisory Commission on Agricultural Biotechnology (CONABIA) Argentina	<a href="https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia">https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia</a>	Aug 9, 2022	Aug 9, 2022	0
Ministry of Agriculture, Forestry and Fisheries (MAFF) Japan	<a href="http://www.maff.go.jp/">http://www.maff.go.jp/</a>	Sept 6, 2022	Sept 6, 2022	0

#### 4.2. Manual searches of reference lists of recent review articles

Recent review articles as sources of reference lists to search for potentially relevant studies were identified via searches of PubMed.gov for general terms such as “GMO” or “GM crops” in the titles and abstracts. The search of PubMed.gov was also restricted to recent reviews published between March 31, 2022 and June 30, 2022. The resulting number of relevant studies found within the bibliographies of these review articles is given in [Table 6](#).

**Table 6: Documents for which reference lists were scanned for relevant studies**

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
1	Halder K, Chaudhuri A, Abdin MZ, Majee M, Datta A. 2022	RNA Interference for Improving Disease Resistance in Plants and Its Relevance in This Clustered Regularly Interspaced Short Palindromic Repeats-Dominated Era in Terms of dsRNA-Based Biopesticides	Front Plant Sci. 2022 May 13;13:885128.	0
2	Lafiandra D, Sestili F, Sissons M, Kiszonas A, Morris CF. 2022	Increasing the Versatility of Durum Wheat through Modifications of Protein and Starch Composition and Grain Hardness	Foods. 2022 May 24;11(11):1532.	0
3	Van Vu T. 2022	Genome editing and beyond: what does it mean for the future of plant breeding?	Planta. 2022 May 19;255(6):130.	0

## 5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches ([Section 3](#)) identified a total of 68 references, which were reduced to 57 after removal of duplicates ([Table 4](#)). No additional studies were identified in the manual searches ([Section 4](#)).

### 5.1. Screening of titles and abstracts to exclude obviously irrelevant references (Stage 1)

All references identified in the database searches described in [Section 3](#) were assessed for relevance based on information in their title and abstract by two reviewers independently. If opinions of relevance differed, the discrepancies were discussed between the reviewers and if a disagreement persisted, the publication under the discussion was transferred to Stage 2 for detailed evaluation by the experts. In this search, both evaluators were in 100 % agreement.

Clearly irrelevant records were tagged as “Not Relevant”. These included:

- Duplicated entries
- Secondary literature (reviews), other than assessments from regulatory agencies
- Articles on non-relevant topics like detection methods, socio-economic implications of GM crops, GM policy, agronomical performance, other herbicide resistant GM crops, other insect resistant GM crops, unrelated topics, etc.

Publications which appeared to be relevant and those of unclear relevance were tagged as “Relevant” and progressed to Stage 2 (detailed assessment; see [Section 5.2](#)).

The number of publications excluded after rapid assessment for relevance is presented in [Table 7](#) documenting the selection process.

### 5.2. Detailed assessment of eligible references (Stage 2)

Publications tagged as “Relevant” in Stage 1 were assessed in detail independently by two scientific experts in each of three corresponding areas (i.e., Molecular Biology, Food and Feed Safety, Environmental Safety), based on the full text of the publications. If opinions of relevance differed between reviewers within each area, the initial reviewers discussed the discrepancy as necessary and consulted additional reviewers to resolve the discrepancy if needed.

[Table 7](#) gives an overview of the reference selection process and results of the detailed assessment.

**Table 7: Results of the publication selection process**

Total number of publications retrieved after all searches of the scientific literature (excluding duplicates)	57
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	57
Total number of full-text documents assessed in detail	0
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	0
Total number of unobtainable/unclear publications	0
Total number of relevant publications	0

[Table 8](#) lists the publications determined to be relevant along with their potential impact on the safety assessment based on detailed evaluation. Publications that were clearly not relevant after a detailed assessment are listed in [Table 9](#). [Table 10](#) lists the publications for which full-text documents were unobtainable for detailed assessment or for which relevance was unclear after detailed assessment.

## 6. NARRATIVE SYNTHESIS/SUMMARY OF RELEVANT STUDIES

No publications were selected during Stage 1 evaluation (rapid assessment based on title and abstract) that were relevant to the safety assessment of the GMB151 soybean and its newly expressed proteins HPPD-4 and Cry14Ab-1.

[Table 11](#) lists the relevant publication along with a summary of any adverse effects reported and the reliability of the publications.

## 7. CONCLUSION

The literature searches performed for the GMB151 soybean and its newly expressed proteins, HPPD-4 and Cry14Ab-1, for the period from March 31, 2022 to June 30, 2022, identified a total of 57 unique publications (after duplicate removal). No publications were progressed for detailed assessment after excluding 57 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).

The data and knowledge generated from this study does not impact the safety assessment of GMB151 soybean. No issues or topics were identified that would trigger or warrant more specific question formulation.

## 8. REFERENCES

No.	Author(s), title, source, edition, year, pages
-----	--

- |    |   |
|----|---|
| 1. | Devos Y, Guajardo IM, Alvarez F and Glanville J. Explanatory note on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market. EFSA supporting publications 2019:EN-1614. 62 pages. doi:10.2903/sp.efsa.2019.EN-1614. |
|----|---|



**Table 8: Report of all relevant publications retrieved after detailed assessment of full-text documents for relevance: ordered by category of information/data requirement(s)**

Main category of information/data requirement	Study (Author(s) and year)	Title	Source
No publications in this category.			

**Table 9: Report of publications excluded from the risk assessment after detailed assessment of full-text documents**

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in <a href="#">Table 1</a>
No publications in this category.			

**Table 10: Report of unobtainable/unclear publications**

Study (Author(s) and year)	Title	Source	Description of (unsuccessful) methods used to try and obtain a copy of the publication
No publications in this category.			

**Table 11: Summary report for all relevant publications retrieved after detailed assessment of full-text documents for relevance and implications for the risk assessment: ordered by category of information/data requirement(s)**

Main category of information/data requirement	Study (Author(s) and year)	Intervention/ test materials used	Adverse effects reported	Which adverse effect reported	Implications for risk assessment
No publications in this category.					



## 9. APPENDICES

### Appendix 1 Database descriptions

Host	File	Description
STN	AGRICOLA	<p>Agriculture Online Access is a bibliographic database containing selected worldwide literature of agriculture and related fields. AGRICOLA is the locator and bibliographic access and control system of the National Agricultural Library (NAL) collections and also includes records from other cooperating institutions. Coverage of the database includes agricultural economics and rural sociology, agricultural production, animal sciences, chemistry, entomology, food and human nutrition, forestry, natural resources, pesticides, plant science, soils and fertilizers, and water resources. Also covered are related areas such as biology and biotechnology, botany, ecology, and natural history.</p> <p>The database draws on bibliographies, serial articles, book chapters, monographs, computer files, serials, maps, audiovisuals, and reports. Bibliographic information, abstracts, geographic terms, controlled terms, and supplementary terms are searchable.</p>
STN	BIOSIS	<p>BIOSIS Previews® is the largest and most comprehensive life science database in the world. Amongst others subject coverage includes Agriculture, Biochemistry, Biophysics, Botany, Environmental Biology, Physiology, Toxicology.</p> <p>Sources include periodicals, journals, conference proceedings, reviews, reports, patents, and short communications. Nearly 6,000 life source journals, 1,500 international meetings as well as review articles, books, and monographs are reviewed for inclusion.</p> <p>Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are all searchable.</p>
STN	CABA/CAB	<p>The CAB Abstracts database covers worldwide literature from all areas of agriculture and related sciences including Agriculture, Agricultural chemicals, Animal sciences and production, Crop protection, Crop sciences and production, Environment, Soils and fertilizers.</p> <p>Sources for CABA include journals, books, reports, published theses, conference proceedings, and patents.</p> <p>Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are searchable.</p>
STN	CAS-CA/CAPLUS	<p>The Chemical Abstracts (CA) database covers all areas of Biochemistry, Chemistry and Chemical engineering, and related sciences.</p> <p>Sources include over 8,000 journals, patents from 38 national patent offices and two international patent organizations, technical reports, books, conference proceedings, and dissertations. Electronic only journals and Web preprints are also covered.</p> <p>Bibliographic terms, indexing terms, roles, CAS Registry Numbers, International Patent Classification, and abstracts are searchable.</p>

Host	File	Description
STN	MEDLINE	<p>MEDLINE contains information on every area of medicine. The MEDLINE database corresponds to Index Medicus, Index to Dental Literature, and International Nursing Index; OLDMEDLINE, with data from NLM's from the Cumulated Index Medicus (1960-1965) and Current List of Medical Literature (1958-1959); and, since August 2001, IN-PROCESS records, the latest documents before they have been completely indexed for inclusion on MEDLINE.</p> <p>Sources include journals and chapters in books or symposia. Bibliographic information, indexing terms, abstracts, chemical names, and CAS Registry Numbers are all searchable.</p> <p>Online thesauri are available for the Medical Subject Headings (/MN), Controlled Terms (/CT) and Chemical Name (/CN) fields.</p>

**Appendix 2 Search history**

```
FILE 'MEDLINE' ENTERED AT 11:01:06 ON 12 JUL 2022
L1      1 SEA GMB151 OR GMB(W)151 OR BCS(W)GM151(W)6 OR BCS-GM151-6 OR
        BCS(W)GMB151?
L2      8 SEA HPPD(W)4 OR HPPD4 OR HPPD(W)PF(W)4PA OR HPPDPF(W)4PA
L3      44 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
        HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE) (W) (DEH
        YDROGENASE OR DIOXYGENASE) OR HPPD) (S) (MODIF? OR MUTANT# OR
        MUTAT?)
L4      1 SEA CRY14AB-1 OR CRY14AB(W)1 OR CRY(W)14AB(W)1 OR CRY(W)14(W)AB
        (W)1 OR CRY14(W)AB1 OR CRY(W)14AB1 OR CRY14AB1
L5      0 SEA CRY14AB-L OR CRY14AB(W)L OR CRY(W)14AB(W)L OR CRY(W)14(W)AB
        (W)L OR CRY14(W)ABL OR CRY(W)14ABL OR CRY14ABL
L6      0 SEA CRY14AB-I OR CRY14AB(W)I OR CRY(W)14AB(W)I OR CRY(W)14(W)AB
        (W)I OR CRY14(W)ABI OR CRY(W)14ABI OR CRY14ABI
L7      0 SEA CRY14AB-1.B OR CRY14AB(W)1(W)B OR CRY14AB(W)1B OR CRY(W)14A
        B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)1(W)B OR
        CRY(W)14AB(W)1B OR CRY(W)14AB1(W)B OR CRY14AB1B
L8      0 SEA CRY14AB-L.B OR CRY14AB(W)L(W)B OR CRY14AB(W)1B OR CRY(W)14A
        B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)L(W)B OR
        CRY(W)14AB(W)LB OR CRY(W)14ABL(W)B OR CRY14ABLB
L9      0 SEA CRY14AB-I.B OR CRY14AB(W)I(W)B OR CRY14AB(W)IB OR CRY(W)14A
        B(W)I(W)B OR CRY(W)14AB(W)I(W)B OR CRY(W)14(W)AB(W)I(W)B OR
        CRY(W)14AB(W)IB OR CRY(W)14ABI(W)B OR CRY14ABIB
L10     50 SEA (L2 OR L3 OR L4 OR L5 OR L6 OR L7 OR L8 OR L9)
L11     3309 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR DIKETONITRILE# OR
        PYRAZOLONE# OR TRIKETONE# OR ISOXAFLUTOL## OR IFT) (5A) (RESIST?
        OR TOLERAN? OR PROTECT?)
L12     5017 SEA (NEMATODE# OR SOYBEAN(W)CYST(W)NEMATODE# OR SCN OR
        HETERODERA(W)GLYCINES OR H(W)GLYCINES) (5A) (RESIST? OR TOLERAN?
        OR PROTECT? OR CONTROL)
L13     8320 SEA (L11 OR L12)
L14     70047 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
        OR GLYCINE(W)MAX OR G(W)MAX
L15     4006274 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
        (GENETIC?(3W) (MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
        ENGINEER?))
L16     456 SEA L13 AND L14 AND L15
L17     501 SEA L1 OR L10 OR L16
L18     64 SEA L17 AND PY>=2021
L19     21 SEA L18 AND UP>=20220331 AND UP<=20220630

FILE 'BIOSIS' ENTERED AT 11:01:13 ON 12 JUL 2022
L20     0 SEA GMB151 OR GMB(W)151 OR BCS(W)GM151(W)6 OR BCS-GM151-6 OR
        BCS(W)GMB151?
L21     5 SEA HPPD(W)4 OR HPPD4 OR HPPD(W)PF(W)4PA OR HPPDPF(W)4PA
L22     65 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
        HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE) (W) (DEH
        YDROGENASE OR DIOXYGENASE) OR HPPD) (S) (MODIF? OR MUTANT# OR
        MUTAT?)
L23     0 SEA CRY14AB-1 OR CRY14AB(W)1 OR CRY(W)14AB(W)1 OR CRY(W)14(W)AB
        (W)1 OR CRY14(W)AB1 OR CRY(W)14AB1 OR CRY14AB1
L24     0 SEA CRY14AB-L OR CRY14AB(W)L OR CRY(W)14AB(W)L OR CRY(W)14(W)AB
        (W)L OR CRY14(W)ABL OR CRY(W)14ABL OR CRY14ABL
L25     0 SEA CRY14AB-I OR CRY14AB(W)I OR CRY(W)14AB(W)I OR CRY(W)14(W)AB
        (W)I OR CRY14(W)ABI OR CRY(W)14ABI OR CRY14ABI
L26     0 SEA CRY14AB-1.B OR CRY14AB(W)1(W)B OR CRY14AB(W)1B OR CRY(W)14A
        B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)1(W)B OR
        CRY(W)14AB(W)1B OR CRY(W)14AB1(W)B OR CRY14AB1B
L27     0 SEA CRY14AB-L.B OR CRY14AB(W)L(W)B OR CRY14AB(W)1B OR CRY(W)14A
        B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)L(W)B OR
        CRY(W)14AB(W)LB OR CRY(W)14ABL(W)B OR CRY14ABLB
```



L28 0 SEA CRY14AB-I.B OR CRY14AB(W)I(W)B OR CRY14AB(W)IB OR CRY(W)14A  
B(W)I(W)B OR CRY(W)14AB(W)I(W)B OR CRY(W)14(W)AB(W)I(W)B OR  
CRY(W)14AB(W)IB OR CRY(W)14ABI(W)B OR CRY14ABIB

L29 69 SEA (L21 OR L22 OR L23 OR L24 OR L25 OR L26 OR L27 OR L28)

L30 9811 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR DIKETONITRILE# OR  
PYRAZOLONE# OR TRIKETONE# OR ISOXAFLUTOL## OR IFT) (5A) (RESIST?  
OR TOLERAN? OR PROTECT?)

L31 13436 SEA (NEMATODE# OR SOYBEAN(W)CYST(W)NEMATODE# OR SCN OR  
HETERODERA(W)GLYCINES OR H(W)GLYCINES) (5A) (RESIST? OR TOLERAN?  
OR PROTECT? OR CONTROL)

L32 23214 SEA (L30 OR L31)

L33 172788 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#  
OR GLYCINE(W)MAX OR G(W)MAX

L34 456607 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR  
(GENETIC?(3W) (MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR  
ENGINEER?))

L35 502 SEA L32 AND L33 AND L34

L36 566 SEA L20 OR L29 OR L35

L37 506 SEA L36 NOT P/DT

L38 0 SEA L36 AND (P/DT AND AR/DT)

L39 506 SEA L37 OR L38

L40 34 SEA L39 AND PY>=2021

L41 11 SEA L40 AND UP>=20220331 AND UP<=20220630

FILE 'AGRICOLA' ENTERED AT 11:01:21 ON 12 JUL 2022

L42 0 SEA GMB151 OR GMB(W)151 OR BCS(W)GM151(W)6 OR BCS-GM151-6 OR  
BCS(W)GMB151?

L43 2 SEA HPPD(W)4 OR HPPD4 OR HPPD(W)PF(W)4PA OR HPPDPF(W)4PA

L44 42 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR  
HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE) (W) (DEH  
YDROGENASE OR DIOXYGENASE) OR HPPD) (S) (MODIF? OR MUTANT# OR  
MUTAT?)

L45 0 SEA CRY14AB-1 OR CRY14AB(W)1 OR CRY(W)14AB(W)1 OR CRY(W)14(W)AB  
(W)1 OR CRY14(W)AB1 OR CRY(W)14AB1 OR CRY14AB1

L46 0 SEA CRY14AB-L OR CRY14AB(W)L OR CRY(W)14AB(W)L OR CRY(W)14(W)AB  
(W)L OR CRY14(W)ABL OR CRY(W)14ABL OR CRY14ABL

L47 0 SEA CRY14AB-I OR CRY14AB(W)I OR CRY(W)14AB(W)I OR CRY(W)14(W)AB  
(W)I OR CRY14(W)ABI OR CRY(W)14ABI OR CRY14ABI

L48 0 SEA CRY14AB-1.B OR CRY14AB(W)1(W)B OR CRY14AB(W)1B OR CRY(W)14A  
B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)1(W)B OR  
CRY(W)14AB(W)1B OR CRY(W)14AB1(W)B OR CRY14AB1B

L49 0 SEA CRY14AB-L.B OR CRY14AB(W)L(W)B OR CRY14AB(W)1B OR CRY(W)14A  
B(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)L(W)B OR  
CRY(W)14AB(W)LB OR CRY(W)14ABL(W)B OR CRY14ABLB

L50 0 SEA CRY14AB-I.B OR CRY14AB(W)I(W)B OR CRY14AB(W)IB OR CRY(W)14A  
B(W)I(W)B OR CRY(W)14AB(W)I(W)B OR CRY(W)14(W)AB(W)I(W)B OR  
CRY(W)14AB(W)IB OR CRY(W)14ABI(W)B OR CRY14ABIB

L51 44 SEA (L43 OR L44 OR L45 OR L46 OR L47 OR L48 OR L49 OR L50)

L52 8478 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR DIKETONITRILE# OR  
PYRAZOLONE# OR TRIKETONE# OR ISOXAFLUTOL## OR IFT) (5A) (RESIST?  
OR TOLERAN? OR PROTECT?)

L53 9435 SEA (NEMATODE# OR SOYBEAN(W)CYST(W)NEMATODE# OR SCN OR  
HETERODERA(W)GLYCINES OR H(W)GLYCINES) (5A) (RESIST? OR TOLERAN?  
OR PROTECT? OR CONTROL)

L54 17905 SEA (L52 OR L53)

L55 97946 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#  
OR GLYCINE(W)MAX OR G(W)MAX

L56 108198 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR  
(GENETIC?(3W) (MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR  
ENGINEER?))

L57 452 SEA L54 AND L55 AND L56

L58 495 SEA L42 OR L51 OR L57

L59 27 SEA L58 AND PY>=2021



L60 6 SEA L59 AND UP>=20220331 AND UP<=20220630

FILE 'CABA' ENTERED AT 11:01:37 ON 12 JUL 2022

L61 1 SEA GMB151 OR GMB(W)151 OR BCS(W)GM151(W)6 OR BCS-GM151-6 OR BCS(W)GMB151?

L62 5 SEA HPPD(W)4 OR HPPD4 OR HPPD(W)PF(W)4PA OR HPPDPF(W)4PA

L63 67 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE) (W) (DEHYDROGENASE OR DIOXYGENASE) OR HPPD) (S) (MODIF? OR MUTANT# OR MUTAT?)

L64 1 SEA CRY14AB-1 OR CRY14AB(W)1 OR CRY(W)14AB(W)1 OR CRY(W)14(W)AB(W)1 OR CRY14(W)AB1 OR CRY(W)14AB1 OR CRY14AB1

L65 0 SEA CRY14AB-L OR CRY14AB(W)L OR CRY(W)14AB(W)L OR CRY(W)14(W)AB(W)L OR CRY14(W)ABL OR CRY(W)14ABL OR CRY14ABL

L66 0 SEA CRY14AB-I OR CRY14AB(W)I OR CRY(W)14AB(W)I OR CRY(W)14(W)AB(W)I OR CRY14(W)ABI OR CRY(W)14ABI OR CRY14ABI

L67 0 SEA CRY14AB-1.B OR CRY14AB(W)1(W)B OR CRY14AB(W)1B OR CRY(W)14AB(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)1(W)B OR CRY(W)14AB(W)1B OR CRY(W)14AB1(W)B OR CRY14AB1B

L68 0 SEA CRY14AB-L.B OR CRY14AB(W)L(W)B OR CRY14AB(W)1B OR CRY(W)14AB(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)L(W)B OR CRY(W)14AB(W)LB OR CRY(W)14ABL(W)B OR CRY14ABLB

L69 0 SEA CRY14AB-I.B OR CRY14AB(W)I(W)B OR CRY14AB(W)IB OR CRY(W)14AB(W)I(W)B OR CRY(W)14AB(W)I(W)B OR CRY(W)14(W)AB(W)I(W)B OR CRY(W)14AB(W)IB OR CRY(W)14ABI(W)B OR CRY14ABIB

L70 71 SEA (L62 OR L63 OR L64 OR L65 OR L66 OR L67 OR L68 OR L69)

L71 18589 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR ISOXAFLUTOL## OR IFT) (5A) (RESIST? OR TOLERAN? OR PROTECT?)

L72 24369 SEA (NEMATODE# OR SOYBEAN(W)CYST(W)NEMATODE# OR SCN OR HETERODERA(W)GLYCINES OR H(W)GLYCINES) (5A) (RESIST? OR TOLERAN? OR PROTECT? OR CONTROL)

L73 42886 SEA (L71 OR L72)

L74 200566 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX

L75 189240 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR (GENETIC?(3W) (MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR ENGINEER?))

L76 883 SEA L73 AND L74 AND L75

L77 948 SEA L61 OR L70 OR L76

L78 948 SEA L77 NOT P/DT

L79 0 SEA L77 AND (P/DT AND J/DT)

L80 948 SEA L78 OR L79

L81 54 SEA L80 AND PY>=2021

L82 16 SEA L81 AND UP>=20220331 AND UP<=20220630

FILE 'HCAPLUS' ENTERED AT 11:01:51 ON 12 JUL 2022

L83 1 SEA GMB151 OR GMB(W)151 OR BCS(W)GM151(W)6 OR BCS-GM151-6 OR BCS(W)GMB151?

L84 15 SEA HPPD(W)4 OR HPPD4 OR HPPD(W)PF(W)4PA OR HPPDPF(W)4PA

L85 219 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE) (W) (DEHYDROGENASE OR DIOXYGENASE) OR HPPD) (S) (MODIF? OR MUTANT# OR MUTAT?)

L86 4 SEA CRY14AB-1 OR CRY14AB(W)1 OR CRY(W)14AB(W)1 OR CRY(W)14(W)AB(W)1 OR CRY14(W)AB1 OR CRY(W)14AB1 OR CRY14AB1

L87 0 SEA CRY14AB-L OR CRY14AB(W)L OR CRY(W)14AB(W)L OR CRY(W)14(W)AB(W)L OR CRY14(W)ABL OR CRY(W)14ABL OR CRY14ABL

L88 0 SEA CRY14AB-I OR CRY14AB(W)I OR CRY(W)14AB(W)I OR CRY(W)14(W)AB(W)I OR CRY14(W)ABI OR CRY(W)14ABI OR CRY14ABI

L89 0 SEA CRY14AB-1.B OR CRY14AB(W)1(W)B OR CRY14AB(W)1B OR CRY(W)14AB(W)1(W)B OR CRY(W)14AB(W)1(W)B OR CRY(W)14(W)AB(W)1(W)B OR CRY(W)14AB(W)1B OR CRY(W)14AB1(W)B OR CRY14AB1B

L90 0 SEA CRY14AB-L.B OR CRY14AB(W)L(W)B OR CRY14AB(W)1B OR CRY(W)L4A  
B(W)1(W)B OR CRY(W)L4AB(W)1(W)B OR CRY(W)14(W)AB(W)L(W)B OR  
CRY(W)14AB(W)LB OR CRY(W)14ABL(W)B OR CRY14ABLB  
L91 0 SEA CRY14AB-I.B OR CRY14AB(W)I(W)B OR CRY14AB(W)IB OR CRY(W)14A  
B(W)I(W)B OR CRY(W)14AB(W)I(W)B OR CRY(W)14(W)AB(W)I(W)B OR  
CRY(W)14AB(W)IB OR CRY(W)14ABI(W)B OR CRY14ABIB  
L92 233 SEA (L84 OR L85 OR L86 OR L87 OR L88 OR L89 OR L90 OR L91)  
L93 28770 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR DIKETONITRILE# OR  
PYRAZOLONE# OR TRIKETONE# OR ISOXAFLUTOL## OR IFT) (5A) (RESIST?  
OR TOLERAN? OR PROTECT?)  
L94 10058 SEA (NEMATODE# OR SOYBEAN(W)CYST(W)NEMATODE# OR SCN OR  
HETERODERA(W)GLYCINES OR H(W)GLYCINES) (5A) (RESIST? OR TOLERAN?  
OR PROTECT? OR CONTROL)  
L95 38456 SEA (L93 OR L94)  
L96 427540 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#  
OR GLYCINE(W)MAX OR G(W)MAX  
L97 643706 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR  
(GENETIC?(3W) (MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR  
ENGINEER?))  
L98 6564 SEA L95 AND L96 AND L97  
L99 6707 SEA L83 OR L92 OR L98  
L100 571 SEA L99 NOT P/DT  
L101 0 SEA L99 AND (P/DT AND J/DT)  
L102 571 SEA L100 OR L101  
L103 45 SEA L102 AND PY>=2021  
L104 14 SEA L103 AND UP>=20220331 AND UP<=20220630

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 05:01:58 ON 12  
JUL 2022

L105 57 DUP REM L19 L41 L60 L82 L104 (11 DUPLICATES REMOVED)  
ANSWERS '1-21' FROM FILE MEDLINE  
ANSWERS '22-30' FROM FILE BIOSIS  
ANSWERS '31-36' FROM FILE AGRICOLA  
ANSWERS '37-48' FROM FILE CABA  
ANSWERS '49-57' FROM FILE HCAPLUS