

Title

**Summary of the Literature Review for A2704-12 soybean
October 1, 2019– September 30, 2020**

DRAFT Report

Data or Guideline Requirement

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

Completion date

December 4, 2020

Principal Author

[REDACTED]

Report Number
20- RSSB0477

Activity ID
RSSB0477

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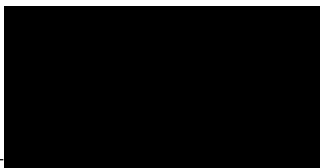
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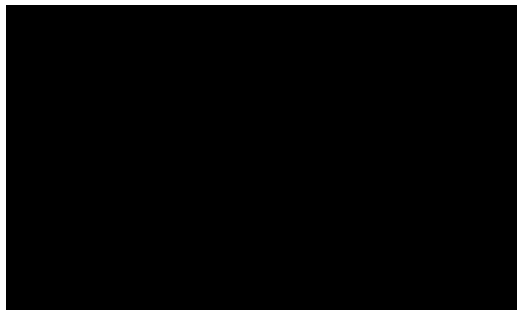


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SIGNATURE PAGE

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STUDY PERSONNEL

Electronic database search	[REDACTED]
Manual search	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
Stage 1 assessment	[REDACTED] [REDACTED]
Stage 2 assessment	<u>Food and Feed safety</u> [REDACTED] [REDACTED] <u>Molecular characterization</u> [REDACTED] [REDACTED] <u>Environmental safety</u> [REDACTED] [REDACTED]
Report	[REDACTED] [REDACTED] [REDACTED]

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SUMMARY

A2704-12 Soybean was transformed by direct gene transfer using vector pB2/35SAcK, which carries a phosphinothricin acetyltransferase (*pat*) gene and a beta-lactamase (*bla*) gene cassette. The *pat* gene encodes the phosphinothricin acetyltransferase (PAT/*pat*) enzyme and confers tolerance to glufosinateammonium herbicides. Prior to transformation, the vector was digested with the *Pvu*I restriction enzyme to disrupt the coding sequence of the *bla* gene and thereby removing any remote possibility of its expression. The OECD identifier is ACS-GMØØ5-3.

A scoping review was performed for the A2704-12 soybean and its newly expressed protein, phosphinothricin acetyltransferase. The objective of this scoping review was to determine if there were studies about the molecular characterization of A2704-12 soybean, its effect on food and feed safety, or in environmental safety, that might require in-depth examination. A set of broad literature searches was performed using several bibliographic databases covering scientific literature from October 1, 2019 to September 30, 2020. 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 152 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of eight publications were progressed for detailed assessment. All but four publications were determined to be not relevant after detailed review. The four publications found to be relevant did not have any negative impact on the safety assessment of A2704-12 soybean and, in fact, supports the existing safety assessment.

No other publications were found that contained new data on the molecular characterization of the A2704-12 soybean and its newly expressed protein, phosphinothricin acetyltransferase. Similarly, no other publications were found that suggested any potential adverse effects of this event on human health, animal health, or the environment.

In summary, these literature searches and review of the retrieved publications identified four relevant publications that support the existing safety assessment of the A2704-12 soybean.

1. INTRODUCTION

A2704-12 Soybean was transformed by direct gene transfer using vector pB2/35SAcK, which carries a phosphinothricin acetyltransferase (*pat*) gene and a beta-lactamase (*bla*) gene cassette. The *pat* gene encodes the phosphinothricin acetyltransferase (PAT/*pat*) enzyme and confers tolerance to glufosinateammonium herbicides. Prior to transformation, the vector was digested with the *PvuI* restriction enzyme to disrupt the coding sequence of the *bla* gene and thereby removing any remote possibility of its expression. The OECD identifier is ACS-GMØØ5-3.

The objective of the literature searches described here was to determine if there were publications published between October 1, 2019 and September 30, 2020 that mention the molecular characterization of the A2704-12 soybean, and/or any adverse effect of A2704-12 soybean in food, feed or the environment. In that context, a broad and inclusive literature search was performed and the articles retrieved were reviewed in a comprehensive and transparent manner. This was intended as a scoping review. The literature review was performed as recommended in the European Food Safety Authority (EFSA) explanatory note on literature searching conducted in the context of Genetically Modified Organisms (GMO)¹ applications and post-market environmental monitoring activities (2019).

The literature searches were performed for the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase. The search terms also included relevant synonyms, trade name, intended trait, plant species and general GMO terms.

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase, 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 PECO structure (Population, Exposure, 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 A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase?

Key elements:

Population: Human health; animal health; environmental safety

Exposure: A2704-12 soybean, derived food/feed products, newly expressed protein in A2704-12 soybean

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

Outcome: Adverse effects

Question 2: Were any studies published during the reporting period that focus on molecular characterization of the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase in soybean?

Key elements:

Population: A2704-12 soybean and newly expressed protein in A2704-12 soybean

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

2.3. Criteria for relevance

Criteria for establishing the relevance of retrieved publications were defined prior to conduct of the search. These criteria were modeled after those given in the EFSA 2019 explanatory 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		
Intervention/exposure	The publication addresses the GMO, derived food/feed products, and/or the intended trait(s) (e.g. newly expressed protein(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
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
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
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

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

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

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

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

2.4. Reference publication

Two publications relevant for A2704-12 soybean were previously identified and used to test and validate the search strategy:

- Federici, S.; Paraskevopoulos, K. (2018). Risk assessment of new sequencing information for genetically modified soybean A2704-12. *EFSA Journal* **16(11)**:e05496.
- Naegeli, H.; Bresson, J. L.; Dalmay, T.; Dewhurst, I. C.; Epstein, 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.; Ardizzone, M.; Papadopoulou, N.; Paraskevopoulos, K. (2019). Assessment of genetically modified soybean A2704-12 for renewal of authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-009). *EFSA Journal* **17(1)**:e05523

These articles selected as reference publications because they mention the event name (A2704-12), the intended trait (herbicide tolerance) and the crop (soybean). Since these reference might have been published outside the searched time, the profile was tested without applying the time limits used in the final search profile (UP>=20191001 and UP<=20200930)

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 October 19, 2020. Only documents updated between October 1, 2019 and September 30, 2020, were considered in the search. The dates of most recent database updates are provided in Table 3.

3.2. Databases used in the literature search

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

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

See Appendix 1 for detailed database descriptions.

3.3. Search strategy

The search profiles were designed to cover event name, trade name, newly expressed proteins and intended traits. Since the 'trade name' profile, 'newly expressed protein' profile and 'intended trait' profile produced too many results when used on their own, they were combined with additional profiles: the 'trade name' profile and the 'newly expressed protein' profile were combined with a 'plant species' profile while the 'intended trait' profile was combined with a 'general GMO' profile as well as with the 'plant species' profile. See Table 2 for a detailed search profile.

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

The search results were limited to documents updated between October 1, 2019 and September 30, 2020 (UP>=20191001 and UP<=20200930), and to non-patent documents (not P/DT). To ensure that documents with indexing errors where two 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 3 summarizes the number of results obtained from each of the databases searched. See Appendix 2 for a complete search history.

Table 2: Search profile for database search

Set	Search string	Concepts
1	LL27 or A2704-12 or A2704(w)12 or A(w)2704(w)12 or ACS-GM005-3 or ACS-GM005-3 or ACS-GM005-3 or ACS(w)GM005(w)3 or ACS(w)GM005(w)3 or ACS(w)GM005(w)3 or ACSGM005(w)3 or ACSGM005(w)3 or ACSGM005(w)3	Event name
2	libertylink or libertylinktm or libertylinkrtm or liberty(w)link or liberty(w)linktm or liberty(w)linkrtm or LL or LLTM or LLRTM	Trade name
3	((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	Newly expressed protein
4	(herbicid? or bialaphos or basta or glufosinate or phosphinothricin or liberty?)(5a)(resist? or toleran? or protect?)	Intended trait
5	soy or soya or soja or soybean# or soyabean# or sojabean# or glycine(w)max or g(w)max	Plant species
6	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3a)(modif? OR transform? OR manipul? OR improv? OR engineer?))	GMO general
7	2 and 5	Trade name AND Plant species
8	3 and 5	Newly expressed protein AND Plant species
9	4 and 5 and 6	Intended trait AND Plant species AND GMO general
10	1 or 7 or 8 or 9	Event name OR (Trade name AND plant species) OR (Newly expressed protein AND Plant species) OR (Intended trait AND Plant species AND GMO general)

Table 3: 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 Oct 2020	19 Oct 2020	19 Oct 2020	19 Oct 2020	19 Oct 2020
Datespan of the search	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020
Latest database update	24 Aug 2020	14 Oct 2020	14 Oct 2020	18 Oct 2020	18 Oct 2020
Number of records identified	19	38	42	67	27
Number of records after duplicate removal	13	30	35	47	27
Number of relevant records after rapid assessment	0	0	2	3	3

4. MANUAL SEARCHES

4.1. Manual searches of web pages of food safety, agriculture, and biotechnology-related authority webpages

In accordance with the EFSA 2019 explanatory note¹ the search in electronic bibliographic databases has been completed with an internet search in webpages of relevant key organisations involved in the risk assessment of GM plants. Of the 13 key organisations cited in the EFSA 2019 explanatory note¹, two (Environment and Climate Change Canada and CIBIOGEM) are not involved in the risk assessment of GM plants. US-EPA regulates only GM plants with Plant-Incorporated Protectant (PIP), and Genetic Engineering Approval Committee (GAEC) is included only for cotton. Therefore, the internet search focused on nine key organisations as listed below in Table 4. Search results were manually examined for relevant records that were either published during the time period under consideration (date span of search: October 1, 2019 to September 30, 2020) or refer to relevant records published during this time frame. Relevance of results were determined based on the criteria listed in Table 1. Search terms consisted of LL27, A2704-12, Libertylink soy 27, ACS-GMOO5-3, PAT/pat or Phosphinothricin in A2704-12 soybean. (All searched singly, with no search limits applied)..

Table 4: Results of search of food safety, agriculture, and biotechnology-related authority websites

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
US Department of Agriculture (USDA)	https://www.usda.gov/	Oct 30 2020	Nov 2-3 2020	0
US Food and Drug Administration (FDA)	https://www.fda.gov/	Oct 30 2020	Nov 2-3 2020	0
Health Canada	https://www.canada.ca/en/health-canada.html	Oct 30 2020	Nov 2-3 2020	0
Canadian Food Inspection Agency	https://www.canada.ca/en/food-inspection-agency.html	Oct 31 2020	Nov 2-3 2020	0
Food Standards Australia New Zealand (FSANZ)	http://www.foodstandards.gov.au/Pages/default.aspx	Oct 30 2020	Nov 2-3 2020	0
Office of the Gene Technology Regulator (OGTR)	http://www.ogtr.gov.au/	Oct 15 2020	Nov 2-3 2020	0
National Technical Commission on Biosafety (CTNBio)	http://ctnbio.mcti.gov.br/en	Oct-20	Oct 22-28 2020	0
National Advisory Commission on Agricultural Biotechnology (CONABIA)	http://www.agroindustria.gob.ar/sitio/areas/biotecnologia/conabia/	later than Aug 21 2020	Oct 21-22 2020	0
Ministry of Agriculture, Forestry and Fisheries (MAFF)	http://www.maff.go.jp/	Oct 26 2020	Oct 26 2020	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 October 1, 2019 and September 30, 2020. The resulting number of relevant studies found within the bibliographies of these review articles is given in Table 5.

Table 5: Documents for which reference lists were scanned for relevant studies

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
1	Ansari WA, Chandanshive SU, Bhatt V, Nadaf AB, Vats S, Katara JL, Sonah H, Deshmukh R. 2020	Genome Editing in Cereals: Approaches, Applications and Challenges	Int J Mol Sci. 2020 Jun 5;21(11):4040. doi: 10.3390/ijms21114040.	0
2	Arpaia S, Christiaens O, Giddings K, Jones H, Mezzetti B, Moronta-Barrios F, Perry JN, Sweet JB, Taning CNT, Smaghe G, Dietz-Pfeilstetter A. 2020	Biosafety of GM Crop Plants Expressing dsRNA: Data Requirements and EU Regulatory Considerations	Front Plant Sci. 2020 Jun 24;11:940. doi: 10.3389/fpls.2020.00940. eCollection 2020.	0
3	Babar U, Nawaz MA, Arshad U, Azhar MT, Atif RM, Golokhvast KS, Tsatsakis AM, Shcherbakova K, Chung G, Rana IA. 2020	Transgenic crops for the agricultural improvement in Pakistan: a perspective of environmental stresses and the current status of genetically modified crops	GM Crops Food. 2020;11(1):1-29. doi: 10.1080/21645698.2019.1680078. Epub 2019 Nov 3.	0
4	Bachtarzi H, Farries T. 2019	The Genetically Modified Organism Medicinal Framework in Europe, United States, and Japan: Underlying Scientific Principles and Considerations Toward the Development of Gene Therapy and Genetically Modified Cell-Based Products	Hum Gene Ther Clin Dev. 2019 Sep;30(3):114-128. doi: 10.1089/humc.2019.042. Epub 2019 Jun 21.	0
5	Bedair M, Glenn KC. 2020	Evaluation of the use of untargeted metabolomics in the safety assessment of genetically modified crops	Metabolomics. 2020 Oct 9;16(10):111. doi: 10.1007/s11306-020-01733-8.	0
6	Feng XJ, Yi HM, Ren XX, Ren JL, Ge JR, Wang FG. 2020	[Digital PCR and its application in biological detection]	Yi Chuan. 2020 Apr 20;42(4):363-373. doi: 10.16288/j.ycz.19-351.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
7	Giraldo PA, Shinozuka H, Spangenberg GC, Cogan NOI, Smith KF. 2019	Safety Assessment of Genetically Modified Feed: Is There Any Difference From Food?	Front Plant Sci. 2019 Dec 11;10:1592. doi: 10.3389/fpls.2019.01592. eCollection 2019.	0
8	Hameed A, Mehmood MA, Shahid M, Fatma S, Khan A, Ali S. 2020	Prospects for potato genome editing to engineer resistance against viruses and cold-induced sweetening	GM Crops Food. 2020 Oct 1;11(4):185-205. doi: 10.1080/21645698.2019.1631115. Epub 2019 Jul 6.	0
9	Holme IB, Gregersen PL, Brinch-Pedersen H. 2019	Induced Genetic Variation in Crop Plants by Random or Targeted Mutagenesis: Convergence and Differences	Front Plant Sci. 2019 Nov 14;10:1468. doi: 10.3389/fpls.2019.01468. eCollection 2019.	0
10	Jyoti A, Kaushik S, Srivastava VK, Datta M, Kumar S, Yugandhar P, Kothari SL, Rai V, Jain A. 2019	The potential application of genome editing by using CRISPR/Cas9, and its engineered and ortholog variants for studying the transcription factors involved in the maintenance of phosphate homeostasis in model plants	Semin Cell Dev Biol. 2019 Dec;96:77-90. doi: 10.1016/j.semcdb.2019.03.010. Epub 2019 Apr 7.	0
11	Kadoić Balaško M, Mikac KM, Bažok R, Lemic D. 2020	Modern Techniques in Colorado Potato Beetle (Leptinotarsa decemlineata Say) Control and Resistance Management: History Review and Future Perspectives	Insects. 2020 Sep 1;11(9):581. doi: 10.3390/insects11090581.	0
12	Kamle M, Mahato DK, Devi S, Soni R, Tripathi V, Mishra AK, Kumar P. 2020	Nanotechnological interventions for plant health improvement and sustainable agriculture	3 Biotech. 2020 Apr;10(4):168. doi: 10.1007/s13205-020-2152-3. Epub 2020 Mar 14.	0
13	Kauffmann F, Van Damme P, Leroux-Roels G, Vandermeulen C, Berthels N, Beuneu C, Mali S. 2019	Clinical trials with GMO-containing vaccines in Europe: Status and regulatory framework	Vaccine. 2019 Sep 30;37(42):6144-6153. doi: 10.1016/j.vaccine.2019.08.018. Epub 2019 Sep 4.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
14	Kenter MJH, Clevers JC, Cornelissen J, Medema RH. 2019	[Environmental regulations impede cancer research and treatment]	Ned Tijdschr Geneesk. 2019 Dec 5;163:D4267.	0
15	Keshani P, Sharifi MH, Heydari MR, Joulaei H. 2020	The Effect of Genetically Modified Food on Infertility Indices: A Systematic Review Study	ScientificWorldJournal. 2020 Aug 13;2020:1424789. doi: 10.1155/2020/1424789. eCollection 2020.	0
16	Kumar K, Gambhir G, Dass A, Tripathi AK, Singh A, Jha AK, Yadava P, Choudhary M, Rakshit S. 2020	Genetically modified crops: current status and future prospects	Planta. 2020 Mar 31;251(4):91. doi: 10.1007/s00425-020-03372-8.	0
17	Papadopoulou N, Devos Y, Álvarez-Alfageme F, Lanzoni A, Waigmann E. 2020	Risk Assessment Considerations for Genetically Modified RNAi Plants: EFSA's Activities and Perspective	Front Plant Sci. 2020 Apr 21;11:445. doi: 10.3389/fpls.2020.00445. eCollection 2020.	0
18	Pottinger SE, Innes RW. 2020	RPS5-Mediated Disease Resistance: Fundamental Insights and Translational Applications	Annu Rev Phytopathol. 2020 Aug 25;58:139-160. doi: 10.1146/annurev-phyto-010820-012733. Epub 2020 Apr 13.	0
19	Rumin J, Nicolau E, Junior RGO, Fuentes-Grünwald C, Picot L. 2020	Analysis of Scientific Research Driving Microalgae Market Opportunities in Europe	Mar Drugs. 2020 May 18;18(5):264. doi: 10.3390/md18050264.	0
20	Woźniak E, Waszkowska E, Zimny T, Sowa S, Twardowski T. 2019	The Rapeseed Potential in Poland and Germany in the Context of Production, Legislation, and Intellectual Property Rights	Front Plant Sci. 2019 Nov 5;10:1423. doi: 10.3389/fpls.2019.01423. eCollection 2019.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches (Section 3) identified a total of 193 references, which were reduced to 152 after removal of duplicates (Table 3). 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, the two reviewers did not disagree in any evaluation.

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, unrelated topics, etc.

Publications which appear 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 6 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 characterization, 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. All eligible references were assessed in detail. This detailed assessment included evaluation of the scope of the article and the study quality and reliability. Categorization of reliability (as described in the EFSA 2019 explanatory note¹ and reported in Table 11) was dependent upon the following:

- appropriateness of methodology
- whether the description of methodology would allow independent repetition of the study
- extent of characterization of test materials
- reporting of evidence of reproducibility

Table 6 gives an overview of the reference selection process and results of the detailed assessment.

Table 6: Results of the publication selection process

Total number of publications retrieved after all searches of the scientific literature (excluding duplicates)	152
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	144
Total number of full-text documents assessed in detail	8
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	4
Total number of unobtainable/unclear publications	0
Total number of relevant publications	4

Table 7 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 8. Table 9 lists the publications for which full-text documents were unobtainable for detailed assessment or for which relevance was unclear after detailed assessment.

Table 7: 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
Food and Feed Safety	Naegeli Hanspeter, Bresson Jean-Louis, Dalmay Tamas, Dewhurst Ian Crawford, Epstein Michelle M, Firbank Leslie George, Guerche Philippe, Hejatko Jan, Moreno Francisco Javier, Mullins Ewen, Nogue Fabien, Rostoks Nils, Sanchez Serrano Jose Juan, Savoini Giovanni, Veromann Eve, Veronesi Fabio, Alvarez Fernando, Ardizzone Michele, Papadopoulou Nikoleta, Paraskevopoulos Konstantinos 2019	Assessment of genetically modified soybean A2704 -12 for renewal of authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO -RX-009).	EFSA journal. European Food Safety Authority, (2019 Jan) Vol. 17, No. 1, pp. e05523. Journal code: 101642076. E-ISSN: 1831-4732. L-ISSN: 1831-4732. Report No.: PMC-PMC7009111
Molecular characterization	Federici Silvia Paraskevopoulos Konstantinos 2018	Risk assessment of new sequencing information for genetically modified soybean A2704 -12 .	EFSA journal. European Food Safety Authority, (2018 Nov) Vol. 16, No. 11, pp. e05496.
Food and Feed Safety	EFSA (European Food Safety Authority) 2020	Scientific advice on the Testbiotech's requests for internal review of Commission Implementing Decisions (EU) No 2019/2083 and 2019/2084 on soybean MON 89788 and soybean A2704 -12 (applications EFSA-GMO-RX-011 and EFSA-GMO-RX-009).	EFSA Supporting Publications (2020), Volume 17, Number 2, 12 refs
Food and Feed Safety	Lin, Huan-Yu. Chen, Bo-Chou Chao, Mei-Li Chang, Hui-Wen Lin, Hsin-Tang Chu, Wen-Shen 2019	Comparison of compositions of imported genetically modified and organic soybeans purchased from Taiwan market.	Journal of Food and Nutrition Research (Newark, DE, United States) (2019), 7(10), 701-708.

Table 8: 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. 2020	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.	A2704-12 soybean was not included in the study.
Sahin, Olcay Karlik, Elif Meriç, Sinan Ari, Sule Gozukirmizi, Nermin. 2020.	Genome organization changes in GM and non-GM soybean [Glycine max (L.) Merr.] under salinity stress by retro-transposition events	Genetic Resources and Crop Evolution (2020), 67(6), 1551-1566	Not a safety related study and the A2704-12 soybean was not specifically mentioned in the study.
Ricroch, A. Akkoyunlu, S. Martin-Laffon, J. Kuntz, M. Editor(s): Kuntz, M. 2018.	Assessing the environmental safety of transgenic plants: honey bees as a case study. Special Issue: Transgenic plants and beyond.	Advances in Botanical Research (2018), Volume 86, pp. 111-167.	Review article. No ERA related to A2704-12 soybean.
Kim, Hye Jin, Kim, Do Young, Moon, Ye Seul, Pack, In Soon, Park, Kee Woong, Chung, Young Soo, Kim, Young Joong, Nam, Kyong-Hee, Kim, Chang-Gi. 2019.	Gene flow from herbicide resistant transgenic soybean to conventional soybean and wild soybean.	Applied Biological Chemistry (2019), 62(1), 1-8.	Examined gene flow from Bert-4-3 soybean to wild cultivars. No ERA related to A2704-12 soybean

Table 9: 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 eight 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 four publications were relevant for the safety assessment of the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase.

In the articles identified as relevant (Tables 7 and 11), the evidence supports the safety assessment of the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase.

Table 10 and Table 11 list the relevant publications along with a summary of any adverse effects reported and the reliability of the publications.

Table 10: Report of the summary 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)	Intervention/ test materials used	Adverse effects reported	Which adverse effect reported
Food and Feed Safety	Naegeli Hanspeter, Bresson Jean-Louis, Dalmay Tamas, Dewhurst Ian Crawford, Epstein Michelle M, Firbank Leslie George, Guerche Philippe, Hejatko Jan, Moreno Francisco Javier, Mullins Ewen, Nogue Fabien, Rostoks Nils, Sanchez Serrano Jose Juan, Savoini Giovanni, Veromann Eve, Veronesi Fabio, Alvarez Fernando, Ardizzone Michele, Papadopoulou Nikoleta, Paraskevopoulos Konstantinos, 2019.	Evaluation of literature and data on sequence of A2704-12 soybean, bioinformatic analyses, and studies performed by or on behalf of the applicant.	No adverse effects reported.	Not applicable.
Molecular Characterization	Federici Silvia Paraskevopoulos Konstantinos. 2018.	Evaluation of literature and data on the new nucleic acid sequencing data and updated bioinformatics data for A2704-12 soybean.	No adverse effects reported.	Not applicable.
Food and Feed Safety	EFSA (European Food Safety Authority). 2020.	Evaluation of the request for additional data on agronomic, meteorological conditions, and management practices regarding cultivation of A2704-12 soybean.	No adverse effects reported.	Not applicable.
Food and Feed Safety	Lin, Huan-Yu. Chen, Bo-Chou Chao, Mei-Li Chang, Hui-Wen Lin, Hsin-Tang Chu, Wen-Shen. 2019.	GTS 40-3-2 (Roundup Ready™ soybean, MON-Ø4Ø32-6), MON89788 (Genuity® Roundup Ready 2 Yield™, MON-89788-1), MON87705 (Vistive Gold™, MON-877Ø5-6), A2704-12 (Liberty Link™ soybean, ACS-GMØØ5-3), A5547-127 (Liberty Link™ soybean, ACS-GMØØ6-4).	No adverse effects reported	Not applicable.

Table 11: Report of the reliability and implications for the risk assessment 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)	Summary of reliability appraisal	Implications for risk assessment
Food and Feed Safety	Naegeli Hanspeter, Bresson Jean-Louis, Dalmay Tamas, Dewhurst Ian Crawford, Epstein Michelle M, Firbank Leslie George, Guerche Philippe, Hejatko Jan, Moreno Francisco Javier, Mullins Ewen, Nogue Fabien, Rostoks Nils, Sanchez Serrano Jose Juan, Savoini Giovanni, Veromann Eve, Veronesi Fabio, Alvarez Fernando, Ardizzone Michele, Papadopoulou Nikolettta, Paraskevopoulos Konstantinos., 2019.	The assessment presented reliable methods and findings.	Report findings and conclusions support the safe status of A2704-12 soybean
Molecular Characterization	Federici Silvia Paraskevopoulos Konstantinos. 2018.	The assessment presented reliable methods and findings.	The sequence differences reported did not change the original safe status of A2704-12 soybean. The differences were attributed to possible sequencing errors.
Food and Feed Safety	EFSA (European Food Safety Authority). 2020.	The assessment presented reliable methods and findings.	Study findings support the safe status of A2704-12 soybean.
Food and Feed Safety	Lin, Huan-Yu. Chen, Bo-Chou Chao, Mei-Li Chang, Hui-Wen Lin, Hsin-Tang Chu, Wen-Shen. 2019.	The study presented reliable methods and findings.	A2704-12 soybean is included in the study. The study supports the safety and substantial equivalence of A2704-12 to organic soybeans.

7. CONCLUSION

The literature searches performed for the A2704-12 soybean and its newly expressed protein phosphinothricin acetyltransferase for the period from October 1, 2019 to September 30, 2020, identified a total of 152 unique publications (after duplicate removal). A total of eight publications were progressed for detailed assessment after excluding 144 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).

The eight 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. Three relevant publications with bearings on human and animal safety and one relevant publication on the molecular characterization of A2704-12 soybean were identified. The findings of these publications support the safety assessment of A2704-12 soybean. No relevant publications with bearing environmental safety were identified. No issues or topics were identified that would trigger or warrant more specific question formulation.

8. REFERENCES

No.	Author(s), title, source, edition, year, pages
1.	Devos Y, Guajardo IM, Alvarez F and Glanville J. Explanatory note on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market. EFSA supporting publications 2019:EN-1614. 62 pages. doi:10.2903/sp.efsa.2019.EN-1614.

9. APPENDICES

Appendix 1 Database descriptions

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

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

Appendix 2 Search history

FILE 'MEDLINE' ENTERED AT 10:54:14 ON 19 OCT 2020
CHARGED TO COST=88148483

L1 15 SEA LL27 OR A2704-12 OR A2704(W)12 OR A(W)2704(W)12 OR
ACS-GM005-3 OR ACS-GM005-3 OR ACS-GMO05-3 OR ACS(W)GM005(W)3
OR ACS(W)GM005(W)3 OR ACS(W)GMO05(W)3 OR ACSGM005(W)3 OR
ACSGM005(W)3 OR ACSGMO05(W)3

L2 12938 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)
)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM
OR LLRTM

L3 1390 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

L4 202 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L5 1464 SEA (L3 OR L4)

L6 3083 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L7 63559 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX

L8 3605083 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?))

L9 48 SEA L2 AND L7

L10 50 SEA L5 AND L7

L11 224 SEA L6 AND L7 AND L8

L12 311 SEA L1 OR L9 OR L10 OR L11

L13 63 SEA L12 AND PY>=2018

L14 27 SEA L13 AND UP>=20191001 AND UP<=20200930

FILE 'BIOSIS' ENTERED AT 10:54:39 ON 19 OCT 2020
CHARGED TO COST=88148483

L15 30 SEA LL27 OR A2704-12 OR A2704(W)12 OR A(W)2704(W)12 OR
ACS-GM005-3 OR ACS-GM005-3 OR ACS-GMO05-3 OR ACS(W)GM005(W)3
OR ACS(W)GM005(W)3 OR ACS(W)GMO05(W)3 OR ACSGM005(W)3 OR
ACSGM005(W)3 OR ACSGMO05(W)3

L16 14024 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)
)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM
OR LLRTM

L17 2749 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 326 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L19 2849 SEA (L17 OR L18)

L20 9424 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L21 162149 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX

L22 447208 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?))

L23 112 SEA L16 AND L21

L24 115 SEA L19 AND L21

L25 394 SEA L20 AND L21 AND L22

L26 605 SEA L15 OR L23 OR L24 OR L25

L27 84 SEA L26 AND PY>=2018

L28 38 SEA L27 AND UP>=20191001 AND UP<=20200930

FILE 'AGRICOLA' ENTERED AT 10:55:03 ON 19 OCT 2020
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L29 13 SEA LL27 OR A2704-12 OR A2704(W)12 OR A(W)2704(W)12 OR
ACS-GMØØ5-3 OR ACS-GM005-3 OR ACS-GMOØ5-3 OR ACS(W)GMØØ5(W)3
OR ACS(W)GM005(W)3 OR ACS(W)GMOØ5(W)3 OR ACSGMØØ5(W)3 OR
ACSGM005(W)3 OR ACSGMOØ5(W)3
L30 2881 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)
)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM
OR LLRTM
L31 727 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
L32 240 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L33 802 SEA (L31 OR L32)
L34 7715 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)
L35 85722 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX
L36 94680 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 66 SEA L30 AND L35
L38 38 SEA L33 AND L35
L39 367 SEA L34 AND L35 AND L36
L40 467 SEA L29 OR L37 OR L38 OR L39
L41 40 SEA L40 AND PY>=2018
L42 19 SEA L41 AND UP>=20191001 AND UP<=20200930

FILE 'CABA' ENTERED AT 10:55:33 ON 19 OCT 2020
CHARGED TO COST=88148483
L43 27 SEA LL27 OR A2704-12 OR A2704(W)12 OR A(W)2704(W)12 OR
ACS-GMØØ5-3 OR ACS-GM005-3 OR ACS-GMOØ5-3 OR ACS(W)GMØØ5(W)3
OR ACS(W)GM005(W)3 OR ACS(W)GMOØ5(W)3 OR ACSGMØØ5(W)3 OR
ACSGM005(W)3 OR ACSGMOØ5(W)3
L44 4875 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)
)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM
OR LLRTM
L45 1482 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
L46 368 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L47 1582 SEA (L45 OR L46)
L48 17371 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)
L49 185029 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX
L50 173943 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?))
L51 131 SEA L44 AND L49
L52 105 SEA L47 AND L49
L53 733 SEA L48 AND L49 AND L50
L54 934 SEA L43 OR L51 OR L52 OR L53
L55 934 SEA L54 NOT P/DT
L56 0 SEA L54 AND (P/DT AND J/DT)
L57 934 SEA L55 OR L56

L58 100 SEA L57 AND PY>=2018
L59 42 SEA L58 AND UP>=20191001 AND UP<=20200930

FILE 'HCAPLUS' ENTERED AT 10:56:05 ON 19 OCT 2020
CHARGED TO COST=88148483

L60 40 SEA LL27 OR A2704-12 OR A2704(W)12 OR A(W)2704(W)12 OR
ACS-GM005-3 OR ACS-GM005-3 OR ACS-GMO05-3 OR ACS(W)GM005(W)3
OR ACS(W)GM005(W)3 OR ACS(W)GMO05(W)3 OR ACSGM005(W)3 OR
ACSGM005(W)3 OR ACSGMO05(W)3

L61 18919 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)
)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM
OR LLRTM

L62 6902 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 761 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L64 7191 SEA (L62 OR L63)

L65 26461 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L66 391751 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX

L67 664676 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?))

L68 213 SEA L61 AND L66
L69 489 SEA L64 AND L66
L70 5631 SEA L65 AND L66 AND L67
L71 6161 SEA L60 OR L68 OR L69 OR L70
L72 715 SEA L71 NOT P/DT
L73 0 SEA L71 AND (P/DT AND J/DT)
L74 715 SEA L72 OR L73
L75 98 SEA L74 AND PY>=2018
L76 67 SEA L75 AND UP>=20191001 AND UP<=20200930

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 10:56:42 ON 19
OCT 2020
CHARGED TO COST=88148483

L77 152 DUP REM L14 L28 L42 L59 L76 (41 DUPLICATES REMOVED)
ANSWERS '1-27' FROM FILE MEDLINE
ANSWERS '28-57' FROM FILE BIOSIS
ANSWERS '58-70' FROM FILE AGRICOLA
ANSWERS '71-105' FROM FILE CABA
ANSWERS '106-152' FROM FILE HCAPLUS