Title

Summary of the Literature Review for T25 Corn
October 1, 2018 – September 30, 2019

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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Stage 2 assessment	Food and Feed safety [redacted] Molecular characterization [redacted] Environmental safety [redacted]
Report	[redacted]

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SUMMARY

T25 corn (maize, Zea mays) plants were transformed by direct gene transfer using transformation vector pUC/Ac, carrying a phosphinothricin acetyltransferase (*pat*) gene and a beta-lactamase (*bla*) gene cassette. The *pat* gene encodes the phosphinothricin acetyltransferase (PAT/*pat*) protein conferring tolerance to glufosinate-ammonium herbicides. The bla gene is not expressed in T25 plants. The OECD unique identifier is ACS-ZMØØ3-2.

A scoping review was performed for T25 corn and its newly expressed proteinPAT/*pat*. The objective was to determine if there were studies about the molecular characterization of T25 corn, its effect on food and feed safety, or on 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, 2018 to September 30, 2019. Additional sources of information, such as web pages of regulatory authorities for food and feed safety, agriculture, and biotechnology- 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.

The literature searches identified a total of 438 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 11 publications were progressed for further assessment. After a detailed revies, all 11 publications were determined to be not relevant.

No publications were found that contained new data on the molecular characterization of T25 corn and its newly expressed protein, PAT/*pat*. Similarly, no new publications were found that suggested any potential adverse effects of this event on human and animal health, or the environment.

In summary, the literature searches and detailed review of the retrieved publications identified no publications that would change the existing safety assessment of T25 corn.

1. INTRODUCTION

T25 corn (maize, Zea mays) plants were transformed by direct gene transfer using transformation vector pUC/Ac, carrying a phosphinothricin acetyltransferase (*pat*) gene and a beta-lactamase (*bla*) gene cassette. The *pat* gene encodes the phosphinothricin acetyltransferase (PAT/*pat*) protein conferring tolerance to glufosinate-ammonium herbicides. The *bla* gene is not expressed in T25 plants. The OECD unique identifier is ACS-ZMØØ3-2.

The objective of the literature searches described here was to determine if there were publications published between October 1, 2018 and September 30, 2019 that mention the molecular characterization of T25 corn, and/or any adverse effects of T25 corn in food, feed or the environment. In that context, broad and inclusive literature searches were performed and the articles retrieved were reviewed in a comprehensive and transparent manner. 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 T25 corn and its newly expressed protein PAT/*pat*. The search terms also included relevant synonyms, 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 T25 corn and the newly expressed protein PAT/*pat*, in order to identify any issues related to the molecular characterization of T25 corn, food and feed safety or environmental safety that may require a more detailed examination.

2.2. Review questions

Review questions were formulated to conform to PECO structure (Population, Exposure, Comparators, Outcome) if possible, and to meet 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 T25 corn and it's the PAT/*pat* protein?

Key elements:

Population: Human health; animal health; environmental safety
Exposure: T25 corn, derived food/feed products, newly expressed protein in T25 corn
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 the of T25 corn and its newly expressed protein phosphinothricin acetyltransferase in T25 corn?

Key elements:

Population: T25 corn and newly expressed protein in T25 corn
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
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
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.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.	This permits the exclusion of publications that do not present original/primary data (e.g., editorials, position papers). 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

No relevant publications for T25 corn were known before starting the search, therefore, a related publication referring to the same trait (glufosinate tolerance) and the same crop (corn) was used used to test and validate the search strategy:

- Krenchinski FH; Carbonari CA; Cesco VJ; Albrecht AJ; Campos Arcuri ML; de Godoy MI; Velini ED (2018). Glufosinate resistance level is proportional to phosphinothricin acetyltransferase gene expression in glufosinate-resistant maize. Journal of Agriculture and Food Chemistry 66(48):12641-12650

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 October 9, 2019. Only documents updated between October 1, 2018 and September 30, 2019, were considered in the search.

3.2. 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 additonal 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 the 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, 2018 and September 30, 2019 (UP>20181001 and UP<20190930), 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.

See Appendix 1 for a complete search history.

Table 2: Search profile for database search

Set	Search string	Concepts
1	T25 or T(w)25 or ACS-ZMØØ3-2 or ACS-ZM003-2 or ACS-ZMOO3-2 or ACS(w)ZMØØ3(w)2 or ACS(w)ZM003(w)2 or ACS(w)ZMOO3(w)2 or ACSZMØØ3-2 or ACSZM003-2 or ACSZMOO3-2	Event name
2	s 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	corn# or maize# or maiz or zea(w)mays or z(w)mays or chardon	Plant species
6	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
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)

3.3. 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).

The dates of the most recent database updates are provided in Table 3.
See Appendix 2 for detailed database descriptions.

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	9 Oct 2019	9 Oct 2019	9 Oct 2019	9 Oct 2019	9 Oct 2019
Datespan of the search	1 Oct 2018 – 30 Sept 2019	1 Oct 2018 – 30 Sept 2019	1 Oct 2018 – 30 Sept 2019	1 Oct 2018 – 30 Sept 2019	1 Oct 2018 – 30 Sept 2019
Latest database update	4 Oct 2019	2 Oct 2019	2 Oct 2019	8 Oct 2019	8 Oct 2019
Number of records retrieved	71	130	84	207	104
Number of records after duplicate removal	47	98	51	138	104
Number of *relevant* records after rapid assessment	1	1	4	2	3

4. MANUAL SEARCHES

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

A search of the web pages of regulatory authorities for food and feed safety, agriculture, and biotechnology was conducted. Search results were manually examined for relevant records that were either published during the time period of October 1, 2018 to September 30, 2019 or refer to relevant records published during this time frame. Relevance of results was determined based on the criteria listed in Table 1 and are summarized in Table 4. All web pages searched chosen based on them being recommended as part of the EFSA 2019 explanatory note[1]. Search terms consisted of T25, LibertyLink corn, ACS-ZM003-2; or PAT/pat, Phosphinothricin in T25 corn. (All searched singly, with no search limits applied).

Table 4: Search of websites for regulatory authorities for food and feed safety, agriculture, and biotechnology

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
US Environmental Protection Agency (EPA)	https://www.epa.gov/	Oct 1, 2019	Oct 1, 2019	0
US Department of Agriculture (USDA)	https://www.usda.gov/	Sept 30, 2019	Oct 1, 2019	0
US Food and Drug Administration (FDA)	https://www.fda.gov/	Oct 7, 2019	Oct 8, 2019	0
Health Canada	https://www.canada.ca/en/health-canada.html	Sept 11, 2019	Oct 8, 2019	0
Canadian Food Inspection Agency	https://www.canada.ca/en/food-inspection-agency.html	Aug 21, 2019	Oct 8, 2019	0
Environment and Climate Change Canada	https://www.canada.ca/en/services/environment/weather/climatechange.html	Jul 26, 2019	Oct 8, 2019	0
Food Standards Australia New Zealand (FSANZ)	http://www.foodstandards.gov.au/Pages/default.aspx	Oct 8, 2019	Oct 8, 2019	0
Office of the Gene Technology Regulator (OGTR)	http://www.ogtr.gov.au/	Oct 8, 2019	Oct 8, 2019	0
National Technical Commission on Biosafety (CTNBio)	http://ctnbio.mcti.gov.br/en	September 2019	Oct 7-21, 2019	0
National Advisory Commission on Agricultural Biotechnology (CONABIA)	https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia	Oct 1, 2019	Oct 2, 2019	0
National Food Safety and Quality Service (SENASA)	https://www.argentina.gob.ar/senasa	Oct 2, 2019	Oct 2, 2019	0
Ministry of Environment, Forest, and Climate Change. Government of India	http://moef.gov.in/	Sept 30, 2019	Oct 8, 2019	0

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
Ministry of Agriculture, Forestry and Fisheries (MAFF)	http://www.maff.go.jp/	Oct 30, 2019	Oct 30, 2019	0
Ministry of Health, Labor and Welfare (MHLW)	http://www.mhlw.go.jp/	Oct 30, 2019	Oct 30, 2019	0

4.2. Manual searches of reference lists of recent review articles

Review articles published between October 1, 2018 and September 30, 2019 served as sources for reference lists to search for potentially relevant studies. The review articles were identified by searching of PubMed.gov for general terms such as “GMO” or “GM crops” in the titles and abstracts. A list of review articles and the resulting number of relevant studies found within the bibliographies 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	Agapito-Tenfen SZ, Okoli AS, Bernstein MJ, Wikmark OG, Myhr AI. 2018	Revisiting Risk Governance of GM Plants: The Need to Consider New and Emerging Gene-Editing Techniques.	Front Plant Sci. 2018 Dec 21;9:1874. doi: 10.3389/fpls.2018.01874.	0
2	Alarcon CM, Shan G, Layton DT, Bell TA, Whipkey S, Shillito RD. 2019	Application of DNA- and Protein-Based Detection Methods in Agricultural Biotechnology.	J Agric Food Chem. 2019 Jan 30;67(4):1019-1028. doi: 10.1021/acs.jafc.8b05157.	0
3	Bogner A, Torgersen H. 2018	Precaution, Responsible Innovation and Beyond - In Search of a Sustainable Agricultural Biotechnology Policy.	Front Plant Sci. 2018 Dec 18;9:1884. doi: 10.3389/fpls.2018.01884.	0
4	Boonchaisri S, Rochfort S, Stevenson T, Dias DA. 2019	Recent developments in metabolomics-based research in understanding transgenic grass metabolism.	Metabolomics. 2019 Mar 15;15(4):47. doi: 10.1007/s11306-019-1507-4.	0
5	Collins C, Lorenzen N, Collet B. 2019	DNA vaccination for finfish aquaculture.	Fish Shellfish Immunol. 2019 Feb;85:106-125. doi: 10.1016/j.fsi.2018.07.012.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
6	Gaffar FY, Koch A. 2019	Catch Me If You Can! RNA Silencing-Based Improvement of Antiviral Plant Immunity.	Viruses. 2019 Jul 23;11(7). pii: E673. doi: 10.3390/v11070673.	0
7	Ghosh S, Ghosh S, Sil PC. 2019	Role of nanostructures in improvising oral medicine.	Toxicol Rep. 2019 Apr 15;6:358-368. doi: 10.1016/j.toxrep.2019.04.004.	0
8	Halford NG. 2019	Legislation governing genetically modified and genome-edited crops in Europe: the need for change.	J Sci Food Agric. 2019 Jan 15;99(1):8-12. doi: 10.1002/jsfa.9227.	0
9	Hamburger DJS. 2018	Normative Criteria and Their Inclusion in a Regulatory Framework for New Plant Varieties Derived From Genome Editing.	Front Bioeng Biotechnol. 2018 Dec 19;6:176. doi: 10.3389/fbioe.2018.00176.	0
10	Hundleby PAC, Harwood WA. 2019	Impacts of the EU GMO regulatory framework for plant genome editing.	Food Energy Secur. 2019 May;8(2):e00161. doi: 10.1002/fes3.161.	0
11	Ichim MC. 2019	The Romanian experience and perspective on the commercial cultivation of genetically modified crops in Europe.	Transgenic Res. 2019 Feb;28(1):1-7. doi: 10.1007/s11248-018-0095-9.	0
12	Ishaq N, Bilal M, Iqbal HMN. 2019	Medicinal Potentialities of Plant Defensins: A Review with Applied Perspectives.	Medicines (Basel). 2019 Feb 19;6(1). pii: E29. doi: 10.3390/medicines6010029.	0
13	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 Apr 6. pii: S1084-9521(18)30112-5. doi: 10.1016/j.semcdb.2019.03.010.	0
14	Kauffmann F, Van Damme P, Leroux-Roels G, Vandermeulen C, Berthels N, Beuneu C, Mali S.	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.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
	2019			
15	Looi FY, Baker ML, Townson T, Richard M, Novak B, Doran TJ, Short KR. 2018	Creating Disease Resistant Chickens: A Viable Solution to Avian Influenza?	Viruses. 2018 Oct 15;10(10). pii: E561. doi: 10.3390/v10100561.	0
16	Mat Jalaluddin NS, Othman RY, Harikrishna JA. 2019	Global trends in research and commercialization of exogenous and endogenous RNAi technologies for crops.	Crit Rev Biotechnol. 2019 Feb;39(1):67-78. doi: 10.1080/07388551.2018.1496064.	0
17	Napier JA, Haslam RP, Tsalavouta M, Sayanova O. 2019	The challenges of delivering genetically modified crops with nutritional enhancement traits.	Nat Plants. 2019 Jun;5(6):563-567. doi: 10.1038/s41477-019-0430-z.	0
18	Rostoks N, GrantiÅ†a-IeviÅ†a L, IeviÅ†a B, Evelone V, ValciÅ†a O, Aleksejeva I. 2019	Genetically modified seeds and plant propagating material in Europe: potential routes of entrance and current status.	Heliyon. 2019 Feb 15;5(2):e01242. doi: 10.1016/j.heliyon.2019.e01242.	0
19	Tyczewska A, WoÅºniak E, Gracz J, KuczyÅ„ski J, Twardowski T. 2018	Towards Food Security: Current State and Future Prospects of Agrobiotechnology.	Trends Biotechnol. 2018 Dec;36(12):1219-1229. doi: 10.1016/j.tibtech.2018.07.008.	0
20	Wolt JD, Wolf C. 2018	Policy and Governance Perspectives for Regulation of Genome Edited Crops in the United States.	Front Plant Sci. 2018 Nov 8;9:1606. doi: 10.3389/fpls.2018.01606.	0
21	Wu Y, Li J, Li X, Zhai S, Gao H, Li Y, Zhang X, Wu G. 2019	Development and strategy of reference materials for the DNA-based detection of genetically modified organisms.	Anal Bioanal Chem. 2019 Mar;411(9):1729-1744. doi: 10.1007/s00216-019-01576-w.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
22	Zimny T, Sowa S, Tyczewska A, Twardowski T. 2019	Certain new plant breeding techniques and their marketability in the context of EU GMO legislation - recent developments.	N Biotechnol. 2019 Jul 25;51:49-56. doi: 10.1016/j.nbt.2019.02.003.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches (Section 3) identified a total of 596 references, which were reduced to 438 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 the 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.

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

- Duplicate entries
- Secondary literature (reviews), other than assessments from regulatory authorities
- 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 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 6.

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 as well as the quality and reliability of the study. Categorization of reliability (as described in the EFSA 2019 explanatory note[1] 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)	438
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	427
Total number of full-text documents assessed in detail	11
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	11
Total number of unobtainable/unclear publications	0
Total number of relevant publications	0

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 based on 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
No publications in this category.			

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
Krenchinski Fabio H Carbonari Caio A S Cesco Victor J Velini Edivaldo D P Albrecht Alfredo J Campos Arcuri Mariana de Lara de Godoy Maia Ivan 2018	Glufosinate Resistance Level is Proportional to Phosphinothricin Acetyltransferase Gene Expression in Glufosinate - Resistant Maize .	Journal of agricultural and food chemistry, (2018 Dec 05) Vol. 66, No. 48, pp. 12641-12650.	The paper studied how the plants perform. No information is provided for T25 corn.
Costa Flavia R Rech Rafael Duke Stephen O Carvalho Leonardo B 2018	Lack of effects of glyphosate and glufosinate on growth, mineral content, and yield of glyphosate- and glufosinate -resistant maize .	GM crops + food, (2018) Vol. 9, No. 4, pp. 189-198.	The article evaluates the effects of glufosinate and glyphosate (herbicide treatment on resitance) on other GM maize but not T25 corn.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Benevenuto, Rafael Fonseca Agapito-Tenfen, Sarah Zanon Vilperte, Vinicius Wikmark, Odd-Gunnar van Rensburg, Peet Jansen Nodari, Rubens Onofre 2017	Molecular responses of genetically modified maize to abiotic stresses as determined through proteomic and metabolomic analyses.	PLoS One, (FEB 28 2017) Vol. 12, No. 2, pp. Article No.: e0173069. http://journals.plos.org/plosone/. ISSN: 1932-6203. E-ISSN: 1932-6203.	The article is a review about the effects of GM crops collectively and not T25 corn specifically.
Naegeli, H., Bresson, J. L,, Dalmay, T., Dewhurst, I. C., Epstein, M. M., Firbank, L. G., Guerche, P., Hejatko, J., Moreno, F. J., Mullins, E., Nogue, F., Rostoks, N., Serrano, J. J. S., Savoini, G., Veromann, E., Veronesi, F., Devos, Y., Ardizzone, M., Neri, F. M., Papadopoulou, N., Sanctis, G. de Dumont, A. F. Gennaro, A., Ruiz, J. A. G., Paraskevopoulos, K., de Sanctis, G. 2018	Assessment of genetically modified maize MZHG0JG for food and feed uses, import and processing under Regulation (EC) No 1829/2003 (application EFSA-GMO -DE-2016-133).	EFSA Journal (2018), Volume 16, Number 11, e05469 p., many ref. ISSN: 1831-4732 DOI: 10.2903/j.efsa.2018.5469 Published by: Wiley, Oxford	T25 corn was not the subject of this document.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Naegeli, H., Birch, A. N., Casacuberta, J., De Schrijver, A., Gralak, M. A., Guerche, P. ; Jones, H., Manachini, B., Messean, A., Nielsen, E. E., Nogue, F., Robaglia, C., Rostoks, N., Sweet, J., Tebbe, C., Visioli, F., Wal, J.M., Alvarez, F., Ardizzone, M., Paraskevopoulos, K., Broll, H., Devos, Y., Dumont, A. F., Ruiz, J. A. G., Lanzoni, A., Neri, F. M., de Schrijver, A. 2018	Assessment of genetically modified maize 4114 for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO -NL-2014-123).	EFSA Journal (2018), Volume 16, Number 5, e05280 p., 28 refs. ISSN: 1831-4732 DOI: 10.2903/j.efsa.2018.5280 Published by: Wiley, Oxford	T25 corn was not the subject of this document.
Herman, R. A., Ekmay, R. D., Schafer, B. W., Song, Ping, Fast, B. J., Papineni, S., Shan, GuoMin, Juberg, D. R., Song, P., Shan, G. M 2018	Food and feed safety of DAS-444O6-6 herbicide -tolerant soybean.	Regulatory Toxicology and Pharmacology (2018), Volume 94, pp. 70-74.	T25 corn was not the subject of this document.
Pellegrino, Elisa Bedini, Stefano Nuti, Marco Ercoli, Laura, 2018	Impact of genetically engineered maize on agronomic, environmental and toxicological traits: a meta-analysis of 21 years of field data	Scientific Reports (2018), 8(1), 1-12.	No data related to T25 corn or the safety of the PAT/*pat* protein.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Duncan, Bill Leyva-Guerrero, Elisa Werk, Todd Stojsin, Duska Baltazar Baltazar, M Meng, Chen Garcia-Lara, Silverio Zavala-Lopez Mariana de la Fuente-Martinez, Juan Manuel 2019	Assessment of potential impacts associated with gene flow from transgenic hybrids to Mexican maize landraces.	Transgenic research, (2019 Jun 27).	The study evaluated the potential impact GM maize could have on native maize landraces in Mexico. It did not contain an environmental risk assessment for T25 corn.
Devos, Yann Raybould, Alan Hokanson, Karen E Ortiz-Garcia, Sol 2018	Teosinte and maize x teosinte hybrid plants in Europe-Environmental risk assessment and management implications for genetically modified maize.	Agriculture, ecosystems + environment (2018), Volume 259, pp. 19-27.	The study evaluated the likelihood of selected GM maize events may cross with teosinte or a maize x teosinte hybrid and its impact. It did not contain an environmental risk assessment for T25 corn.
Gao, XinXin, Quan, YuDong, Wang, ZhenYing, Bai, ShuXiong, Zhang, TianTao, He, KangLai, Gao, X. X., Quan, Y. D., Wang, Z. Y., Bai, S. X., Zhang, T. T., He, K. L. 2018	The risk assessment of Cry1Ab, EPSPS, and PAT proteins expressed by transgenic corn for Chinese green lacewing Chrysoperla nipponensis larvae.	Journal of Plant Protection (2018), Volume 45, Number 4, pp. 663-669, 39 refs.	The study assessed exposure of green lacewings to two GM maize products through diet. It did not contain an environmental risk assessment for T25 corn.
Ali, Fatin Hussien 2017	Isolation of selected Four Events GM Maize(Bt11, Mon863, Mon810 and T25) product in Baghdad markets using Single Tube Multiplex PCR	Advances in Environmental Biology (2017), 11(7), 26-30.	A simplified PCR based method was developed for rapid analysis of four GM maize products available in an Iraqi market. There is no relevance to the safety assessment of T25 corn.

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 AND SUMMARY OF RELEVANT STUDIES

A total of 11 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 11 publications were relevant for the safety assessment of T25 corn and its newly expressed PAT/*pat* protein.

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

Table 10: Summary of all relevant publications retrieved after detailed assessment of full-text documents for relevance (Stage 2), 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
No publications in this category.				

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 (Stage 2), 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
No publications in this category.			

7. CONCLUSION

The literature searches performed for T25 corn and the PAT/*pat* protein for the period from October 1, 2018 to September 30, 2019, identified a total of 438 unique publications. A total of 11 publications were progressed for detailed assessment after excluding 427 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).
These 11 publications were evaluated in detail based on their full text for potential relevance, following the pre-established criteria. No relevant references with bearing on human and animal safety, molecular characterization or environmental safety were identified. No issues or topics were identified that would trigger or warrant a 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 Search history

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     FILE 'MEDLINE' ENTERED AT 09:44:34 ON 09 OCT 2019
L1          984 SEA T25 OR T(W)25 OR ACS-ZMØØ3-2 OR ACS-ZM003-2 OR ACS-ZMOO3-2
                OR ACS(W)ZMØØ3(W)2 OR ACS(W)ZM003(W)2 OR ACS(W)ZMOO3(W)2 OR
                ACSZMØØ3-2 OR ACSZM003-2 OR ACSZMOO3-2
L2        12035 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         1318 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          194 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L5         1389 SEA (L3 OR L4)
L6         2813 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR
                PROTECT?)
L7        68709 SEA CORN# OR MAIZE# OR MAIZ OR ZEA(W)MAYS OR Z(W)MAYS OR
                CHARDON
L8      3437562 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           46 SEA L2 AND L7
L10         114 SEA L5 AND L7
L11         335 SEA L6 AND L7 AND L8
L12        1407 SEA L1 OR L9 OR L10 OR L11
L13         214 SEA L12 AND PY>=2017
L14         104 SEA L13 AND UP>20181001 AND UP<20190930

     FILE 'BIOSIS' ENTERED AT 09:45:07 ON 09 OCT 2019
L15        1111 SEA T25 OR T(W)25 OR ACS-ZMØØ3-2 OR ACS-ZM003-2 OR ACS-ZMOO3-2
                OR ACS(W)ZMØØ3(W)2 OR ACS(W)ZM003(W)2 OR ACS(W)ZMOO3(W)2 OR
                ACSZMØØ3-2 OR ACSZM003-2 OR ACSZMOO3-2
L16       13352 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        2643 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         321 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L19        2741 SEA (L17 OR L18)
L20        9035 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR
                PROTECT?)
L21      230132 SEA CORN# OR MAIZE# OR MAIZ OR ZEA(W)MAYS OR Z(W)MAYS OR
                CHARDON
L22      428342 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         140 SEA L16 AND L21
L24         292 SEA L19 AND L21
L25         555 SEA L20 AND L21 AND L22
L26        1977 SEA L15 OR L23 OR L24 OR L25
L27         251 SEA L26 AND PY>=2017
L28         130 SEA L27 AND UP>20181001 AND UP<20190930
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     FILE 'AGRICOLA' ENTERED AT 09:45:32 ON 09 OCT 2019
L29          325 SEA T25 OR T(W)25 OR ACS-ZMØØ3-2 OR ACS-ZM003-2 OR ACS-ZMOO3-2
                 OR ACS(W)ZMØØ3(W)2 OR ACS(W)ZM003(W)2 OR ACS(W)ZMOO3(W)2 OR
                 ACSZMØØ3-2 OR ACSZM003-2 OR ACSZMOO3-2
L30         2648 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          710 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          238 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                 N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                 ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L33          784 SEA (L31 OR L32)
L34         7413 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                 PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR
                 PROTECT?)
L35       130503 SEA CORN# OR MAIZE# OR MAIZ OR ZEA(W)MAYS OR Z(W)MAYS OR
                 CHARDON
L36        90274 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           75 SEA L30 AND L35
L38          126 SEA L33 AND L35
L39          388 SEA L34 AND L35 AND L36
L40          835 SEA L29 OR L37 OR L38 OR L39
L41          116 SEA L40 AND PY>=2017
L42           71 SEA L41 AND UP>20181001 AND UP<20190930

     FILE 'CABA' ENTERED AT 09:46:14 ON 09 OCT 2019
L43          599 SEA T25 OR T(W)25 OR ACS-ZMØØ3-2 OR ACS-ZM003-2 OR ACS-ZMOO3-2
                 OR ACS(W)ZMØØ3(W)2 OR ACS(W)ZM003(W)2 OR ACS(W)ZMOO3(W)2 OR
                 ACSZMØØ3-2 OR ACSZM003-2 OR ACSZMOO3-2
L44         4542 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         1437 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          364 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                 N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                 ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L47         1535 SEA (L45 OR L46)
L48        16565 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                 PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR
                 PROTECT?)
L49       320188 SEA CORN# OR MAIZE# OR MAIZ OR ZEA(W)MAYS OR Z(W)MAYS OR
                 CHARDON
L50       165757 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          167 SEA L44 AND L49
L52          272 SEA L47 AND L49
L53          910 SEA L48 AND L49 AND L50
L54         1772 SEA L43 OR L51 OR L52 OR L53
L55          201 SEA L54 AND PY>=2017
L56           84 SEA L55 AND UP>20181001 AND UP<20190930
L57           84 SEA L56 NOT P/DT
L58            0 SEA L56 AND (P/DT AND J/DT)
L59           84 SEA L57 OR L58

     FILE 'HCAPLUS' ENTERED AT 09:46:48 ON 09 OCT 2019
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L60         2951 SEA T25 OR T(W)25 OR ACS-ZMØØ3-2 OR ACS-ZM003-2 OR ACS-ZMOO3-2
                 OR ACS(W)ZMØØ3(W)2 OR ACS(W)ZM003(W)2 OR ACS(W)ZMOO3(W)2 OR
                 ACSZMØØ3-2 OR ACSZM003-2 OR ACSZMOO3-2
L61        17778 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         6265 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          744 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                 N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                 ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L64         6545 SEA (L62 OR L63)
L65        24864 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                 PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR
                 PROTECT?)
L66       358092 SEA CORN# OR MAIZE# OR MAIZ OR ZEA(W)MAYS OR Z(W)MAYS OR
                 CHARDON
L67       635515 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          139 SEA L61 AND L66
L69          711 SEA L64 AND L66
L70         5938 SEA L65 AND L66 AND L67
L71         9380 SEA L60 OR L68 OR L69 OR L70
L72         1993 SEA L71 AND PY>=2017
L73          584 SEA L72 AND UP>20181001 AND UP<20190930
L74          207 SEA L73 NOT P/DT
L75            0 SEA L73 AND (P/DT AND J/DT)
L76          207 SEA L74 OR L75

     FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 09:47:19 ON 09
     OCT 2019
L77          438 DUP REM L14 L28 L42 L59 L76 (158 DUPLICATES REMOVED)
                     ANSWERS '1-104' FROM FILE MEDLINE
                     ANSWERS '105-202' FROM FILE BIOSIS
                     ANSWERS '203-249' FROM FILE AGRICOLA
                     ANSWERS '250-300' FROM FILE CABA
                     ANSWERS '301-438' FROM FILE HCAPLUS
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Appendix 2 Database descriptions

Host	File	Description
STN	AGRICOLA	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. 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.
STN	BIOSIS	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. 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. Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are all searchable.
STN	CABA/CAB	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. Sources for CABA include journals, books, reports, published theses, conference proceedings, and patents. Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are searchable.
STN	CAS-CA/CAPLUS	The Chemical Abstracts (CA) database covers all areas of Biochemistry, Chemistry and Chemical engineering, and related sciences. 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. Bibliographic terms, indexing terms, roles, CAS Registry Numbers, International Patent Classification, and abstracts are searchable.

Host	File	Description
STN	MEDLINE	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. Sources include journals and chapters in books or symposia. Bibliographic information, indexing terms, abstracts, chemical names, and CAS Registry Numbers are all searchable. Online thesauri are available for the Medical Subject Headings (/MN), Controlled Terms (/CT) and Chemical Name (/CN) fields.