

Title

**Summary of the Literature Review for T304-40 cotton
July 1, 2022 – June 30, 2023**

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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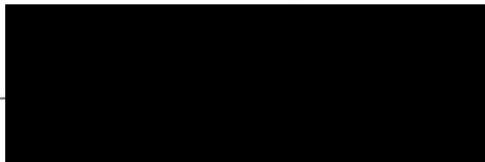
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SUMMARY

The T304-40 cotton event produces the *Bacillus thuringiensis* subsp. *berliner* Cry1Ab protein that is effective in controlling lepidopteran larvae such as cotton bollworm and tobacco budworm. T304-40 cotton also expresses the herbicide tolerant inert ingredient phosphinothricin acetyl transferase (PAT/*bar*) as a selectable marker which confers tolerance to glufosinate-ammonium herbicides. The OECD identifier is BCS-GHØØ4-7.

A scoping review was performed for the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*. The objective of this scoping review was to determine if there were studies about the molecular characterization of T304-40 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 July 1, 2022 to June 30, 2023. 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 307 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of six publications were progressed for detailed assessment and none of them was determined to be relevant after detailed review.

No new relevant publications were found that contained new data on the molecular characterization of the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*. Similarly, no new publications were found that suggested any potential adverse effects of T304-40 cotton on human health, animal health, or 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

The T304-40 cotton event produces the *Bacillus thuringiensis* subsp. *berliner* Cry1Ab protein that is effective in controlling lepidopteran larvae such as cotton bollworm and tobacco budworm. T304-40 cotton also expresses the herbicide tolerant inert ingredient phosphinothricin acetyl transferase (PAT/*bar*) as a selectable marker which confers tolerance to glufosinate-ammonium herbicides. The OECD identifier is BCS-GHØØ4-7.

The objective of the literature searches described here was to determine if there were publications published between July 1, 2022 and June 30, 2023 that mention the molecular characterization of the T304-40 cotton, and/or any adverse effect of T304-40 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) applications and post-market environmental monitoring activities (2019, (1)).

The literature searches were performed for the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*. The search terms also included relevant synonyms, the trade name and intended trait. When needed, plant species and general GMO terms were used to limit the search results (described in [Section 3.3](#)).

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*, 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 (1).

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

Key elements:

Population: Human health; animal health; environmental safety

Exposure: T304-40 cotton, derived food/feed products, newly expressed proteins in T304-40 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 T304-40 cotton and its newly expressed proteins Cry1Ab and PAT/*bar* in cotton?

Key elements:

Population: T304-40 cotton and newly expressed proteins in T304-40 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 note (1) 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

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>i.e.</i> , 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

<p>Stacked events obtained by conventional crosses/ subcombinations</p>	<p>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</p>	<p>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</p>
<p>Molecular stacks</p>	<p>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</p>	<p>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</p>
<p>Previously risk assessed publications</p>	<p>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</p>	<p>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</p>
<p>Access</p>	<p>Full-text document is accessible</p>	<p>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</p>

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 (1).

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 (1). 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 7, 2023. Only documents updated between July 1, 2022 and June 30, 2023, were considered in the search. The dates of most recent database updates are provided in [Table 4](#).

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	Search string	Concepts
1	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	Event name
	none	Trade name
2	((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 (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 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# 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
3	(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 traits
4	cotton# or gossypium or G(w)hirsutum or g(w)barbadense	Plant species
5	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
6	2 and 4	Newly expressed proteins AND Plant species

7	3 and 4 and 5	Intended traits AND Plant species AND GMO general
8	1 or 6 or 7	Event name OR (Newly expressed proteins AND Plant species) OR (Intended traits 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	New proteins	Intended traits	Plant species	GM plants
Agricola	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIUM BARBADENSE" "GOSSYPIUM HIRSUTUM"	"TRANSGENIC PLANTS"
Biosis	None	None	No terms for herbicide or insect resistance	"GOSSYPIUM BARBADENSE" "GOSSYPIUM HIRSUTUM"	None
CABA	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIUM BARBADENSE"/CT "GOSSYPIUM HIRSUTUM"/CT	"TRANSGENIC PLANTS"

Database	Event	New proteins	Intended traits	Plant species	GM plants
CAS	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	GOSSYPIUM/CT	"GENETICALLY MODIFIED PLANTS"
Medline	None	None	"HERBICIDE RESISTANCE" No terms for insect resistance	"GOSSYPIUM BARBADENSE" "GOSSYPIUM HIRSUTUM"	"PLANTS, GENETICALLY MODIFIED"

The search results were limited to documents updated between July 1, 2022 and June 30, 2023 (UP>=20220701 and UP<=20230630), 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	CABA	CA-Plus	Medline
Database Provider	STN International				
Coverage	1970-present	1926-present	1973-present	1907-present	1946-present
Date of search	7 Jul 2023				
Datespan of the search	1 Jul 2022 – 30 Jun 2023				
Latest database update	7 Jun 2023	5 Jul 2023	27 Jun 2023	6 Jul 2023	6 Jul 2023
Number of records retrieved	18	62	193	64	64
Number of records after duplicate removal	16	47	150	30	64

Database	AGRICOLA	BIOSIS	CABA	CA-Plus	Medline
Number of relevant records after rapid assessment	0	2	2	2	0

3.4. Reference publication

One publication related to T304-40 cotton was previously identified and used to test and validate the search strategy:

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

Although this article is not directly relevant for the T304-40 cotton, it was selected as reference publication because it mentions the event (T304-40 cotton), one of the newly expressed proteins (PAT/*bar*, phosphinothricin acetyl transferase) 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>=20220701 and UP<=20230630).

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: July 1, 2022 to June 30, 2023) 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 (1). Of the 13 key organisations cited in the EFSA 2019 explanatory note (1), 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. Therefore, the internet search was limited to 11 key organisations relevant for T304-40 cotton. Search terms consisted of T304-40 or BCS-GHØØ4-7, PAT/*bar* or phosphinothricin, and Cry1Ab (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 (dd.mm.yyyy)	Date of Search (dd.mm.yyyy)	No. of Relevant Records
US Environmental Protection Agency (EPA)	https://www.epa.gov/	25.07.2023	25.07.2023	0
US Department of Agriculture (USDA)	https://www.usda.gov/	25.07.2023	25.07.2023	0
US Food and Drug Administration (FDA)	https://www.fda.gov/	25.07.2023	28.07.2023	0
Health Canada	https://www.canada.ca/en/health-canada.html	26.06.2023	10.07.2023	0
Canadian Food Inspection Agency (CFIA)	https://www.canada.ca/en/food-inspection-agency.html	26.06.2023	20.07.2023	0
Food Standards Australia New Zealand (FSANZ)	http://www.foodstandards.gov.au/Pages/default.aspx	30.06.2023	10.07.2023	0
Office of the Gene Technology Regulator (OGTR) Australia	http://www.ogtr.gov.au/	06.04.2023	10.07.2023	0
National Technical Commission on Biosafety (CTNBio) Brazil	http://ctnbio.mcti.gov.br/en	24.07.2023	17.-24.07.2023	0
National Advisory Commission on Agricultural Biotechnology (CONABIA) Argentina	https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia	17.07.2023	17.07.2023	0
Genetic Engineering Approval Committee (GEAC) India	http://moef.gov.in/	19.07.2023	19.07.2023	0
Ministry of Agriculture, Forestry and Fisheries (MAFF) Japan	http://www.maff.go.jp/	27.07.2023	27.07.2023	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 July 1, 2022 and June 30, 2023. 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	Bhattacharjee S, Bhowmick R, Kant L, Paul K. 2023	Strategic transgene-free approaches of CRISPR-based genome editing in plants.	Mol Genet Genomics. 2023 May;298(3):507-520	0
2	Cermakova E, Lencova S, Mukherjee S, Horka P, Vobruba S, Demnerova K, Zdenkova K. 2023	Identification of Fish Species and Targeted Genetic Modifications Based on DNA Analysis: State of the Art.	Foods. 2023 Jan 3;12(1):228.	0
3	Connolly JB, Romeis J, Devos Y, Glandorf DCM, Turner G, Coulibaly MB. 2023	Gene drive in species complexes: defining target organisms.	Trends Biotechnol. 2023 Feb;41(2):154-164.	0
4	Eckerstorfer MF, Dolezel M, Engelhard M, Giovannelli V, Grabowski M, Heissenberger A, Lener M, Reichenbecher W, Simon S, Staiano G, Wüst Saucy AG, Zünd J, Lüthi C. 2023	Recommendations for the Assessment of Potential Environmental Effects of Genome-Editing Applications in Plants in the EU.	Plants (Basel). 2023 Apr 25;12(9):1764.	0
5	Ghidoli M, Ponzoni E, Araniti F, Miglio D, Pilu R. 2023	Genetic Improvement of <i>Camelina sativa</i> (L.) Crantz: Opportunities and Challenges.	Plants (Basel). 2023 Jan 27;12(3):570.	0
6	Krasnodębski C, Sawuła A, Kaźmierczak U, Żuk M. 2023	Oligo-Not Only for Silencing: Overlooked Potential for Multidirectional Action in Plants.	Int J Mol Sci. 2023 Feb 24;24(5):4466.	0
7	Křížkovská B, Viktorová J, Lipov J. 2022	Approved Genetically Modified Potatoes (<i>Solanum tuberosum</i>) for Improved Stress Resistance and Food Safety.	J Agric Food Chem. 2022 Sep 28;70(38):11833-11843.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
8	Liang J, Yang X, Jiao Y, Wang D, Zhao Q, Sun Y, Li Y, Wu K. 2022	The evolution of China's regulation of agricultural biotechnology.	aBIOTECH. 2022 Dec 5;3(4):237-249.	0
9	Platani M, Sokefun O, Bassil E, Apidianakis Y. 2023	Genetic engineering and genome editing in plants, animals, and humans: Facts and myths. Gene.	2023 Mar 10; 856:147141.	0
10	Pott A, Bundschuh M, Otto M, Schulz R. 2023	Assessing Effects of Genetically Modified Plant Material on the Aquatic Environment Using higher-tier Studies.	Bull Environ Contam Toxicol. 2023 Jan 2;110(1):35.	0
11	Rai GK, Kumar P, Choudhary SM, Kossler R, Khanday DM, Choudhary S, Kumar B, Magotra I, Kumar RR, Ram C, Roupheal Y, Corrado G, Behera TK. 2022	Biomimetic Strategies for Developing Abiotic Stress-Tolerant Tomato Cultivars:	An Overview. Plants (Basel). 2022 Dec 23;12(1):86	0
12	Rozas P, Kessi-Pérez EI, Martínez C. 2022	Genetically modified organisms: adapting regulatory frameworks for evolving genome editing technologies.	Biol Res. 2022 Oct 20;55(1):31.	0
13	Spök A, Sprink T, Allan AC, Yamaguchi T, Dayé C. 2022	Towards social acceptability of genome-edited plants in industrialised countries? Emerging evidence from Europe, United States, Canada, Australia, New Zealand, and Japan.	Front Genome Ed. 2022 Aug 31;4:899331.	0
14	Tatineni S, Hein GL. 2023	Plant Viruses of Agricultural Importance: Current and Future Perspectives of Virus Disease Management Strategies.	Phytopathology. 2023 Feb;113(2):117-141.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
15	Tripathi S, Purchase D, Chandra R, Nadda AK, Bhargava PC. 2022	Mitigation of hazards and risks of emerging pollutants through innovative treatment techniques of post methanated distillery effluent - A review.	Chemosphere. 2022 Aug;300:134586 . doi: 10.1016/j.chemosphere.2022.134586.	0
16	Wang M, Wang H, Li K, Li X, Wang X, Wang Z. 2023	Review of CRISPR/Cas Systems on Detection of Nucleotide Sequences.	Foods. 2023 Jan 19;12(3):477.	0
17	Zimny T. 2023	Regulation of GMO field trials in the EU and new genomic techniques: will the planned reform facilitate experimenting with gene-edited plants?	BioTechnologia (Pozn). 2023 Mar 27;104(1):75-83.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches ([Section 3](#)) identified a total of 401 references, which were reduced to 307 references 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 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 tolerant 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 T304-40 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)	307
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	301
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 based on the 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
Silva, I. H. S. da Gomez, I. Pacheco, S. Sanchez, J. Zhang Jie Castellane, T. C. L. Desiderio, J. A. Soberon, M. Bravo, A. Polanczyk, R. A. da Silva, I. H. S. Zhang, J. 2021	Bacillus thuringiensis Cry1AB domain III β -16 is involved in binding to prohibitin, which correlates with toxicity against <i>Helicoverpa armigera</i> (Lepidoptera: Noctuidae).	Applied and Environmental Microbiology (2021), Volume 87, Number 2, 67 refs. ISSN: 0099-2240; 1098-5336 DOI: https://doi.org/10.1128/AEM.01930-20 Published by: American Society for Microbiology (ASM), Washington, D.C.	T304-40 cotton was not studied and not discussed in this publication.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Zhang, Meng Ma, Yamin Luo, Junyu Ji, Jichao Gao, Xueke Wu, Changcai Zhu, Xiangzhen Wang, Li Zhang, Kaixin Li, Dongyang Wang, Lisha Niu, Lin Cui, Jinjie 2022	Transgenic insect - resistant Bt cotton expressing Cry1Ac/1Ab does not harm the insect predator <i>Geocoris pallidipennis</i> .	Ecotoxicology and Environmental Safety, (JAN 15 2022) Vol. 230, pp. Article No.: 113129. http://www.journals.elsevier.com/ecotoxicology-and-environmental-safety/#description . CODEN: EESADV. ISSN: 0147-6513. E-ISSN: 1090-2414.	The authors tested the effect of the GM cotton variety A26-5 (which produces Cry1Ac) on the predatory insect <i>G. pallidipennis</i> . The variety J14 (conventional parental of A26-5) was used as control. The environmental risk assessment is not related to T304-40 cotton.
Ma, Yamin Zhang, Meng Luo, Junyu Ji, Jichao Zhu, Xiangzhen Wang, Li Zhang, Kaixin Li, Dongyang Cui, Jinjie Niu, Lin 2023	Transgenic Bt cotton expressing Cry1Ac/1Ab does not have detrimental effects on the predator <i>Arma chinensis</i> through its prey <i>Helicoverpa armigera</i>	Journal of Pest Science (2023), 96(1), 317-326 CODEN: JPSOK8; ISSN: 1612-4766	The authors tested the effect of insect-resistant cotton variety A26-5 (expressing the Cry1Ac/1Ab protein). The authors investigated the transmission of Cry1Ac toxin from cotton to <i>H. armigera</i> and then to <i>A. chinensis</i> . Cry1Ac protein was detected in <i>H. armigera</i> and <i>A. chinensis</i> . However, transgenic cotton did not have adverse impacts on survival, growth, development, or fecundity, and that detoxification-related genes were not significantly regulated in response to Bt protein exposure. Cry1Ac was not found to bind in the midgut of <i>A. chinensis</i> . The environmental risk assessment is not related to T304-40 cotton.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Ma, Yamin [Reprint Author] Zhang, Meng Luo, Junyu Ji, Jichao Zhu, Xiangzhen Wang, Li Zhang, Kaixin Li, Dongyang Cui, Jinjie Niu, Lin 2023	Transgenic Bt cotton expressing Cry1Ac/1Ab does not have detrimental effects on the predator <i>Arma chinensis</i> through its prey <i>Helicoverpa armigera</i> .	Journal of Pest Science, (JAN 2023) Vol. 96, No. 1. http://www.springerlink.com/content/110826/ . ISSN: 1612-4758. E-ISSN: 1612-4766.	Same above; excluded as duplicate.
Wang TianTian Yan Bing Chen YanJun Li JunSheng Wang, T. T. Yan, B. Chen, Y. J. Li, J. S. 2021	Characteristics of bacterial community of rhizosphere soil of transgenic insect - resistant cotton at different growth stages.	Research of Environmental Sciences (2021), Volume 34, Number 7, pp. 1728-1736, 39 refs. ISSN: 1001-6929 DOI: https://doi.org/10.13198/j.issn.1001-6929.2021.04.11 Published by: China Environmental Science, Beijing	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). The environmental risk assessment is not related to T304-40 cotton.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Guan, Zheng-Jun Zhou, Qiu-Ju Shi, Hong Tang, Zhi-Xi Liu, Biao Wei, Wei	Effect of Transgenic Cotton Expressing Bt Cry1Ac or Cry1Ab /Ac Toxins on Lacewing Larvae Mediated by Herbivorous Insect Pests	Plants (2022), 11(20), 2755 CODEN: PLANCD; ISSN: 2223-7747 URL: https://www.mdpi.com/journal/plants	The authors conducted a tri-trophic level study using Bt cotton variety ‘Zhong-30’ containing a Cry1Ac gene, its non-transgenic parent ‘Zhong-16’; and a Bt cotton hybrid ‘GK-19’ containing a recombinant cry1Ab/1Ac gene and its conventional and maternal parent ‘Simian-3’, lepidopteran species and lacewing. It was found that the Bt toxin studied could have an indirect effect on lacewing due to the effect on nutritional quality of preys. The environmental risk assessment is not related to T304-40 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 T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*.

7. CONCLUSION

The literature searches performed for the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*, for the period from July 1, 2022 to June 30, 2023, identified a total of 307 unique publications (after duplicate removal). A total of six publication(s) were progressed for detailed assessment after excluding 301 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 relevant publications were found that contained new data on the molecular characterization of the T304-40 cotton and its newly expressed proteins, Cry1Ab and PAT/*bar*. Similarly, no new publications were found that suggested any potential adverse effects of T304-40 cotton on human health, animal health, or 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
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- | | |
|----|---|
| 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/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 16:21:33 ON 07 JUL 2023

L1 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

L2 1590 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

L3 208 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L4 979 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#

L5 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#

L6 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#

L7 2764 SEA (L2 OR L3 OR L4 OR L5 OR L6)

L8 33377 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L9 226652 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)NONAGRIODES

L10 15153 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

L11 26253 SEA AGROTIS OR A(W)IPSILON OR S(W)CRETICA OR MYTHIMNA OR
M(W)UNIPUNCTA OR ECB OR MCB OR SWCB OR SCWB OR CEW OR FAW OR
SCB OR WBC

L12 2691379 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L13 13402 SEA ((L8 OR L9 OR L10 OR L11)) (5A)L12

L14 30447 SEA COTTON# OR GOSSYPIUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L15 4176223 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?))

L16 81 SEA L7 AND L14

L17 744 SEA L13 AND L14 AND L15

L18 787 SEA L1 OR L16 OR L17

L19 142 SEA L18 AND PY>=2021

L20 64 SEA L19 AND UP>=20220701 AND UP<=20230630

FILE 'BIOSIS' ENTERED AT 16:21:43 ON 07 JUL 2023

L21 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

L22 2986 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

L23 337 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L24 1618 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#

L25 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#

L26 267 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#

L27 4923 SEA (L22 OR L23 OR L24 OR L25 OR L26)

L28 92605 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L29 1483452 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
L30 29296 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
L31 37111 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
L32 2618498 SEA (RESIST? OR PROTECT? OR TOLERAN?)
L33 36721 SEA ((L28 OR L29 OR L30 OR L31)) (5A)L32
L34 79376 SEA COTTON# OR GOSSYPIUM OR G(W)HIRSUTUM OR G(W)BARBADENSE
L35 495237 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?))
L36 206 SEA L27 AND L34
L37 1045 SEA L33 AND L34 AND L35
L38 1168 SEA L21 OR L36 OR L37
L39 122 SEA L38 AND PY>=2021
L40 62 SEA L39 AND UP>=20220701 AND UP<=20230630

FILE 'AGRICOLA' ENTERED AT 16:21:50 ON 07 JUL 2023
L41 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
L42 826 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
L43 257 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L44 943 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#
L45 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#
L46 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#
L47 1992 SEA (L42 OR L43 OR L44 OR L45 OR L46)
L48 60544 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?
L49 354969 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
L50 15271 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
L51 8173 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
L52 709944 SEA (RESIST? OR PROTECT? OR TOLERAN?)
L53 31780 SEA ((L48 OR L49 OR L50 OR L51)) (5A)L52
L54 67931 SEA COTTON# OR GOSSYPIUM OR G(W)HIRSUTUM OR G(W)BARBADENSE
L55 113118 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?))
L56 104 SEA L47 AND L54
L57 795 SEA L53 AND L54 AND L55
L58 857 SEA L41 OR L56 OR L57
L59 57 SEA L58 AND PY>=2021

L60 18 SEA L59 AND UP>=20220701 AND UP<=20230630

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L61 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

L62 1630 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

L63 387 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L64 1764 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#

L65 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#

L66 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#

L67 3701 SEA (L62 OR L63 OR L64 OR L65 OR L66)

L68 160834 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSIN
ATE OR PHOSPHINOTHRICIN OR LIBERTY?

L69 988145 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

L70 35287 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

L71 15101 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

L72 1472770 SEA (RESIST? OR PROTECT? OR TOLERAN?)

L73 92352 SEA ((L68 OR L69 OR L70 OR L71)) (5A) L72

L74 112536 SEA COTTON# OR GOSSYPIUM OR G(W)HIRSUTUM OR G(W)BARBADENSE

L75 204631 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?))

L76 297 SEA L67 AND L74

L77 2543 SEA L73 AND L74 AND L75

L78 2705 SEA L61 OR L76 OR L77

L79 227 SEA L78 AND PY>=2021

L80 193 SEA L79 AND UP>=20220701 AND UP<=20230630

L81 193 SEA L80 NOT P/DT

L82 0 SEA L80 AND (P/DT AND J/DT)

L83 193 SEA L81 OR L82

FILE 'HCAPLUS' ENTERED AT 16:22:15 ON 07 JUL 2023

L84 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

L85 5699 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

L86 809 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L87 1898 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#

L88 1497 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#

L89 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#

L90 8409 SEA (L85 OR L86 OR L87 OR L88 OR L89)
L91 165458 SEA HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR GLUPHOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?
L92 342556 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
L93 25558 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
L94 29545 SEA AGROTIS OR A(W)IPSILOIN 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
L95 6562845 SEA (RESIST? OR PROTECT? OR TOLERAN?)
L96 61870 SEA ((L91 OR L92 OR L93 OR L94)) (5A)L95
L97 293302 SEA COTTON# OR GOSSYPIUM OR G(W)HIRSUTUM OR G(W)BARBADENSE
L98 746952 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?))
L99 532 SEA L90 AND L97
L100 2601 SEA L96 AND L97 AND L98
L101 2866 SEA L84 OR L99 OR L100
L102 567 SEA L101 AND PY>=2021
L103 137 SEA L102 AND UP>=20220701 AND UP<=20230630
L104 64 SEA L103 NOT P/DT
L105 0 SEA L103 AND (P/DT AND J/DT)
L106 64 SEA L104 OR L105

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 10:22:23 ON 07 JUL 2023

L107 307 DUP REM L20 L40 L60 L83 L106 (94 DUPLICATES REMOVED)
ANSWERS '1-64' FROM FILE MEDLINE
ANSWERS '65-111' FROM FILE BIOSIS
ANSWERS '112-127' FROM FILE AGRICOLA
ANSWERS '128-277' FROM FILE CABA
ANSWERS '278-307' FROM FILE HCAPLUS