

Title

**Summary of the Literature Review for GHB614 x T304-40 x GHB119 (GLT) cotton
August 1, 2021 – 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

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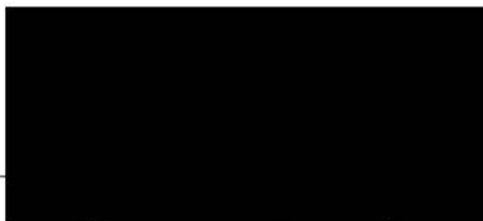
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SUMMARY

BASF used conventional breeding techniques to develop the cotton product GHB614 x T304-40 x GHB119 (GlyTol x TwinLink; GLT) which confers insect resistance and herbicide tolerance. Each single trait contributes specific benefits to the final stacked trait product.

A scoping review was performed for the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae. The objective of this scoping review was to determine if there were studies about the molecular characterization of GHB614 x T304-40 x GHB119 cotton, 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 August 1, 2021 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 237 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 6 publications were progressed for detailed assessment and were determined to be not relevant after the detailed review.

No new publications were found that contained new data on the molecular characterization of the GHB614 x T304-40 x GHB119 cotton or the 2mEPSPS, PAT/*bar*, Cry1Ab, and Cry2Ae protein. Similarly, no new publications were found that suggested any potential adverse effects of GHB614 x T304-40 x GHB119 cotton on human and animal health, and on the environment. No issues or topics were identified that would trigger or warrant more specific question formulation or indicate that a systematic review would be of value.

1. INTRODUCTION

BASF used conventional breeding techniques to develop the cotton product GHB614 x T304-40 x GHB119 (GlyTol x TwinLink; GLT) which confers insect resistance and herbicide tolerance. Each single trait contributes specific benefits to the final stacked trait product.

The objective of the literature searches described here was to determine if there were studies published between August 1, 2021 and June 30, 2022 that mention the molecular characterization of the GHB614 x T304-40 x GHB119 cotton, and/or any adverse effect of GHB614 x T304-40 x GHB119 cotton 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)¹ applications and post-market environmental monitoring activities (2019).

The literature searches were performed for the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae. The search terms also included relevant synonyms, trade name and intended trait, plant species and general GMO terms. When needed, plant species and general GMO terms were used to limit the search results (described in [Section 3](#)).

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae, 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 note¹.

Question 1: Were any studies published during the reporting period that describe adverse effects on human or animal health or the environment of the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae?

Key elements:

Population: Human health; animal health; environmental safety

Exposure: GHB614 x T304-40 x GHB119 cotton, derived food/feed products, newly expressed proteins in GHB614 x T304-40 x GHB119 cotton

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 GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae in cotton?

Key elements:

Population: GHB614 x T304-40 x GHB119 cotton and newly expressed proteins in GHB614 x T304-40 x GHB119 cotton

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 note¹ 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 stacked event and not any subcombinations or the single events	This permits the selection of publications on the stacked event and the exclusion of publications on any subcombinations and the single events of the stacked event, because the risk assessment of GMO applications for stacked events covers only the products in the scope of the GMO application
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
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

Concepts	Criteria	Comment
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

One publication related to GHB614 x T304-40 x GHB119 cotton was used to test and validate the search strategy:

- Wu A-J; Sathischandra S; Massengill J; Araujo R; Soria M; Bugas M; Bishop Z; Haas C; Cisneros K; Lor J; Canez C; New S; Mackie S; Ghoshal D; Privalle L; Hunst P (2019). GHB614 x T304-40 x GHB119 x COT102 Cotton: Protein Expression Analyses of Field-Grown Samples. *Journal of Agricultural and Food Chemistry* 67(1):275-281

Although this article is not directly relevant for the GHB614 x T304-40 x GHB119 cotton, it was selected as reference publication because its title and abstract mention the event names (GHB614, T304-40 and GHB119 cotton), one of the newly expressed proteins (PAT/*bar*) and the intended traits (herbicide tolerance, insect control). Since this reference was published before the current search period, the search profile was tested without applying the time limit used in the final search profile (UP>=20210801 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 activities¹. 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 August 19, 2022. Only documents updated between August 1, 2021 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 profile was designed to cover the higher stack's and substacks' event names, newly expressed proteins, trade names and intended traits. Since the 'intended trait' profiles produced too many results when used on their own, they were combined with additional profiles: a 'general GMO' profile as well as a 'plant species' profile. The reference publication ([Section 2.4](#)) was identified by the search profiles confirming the validity of the applied search strategy. See Table 2 for a detailed search profile.

Table 2: Search profile for database search

#	Profile	Element
1	GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)5 OR BCSGH002(W)5	Event name GHB614
2	T304-40 or T304(w)40 or T(w)304(w)40 or BCS-GHØØ4-7 or BCS-GH004-7 or BCS-GHØØ4-7 or BCS(w)GH004(w)7 or BCS(w)GHØØ4(w)7 or BCSGH004(w)7 or BCSGHØØ4(w)7	Event name T304-40
3	GHB119 or GHB(w)119 or BCS-GH005-8 or BCS-(w)GH005(w)8 or BCSGH005(w)8 or BCS-GHØØ5-8 or BCS-(w)GHØØ5(w)8 or BCSGHØØ5(w)8	Event name GHB119
4	GHB614xT304-40xGHB119	Event name stack
5	(1 and 2) or (2 and 3) or (1 and 3) or (1 and 2 and 3) or 4	Event name ALL
6	GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(w)TOL OR GLY(w)TOLTM OR GLY(w)TOLRTM	Trade name GHB614
7	LibertyLink or LibertyLinktm or LibertyLinkr or LibertyLinkrtm or Liberty(w)Link or Liberty(w)Linktm or Liberty(w)Linkr or Liberty(w)Linkrtm	Trade name T304-40 and GHB119
8	TwinLink or TwinLinktm or TwinLinkr or TwinLinkrtm or twin(w)link or twin(w)linktm or twin(w)linkr or twin(w)linkrtm	Trade name T304-40 x GHB119
9	(6 and 8) or (6 and 7 and 8)	Trade name ALL
10	2MEPSPS or 2(w)MEPSPS or 2M(w)EPSPS or 2(w)M(w)EPSPS or (EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVØYLSHIKIMATE or ENØYLPYRUVØYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE) or (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVØYL)(W)(PHOSPHOSHIKIMATE OR PHOSPHOSHIKIMIC or ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(SYNTHASE OR SYNTHETASE) or (ENOL(W)PYRUVØYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVØYL)(W)SHIKIMATE)(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE) or (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIKIMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVØYL(W)SHIKIMIC(3W)PHOSPHOSYNTHASE)) (s)((DOUBL# or DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)	Newly expressed proteins GHB614

11	((bar or pat)(2a)(gene# or protein# or enzyme#)) or ppt(2w)acetyltransferase or ppt(2w)acetyl(w)transferase or pt(w)n(2w)acetyltransferase or pt(w)n(2w)acetyl(w)transferase or phosphinothricin(w)n(w)acetyltransferase or phosphinothricin(2w)acetyltransferase or phosphinothricin(2w)acetyl(w)transferase or phosphinothricinacetyl(w)transferase or cry1ab# or cry(w)1(w)ab# or cry(w)1ab# or cry1(w)ab# or cry1(w)a(w)b# or cry(w)1(w)a(w)b# or cry1a(w)b# or crylab# or cry(w)l(w)ab# or cry(w)lab# or cryl(w)ab# or cryl(w)a(w)b# or cry(w)l(w)a(w)b# or cryla(w)b# or crylab# or cry(w)l(w)ab# or cry(w)lab# or cryl(w)ab# or cryl(w)a(w)b# or cry(w)l(w)a(w)b# or cryla(w)b#	Newly expressed proteins T304-40
12	cry2ae# or cry(w)2(w)ae# or cry(w)2ae# or cry2(w)ae# or cry2(w)a(w)e# or cry(w)2(w)a(w)e# or cry2a(w)e# or cryllae# or cry(w)ll(w)ae# or cry(w)llae# or cryll(w)ae# or cryll(w)a(w)e# or cry(w)ll(w)a(w)e# or crylla(w)e# or cryllae# or cry(w)ll(w)ae# or cryll(w)ae# or cryll(w)a(w)e# or cry(w)ll(w)a(w)e# or crylla(w)e#	Newly expressed proteins GHB119
13	(10 and 11) or (11 and 12) or (10 and 12) or (10 and 11 and 12)	Newly expressed proteins ALL
14	(herbicid? or GLIPHOSATE# or GLIFOSATE# OR G360 or g(w)360 or roundup? or round(w)up?)(5a)(resist? or toleran? or protect?)	Intended trait GHB614
15	herbicid? or bialaphos or basta or glufosinate or gluphosinate or phosphinothricin or liberty? or Insect# OR pest# OR Lepidoptera# OR Noctuidae OR Crambidae OR borer# OR cornborer# OR stalkborer# OR earworm# OR ear(w)worm# OR armyworm# OR army(w)worm# OR cutworm# OR cut(w)worm# OR Ostrinia OR O(w)nubilalis OR Sesamia OR S(w)nonagrioides or Diatraea OR D(w)grandiosella OR D(w)crambidoides OR Helicoverpa OR H(w)zea OR Spodoptera OR S(w)frugiperda OR Papaipema OR P(w)nebris OR Elasmopalpus OR E(w)lignosellus OR D(w)saccharalis OR Striacosta OR S(w)albicosta or Agrotis OR A(w)ipsilon OR S(w)cretica OR Mythimna OR M(w)unipuncta OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR SCB OR WBC) (5a) (resist? OR protect? OR toleran?)	Intended trait T304-40 Intended trait GHB614
16	14 and 15	Intended trait ALL
17	cotton# or gossypium or G(w)hirsutum or g(w)barbadense	Crop
18	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3a)(modif? OR transform? OR manipulat? OR improv? OR engineer?))	GMO general
19	16 and 17 and 18	Intended trait all and crop and GMO general
20	5 or 9 or 13 or 19	Event name ALL or trade name ALL or newly expressed proteins ALL or (intended traits ALL and crop 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	New proteins	Intended traits	Plant species	GM plants
Agricola	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIMUM BARBADENSE" "GOSSYPIMUM HIRSUTUM"	"TRANSGENIC PLANTS"
Biosis	None	None	No terms for herbicide or insect resistance	"GOSSYPIMUM BARBADENSE" "GOSSYPIMUM HIRSUTUM"	None
CABA	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIMUM BARBADENSE"/CT "GOSSYPIMUM HIRSUTUM"/CT	"TRANSGENIC PLANTS"
CAS	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	GOSSYPIMUM/CT	"GENETICALLY MODIFIED PLANTS"
Medline	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIMUM BARBADENSE" "GOSSYPIMUM HIRSUTUM"	"PLANTS, GENETICALLY MODIFIED"

The search results were limited to documents updated between August 1, 2021 and June 30, 2022 (UP>=20210801 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	19 Aug 2022	19 Aug 2022	19 Aug 2022	19 Aug 2022	19 Aug 2022
Datespan of the search	1 Aug 2021 – 30 Jun 2022	1 Aug 2021 – 30 Jun 2022	1 Aug 2021 – 30 Jun 2022	1 Aug 2021 – 30 Jun 2022	1 Aug 2021 – 30 Jun 2022
Latest database update	8 Aug 2022	17 Aug 2022	16 Aug 2022	18 Aug 2022	18 Aug 2022
Number of records retrieved	27	63	99	54	61
Number of records after duplicate removal	22	52	70	32	61
Number of relevant records after rapid assessment	1	3	1	1	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: August 1, 2021 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 note¹. Of the 13 key organisations cited in the EFSA 2019 explanatory note¹, 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 USDA, EPA, FDA, CFIA, Health Canada, FSANZ and MAFF websites were excluded, since these agencies do not regulate GM stacked products obtained by conventional breeding techniques. Therefore, the internet search was limited to four key organisations relevant for GHB614 x T304-40 x GHB119 cotton. Search terms consisted of GHB614 x T304-40 x GHB119 cotton or OECD Identifier or trait-specific protein(s) in GHB614 x T304-40 x GHB119 cotton (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
Office of the Gene Technology Regulator (OGTR) Australia	http://www.ogtr.gov.au/	Aug 1 2022	Aug 29 2022	0
National Technical Commission on Biosafety (CTNBio) Brazil	http://ctnbio.mcti.gov.br/en	Aug 1 2022	Aug 29 2022	0
National Advisory Commission on Agricultural Biotechnology (CONABIA) Argentina	https://www.argentina.gob.ar/agroindustria/bioeconomia/biotechnologia	Sep 8 2022	Sep 8 2022	0
Genetic Engineering Approval Committee (GEAC) India	http://moef.gov.in/	Aug 12 2022	Aug 24 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 August 1, 2021 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	Ahmad A, Munawar N, Khan Z, Qusmani AT, Khan SH, Jamil A, Ashraf S, Ghouri MZ, Aslam S, Mubarik MS, Munir A, Sultan Q, Abd-Elsalam KA, Qari SH. 2021	An Outlook on Global Regulatory Landscape for Genome-Edited Crops	Int J Mol Sci. 2021 Oct 29;22(21):11753.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
2	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
3	Kawall K. 2021	The Generic Risks and the Potential of SDN-1 Applications in Crop Plants	Plants (Basel). 2021 Oct 22;10(11):2259.	0
4	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
5	Nagamine A, Ezura H. 2022	Genome Editing for Improving Crop Nutrition	Front Genome Ed. 2022 Feb 9;4:850104.	0
6	Niraula PM, Fondong VN. 2021	Development and Adoption of Genetically Engineered Plants for Virus Resistance: Advances, Opportunities and Challenges	Plants (Basel). 2021 Oct 29;10(11):2339.	0
7	Okoli AS, Blix T, Myhr AI, Xu W, Xu X. 2022	Sustainable use of CRISPR/Cas in fish aquaculture: the biosafety perspective	Transgenic Res. 2022 Feb;31(1):1-21.	0
8	Then C. 2022	Deficiencies in the Risk Assessment of Genetically Engineered Bt Cowpea Approved for Cultivation in Nigeria: A Critical Review	Plants (Basel). 2022 Jan 29;11(3):380.	0
9	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 304 references, which were reduced to 237 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 evaluator 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.

In the relevance assessment of the literature review for the GHB614 x T304-40 x GHB119 cotton, reviewers agreed in 100% of the Stage 2 evaluations.

[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)	237
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	231
Total number of full-text documents assessed in detail	6
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	6
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.

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 any 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 Table 1
Fast Brandon J. Shan Guomin Herman Rod A. Gampala Satyalinga Srinivas. 2019	Transgene expression in sprayed and non-sprayed herbicide - tolerant genetically engineered crops is equivalent.	Regulatory toxicology and pharmacology : RTP, (2020 Mar) Vol. 111, pp. 104572. Electronic Publication Date: 26 Dec 2019 Journal code: 8214983. E-ISSN: 1096-0295. L-ISSN: 0273-2300.	The GHB614 x T304-40 x GHB119 cotton was not considered in this paper.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Naegeli, H.Bresson, J. L. Dalmay, T. Dewhurst, I. C. Epstein, M. M. Firbank, L. G. Guerche, P. Hejatko, J. Moreno, F. J. Mullins, E. Nogue, F. Rostoks, N. Serrano, J. J. S. Savoini, G. Veromann, E. Veronesi, F. Alvarez, F. Ardizzzone, M. Raffaello, T. 2021	Assessment of genetically modified cotton GHB614 for renewal authorisation under regulation (EC) No 1829/2003 (application EFSA-GMO -RX-018).	EFSA Journal (2021), Volume 19, Number 7, 10 refs. ISSN: 1831-4732 DOI: https://doi.org/10.2903/j.efs.a.2021.6671 Published by: Wiley, Oxford	EFSA evaluation of GHB614 cotton. Single events are not considered relevant for stacks. Not relevant for GHB614 x T304-40 x GHB119 cotton.
Luz, Carlos Eduardo Almeida Zuim, Vitor Oliveira, Andrea Aparecida Santos dos Santos, Patricia de Jesus Campos, Karolayne Lopes Haro, Marcelo Mendes Vivan, Lucia Madalena Bastos, Cristina Schetino Guedes, Raul Narciso Carvalho. 2022	Arthropod food webs associated with cotton : Does Bt cotton mediate community stress?	Journal of Applied Entomology, (FEB 2022) Vol. 146, No. 1-2. http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1439-0418 . ISSN: 0931-2048. E-ISSN: 1439-0418.	The authors analysed the short-term impact of Bt cotton on the associated arthropod community in Neotropical fields. Bt cotton (MON15985; Bollgard II) and related non-Bt cotton (FMT 709) were cultivated for two years, and the arthropods were sampled. The Bt cotton-associated food webs were similar to those of the non-Bt cotton, indicating no significant impact of the event on arthropod food webs. This ERA is not related to GHB614 x T304-40 x GHB119 cotton.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Wang, Tiantian. Yan, Bing. Chen, Yanjun. Guan, Xiao Li, Junsheng. 2021	Characteristics of bacterial community of rhizosphere soil of transgenic insect - resistant cotton at different growth stages	Huanjing Kexue Yanjiu (2021), 34(7), 1728-1736 CODEN: HKYAEZ; ISSN: 1001-6929	The authors conducted a study at Xingtai, Hebei Province in China to assess the effect of Bt cotton on rhizosphere soil bacterial community using high-throughput sequencing technology to study the composition and diversity compared with samples from non-GM cotton at different crop growth stages. According to the paper the Bt protein content in rhizosphere of the GM cotton did not affect the alpha diversity of bacteria besides the effect observed on abundance and community structure at different growth stages. There is no information about the event neither the protein(s) expressed and clarity on the methods (already considering that the paper is in Chinese). This ERA is not related to GHB614 x T304-40 x GHB119 cotton.
Calvin, Wilfrid. Yang, Fei. Brown, Sebe A. Catchot, Angus L. Crow, Whitney D. Cook, Donald R. Gore, Jeffrey Kurtz, Ryan. Lorenz, Gustav M. Seiter, Nicholas J. Stewart, Scott D. Towles, Tyler. Kerns, David L. 2021	Development of Economic Thresholds Toward Bollworm (Lepidoptera: Noctuidae), Management in Bt Cotton, and Assessment of the Benefits From Treating Bt Cotton With Insecticide	Journal of economic entomology (9 Oct 2021), Volume 114, Number 6, pp. 2493-2504, 12 p. ISSN: 0022-0493; 0022-0493	The authors report the relationships between cotton yield and fruit loss due to bollworm feeding and bollworm larval density, and compute economic injury levels and economic thresholds. Additionally, the authors reported yield response of second- and third generation Bt cotton when subjected to insecticide applications targeting bollworm. The Bt cotton technologies evaluated included TwinLink (TL; Cry1Ab+Cry2Ae), TwinLink Plus (TLP; Cry1Ab+Cry2Ae +Vip3Aa), Bollgard II (BG2;Cry1Ac+Cry2Ab), Bollgard 3 (BG3;Cry1Ac+Cry2Ab+Vip3Aa), WideStrike (WS; Cry1Ac+Cry1F), and WideStrike 3 (WS3; Cry1Ac+Cry1F +Vip3Aa). The authors assessed the effectiveness (evidences to support resistance) of the events. This ERA is not related to GHB614 x T304-40 x GHB119 cotton (Cry1Ab + Cry2Ae + 2mEPSs + PAT/bar).

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Shen Wen-Jing. Liu Lai-Pan. Fang Zhi-Xiang. Zhang Li. Liu Biao. 2021	Effects of planting transgenic cotton beneath transgenic poplar trees on the diversity of arthropod community in the transgenic poplar-cotton composite system.	Acta Entomologica Sinica, (OCT 20 2021) Vol. 64, No. 10, pp. 1187-1195. http://www.insect.org.cn/EN/article/showOldVolumn.do . CODEN: KCHPA2. ISSN: 0454-6296.	The composition and diversity indexes of arthropod community on polar and cotton plants in the two poplar-cotton composite systems were investigated by the authors. They concluded that the transgenic poplar can control target insects, and have a synergistic effect against lepidopteran pests on cotton . The community structure of above-ground arthropods in the transgenic poplar-cotton composite system was stable, without significant effect on the diversity of the above-ground arthropod community on cotton plants. However, there is no information about the event neither the protein(s) expressed and clarity on the methods (already considering that the paper is in Chinese). This ERA is not related to GHB614 x T304-40 x GHB119 cotton.

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.			

6. NARRATIVE SYNTHESIS/SUMMARY OF RELEVANT STUDIES

A total of six publications were selected during Stage 1 evaluation (rapid assessment based on title and abstract). After Stage 2 evaluation (detailed review based on full text), it was determined that none of the publications were relevant for the safety assessment of the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab, and Cry2Ae.

7. CONCLUSION

The literature searches performed for the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab, and Cry2Ae, for the period from August 1, 2021 to June 30, 2022, identified a total of 237 unique publications (after duplicate removal). A total of six publications were progressed for detailed assessment after excluding 231 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract). The six publications that progressed to Stage 2 were evaluated in detail, based on full text, for potential relevance, following the pre-established criteria listed in [Table 1](#).

No new publications were found that contained new data on the molecular characterization of the GHB614 x T304-40 x GHB119 cotton and its newly expressed proteins, 2mEPSPS, PAT/*bar*, Cry1Ab and Cry2Ae. Similarly, no new publications were found that suggested any potential adverse effects of GHB614 x T304-40 x GHB119 cotton on human and animal health, and the environment. No issues or topics were identified that would trigger or warrant more specific question formulation or indicate that a systematic review would be of value.

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.

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

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FILE 'MEDLINE' ENTERED AT 11:09:06 ON 19 AUG 2022
L1      4 SEA GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR
        BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)
        )5 OR BCSGH002(W)5
L2      4 SEA T304-40 OR T304(W)40 OR T(W)304(W)40 OR BCS-GH004-7 OR
        BCS-GH004-7 OR BCS(W)GH004(W)7 OR BCS(W)GH004(W)7 OR BCSGH004(W)
        )7 OR BCSGH004(W)7
L3      4 SEA GHB119 OR GHB(W)119 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR
        BCSGH005(W)8 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8
L4      2 SEA GHB614XT304-40XGHB119 OR GHB614.TIME#.T304-40.TIME#.GHB119

L5      4 SEA (L1 AND L2) OR (L2 AND L3) OR (L1 AND L3) OR (L1 AND L2
        AND L3) OR L4
L6      0 SEA GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(W)TOL OR GLY(W)TOLTM
        OR GLY(W)TOLRTM
L7      18 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKR OR LIBERTYLINK
        RTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKR
        OR LIBERTY(W)LINKRTM
L8      6 SEA TWINLINK OR TWINLINKTM OR TWINLINKR OR TWINLINKRTM OR
        TWIN(W)LINK OR TWIN(W)LINKTM OR TWIN(W)LINKR OR TWIN(W)LINKRTM
L9      0 SEA (L6 AND L8) OR (L6 AND L7 AND L8)
L10     14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
L11     4282 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
        ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
        OYLSHIKIMATE OR ENOYLPYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
        4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L12     0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
        MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
        YNTHASE OR SYNTHETASE)
L13     402 SEA (ENOL(W)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
        ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVYOYL)(W)SHIKIMATE
        )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L14     504 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
        IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVYOYL(W)SHIKIMIC(
        3W)PHOSPHOSYNTHASE)
L15     25144 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L16     20 SEA L10 OR ((L11 OR L12 OR L13 OR L14))(S)L15)
L17     1522 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
        PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
        PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L18     204 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
        N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
        ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L19     948 SEA CRY1AB# OR CRY(W)1(W)AB# OR CRY(W)1AB# OR CRY1(W)AB# OR
        CRY1(W)A(W)B# OR CRY(W)1(W)A(W)B# OR CRY1A(W)B#
L20     115 SEA CRYIAB# OR CRY(W)I(W)AB# OR CRY(W)IAB# OR CRYI(W)AB# OR
        CRYI(W)A(W)B# OR CRY(W)I(W)A(W)B# OR CRYIA(W)B#
L21     36 SEA CRYLAB# OR CRY(W)L(W)AB# OR CRY(W)LAB# OR CRYL(W)AB# OR
        CRYL(W)A(W)B# OR CRY(W)L(W)A(W)B# OR CRYLA(W)B#
L22     2665 SEA (L17 OR L18 OR L19 OR L20 OR L21)
L23     13 SEA CRY2AE# OR CRY(W)2(W)AE# OR CRY(W)2AE# OR CRY2(W)AE# OR
        CRY2(W)A(W)E# OR CRY(W)2(W)A(W)E# OR CRY2A(W)E#
L24     0 SEA CRYIIAE# OR CRY(W)II(W)AE# OR CRY(W)IIAE# OR CRYII(W)AE#
        OR CRYII(W)A(W)E# OR CRY(W)II(W)A(W)E# OR CRYIIA(W)E#
L25     0 SEA CRYLLAE# OR CRY(W)LL(W)AE# OR CRY(W)LLAE# OR CRYLL(W)AE#
        OR CRYLL(W)A(W)E# OR CRY(W)LL(W)A(W)E# OR CRYLLA(W)E#
L26     13 SEA (L23 OR L24 OR L25)
L27     17 SEA (L16 AND L22) OR (L22 AND L26) OR (L16 AND L26) OR (L16
        AND L22 AND L26)
L28     3771 SEA (HERBICID? OR GL!PHOSATE# OR GL!FOSATE# OR G360 OR G(W)360
        OR ROUNDUP? OR ROUND(W)UP?)(5A)(RESIST? OR TOLERAN? OR

```

PROTECT?)

L29 31798 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L30 217229 SEA INSECT# OR PEST# OR LEPIDOPTERA# OR NOCTUIDAE OR CRAMBIDAE
OR BORER# OR CORNBORER# OR STALKBORER# OR EARWORM# OR EAR(W)WORM#
OR ARMYWORM# OR ARMY(W)WORM# OR CUTWORM# OR CUT(W)WORM# OR
OSTRINIA OR O(W)NUBILALIS OR SESAMIA OR S(W)NONAGRIOIDES

L31 14593 SEA DIATRAEA OR D(W)GRANDIOSELLA OR D(W)CRAMBIDOIDES OR
HELICOVERPA OR H(W)ZEA OR SPODOPTERA OR S(W)FRUGIPERDA OR
PAPAIPEMA OR P(W)NEBRIS OR ELASMOPALPUS OR E(W)LIGNOSELLUS OR
D(W)SACCHARALIS OR STRIACOSTA OR S(W)ALBICOSTA

L32 24511 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR
M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR
SCB OR WBC

L33 2547672 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L34 12872 SEA ((L28 OR L29 OR L30 OR L31 OR L32))(5A)L33

L35 28667 SEA COTTON# OR GOSSYPIMUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L36 4028245 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
(GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
ENGINEER?))

L37 710 SEA L34 AND L35 AND L36

L38 723 SEA L5 OR L9 OR L27 OR L37

L39 125 SEA L38 AND PY>=2020

L40 61 SEA L39 AND UP>=20210801 AND UP<=20220630

FILE 'BIOSIS' ENTERED AT 11:09:25 ON 19 AUG 2022

L41 4 SEA GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR
BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)
5 OR BCSGH002(W)5

L42 2 SEA T304-40 OR T304(W)40 OR T(W)304(W)40 OR BCS-GH004-7 OR
BCS-GH004-7 OR BCS(W)GH004(W)7 OR BCS(W)GH004(W)7 OR BCSGH004(W)
7 OR BCSGH004(W)7

L43 2 SEA GHB119 OR GHB(W)119 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR
BCSGH005(W)8 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8

L44 0 SEA GHB614XT304-40XGHB119 OR GHB614.TIME#.T304-40.TIME#.GHB119

L45 2 SEA (L41 AND L42) OR (L42 AND L43) OR (L41 AND L43) OR (L41
AND L42 AND L43) OR L44

L46 2 SEA GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(W)TOL OR GLY(W)TOLTM
OR GLY(W)TOLRTM

L47 47 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKR OR LIBERTYLINK
RTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKR
OR LIBERTY(W)LINKRTM

L48 6 SEA TWINLINK OR TWINLINKTM OR TWINLINKR OR TWINLINKRTM OR
TWIN(W)LINK OR TWIN(W)LINKTM OR TWIN(W)LINKR OR TWIN(W)LINKRTM

L49 0 SEA (L46 AND L48) OR (L46 AND L47 AND L48)

L50 12 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L51 5113 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPIRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)

L52 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
YNTHASE OR SYNTHETASE)

L53 746 SEA (ENOL(W)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)

L54 28 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
3W)PHOSPHOSYNTHASE)

L55 27470 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)

L56 19 SEA L50 OR ((L51 OR L52 OR L53 OR L54))(S)L55)

L57 2905 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR

PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L58 334 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L59 1586 SEA CRY1AB# OR CRY(W)1(W)AB# OR CRY(W)1AB# OR CRY1(W)AB# OR
CRY1(W)A(W)B# OR CRY(W)1(W)A(W)B# OR CRY1A(W)B#
L60 229 SEA CRYIAB# OR CRY(W)I(W)AB# OR CRY(W)IAB# OR CRYI(W)AB# OR
CRYI(W)A(W)B# OR CRY(W)I(W)A(W)B# OR CRYIA(W)B#
L61 265 SEA CRYLAB# OR CRY(W)L(W)AB# OR CRY(W)LAB# OR CRYL(W)AB# OR
CRYL(W)A(W)B# OR CRY(W)L(W)A(W)B# OR CRYLA(W)B#
L62 4808 SEA (L57 OR L58 OR L59 OR L60 OR L61)
L63 19 SEA CRY2AE# OR CRY(W)2(W)AE# OR CRY(W)2AE# OR CRY2(W)AE# OR
CRY2(W)A(W)E# OR CRY(W)2(W)A(W)E# OR CRY2A(W)E#
L64 0 SEA CRYIIAE# OR CRY(W)II(W)AE# OR CRY(W)IIAE# OR CRYII(W)AE#
OR CRYII(W)A(W)E# OR CRY(W)II(W)A(W)E# OR CRYIIA(W)E#
L65 0 SEA CRYLLAE# OR CRY(W)LL(W)AE# OR CRY(W)LLAE# OR CRYLL(W)AE#
OR CRYLL(W)A(W)E# OR CRY(W)LL(W)A(W)E# OR CRYLLA(W)E#
L66 19 SEA (L63 OR L64 OR L65)
L67 19 SEA (L56 AND L62) OR (L62 AND L66) OR (L56 AND L66) OR (L56
AND L62 AND L66)
L68 11502 SEA (HERBICID? OR GL!PHOSATE# OR GL!FOSATE# OR G360 OR G(W)360
OR ROUNDUP? OR ROUND(W)UP?)(5A)(RESIST? OR TOLERAN? OR
PROTECT?)
L69 90678 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?
L70 1455056 SEA INSECT# OR PEST# OR LEPIDOPTERA# OR NOCTUIDAE OR CRAMBIDAE
OR BORER# OR CORNBORER# OR STALKBORER# OR EARWORM# OR EAR(W)WORM
M# OR ARMYWORM# OR ARMY(W)WORM# OR CUTWORM# OR CUT(W)WORM# OR
OSTRINIA OR O(W)NUBILALIS OR SESAMIA OR S(W)NONAGRIODES
L71 28337 SEA DIATRAEA OR D(W)GRANDIOSELLA OR D(W)CRAMBIDOIDES OR
HELICOVERPA OR H(W)ZEA OR SPODOPTERA OR S(W)FRUGIPERDA OR
PAPAIPEMA OR P(W)NEBRIS OR ELASMOPALPUS OR E(W)LIGNOSELLUS OR
D(W)SACCHARALIS OR STRIACOSTA OR S(W)ALBICOSTA
L72 34844 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR
M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR
SCB OR WBC
L73 2514655 SEA (RESIST? OR PROTECT? OR TOLERAN?)
L74 37024 SEA ((L68 OR L69 OR L70 OR L71 OR L72))(5A)L73
L75 77364 SEA COTTON# OR GOSSYPIMUM OR G(W)HIRSUTUM OR G(W)BARBADENSE
L76 480388 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
(GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
ENGINEER?))
L77 1038 SEA L74 AND L75 AND L76
L78 1054 SEA L45 OR L49 OR L67 OR L77
L79 119 SEA L78 AND PY>=2020
L80 63 SEA L79 AND UP>=20210801 AND UP<=20220630

FILE 'AGRICOLA' ENTERED AT 11:09:41 ON 19 AUG 2022
L81 2 SEA GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR
BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)
)5 OR BCSGH002(W)5
L82 3 SEA T304-40 OR T304(W)40 OR T(W)304(W)40 OR BCS-GH004-7 OR
BCS-GH004-7 OR BCS(W)GH004(W)7 OR BCS(W)GH004(W)7 OR BCSGH004(W)
)7 OR BCSGH004(W)7
L83 2 SEA GHB119 OR GHB(W)119 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR
BCSGH005(W)8 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8
L84 1 SEA GHB614XT304-40XGHB119 OR GHB614.TIME#.T304-40.TIME#.GHB119

L85 2 SEA (L81 AND L82) OR (L82 AND L83) OR (L81 AND L83) OR (L81
AND L82 AND L83) OR L84
L86 2 SEA GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(W)TOL OR GLY(W)TOLTM
OR GLY(W)TOLRTM

L87 42 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKR OR LIBERTYLINK
RTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKR
OR LIBERTY(W)LINKRTM

L88 4 SEA TWINLINK OR TWINLINKTM OR TWINLINKR OR TWINLINKRTM OR
TWIN(W)LINK OR TWIN(W)LINKTM OR TWIN(W)LINKR OR TWIN(W)LINKRTM

L89 0 SEA (L86 AND L88) OR (L86 AND L87 AND L88)

L90 4 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L91 727 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)

L92 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
YNTHASE OR SYNTHETASE)

L93 333 SEA (ENOL(W)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)

L94 265 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
3W)PHOSPHOSYNTHASE)

L95 6893 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)

L96 9 SEA L90 OR ((L91 OR L92 OR L93 OR L94))(S)L95)

L97 815 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE

L98 255 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L99 933 SEA CRY1AB# OR CRY(W)1(W)AB# OR CRY(W)1AB# OR CRY1(W)AB# OR
CRY1(W)A(W)B# OR CRY(W)1(W)A(W)B# OR CRY1A(W)B#

L100 158 SEA CRYIAB# OR CRY(W)I(W)AB# OR CRY(W)IAB# OR CRYI(W)AB# OR
CRYI(W)A(W)B# OR CRY(W)I(W)A(W)B# OR CRYIA(W)B#

L101 11 SEA CRYLAB# OR CRY(W)L(W)AB# OR CRY(W)LAB# OR CRYL(W)AB# OR
CRYL(W)A(W)B# OR CRY(W)L(W)A(W)B# OR CRYLA(W)B#

L102 1971 SEA (L97 OR L98 OR L99 OR L100 OR L101)

L103 10 SEA CRY2AE# OR CRY(W)2(W)AE# OR CRY(W)2AE# OR CRY2(W)AE# OR
CRY2(W)A(W)E# OR CRY(W)2(W)A(W)E# OR CRY2A(W)E#

L104 0 SEA CRYIIAE# OR CRY(W)II(W)AE# OR CRY(W)IIAE# OR CRYII(W)AE#
OR CRYII(W)A(W)E# OR CRY(W)II(W)A(W)E# OR CRYIIA(W)E#

L105 0 SEA CRYLLAE# OR CRY(W)LL(W)AE# OR CRY(W)LLAE# OR CRYLL(W)AE#
OR CRYLL(W)A(W)E# OR CRY(W)LL(W)A(W)E# OR CRYLLA(W)E#

L106 10 SEA (L103 OR L104 OR L105)

L107 10 SEA (L96 AND L102) OR (L102 AND L106) OR (L96 AND L106) OR
(L96 AND L102 AND L106)

L108 9209 SEA (HERBICID? OR GL!PHOSATE# OR GL!FOSATE# OR G360 OR G(W)360
OR ROUNDUP? OR ROUND(W)UP?)(5A)(RESIST? OR TOLERAN? OR
PROTECT?)

L109 59817 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L110 351392 SEA INSECT# OR PEST# OR LEPIDOPTERA# OR NOCTUIDAE OR CRAMBIDAE
OR BORER# OR CORNBORER# OR STALKBORER# OR EARWORM# OR EAR(W)WOR
M# OR ARMYWORM# OR ARMY(W)WORM# OR CUTWORM# OR CUT(W)WORM# OR
OSTRINIA OR O(W)NUBILALIS OR SESAMIA OR S(W)NONAGRIOIDES

L111 15086 SEA DIATRAEA OR D(W)GRANDIOSELLA OR D(W)CRAMBIDOIDES OR
HELICOVERPA OR H(W)ZEA OR SPODOPTERA OR S(W)FRUGIPERDA OR
PAPAIPEMA OR P(W)NEBRIS OR ELASMOPALPUS OR E(W)LIGNOSELLUS OR
D(W)SACCHARALIS OR STRIACOSTA OR S(W)ALBICOSTA

L112 5590 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR
M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR
SCB OR WBC

L113 689311 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L114 32003 SEA ((L108 OR L109 OR L110 OR L111 OR L112))(5A)L113

L115 66887 SEA COTTON# OR GOSSYPIMUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L116 110799 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
(GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
ENGINEER?))

L117 798 SEA L114 AND L115 AND L116

L118 806 SEA L85 OR L89 OR L107 OR L117

L119 68 SEA L118 AND PY>=2020

L120 27 SEA L119 AND UP>=20210801 AND UP<=20220630

FILE 'CABA' ENTERED AT 05:10:16 ON 19 AUG 2022

L121 7 SEA GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR
BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)
5 OR BCSGH002(W)5

L122 6 SEA T304-40 OR T304(W)40 OR T(W)304(W)40 OR BCS-GH004-7 OR
BCS-GH004-7 OR BCS(W)GH004(W)7 OR BCS(W)GH004(W)7 OR BCSGH004(W)
7 OR BCSGH004(W)7

L123 6 SEA GHB119 OR GHB(W)119 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR
BCSGH005(W)8 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8

L124 2 SEA GHB614XT304-40XGHB119 OR GHB614.TIME#.T304-40.TIME#.GHB119

L125 4 SEA (L121 AND L122) OR (L122 AND L123) OR (L121 AND L123) OR
(L121 AND L122 AND L123) OR L124

L126 4 SEA GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(W)TOL OR GLY(W)TOLTM
OR GLY(W)TOLRTM

L127 106 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKR OR LIBERTYLINK
RTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKR
OR LIBERTY(W)LINKRTM

L128 8 SEA TWINLINK OR TWINLINKTM OR TWINLINKR OR TWINLINKRTM OR
TWIN(W)LINK OR TWIN(W)LINKTM OR TWIN(W)LINKR OR TWIN(W)LINKRTM

L129 0 SEA (L126 AND L128) OR (L126 AND L127 AND L128)

L130 14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L131 1204 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)

L132 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
YNTHASE OR SYNTHETASE)

L133 463 SEA (ENOL(W)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVYOYL)(W)SHIKIMATE
(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)

L134 192 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVYOYL(W)SHIKIMIC(
3W)PHOSPHOSYNTHASE)

L135 7692 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)

L136 22 SEA L130 OR ((L131 OR L132 OR L133 OR L134))(S)L135)

L137 1587 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE

L138 381 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L139 1719 SEA CRY1AB# OR CRY(W)1(W)AB# OR CRY(W)1AB# OR CRY1(W)AB# OR
CRY1(W)A(W)B# OR CRY(W)1(W)A(W)B# OR CRY1A(W)B#

L140 221 SEA CRYIAB# OR CRY(W)I(W)AB# OR CRY(W)IAB# OR CRYI(W)AB# OR
CRYI(W)A(W)B# OR CRY(W)I(W)A(W)B# OR CRYIA(W)B#

L141 27 SEA CRYLAB# OR CRY(W)L(W)AB# OR CRY(W)LAB# OR CRYL(W)AB# OR
CRYL(W)A(W)B# OR CRY(W)L(W)A(W)B# OR CRYLA(W)B#

L142 3611 SEA (L137 OR L138 OR L139 OR L140 OR L141)

L143 15 SEA CRY2AE# OR CRY(W)2(W)AE# OR CRY(W)2AE# OR CRY2(W)AE# OR
CRY2(W)A(W)E# OR CRY(W)2(W)A(W)E# OR CRY2A(W)E#

L144 0 SEA CRYIIAE# OR CRY(W)II(W)AE# OR CRY(W)IIAE# OR CRYII(W)AE#
OR CRYII(W)A(W)E# OR CRY(W)II(W)A(W)E# OR CRYIIA(W)E#

L145 0 SEA CRYLLAE# OR CRY(W)LL(W)AE# OR CRY(W)LLAE# OR CRYLL(W)AE#

OR CRYLL(W)A(W)E# OR CRY(W)LL(W)A(W)E# OR CRYLLA(W)E#

L146 15 SEA (L143 OR L144 OR L145)

L147 19 SEA (L136 AND L142) OR (L142 AND L146) OR (L136 AND L146) OR (L136 AND L142 AND L146)

L148 19855 SEA (HERBICID? OR GL!PHOSATE# OR GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)

L149 156509 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L150 954384 SEA INSECT# OR PEST# OR LEPIDOPTERA# OR NOCTUIDAE OR CRAMBIDAE OR BORER# OR CORNBORER# OR STALKBORER# OR EAWORM# OR EAR(W)WORM# OR ARMYWORM# OR ARMY(W)WORM# OR CUTWORM# OR CUT(W)WORM# OR OSTRINIA OR O(W)NUBILALIS OR SESAMIA OR S(W)NONAGRIOIDES

L151 33910 SEA DIATRAEA OR D(W)GRANDIOSELLA OR D(W)CRAMBIDOIDES OR HELICOVERPA OR H(W)ZEA OR SPODOPTERA OR S(W)FRUGIPERDA OR PAPAIPEMA OR P(W)NEBRIS OR ELASMOPALPUS OR E(W)LIGNOSELLUS OR D(W)SACCHARALIS OR STRIACOSTA OR S(W)ALBICOSTA

L152 14173 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR SCB OR WBC

L153 1386344 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L154 90771 SEA ((L148 OR L149 OR L150 OR L151 OR L152))(5A)L153

L155 99593 SEA COTTON# OR GOSSYPIMUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L156 194464 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR ENGINEER?))

L157 2361 SEA L154 AND L155 AND L156

L158 2375 SEA L125 OR L129 OR L147 OR L157

L159 218 SEA L158 AND PY>=2020

L160 99 SEA L159 AND UP>=20210801 AND UP<=20220630

L161 99 SEA L160 NOT P/DT

L162 0 SEA L160 AND (P/DT AND J/DT)

L163 99 SEA L161 OR L162

FILE 'HCAPLUS' ENTERED AT 05:10:49 ON 19 AUG 2022

L164 7 SEA GHB614 OR GHB(W)614 OR BCS-GH002-5 OR BCSGH002-5 OR BCS(W)GH002(W)5 OR BCSGH002(W)5 OR BCS-GH002-5 OR BCS(W)GH002(W)5 OR BCSGH002(W)5

L165 4 SEA T304-40 OR T304(W)40 OR T(W)304(W)40 OR BCS-GH004-7 OR BCS-GH004-7 OR BCS(W)GH004(W)7 OR BCS(W)GH004(W)7 OR BCSGH004(W)7 OR BCSGH004(W)7

L166 7 SEA GHB119 OR GHB(W)119 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8 OR BCS-GH005-8 OR BCS(W)GH005(W)8 OR BCSGH005(W)8

L167 1 SEA GHB614XT304-40XGHB119 OR GHB614.TIME#.T304-40.TIME#.GHB119

L168 3 SEA (L164 AND L165) OR (L165 AND L166) OR (L164 AND L166) OR (L164 AND L165 AND L166) OR L167

L169 5 SEA GLYTOL OR GLYTOLTM OR GLYTOLRTM OR GLY(W)TOL OR GLY(W)TOLTM OR GLY(W)TOLRTM

L170 52 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKR OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKR OR LIBERTY(W)LINKRTM

L171 4 SEA TWINLINK OR TWINLINKTM OR TWINLINKR OR TWINLINKRTM OR TWIN(W)LINK OR TWIN(W)LINKTM OR TWIN(W)LINKR OR TWIN(W)LINKRTM

L172 0 SEA (L169 AND L171) OR (L169 AND L170 AND L171)

L173 30 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L174 4515 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV OYLSHIKIMATE OR ENOYLPYRUV OYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)

L175 9 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUV OYL)(W)(PHOSPHOSHIKI MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(SYNTHASE OR SYNTHETASE)

L176 1111 SEA (ENOL(W)PYRUVYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE)(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)

L177 84 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIKIMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(3W)PHOSPHOSYNTHASE)

L178 76018 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)

L179 43 SEA L173 OR (((L174 OR L175 OR L176 OR L177))(S)L178)

L180 5435 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE

L181 794 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L182 1844 SEA CRYLAB# OR CRY(W)1(W)AB# OR CRY(W)1AB# OR CRY1(W)AB# OR CRY1(W)A(W)B# OR CRY(W)1(W)A(W)B# OR CRY1A(W)B#

L183 1455 SEA CRYIAB# OR CRY(W)I(W)AB# OR CRY(W)IAB# OR CRYI(W)AB# OR CRYI(W)A(W)B# OR CRY(W)I(W)A(W)B# OR CRYIA(W)B#

L184 58 SEA CRYLAB# OR CRY(W)L(W)AB# OR CRY(W)LAB# OR CRYL(W)AB# OR CRYL(W)A(W)B# OR CRY(W)L(W)A(W)B# OR CRYLA(W)B#

L185 8063 SEA (L180 OR L181 OR L182 OR L183 OR L184)

L186 47 SEA CRY2AE# OR CRY(W)2(W)AE# OR CRY(W)2AE# OR CRY2(W)AE# OR CRY2(W)A(W)E# OR CRY(W)2(W)A(W)E# OR CRY2A(W)E#

L187 7 SEA CRYIIAE# OR CRY(W)II(W)AE# OR CRY(W)IIAE# OR CRYII(W)AE# OR CRYII(W)A(W)E# OR CRY(W)II(W)A(W)E# OR CRYIIA(W)E#

L188 0 SEA CRYLLAE# OR CRY(W)LL(W)AE# OR CRY(W)LLAE# OR CRYLL(W)AE# OR CRYLL(W)A(W)E# OR CRY(W)LL(W)A(W)E# OR CRYLLA(W)E#

L189 49 SEA (L186 OR L187 OR L188)

L190 57 SEA (L179 AND L185) OR (L185 AND L189) OR (L179 AND L189) OR (L179 AND L185 AND L189)

L191 30370 SEA (HERBICID? OR GL!PHOSATE# OR GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)

L192 160244 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?

L193 326842 SEA INSECT# OR PEST# OR LEPIDOPTERA# OR NOCTUIDAE OR CRAMBIDAE OR BORER# OR CORNBORER# OR STALKBORER# OR EARWORM# OR EAR(W)WORM# OR ARMYWORM# OR ARMY(W)WORM# OR CUTWORM# OR CUT(W)WORM# OR OSTRINIA OR O(W)NUBILALIS OR SESAMIA OR S(W)NONAGRIOIDES

L194 24336 SEA DIATRAEA OR D(W)GRANDIOSELLA OR D(W)CRAMBIDOIDES OR HELICOVERPA OR H(W)ZEA OR SPODOPTERA OR S(W)FRUGIPERDA OR PAPAPEMA OR P(W)NEBRIS OR ELASMOPALPUS OR E(W)LIGNOSELLUS OR D(W)SACCHARALIS OR STRIACOSTA OR S(W)ALBICOSTA

L195 27484 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCSB OR CEW OR FAW OR SCB OR WBC

L196 6226884 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L197 60129 SEA ((L191 OR L192 OR L193 OR L194 OR L195))(5A)L196

L198 280752 SEA COTTON# OR GOSSYPIMUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L199 720279 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR ENGINEER?))

L200 2584 SEA L197 AND L198 AND L199

L201 2622 SEA L168 OR L172 OR L190 OR L200

L202 598 SEA L201 AND PY>=2020

L203 111 SEA L202 AND UP>=20210801 AND UP<=20220630

L204 54 SEA L203 NOT P/DT

L205 0 SEA L203 AND (P/DT AND J/DT)

L206 54 SEA L204 OR L205

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 05:11:06 ON 19 AUG 2022

L207 237 DUP REM L40 L80 L120 L163 L206 (67 DUPLICATES REMOVED)

ANSWERS '1-61' FROM FILE MEDLINE
ANSWERS '62-113' FROM FILE BIOSIS
ANSWERS '114-135' FROM FILE AGRICOLA
ANSWERS '136-205' FROM FILE CABA
ANSWERS '206-237' FROM FILE HCAPLUS