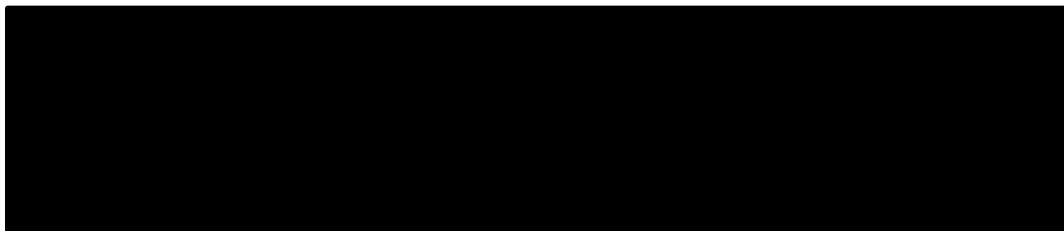


**Review of literature for authorised genetically modified maize products  
in the scope of their authorisations for food and feed uses, import and  
processing (2021 update)**



**Products covered:**

**Single events: 1507, 59122, 4114, DAS-40278-9**

**Stacks: 1507xNK603, 1507x59122xMON810xNK603,  
MON89034x1507xMON88017x59122xDAS-40278-9,  
MON89034x1507xNK603xDAS-40278-9 and their subcombinations  
covered by the authorisations**

**PHI-R132-Y21**

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## 1. Summary

An updated systematic search and review of peer-reviewed literature was conducted for the authorised genetically modified (GM) maize 1507, 59122, 4114, DAS-40278-9, 1507xNK603, 1507x59122xMON810xNK603, MON89034x1507xMON88017x59122xDAS-40278-9, MON89034x1507xNK603xDAS-40278-9 and their sub-combinations covered by their respective authorisations<sup>1</sup> (hereafter collectively referred to as “authorised GM maize”). This exercise was performed in line with the EFSA Guidance on conducting a systematic review (EFSA, 2010) and taking into account the explanatory note on literature searching (EFSA, 2019), with the following review question “Do the authorised GM maize<sup>2</sup> and derived food/feed products, or the intended traits (the newly expressed proteins or their combination) have adverse effects on human and animal health and the environment in the scope of their authorisations?”.

The current systematic search complements the search performed in 2020. Unless indicated below, all portions of the search were conducted according to the methodologies outlined in the previous searches.

The outcome of this analysis showed that one publication relevant for the review question was identified (notably for 1507 and 4114 maize) during the selected time period. No safety concerns were identified for the authorised GM maize<sup>2</sup> by this literature search exercise.

## 2. Confirmation of the Suitability of the Search Strings

It was confirmed that the search strategy utilized in the previous literature search report (2020) in the frame of the 2020 annual monitoring reports is still relevant; updates were introduced only for consistency or to fine-tune the syntaxes to the databases queried. It was previously confirmed that searches on the single events would find results on the stack events covered by the authorisations.

## 3. Results of the scoping exercise

### 3.1. Outcome of the literature searches

In July 2021, searches against electronic bibliographic databases and manual searches in view of screening of reference lists were performed. The search process is reported in line with EFSA guidance (EFSA, 2010 Appendix B4(2)) in Table 1.

<sup>1</sup> 1507x59122xMON810xNK603 maize and the following subcombinations: 1507x59122xMON810, 59122x1507xNK603, 1507xMON810xNK603, 59122xMON810xNK603, 1507x59122, 1507xMON810, 59122xMON810, 59122xNK603.

MON89034x1507xMON88017x59122xDAS-40278-9 and the following subcombinations: MON89034x1507xMON88017xDAS-40278-9, MON89034x1507x59122xDAS-40278-9, MON89034xMON88017x59122xDAS-40278-9, 1507xMON88017x59122xDAS-40278-9, MON89034x1507xDAS-40278-9, MON89034xMON88017xDAS-40278-9, MON89034x59122xDAS-40278-9, 1507xMON88017xDAS-40278-9, 1507x59122xDAS-40278-9, MON88017x59122xDAS-40278-9, MON89034xDAS-40278-9, 1507xDAS-40278-9, MON88017xDAS-40278-9, 59122xDAS-40278-9.

MON89034x1507xNK603xDAS-40278-9 and the following subcombinations: MON89034xNK603xDAS-40278-9, 1507xNK603xDAS-40278-9 and NK603xDAS-40278-9.

<sup>2</sup> As previously defined, 1507, 59122, 4114, DAS-40278-9, 1507xNK603, 1507x59122xMON810xNK603, MON89034x1507xMON88017x59122xDAS-40278-9, MON89034x1507xNK603xDAS-40278-9 maize and their sub-combinations covered by their respective authorisations.

**Table 1.** Documenting and reporting the search process

Resources	Date of search	Period searched	Other restrictions	Number of records retrieved
Web of Science Core collection <sup>§</sup>	6 July 2021	1 Jan 2020-6 July 2021	None	173
CAB Abstracts <sup>§</sup>	6 July 2021	1 Jan 2020-6 July 2021	None	109
MEDLINE <sup>§</sup>	6 July 2021	1 Jan 2020-6 July 2021	None	90
Europe PMC <sup>§</sup>	6 July 2021	1 Jan 2020-6 July 2021	None	23
Screening reference lists	NA	-	NA	NA

<sup>§</sup> The search syntaxes used for electronic bibliographic databases are reported in Appendix 1.

NA: Not applicable as no publications relevant for screening reference lists were identified.

The publications retrieved across all methods of searching (Web of Science Core collection, CAB Abstracts, MEDLINE, Europe PMC, and screening of reference lists) can be found in Appendix 3.

In the framework of the reference list screening exercise, no detailed risk assessments regarding the authorised GM maize were retrieved that contained information on food and feed safety. Considering that no relevant opinions were published within the selected time period, no further screening was performed.

The publications grouped in the Endnote® library were deduplicated and publications retrieved by the previous searches conducted in the frame of the 2020 annual monitoring reports were removed (see Appendix 3, Section 6).

The results of the publication selection process are presented in Table 2.

**Table 2.** Results of the publication selection process, for the review question

<b>Review question:</b> “Do the authorised GM maize <sup>2</sup> and their respective derived food/feed products, or the intended trait(s) (the newly expressed protein(s) or their combination), have adverse effects on human and animal health and the environment in the scope of their authorisations?”	<b>Number of records</b>
Total number of publications retrieved after all searches of the scientific literature (excluding duplicates and publications retrieved by the previous searches conducted in the frame of the 2020 monitoring reports)	109
Number of publications excluded from the search results after rapid assessment for relevance based on title and abstract	104
Total number of full-text documents assessed in detail	5
Number of publications excluded from further consideration after detailed assessment for relevance based on full text	4
Total number of unobtainable/unclear publications	0
Total number of relevant publications	1

The 109 unique entries present in the Endnote database (Table 2) were manually screened for relevance to the review question by two independent reviewers using the *a priori* eligibility/inclusion criteria described in Appendix 2.

In the first stage of screening, entries were screened based on title/abstract. Records that were deemed to be irrelevant were not further retained. In cases where the record seemed relevant,

or if the title/abstract did not contain sufficient information, the publication was progressed to the second stage and assessed for relevance at the level of the full text.

Publications assessed at full text level and found not to be relevant were not further assessed and a justification was provided. Records that are relevant were summarized and their potential to influence the initial risk assessment was evaluated in the format laid out by the Commission decision 2009/770/EC (EC, 2009).

In this literature search exercise, one peer-reviewed publication relevant to the risk assessment of the authorised GM maize<sup>2</sup> (notably for 1507 and 4114 maize) was identified (Vieira et al., 2021) (see Table 4.1 in Appendix 4 and Table 3 hereafter). Publications excluded after assessment of the full-text are presented in Table 4.2 in Appendix 4 and a reason for exclusion based on the eligibility/inclusion criteria is provided. No unclear publications were identified (see Appendix 4, Table 4.3).

**Table 3:** Review of a relevant peer-reviewed publication: Food/Feed safety (1507 and 4114 maize) (Vieira et al., 2021)

Publication	Summary of research and results	Protection goal	Observed parameter	Adverse effects	Feedback on initial risk assessment
Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, 2021. Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. Chemosphere 264, 7.	As indicated by the authors, their work aimed to evaluate the toxicity of Cry1F (and Cry1C and Cry1Ab) on zebrafish embryos and larvae, allying the embryotoxicity test and dosage of enzyme biomarkers and proteomics analysis to investigate the acute effects of a predicted worst-case scenario concentration of Cry proteins (set to 1.1 mg/L). The authors show that, at the analysed concentration, after 96h exposure, “these proteins did not cause adverse effects observable in the zebrafish early life stages, either by verifying phenotypic endpoints of toxicity or alterations in representative enzymatic biomarkers. The authors demonstrate that at the molecular level, Cry proteins tested lead to very small changes in the proteome of zebrafish larvae. Overall, these data lead the authors to the conclusion that Cry1F” (and Cry1C and Cry1Ab proteins), “even at a very high concentration, have limited effects in the zebrafish early life stages”. The authors state that, “in a natural setting, these proteins would not have deleterious effects on aquatic vertebrates.”	Food Feed safety	Toxicology	None	No change

#### **4. Conclusion**

One publication was identified as relevant for the molecular characterisation, food/feed and environmental safety of the authorised GM maize<sup>2</sup> (notably for 1507 and 4114 maize) within the scope of the authorisations for the defined time period. No safety concerns have been identified for the authorised GM maize by this literature search exercise.

#### **References**

- EC, **2009**. Commission Decision 2009/770/EC of 13 October 2009 establishing standard reporting formats for presenting the monitoring results of the deliberate release into the environment of genetically modified organisms, as or in products, for the purpose of placing on the market, pursuant to Directive 2001/18/EC of the European Parliament and of the Council. Official Journal of the European Union 275, 9-27.
- EFSA, **2010**. Application of systematic review methodology to food and feed safety assessments to support decision making. EFSA Journal 8(6):1637. [90 pp.].
- 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. EFSA supporting publication 2019:EN-1614. [62 pp.].
- Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, **2021**. Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. Chemosphere 264, 7.

# Appendix 1. Detailed search syntaxes for the authorised GM maize

## Web of Science Core collection

Set	Search query
Event 1507 #1	TS=(tc1507* OR das-01507-1 OR das01507* OR DAS-Ø15Ø7 OR DAS-circle-divide-15-circle-divide-7 OR DAS-empty-set15empty set7 OR das-01507 OR tc-1507 OR (1507 AND (maize OR corn OR zea OR mays OR Dupont OR Dow OR Pioneer OR Corteva)) OR herculex* or hx-corn or hx-maize)
Event 59122 #2	TS=((59122 AND (maize OR corn OR zea OR mays OR DuPont OR dow OR pioneer OR corteva)) OR das59122* OR das-59122 OR herculex-rw OR (herculex and rootworm) OR (hx AND rw))
Event 4114 #3	TS=(DP-ØØ4114 OR DP-circle-divide-circle-divide-4114 OR DP-empty-setempty-set4114 OR dp-004114 OR dp004114* OR DP4114 OR (4114 AND (maize OR corn OR zea OR mays OR Dupont OR Corteva)))
Event DAS-40278-9 #4	TS=(DAS40278* OR DAS-40278 OR DAS-4Ø278-9 OR DAS-4-circle-divide-278-9 OR DAS-4empty-set278-9 OR (Enlist* AND (maize OR corn OR zea OR mays OR dow OR Corteva OR herbicid*)))
Stack and relevant subcombinations #5	TS=(*1507x59122xMON810xNK603* OR *1507x59122xMON810* OR *1507x59122xNK603* OR *59122x1507xNK603* OR *1507xMON810xNK603* OR *59122xMON810xNK603* OR *1507x59122* OR *1507xMON810* OR *1507xNK603* OR *59122xMON810* OR *59122xNK603* OR *MON89034x1507xNK603xDAS-40278-9* OR *MON89034xNK603xDAS-40278-9* OR *1507xNK603xDAS-40278-9* OR *MON89034x1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xMON88017xDAS-40278-9* OR *MON89034x1507x59122xDAS-40278-9* OR *1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xDAS-40278-9* OR *MON89034xMON88017xDAS-40278-9* OR *MON89034x59122xDAS-40278-9* OR *1507xMON88017xDAS-40278-9* OR *1507x59122xDAS-40278-9* OR *MON88017x59122xDAS-40278-9* OR *MON89034xDAS-40278-9* OR *1507xDAS-40278-9* OR *MON88017xDAS-40278-9* OR *59122xDAS-40278-9* OR acremax OR smartstax*-enlist* OR Powercore*-enlist* OR intrasect)
#6	#1 OR #2 OR #3 OR #4 OR #5
Protein 1507 #7	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 59122	TS=(cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a* OR (phosphinothricin AND



#8	(acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 4114 #9	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin) OR cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a*))
Protein DAS-40278-9 #10	TS=(aad-1 OR aryloxyalkanoate-dioxygenase-1)
General #11	TS=(Streptomyces OR viridochromogenes OR sphingobium OR herbicidovorans OR Bacillus OR thuringiensis OR bt OR maize OR corn OR zea OR mays OR (((herbicid* AND (genetical* NEAR/3 modif*)) OR GMHT) AND (crop OR plant OR food OR feed)) OR gmo OR gmos OR lmo OR lmos OR gm OR ge OR stack)
#12	(#7 OR #8 OR #9 OR #10) AND #11
Trait 1507 #13	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 59122 #14	TS=(coleopter* OR rootworm* OR root-worm* OR virgifera OR WCR OR barberi OR diabrotica* OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 4114 #15	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*) OR coleopter* OR rootworm* OR root-worm* OR diabrotica OR virgifera OR WCR OR barberi)
Trait DAS-40278-9 #16	TS=((((2-4-D OR AOPP) AND herbicid*) OR 2-4-dichlorophenoxyacetic-acid OR 2-4-dichlorophenoxy-acetic-acid OR aryloxyphenoxypropionate OR aryloxyphenoxy-propionate OR (fop AND (herbicid* OR aryloxyphen*)) OR quizalofop OR haloxyfop)
General #17	TS=((toler* OR resist* OR protec*) AND (maize OR corn OR zea OR mays) AND (GMO OR GMOS OR LMO OR LMOS OR living-modified OR transgen* OR GMHT OR ((GM OR GE OR genetic*) NEAR/5 (modif* OR transform* OR manipul* OR engineer* OR stack))))
#18	(#13 OR #14 OR #15 OR #16) AND #17
Reporting Period #19	PY=(2020-2100)
<b>Final Results</b> #20	(#6 OR #12 OR #18) AND #19

## CAB Abstracts

Set	Search query
Event 1507 #1	TS=(tc1507* OR das-01507-1 OR das01507* OR DAS-Ø15Ø7 OR DAS-<o>15<o>7 OR das-01507 OR tc-1507 OR (1507 AND (maize OR corn OR zea OR mays OR Dupont OR Dow OR Pioneer OR Corteva)) OR herculex* or hx-corn or hx-maize)
Event 59122 #2	TS=((59122 AND (maize OR corn OR zea OR mays OR DuPont OR dow OR pioneer OR corteva)) OR das59122* OR das-59122 OR herculex-rw OR (herculex and rootworm) OR (hx AND rw))
Event 4114 #3	TS=(DP-ØØ4114 OR DP-<o><o>4114 OR dp-004114 OR dp004114* OR DP4114 OR (4114 AND (maize OR corn OR zea OR mays OR Dupont OR Corteva)))
Event DAS-40278-9 #4	TS=(DAS40278* OR DAS-40278 OR DAS-4Ø278-9 OR DAS-4<o>278-9 OR (Enlist* AND (maize OR corn OR zea OR mays OR dow OR Corteva OR herbicid*)))
Stack and relevant subcombinations #5	TS=(*1507x59122xMON810xNK603* OR *1507x59122xMON810* OR *1507x59122xNK603* OR *59122x1507xNK603* OR *1507xMON810xNK603* OR *59122xMON810xNK603* OR *1507x59122* OR *1507xMON810* OR *1507xNK603* OR *59122xMON810* OR *59122xNK603* OR *MON89034x1507xNK603xDAS-40278-9* OR *MON89034xNK603xDAS-40278-9* OR *1507xNK603xDAS-40278-9* OR *MON89034x1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xMON88017xDAS-40278-9* OR *MON89034x1507x59122xDAS-40278-9* OR *1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xDAS-40278-9* OR *MON89034xMON88017xDAS-40278-9* OR *MON89034x59122xDAS-40278-9* OR *1507xMON88017xDAS-40278-9* OR *MON88017x59122xDAS-40278-9* OR *MON89034xDAS-40278-9* OR *1507xDAS-40278-9* OR *MON88017xDAS-40278-9* OR *59122xDAS-40278-9* OR acremax OR smartstax*-enlist* OR Powercore*-enlist* OR intrasect OR stack)
#6	#1 OR #2 OR #3 OR #4 OR #5
Protein 1507 #7	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 59122 #8	TS=(cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a* OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 4114 #9	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR

	(pat AND phosphinothricin) OR cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a*)
Protein DAS-40278-9 #10	TS=(aad-1 OR aryloxyalkanoate-dioxygenase-1)
General #11	TS=(Streptomyces OR viridochromogenes OR sphingobium OR herbicidovorans OR Bacillus OR thuringiensis OR bt OR maize OR corn OR zea OR mays OR (((herbicid* AND (genetical* NEAR/3 modif*)) OR GMHT) AND (crop OR plant OR food OR feed)) OR lmo OR lmos OR ge OR "genetically engineered foods" OR stack)
#12	(#7 OR #8 OR #9 OR #10) AND #11
Trait 1507 #13	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 59122 #14	TS=(coleopter* OR rootworm* OR root-worm* OR virgifera OR WCR OR barberi OR diabrotica* OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 4114 #15	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*) OR coleopter* OR rootworm* OR root-worm* OR diabrotica OR virgifera OR WCR OR barberi)
Trait DAS-40278-9 #16	TS=((((2-4-D OR AOPP) AND herbicid*) OR 2-4-dichlorophenoxyacetic-acid OR 2-4-dichlorophenoxy-acetic-acid OR aryloxyphenoxypropionate OR aryloxyphenoxy-propionate OR (fop AND (herbicid* or aryloxyphen*)) OR quizalofop OR haloxyfop)
General #17	TS=((toler* OR resist* OR protec*) AND (maize OR corn OR zea OR mays) AND (GMHT OR transgen* OR engineer* OR lmo or lmos OR ge OR manipul* OR transform* OR stack OR "genetically engineered foods"))
#18	(#13 OR #14 OR #15 OR #16) AND #17
Reporting Period #19	PY=(2020-2100)
<b>Final Results</b> #20	(#6 OR #12 OR #18) AND #19

# MEDLINE

Set	Search query
Event 1507 #1	TS=(tc1507* OR das-01507-1 OR das01507* OR DAS-Ø15Ø7 OR das-01507 OR tc-1507 OR (1507 AND (maize OR corn OR zea OR mays OR Dupont OR Dow OR Pioneer OR Corteva)) OR herculex* or hx-corn or hx-maize)
Event 59122 #2	TS=((59122 AND (maize OR corn OR zea OR mays OR DuPont OR dow OR pioneer OR corteva)) OR das59122* OR das-59122 OR herculex-rw OR (herculex and rootworm) OR (hx AND rw))
Event 4114 #3	TS=(DP-ØØ4114 OR dp-004114 OR dp004114* OR DP4114 OR (4114 AND (maize OR corn OR zea OR mays OR Dupont OR Corteva)))
Event DAS-40278-9 #4	TS=(DAS40278* OR DAS-40278 OR DAS-4Ø278-9 OR (Enlist* AND (maize OR corn OR zea OR mays OR dow OR Corteva OR herbicid*)))
Stack and relevant subcombinations #5	TS=(*1507x59122xMON810xNK603* OR *1507x59122xMON810* OR *1507x59122xNK603* OR *59122x1507xNK603* OR *1507xMON810xNK603* OR *59122xMON810xNK603* OR *1507x59122* OR *1507xMON810* OR *1507xNK603* OR *59122xMON810* OR *59122xNK603* OR *MON89034x1507xNK603xDAS-40278-9* OR *MON89034xNK603xDAS-40278-9* OR *1507xNK603xDAS-40278-9* OR *MON89034x1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xMON88017xDAS-40278-9* OR *MON89034x1507x59122xDAS-40278-9* OR *1507xMON88017x59122xDAS-40278-9* OR *MON89034x1507xDAS-40278-9* OR *MON89034xMON88017xDAS-40278-9* OR *MON89034x59122xDAS-40278-9* OR *1507xMON88017xDAS-40278-9* OR *MON88017x59122xDAS-40278-9* OR *MON89034xDAS-40278-9* OR *1507xDAS-40278-9* OR *MON88017xDAS-40278-9* OR *59122xDAS-40278-9* OR acremax OR smartstax*-enlist* OR Powercore*-enlist* OR intrasect OR stack)
#6	#1 OR #2 OR #3 OR #4 OR #5
Protein 1507 #7	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 59122 #8	TS=(cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a* OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR (pat AND phosphinothricin))
Protein 4114 #9	TS=(cry1f OR cry-1f OR cryif OR "cry-if" OR Cry1-f OR Cry-1-f OR (phosphinothricin AND (acetyltransferase OR acetyl-transferase)) OR

	(pat AND phosphinothricin) OR cry34ab1 OR cry34* OR cry35ab1 OR cry35* OR cry-34 OR cry-35 OR cry-34a* OR cry-35a*)
Protein DAS-40278-9 #10	TS=(aad-1 OR aryloxyalkanoate-dioxygenase-1)
General #11	TS=(Streptomyces OR viridochromogenes OR sphingobium OR herbicidovorans OR Bacillus OR thuringiensis OR bt OR maize OR corn OR zea OR mays OR (((herbicid* AND (genetical* NEAR/3 modif*)) OR GMHT) AND (crop OR plant OR food OR feed)) OR lmo OR lmos OR ge OR "Food, Genetically Modified" OR stack)
#12	(#7 OR #8 OR #9 OR #10) AND #11
Trait 1507 #13	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 59122 #14	TS=(coleopter* OR rootworm* OR root-worm* OR virgifera OR WCR OR barberi OR diabrotica* OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*))
Trait 4114 #15	TS=(lepidopter* OR ecb OR corn-borer OR cornborer OR ostrinia OR nubilalis OR earworm OR cutworm OR spodoptera OR frugiperda OR glufosinate* OR gluphosinate* OR (liberty* AND herbicid*) OR coleopter* OR rootworm* OR root-worm* OR diabrotica OR virgifera OR WCR OR barberi)
Trait DAS-40278-9 #16	TS=((((2-4-D OR AOPP) AND herbicid*) OR 2-4-dichlorophenoxyacetic-acid OR 2-4-dichlorophenoxy-acetic-acid OR aryloxyphenoxypropionate OR aryloxyphenoxy-propionate OR (fop AND (herbicid* or aryloxyphen*)) OR quizalofop OR haloxyfop)
General #17	TS=((toler* OR resist* OR protec*) AND (maize OR corn OR zea OR mays) AND (GMHT OR transgen* OR engineer* OR lmo or lmos OR ge OR manipul* OR transform* OR stack OR "Food, Genetically Modified"))
#18	(#13 OR #14 OR #15 OR #16) AND #17
Reporting Period #19	PY=(2020-2100)
<b>Final Results</b> #20	(#6 OR #12 OR #18) AND #19

**Europe PMC**

(1507x59122xMON810xNK603 OR 1507x59122xMON810 OR 1507x59122xNK603 OR 1507xMON810xNK603 OR 59122xMON810xNK603 OR 1507x59122 OR 1507xMON810 OR 1507xNK603 OR 59122xMON810 OR 59122xNK603 OR “MON89034x1507xNK603xDAS-40278” OR “MON89034xNK603xDAS-40278” OR “1507xNK603xDAS-40278” OR “MON89034x1507xMON88017x59122xDAS-40278” OR “MON89034x1507xMON88017xDAS-40278” OR “MON89034x1507x59122xDAS-40278” OR “1507xMON88017x59122xDAS-40278” OR “MON89034x1507xDAS-40278” OR “MON89034xMON88017xDAS-40278” OR “MON89034x59122xDAS-40278” OR “1507xMON88017xDAS-40278” OR “1507x59122xDAS-40278” OR “MON88017x59122xDAS-40278” OR “MON89034xDAS-40278” OR “1507xDAS-40278” OR “MON88017xDAS-40278” OR “59122xDAS-40278” OR tc1507 OR “tc-1507” OR DAS01507 OR “DAS-01507” OR DASØ15Ø7 OR “DAS-Ø15Ø7” OR “1507 corn” OR “1507 maize” OR “maize 1507” OR “corn 1507” OR das59122 OR “das-59122” OR “59122 corn” OR “59122 maize” OR “maize 59122” OR “corn 59122” OR “DP-ØØ4114” OR “dp-004114” OR dp004114 OR DP4114 OR DAS40278 OR “DAS-40278” OR DAS4Ø278 OR “DAS-4Ø278” OR “40278 corn” OR “40278 maize” OR “maize 40278” OR “corn 40278”) AND (FIRST\_PDATE:[2020-01-01 TO 2100-12-31])

## Appendix 2. Eligibility/Inclusion Criteria<sup>3</sup>

Concept	Criteria
Population (taking into account scope of the authorisation)	<p>Publication addressing human and animal health, and/or the environment relevant for the scope of the authorisation.</p> <p>The pathways and level of exposure to the GMO, derived food/feed products, and the intended traits addressed in the study (as assessed under the Intervention/exposure part) are relevant for the intended uses of the GMO and derived food/feed products under regulatory review (e.g. in case of an authorisation for food, food, import, efficacy of the traits, pest susceptibility, etc. are not considered relevant).</p>
Intervention/exposure	Publication addressing authorised GM maize <sup>2</sup> and derived food/feed products, and/or the intended traits (newly expressed protein(s) or their combination, when applicable).
Intervention/exposure Plant species	In case of studies using GM plants, only studies using maize are considered eligible. This criterion is not employed for studies regarding the newly expressed proteins.
Intervention/exposure Source organism of the protein	In case of publications using the protein of interest, only publications with the protein from the specific source organism will be considered eligible.
Comparator	If the study is a comparative study that uses plant material as test material, eligible publications must report a non-GM variety.
Outcomes	<p>Effects/impacts on human and animal health, and/or the environment are addressed.</p> <p>Publications addressing other issues such as benefits, socio-economics, ethics, crop protection, detection methods, efficacy, public perception and risk communication are to be excluded using this criterion, as they are not relevant to the risk assessment of GMOs.</p>
Reporting format	<p>Original/primary data are presented in the study. This permits the exclusion of publications that do not present original/primary data (e.g., reviews, editorial, position papers).</p> <p>However, risk assessments from relevant risk assessment bodies (excluding EFSA) will not be excluded.</p>

<sup>3</sup> This table is provided for ease of reference, no updates have been introduced since the previous report.

### **Appendix 3. Entries retrieved by the performed searches to literature databases for the authorised GM maize within the indicated search period**

Note: the numbering of the references in the different appendixes is independent of each other (e.g. a certain reference might be called EFSA 2021a in one appendix and EFSA 2021b in another)

#### **1. Entries retrieved using Web of Science Core collection**

- Abdelgaffar H, Perera OP and Jurat-Fuentes JL, **2021**. ABCtransporter mutations inCry1F-resistant fall armyworm (*Spodoptera frugiperda*) do not result in altered susceptibility to selected small molecule pesticides. *Pest Management Science* 77, 949-955. 10.1002/ps.6106
- Albrecht AJP, de Brito I, Albrecht LP, Silva AFM, de Matos AKA, Carbonari CA and Velini ED, **2020**. Metabolic changes, agronomic performance, and quality of seeds in soybean with the pat gene after application of glufosinate. *Weed Science* 68, 594-604. 10.1017/wsc.2020.74
- Alvarez F, Georgiadis M, Messean A, Streissl F and European Food Safety Authority EFS, **2020**. Assessment of the 2018 post-market environmental monitoring report on the cultivation of genetically modified maize MON 810 in the EU. *Efsa Journal* 18, 42. 10.2903/j.efsa.2020.6245
- Alves Leite N, Redaelli LR and Sant'Ana J, **2020**. Fitness, acceptance and olfactory responses of *Trichogramma pretiosum* on eggs of *Spodoptera frugiperda* fed with Cryl Ac soybean. *Bulletin of Insectology* 73, 217-224.
- Amaral FSA, Guidolin AS, Salmeron E, Kanno RH, Padovez FEO, Faretto JC and Omoto C, **2020**. Geographical distribution of Vip3Aa20 resistance allele frequencies in *Spodoptera frugiperda* (Lepidoptera: Noctuidae) populations in Brazil. *Pest Management Science* 76, 169-178. 10.1002/ps.5490
- Amin MR, Oh SD and Suh SJ, **2020**. Comparing the effects of GM and non-GM soybean varieties on non-target arthropods. *Entomological Research* 50, 423-432. 10.1111/1748-5967.12461
- Anderson JA, Mickelson J, Challender M, Moelling E, Sult T, TeRonde S, Walker C, Wang YW and Maxwell CA, **2020**. Agronomic and compositional assessment of genetically modified DP23211 maize for corn rootworm control. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 11, 206-214. 10.1080/21645698.2020.1770556
- Arpaia S, **2021**. Environmental risk assessment in agro-ecosystems: Revisiting the concept of receiving environment after the EFSA guidance document. *Ecotoxicology and Environmental Safety* 208, 8. 10.1016/j.ecoenv.2020.111676
- Babu A, Reisig DD, Pes MP, Ranger CM, Chamkasem N and Reding ME, **2021**. Effects of chlorantraniliprole residual on *Helicoverpa zea* in Bt and non-Bt cotton. *Pest Management Science* 77, 2367-2374. 10.1002/ps.6263
- Bacalhau FB, Dourado PM, Horikoshi RJ, Carvalho RA, Semeao A, Martinelli S, Berger GU, Head GP, Salvadori JR and Bernardi O, **2020**. Performance of Genetically Modified Soybean Expressing the Cry1A.105, Cry2Ab2, and Cry1Ac Proteins Against Key Lepidopteran Pests in Brazil. *Journal of Economic Entomology* 113, 2883-2889. 10.1093/jee/toaa236
- Bengyella L, Hetsa BA, Fonmboh DJ and Jose RC, **2021**. Assessment of damage caused by evolved fall armyworm on native and transgenic maize in South Africa. *Phytoparasitica* 49, 1-12. 10.1007/s12600-020-00862-z
- Bertho L, Schmidt K, Schmidtke J, Brants I, Canton RF, Novillo C and Head G, **2020**. Results from ten years of post-market environmental monitoring of genetically modified MON 810 maize in the European Union. *PloS one* 15, 19.



- 10.1371/journal.pone.0217272
- Bilbo TR, Reay-Jones FPF and Greene JK, **2020**. Evaluation of Insecticide Thresholds in Late-Planted Bt and Non-Bt Corn for Management of Fall Armyworm (Lepidoptera: Noctuidae). *Journal of Economic Entomology* 113, 814-823. 10.1093/jee/toz364
- Boaventura D, Bolzan A, Padovez FEO, Okuma DM, Omoto C and Nauen R, **2020**. Detection of a ryanodine receptor target-site mutation in diamide insecticide resistant fall armyworm, *Spodoptera frugiperda*. *Pest Management Science* 76, 47-54. 10.1002/ps.5505
- Boaventura D, Martin M, Pozzebon A, Mota-Sanchez D and Nauen R, **2020**. Monitoring of Target-Site Mutations Conferring Insecticide Resistance in *Spodoptera frugiperda*. *Insects* 11, 15. 10.3390/insects11080545
- Boaventura D, Ulrich J, Lueke B, Bolzan A, Okuma D, Gutbrod O, Geibel S, Zeng Q, Dourado PM, Martinelli S, Flágel L, Head G and Nauen R, **2020**. Molecular characterization of CryIF resistance in fall armyworm, *Spodoptera frugiperda* from Brazil. *Insect biochemistry and molecular biology* 116, 11. 10.1016/j.ibmb.2019.103280
- Boonchaisri S, Rochfort S, Stevenson T and Dias DA, **2021**. LC-MS untargeted metabolomics assesses the delayed response of glufosinate treatment of transgenic glufosinate resistant (GR) buffalo grasses (*Stenotaphrum secundatum* L.). *Metabolomics* 17, 17. 10.1007/s11306-021-01776-5
- Bouwer G, **2020**. A Framework for Effective Bt Maize IRM Programs: Incorporation of Lessons Learned From *Busseola fusca* Resistance Development. *Frontiers in Bioengineering and Biotechnology* 8, 7. 10.3389/fbioe.2020.00717
- Bowen D, Yin Y, Flasiński S, Chay C, Bean G, Milligan J, Moar W, Pan A, Werner B, Buckman K, Howe A, Ciche T, Turner K, Pleau M, Zhang J, Kouadio JL, Hibbard BE, Price P and Roberts J, **2021**. Cry75Aa (Mpp75Aa) Insecticidal Proteins for Controlling the Western Corn Rootworm, *Diabrotica virgifera virgifera* LeConte (Coleoptera: Chrysomelidae), Isolated from the Insect-Pathogenic Bacterium *Brevibacillus laterosporus*. *Applied and Environmental Microbiology* 87, 16. 10.1128/aem.02507-20
- Bramlett M, Plaetinck G and Maienfisch P, **2020**. RNA-Based Biocontrols-A New Paradigm in Crop Protection. *Engineering* 6, 522-527. 10.1016/j.eng.2019.09.008
- Brara Z, Costa J, Villa C, Grazina L, Bitam A and Mafra I, **2020**. Surveying genetically modified maize in foods marketed in Algeria. *Food Control* 109, 8. 10.1016/j.foodcont.2019.106928
- Brewer TR and Bonsall MB, **2021**. Combining refuges with transgenic insect releases for the management of an insect pest with non-recessive resistance to Bt crops in agricultural landscapes. *Journal of Theoretical Biology* 509, 11. 10.1016/j.jtbi.2020.110514
- Brookes G and Dinh TX, **2021**. The impact of using genetically modified (GM) corn/maize in Vietnam: Results of the first farm-level survey. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 71-83. 10.1080/21645698.2020.1816800
- Carlson AB, Mukerji P, Mathesius CA, Huang E, Herman R, Hoban D, Thurman JD and Roper JM, **2020**. DP-2empty set2216-6 maize does not adversely affect rats in a 90-day feeding study. *Regulatory Toxicology and Pharmacology* 117, 7. 10.1016/j.yrtph.2020.104779
- Carriere Y, Brown Z, Aglasan S, Dutilleul P, Carroll M, Head G, Tabashnik BE, Jorgensen PS and Carroll SP, **2020**. Crop rotation mitigates impacts of corn rootworm resistance to transgenic Bt corn. *Proceedings of the National Academy of Sciences of the United States of America* 117, 18385-18392. 10.1073/pnas.2003604117

- Carriere Y, Degain B, Harpold VS, Unnithan GC and Tabashnik BE, **2020**. Gene Flow Between Bt and Non-Bt Plants in a Seed Mixture Increases Dominance of Resistance to Pyramided Bt Corn in *Helicoverpa zea* (Lepidoptera: Noctuidae). *Journal of Economic Entomology* 113, 2041-2051. 10.1093/jee/toaa138
- Chung SH, Feng HL and Jander G, **2021**. Engineering pest tolerance through plant-mediated RNA interference. *Current Opinion in Plant Biology* 60, 9. 10.1016/j.pbi.2021.102029
- Coates BS, Abel CA, Swoboda-Bhattarai KA, Palmquist DE, Montezano DG, Zukoff SN, Wang YZ, Bradshaw JD, DiFonzo CD, Shields E, Tilmon KJ, Hunt TE and Peterson JA, **2020**. Geographic Distribution of *Bacillus thuringiensis* Cry1F Toxin Resistance in Western Bean Cutworm (Lepidoptera: Noctuidae) Populations in the United States. *Journal of Economic Entomology* 113, 2465-2472. 10.1093/jee/toaa136
- Costa EN, Fernandes MG, Medeiros PH and Evangelista BMD, **2020**. Resistance of maize landraces from Brazil to fall armyworm (Lepidoptera: Noctuidae) in the winter and summer seasons. *Bragantia* 79, 377-386. 10.1590/1678-4499.20200034
- de Souza MWR, Ferreira EA, dos Santos JB, Soares MA, Castro B and Zanuncio JC, **2020**. Fluorescence of chlorophyll a in transgenic maize with herbicide application and attacked by *Spodoptera frugiperda* (Lepidoptera: Noctuidae). *Phytoparasitica* 48, 567-573. 10.1007/s12600-020-00816-5
- Deguenon JM, Dhammi A, Ponnusamy L, Travanty NV, Cave G, Lawrie R, Mott D, Reisig D, Kurtz R and Roe RM, **2021**. Bacterial Microbiota of Field-Collected *Helicoverpa zea* (Lepidoptera: Noctuidae) from Transgenic Bt and Non-Bt Cotton. *Microorganisms* 9, 15. 10.3390/microorganisms9040878
- Devos Y, De Sanctis G, Neri FM and Messean A, **2021**. EFSA is working to advance the environmental risk assessment of genetically modified crops to better protect butterflies and moths. *Efsa Journal* 19, 5. 10.2903/j.efsa.2021.e190301
- Dively GP, Kuhar TP, Taylor S, Doughty HB, Holmstrom K, Gilrein D, Nault BA, Ingerson-Mahar J, Whalen J, Reisig D, Frank DL, Fleischer SJ, Owens D, Welty C, Reay-Jones FPF, Porter P, Smith JL, Saguez J, Murray S, Wallingford A, Byker H, Jensen B, Burkness E, Hutchison WD and Hamby KA, **2021**. Sweet Corn Sentinel Monitoring for Lepidopteran Field-Evolved Resistance to Bt Toxins. *Journal of Economic Entomology* 114, 307-319. 10.1093/jee/toaa264
- Dominguez-Arrizabalaga M, Villanueva M, Escriche B, Ancin-Azpilicueta C and Caballero P, **2020**. Insecticidal Activity of *Bacillus thuringiensis* Proteins against Coleopteran Pests. *Toxins* 12, 29. 10.3390/toxins12070430
- Eghrari K, Oliveira SC, Nascimento AM, Queiroz B, Fatoreto J, de Souza BHS, Fernandes OA and Moro GV, The implications of homozygous vip3Aa20- and cry1Ab-maize on *Spodoptera frugiperda* control. *Journal of Pest Science* 13. 10.1007/s10340-021-01362-7
- Fabrick JA, Mathew LG, LeRoy DM, Hull JJ, Unnithan GC, Yelich AJ, Carriere Y, Li XC and Tabashnik BE, **2020**. Reduced cadherin expression associated with resistance to Bt toxin Cry1Ac in pink bollworm. *Pest Management Science* 76, 67-74. 10.1002/ps.5496
- Fabrick JA, LeRoy DM, Mathew LG, Wu YD, Unnithan GC, Yelich AJ, Carriere Y, Li XC and Tabashnik BE, **2021**. CRISPR-mediated mutations in the ABC transporter gene ABCA2 confer pink bollworm resistance to Bt toxin Cry2Ab. *Scientific Reports* 11, 11. 10.1038/s41598-021-89771-7
- Fanela TLM, Baldin ELL, Hunt TE and Faria RD, **2020**. Baseline Plant-to-Plant Larval Movement of *Spodoptera eridania* in Bt and Non-Bt Soybean and Its Possible Impacts on IRM. *Journal of Economic Entomology* 113, 1741-1752.

- 10.1093/jee/toaa079
- Fast BJ, Shan GM, Gampala SS and Herman R, **2020**. Transgene expression in sprayed and non-sprayed herbicide-tolerant genetically engineered crops is equivalent. *Regulatory Toxicology and Pharmacology* 111, 8. 10.1016/j.yrtph.2019.104572
- Fritz ML, Nunziata SO, Guo R, Tabashnik BE and Carriere Y, **2020**. Mutations in a Novel Cadherin Gene Associated with Bt Resistance in *Helicoverpa zea*. *G3-Genes Genomes Genetics* 10, 1563-1574. 10.1534/g3.120.401053
- Garcia JR, Vargas AAM, Perboni LT, Souza EA, Tessaro D, Lucio FR and Agostinetto D, **2020**. Physiological attributes of Enlist E3 (TM) soybean seed submitted to herbicides application. *Planta Daninha* 38, 6. 10.1590/s0100-83582020380100088
- Garcia-Ruiz E, Cobos G, Sanchez-Ramos I, Pascual S, Chueca MC, Escorial MC, Santin-Montanya I, Loureiro I and Gonzalez-Nunez M, Dynamics of canopy-dwelling arthropods under different weed management options, including glyphosate, in conventional and genetically modified insect-resistant maize. *Insect science* 18. 10.1111/1744-7917.12825
- Gassmann AJ, Shrestha RB, Kropf AL, St Clair CR and Brenizer B, **2020**. Field-evolved resistance by western corn rootworm to Cry34/35Ab1 and other *Bacillus thuringiensis* traits in transgenic maize. *Pest Management Science* 76, 268-276. 10.1002/ps.5510
- Gassmann AJ, **2021**. Resistance to Bt Maize by Western Corn Rootworm: Effects of Pest Biology, the Pest-Crop Interaction and the Agricultural Landscape on Resistance. *Insects* 12, 16. 10.3390/insects12020136
- Gilreath RT, Kerns DL, Huang FN and Yang F, **2021**. No positive cross-resistance to Cry1 and Cry2 proteins favors pyramiding strategy for management of Vip3Aa resistance in *Spodoptera frugiperda*. *Pest Management Science* 77, 1963-1970. 10.1002/ps.6224
- Gomez I, Ocelotl J, Sanchez J, Aguilar-Medel S, Pena-Chora G, Lina-Garcia L, Bravo A and Soberon M, **2020**. *Bacillus thuringiensis* Cry1Ab Domain III beta-22 Mutants with Enhanced Toxicity to *Spodoptera frugiperda* (J. E. Smith). *Applied and Environmental Microbiology* 86, 11. 10.1128/aem.01580-20
- Goncalves J, Rodrigues JVC, Santos-Amaya OF, Paula-Moraes SV and Pereira EJG, **2020**. The oviposition behavior of fall armyworm moths is unlikely to compromise the refuge strategy in genetically modified Bt crops. *Journal of Pest Science* 93, 965-977. 10.1007/s10340-020-01219-5
- Gordy CL and Goller CC, **2020**. Using Metabolic Engineering to Connect Molecular Biology Techniques to Societal Challenges. *Frontiers in Microbiology* 11, 7. 10.3389/fmicb.2020.577004
- Guan F, Zhang JP, Shen HW, Wang XL, Padovan A, Walsh TK, Tay WT, Gordon KHJ, James W, Czepak C, Otim MH, Kachigamba D and Wu YD, **2021**. Whole-genome sequencing to detect mutations associated with resistance to insecticides and Bt proteins in *Spodoptera frugiperda*. *Insect science* 28, 627-638. 10.1111/1744-7917.12838
- Gupta M, Kumar H and Kaur S, **2021**. Vegetative Insecticidal Protein (Vip): A Potential Contender From *Bacillus thuringiensis* for Efficient Management of Various Detrimental Agricultural Pests. *Frontiers in Microbiology* 12, 28. 10.3389/fmicb.2021.659736
- Gutierrez-Moreno R, Mota-Sanchez D, Blanco CA, Chandrasena D, Difonzo C, Conner J, Head G, Berman K and Wise J, **2020**. Susceptibility of Fall Armyworms (*Spodoptera frugiperda* JE) from Mexico and Puerto Rico to Bt Proteins. *Insects* 11, 14. 10.3390/insects11120831

- Haile F, Nowatzki T and Storer N, **2021**. Overview of Pest Status, Potential Risk, and Management Considerations of *Helicoverpa armigera* (Lepidoptera: Noctuidae) for US Soybean Production. *Journal of Integrated Pest Management* 12, 10. 10.1093/jipm/pmaa030
- Hao J, Li YH, Wang JX, Xu CX, Gao MJ, Chen W, Zhang X, Hu XD, Liu Y and Liu XJ, **2020**. Screening and activity identification of an anti-idiotypic nanobody for Bt Cry1F toxin from the camelid naive antibody phage display library. *Food and Agricultural Immunology* 31, 16. 10.1080/09540105.2019.1691156
- He LM, Zhao SY, Gao XW and Wu KM, **2021**. Ovipositional responses of *Spodoptera frugiperda* on host plants provide a basis for using Bt-transgenic maize as trap crop in China. *Journal of Integrative Agriculture* 20, 804-814. 10.1016/s2095-3119(20)63334-2
- Heckel DG, **2021**. The Essential and Enigmatic Role of ABC Transporters in Bt Resistance of Noctuids and Other Insect Pests of Agriculture. *Insects* 12, 16. 10.3390/insects12050389
- Horikoshi RJ, Vertuan H, de Castro AA, Morrell K, Griffith C, Evans A, Tan JG, Asimwe P, Anderson H, Jose M, Dourado PM, Berger G, Martinelli S and Head G, A new generation of Bt maize for control of fall armyworm (*Spodoptera frugiperda*). *Pest Management Science* 10. 10.1002/ps.6334
- Hu X, Boeckman CJ, Cong B, Steimel JP, Richtman NM, Sturtz K, Wang YW, Walker CL, Yin JM, Unger A, Farris C and Lu AL, **2020**. Characterization of DvSSJ1 transcripts targeting the smooth septate junction (SSJ) of western corn rootworm (*Diabrotica virgifera virgifera*). *Scientific Reports* 10, 13. 10.1038/s41598-020-68014-1
- Huang FN, **2021**. Dominance and fitness costs of insect resistance to genetically modified *Bacillus thuringiensis* crops. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 192-211. 10.1080/21645698.2020.1852065
- Huang FN, **2021**. Resistance of the fall armyworm, *Spodoptera frugiperda*, to transgenic *Bacillus thuringiensis* Cry1F corn in the Americas: lessons and implications for Bt corn IRM in China. *Insect science* 28, 574-589. 10.1111/1744-7917.12826
- Huseth AS, D'Ambrosio DA and Kennedy GG, **2020**. Understanding the potential impact of continued seed treatment use for resistance management in Cry1Aa2.834\_16 Bt cotton against *Frankliniella fusca*. *PloS one* 15, 12. 10.1371/journal.pone.0239910
- Ingber DA, McDonald JH, Mason CE and Flexner L, Oviposition preferences, Bt susceptibilities, and tissue feeding of fall armyworm (Lepidoptera: Noctuidae) host strains. *Pest Management Science* 9. 10.1002/ps.6434
- Jhala AJ, Beckie HJ, Peters TJ, Culpepper AS and Norsworthy JK, **2021**. Interference and management of herbicide-resistant crop volunteers. *Weed Science* 69, 257-273. 10.1017/wsc.2021.3
- Jin MH, Tao JH, Li Q, Cheng Y, Sun XX, Wu KM and Xiao YT, **2021**. Genome editing of the SfABCC2 gene confers resistance to Cry1F toxin from *Bacillus thuringiensis* in *Spodoptera frugiperda*. *Journal of Integrative Agriculture* 20, 815-820. 10.1016/s2095-3119(19)62772-3
- Katta S, Talakayala A, Reddy MK, Addepally U and Garladinne M, **2020**. Development of transgenic cotton (Narasimha) using triple gene Cry2Ab-Cry1F-Cry1Ac construct conferring resistance to lepidopteran pest. *Journal of Biosciences* 45, 11. 10.1007/s12038-020-0006-0
- Kerns DD, Kerns DL, Lorenz GM, Catchot AL and Stewart SD, **2020**. Impact of Various Bt Cotton Traits and the Application of an Insecticide on the Within Plant Distribution of *Helicoverpa zea* (Lepidoptera: Noctuidae) Larvae and Injured Floral

- Structures. *Journal of Cotton Science* 24, 148-158.
- Khan MH, Jander G, Mukhtar Z, Arshad M, Sarwar M and Asad S, **2020**. Comparison of in Vitro and in Planta Toxicity of Vip3A for Lepidopteran Herbivores. *Journal of Economic Entomology* 113, 2959-2971. 10.1093/jee/toaa211
- Krogh PH, Kostov K and Damgaard CF, **2020**. The effect of Bt crops on soil invertebrates: a systematic review and quantitative meta-analysis. *Transgenic Research* 29, 487-498. 10.1007/s11248-020-00213-y
- Kunte N, McGraw E, Bell S, Held D and Avila LA, **2020**. Prospects, challenges and current status of RNAi through insect feeding. *Pest Management Science* 76, 26-41. 10.1002/ps.5588
- Lawrie RD, Mitchell RD, Deguenon JM, Ponnusamy L, Reisig D, Del Pozo-Valdivia A, Kurtz RW and Roe RM, **2020**. Multiple Known Mechanisms and a Possible Role of an Enhanced Immune System in Bt-Resistance in a Field Population of the Bollworm, *Helicoverpa zea*: Differences in Gene Expression with RNAseq. *International Journal of Molecular Sciences* 21, 24. 10.3390/ijms21186528
- Lee MS, Ardanuy A, Juarez-Escario A and Albajes R, **2021**. Sampling and selection of butterfly indicators for general surveillance of genetically modified maize in north-east Spain. *Ecological Indicators* 124, 11. 10.1016/j.ecolind.2021.107380
- Li XW, Du LX, Zhang L, Peng YF, Hua HX, Romeis J and Li YH, Reduced *Mythimna separata* infestation on Bt corn could benefit aphids. *Insect science* 8. 10.1111/1744-7917.12833
- Li GP, Huang JR, Ji TJ, Tian CH, Zhao XC and Feng HQ, **2020**. Baseline susceptibility and resistance allele frequency in *Ostrinia furnacalis* related to Cry1 toxins in the Huanghuaihai summer corn region of China. *Pest Management Science* 76, 4311-4317. 10.1002/ps.5999
- Li XY, Miyamoto K, Takasu Y, Wada S, Iizuka T, Adegawa S, Sato R and Watanabe K, **2020**. ATP-Binding Cassette Subfamily a Member 2 Is a Functional Receptor for *Bacillus thuringiensis* Cry2A Toxins in *Bombyx mori*, But Not for Cry1A, Cry1C, Cry1D, Cry1F, or Cry9A Toxins. *Toxins* 12, 14. 10.3390/toxins12020104
- Li YH, Hallerman EM, Wu KM and Peng YF, **2020**. Insect-Resistant Genetically Engineered Crops in China: Development, Application, and Prospects for Use. In: *Annual Review of Entomology*, Vol 65. Ed Douglas AE. Annual Reviews, Palo Alto, 273-292. 10.1146/annurev-ento-011019-025039
- Li GP, Feng HQ, Ji TJ, Huang JR and Tian CH, **2021**. What type of Bt corn is suitable for a region with diverse lepidopteran pests: A laboratory evaluation. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 115-124. 10.1080/21645698.2020.1831728
- Liang JG, Zhang DD, Li DY, Zhao SY, Wang CY, Xiao YT, Xu D, Yang YZ, Li GP, Wang LL, Gao Y, Yang XQ, Yuan HB, Liu J, Zhang XJ and Wu KM, **2021**. Expression profiles of Cry1Ab protein and its insecticidal efficacy against the invasive fall armyworm for Chinese domestic GM maize DBN9936. *Journal of Integrative Agriculture* 20, 792-803. 10.1016/s2095-3119(20)63475-x
- Liu SS, Jaouannet M, Dempsey DA, Imani J, Coustau C and Kogel KH, **2020**. RNA-based technologies for insect control in plant production. *Biotechnology Advances* 39, 13. 10.1016/j.biotechadv.2019.107463
- Liu WX, Liu XR, Liu C, Zhang Z and Jin WJ, **2020**. Development of a sensitive monoclonal antibody-based sandwich ELISA to detect Vip3Aa in genetically modified crops. *Biotechnology Letters* 42, 1467-1478. 10.1007/s10529-020-02854-9
- Lohn AF, Trtikova M, Chapela I, Van den Berg J, du Plessis H and Hilbeck A, **2020**. Transgene behavior in *Zea mays* L. crosses across different genetic backgrounds:

- Segregation patterns, cry1Ab transgene expression, insecticidal protein concentration and bioactivity against insect pests. *PloS one* 15, 28. 10.1371/journal.pone.0238523
- Lohn AF, Trtikova M, Chapela I, Binimelis R and Hilbeck A, **2021**. Transgene behavior in genetically modified teosinte hybrid plants: transcriptome expression, insecticidal protein production and bioactivity against a target insect pest. *Environmental Sciences Europe* 33, 13. 10.1186/s12302-021-00506-x
- Lovei GL, Lang A, Ferrante M and Bacle V, Can the growing of transgenic maize threaten protected Lepidoptera in Europe? *Insect science* 10. 10.1111/1744-7917.12849
- Machado EP, Rodrigues GL, Somavilla JC, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Survival and development of *Spodoptera eridania*, *Spodoptera cosmioides* and *Spodoptera albula* (Lepidoptera: Noctuidae) on genetically-modified soybean expressing Cry1Ac and Cry1F proteins. *Pest Management Science* 76, 4029-4035. 10.1002/ps.5955
- Machado EP, Rodrigues GLD, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Cross-crop resistance of *Spodoptera frugiperda* selected on Bt maize to genetically-modified soybean expressing Cry1Ac and Cry1F proteins in Brazil. *Scientific Reports* 10, 9. 10.1038/s41598-020-67339-1
- Malaquias JB, Godoy WAC, Caprio MA, Pachu J, Ramalho FD, Omoto C and Ferreira CP, Evolutionary process modeling with Bayesian inference of *Spodoptera frugiperda* ballooning and walking dispersal in Bt and non-Bt cotton plant mixtures. *Entomologia Experimentalis Et Applicata* 11. 10.1111/eea.13045
- Malaquias JB, Caprio MA, Godoy WAC, Omoto C, Ramalho FS and Pachu JKS, **2020**. Experimental and theoretical landscape influences on *Spodoptera frugiperda* movement and resistance evolution in contaminated refuge areas of Bt cotton. *Journal of Pest Science* 93, 329-340. 10.1007/s10340-019-01145-1
- McDonald J, Burns A and Raybould A, **2020**. Advancing ecological risk assessment on genetically engineered breeding stacks with combined insect-resistance traits. *Transgenic Research* 29, 135-148. 10.1007/s11248-019-00185-8
- Meinke LJ, Souza D and Siegfried BD, **2021**. The Use of Insecticides to Manage the Western Corn Rootworm, *Diabrotica virgifera virgifera*, LeConte: History, Field-Evolved Resistance, and Associated Mechanisms. *Insects* 12, 22. 10.3390/insects12020112
- Meissle M, Kloos S and Romeis J, **2021**. Fate of multiple Bt proteins from stacked Bt maize in the predatory lady beetle *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae). *Environmental Pollution* 268, 10. 10.1016/j.envpol.2020.115421
- Mendes RR, Franchini LHM, Lucio FR, Zobiolo LHS and Oliveira RS, **2020**. Aryloxyphenoxypropionates tolerant and non-tolerant corn: plant-back interval after acetyl-coA-carboxylase inhibitors applications. *Planta Daninha* 38, 8. 10.1590/50100-83582020380100062
- Meyer CJ, Norsworthy JK and Kruger GR, **2020**. What antagonistic interactions mean for Enlist and Roundup Ready Xtend technologies. *Crop Forage & Turfgrass Management* 6, 12. 10.1002/cft2.20044
- Moscardini VF, Marques LH, Santos AC, Rossetto J, Silva O, Rampazzo PE and Castro BA, **2020**. Efficacy of *Bacillus thuringiensis* (Bt) maize expressing Cry1F, Cry1A.105, Cry2Ab2 and Vip3Aa20 proteins to manage the fall armyworm (Lepidoptera: Noctuidae) in Brazil. *Crop Protection* 137, 8. 10.1016/j.cropro.2020.105269

- Muraro DS, Stacke RF, Cossa GE, Godoy DN, Garlet CG, Valmorbida I, O'Neal ME and Bernardi O, **2020**. Performance of Seed Treatments Applied on Bt and Non-Bt Maize Against Fall Armyworm (Lepidoptera: Noctuidae). *Environmental Entomology* 49, 1137-1144. 10.1093/ee/nvaa088
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Dumont AF, Federici S, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Modified EPG, **2020**. Scientific Opinion on application EFSA-GMO-NL-2016-132 for authorisation of genetically modified of insect-resistant and herbicide-tolerant soybean DAS-81419-2 x DAS-44406-6 for food and feed uses, import and processing submitted in accordance with Regulation (EC) No 1829/2003 by Dow Agrosiences LCC. *Efsa Journal* 18, 37. 10.2903/j.efsa.2020.6302
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Dumont AF, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and O EPGM, **2020**. Assessment of genetically modified maize MZIR098 for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-DE-2017-142). *Efsa Journal* 18, 28. 10.2903/j.efsa.2020.6171
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Fernandez A, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Or EPGM, **2021**. Assessment of genetically modified maize 1507 x MIR162 x MON810 x NK603 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2015-127). *Efsa Journal* 19, 40. 10.2903/j.efsa.2021.6348
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Dumont AF, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Or EPGM, **2021**. Assessment of genetically modified maize MON 87427 x MON 87460 x MON 89034 x 1507 x MON 87411 x 59122 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2017-139). *Efsa Journal* 19, 45. 10.2903/j.efsa.2021.6351
- Nascimento PT, Von Pinho RG, Fadini MAM, Souza CSF and Valicente FH, **2020**. Does Singular and Stacked Corn Affect Choice Behavior for Oviposition and Feed in *Spodoptera frugiperda* (Lepidoptera: Noctuidae)? *Neotropical Entomology* 49, 302-310. 10.1007/s13744-019-00750-0
- Nascimento PT, Fadini MAM, Rocha MS, Souza CSF, Barros BA, Melo JOF, Von Pinho RG and Valicente FH, **2021**. Response of *Trichogramma pretiosum* females (Hymenoptera: Trichogrammatidae) to herbivore-induced Bt maize volatiles. *Arthropod-Plant Interactions* 15, 107-125. 10.1007/s11829-020-09801-5
- Niu XP, Kassa A, Hasler J, Griffin S, Perez-Ortega C, Procyk L, Zhang J, Kapka-Kitzman DM, Nelson ME and Lu A, **2020**. Functional validation of DvABCB1 as a receptor of Cry3 toxins in western corn rootworm, *Diabrotica virgifera virgifera*. *Scientific Reports* 10, 13. 10.1038/s41598-020-72572-9

- Niz JM, Salvador R, Ferrelli ML, de Cap AS, Romanowski V and Berretta MF, **2020**. Genetic variants in Argentinean isolates of *Spodoptera frugiperda* Multiple Nucleopolyhedrovirus. *Virus Genes* 56, 401-405. 10.1007/s11262-020-01741-9
- Onstad DW, Caprio MA and Pan ZQ, **2020**. Models of *Diabrotica* Populations: Demography, Population Genetics, Geographic Spread, and Management. *Insects* 11, 23. 10.3390/insects11100712
- Ortega CP, Leininger C, Barry J, Poland B, Yalpani N, Altier D, Nelson ME and Lu ALL, **2021**. Coordinated binding of a two-component insecticidal protein from *Alcaligenes faecalis* to western corn rootworm midgut tissue. *Journal of Invertebrate Pathology* 183, 10. 10.1016/j.jip.2021.107597
- Overton K, Maino JL, Day R, Umina PA, Bett B, Carnovale D, Ekesi S, Meagher R and Reynolds OL, **2021**. Global crop impacts, yield losses and action thresholds for fall armyworm (*Spodoptera frugiperda*): A review. *Crop Protection* 145, 15. 10.1016/j.cropro.2021.105641
- Pachu JKS, Macedo FCO, Malaquias JB, Ramalho FS, Oliveira RF, Franco FP and Godoy WAC, **2021**. Electrical signalling on Bt and non-Bt cotton plants under stress by *Aphis gossypii*. *PloS one* 16, 15. 10.1371/journal.pone.0249699
- Paddock KJ, Pereira AE, Finke DL, Ericsson AC, Hibbard BE and Shelby KS, Host resistance to *Bacillus thuringiensis* is linked to altered bacterial community within a specialist insect herbivore. *Molecular ecology* 16. 10.1111/mec.15875
- Paddock KJ, Hibbard BE, Barry J, Sethi A, Mueller AL, Shelby KS and Pereira AE, **2021**. Restoration of susceptibility following removal of selection for Cry34/35Ab1 resistance documents fitness costs in resistant population of western corn rootworm, *Diabrotica virgifera virgifera*. *Pest Management Science* 77, 2385-2394. 10.1002/ps.6266
- Pan HP, Yang XW, Romeis J, Siegfried BD and Zhou XG, **2020**. Dietary RNAi toxicity assay exhibits differential responses to ingested dsRNAs among lady beetles. *Pest Management Science* 76, 3606-3614. 10.1002/ps.5894
- Pereira AE, Huynh MP, Sethi A, Miles AL, French BW, Ellersieck MR, Coudron TA, Shelby KS and Hibbard BE, **2020**. Baseline Susceptibility of a Laboratory Strain of Northern Corn Rootworm, *Diabrotica barberi* (Coleoptera: Chrysomelidae) to *Bacillus thuringiensis* Traits in Seedling, Single Plant, and Diet-Toxicity Assays. *Journal of Economic Entomology* 113, 1955-1962. 10.1093/jee/toaa107
- Pinos D, Chakroun M, Millan-Leiva A, Jurat-Fuentes JL, Wright DJ, Hernandez-Martinez P and Ferre J, **2020**. Reduced Membrane-Bound Alkaline Phosphatase Does Not Affect Binding of Vip3Aa in a *Heliothis virescens* Resistant Colony. *Toxins* 12, 12. 10.3390/toxins12060409
- Portilla M, Blanco CA, Arias R and Zhu YC, **2020**. Effect of Two *Bacillus thuringiensis* Proteins on Development of the Fall Armyworm after Seven-Day Exposure. *Southwestern Entomologist* 45, 389-403. 10.3958/059.045.0208
- Pruter LS, Weaver M and Brewer MJ, **2020**. Overview of Risk Factors and Strategies for Management of Insect-Derived Ear Injury and Aflatoxin Accumulation for Maize Grown in Subtropical Areas of North America. *Journal of Integrated Pest Management* 11, 8. 10.1093/jipm/pmaa005
- Quan YD, Yang J, Wang YQ, Hernandez-Martinez P, Ferre J and He KL, **2021**. The Rapid Evolution of Resistance to Vip3Aa Insecticidal Protein in *Mythimna separata* (Walker) Is Not Related to Altered Binding to Midgut Receptors. *Toxins* 13, 8. 10.3390/toxins13050364
- Rabelo MM, Matos JML, Orozco-Restrepo SM, Paula-Moraes SV and Pereira EJG, **2020**. Like Parents, Like Offspring? Susceptibility to Bt Toxins, Development on Dual-



- Gene Bt Cotton, and Parental Effect of Cry1Ac on a Nontarget Lepidopteran Pest. *Journal of Economic Entomology* 113, 1234-1242. 10.1093/jee/toaa051
- Rabelo MM, Matos JML, Santos-Amaya OF, Franca JC, Goncalves J, Paula-Moraes SV, Guedes RNC and Pereira EJG, **2020**. Bt-toxin susceptibility and hormesis-like response in the invasive southern armyworm (*Spodoptera eridania*). *Crop Protection* 132, 7. 10.1016/j.cropro.2020.105129
- Rabelo MM, Paula-Moraes SV, Pereira EJG and Siegfried BD, **2020**. Demographic Performance of *Helicoverpa zea* Populations on Dual and Triple-Gene Bt Cotton. *Toxins* 12, 16. 10.3390/toxins12090551
- Ramos LN, Souza NOS and Vilela MS, **2020**. AGRONOMIC PARAMETERS AND MORPHO-AGRONOMIC CHARACTERISTICS OF GENETICALLY MODIFIED MAIZE HYBRIDS COMPARED TO CONVENTIONAL MAIZE HYBRIDS. *Bioscience Journal* 36, 1156-1166. 10.14393/BJ-v36n4a2020-47973
- Raszyk TJ, Suh CPC, Dickens CM and Sword GA, **2020**. Genome-wide markers reveal temporal instability of local population genetic structure in the cotton fleahopper, *Pseudatomoscelis seriatus* (Hemiptera: Miridae). *Pest Management Science* 76, 324-332. 10.1002/ps.5518
- Reay-Jones FPF, Bilbo TR and Reisig DD, **2020**. Decline in Sublethal Effects of Bt Corn on Corn Earworm (*Lepidoptera*: Noctuidae) Linked to Increasing Levels of Resistance. *Journal of Economic Entomology* 113, 2241-2249. 10.1093/jee/toaa163
- Riaz S, Nasir IA, Bhatti MU, Adeyinka OS, Toufiq N, Yousaf I and Tabassum B, **2020**. Resistance to *Chilo infuscatellus* (*Lepidoptera*: Pyraloidea) in transgenic lines of sugarcane expressing *Bacillus thuringiensis* derived Vip3A protein. *Molecular Biology Reports* 47, 2649-2658. 10.1007/s11033-020-05355-0
- Riaz S, Johnson JB, Ahmad M, Fitt GP and Naiker M, **2021**. A review on biological interactions and management of the cotton bollworm, *Helicoverpa armigera* (*Lepidoptera*: Noctuidae). *Journal of Applied Entomology* 145, 467-498. 10.1111/jen.12880
- Rivero-Borja M, Rodriguez-Maciel JC, Gutierrez JAU, Silva-Aguayo G, Chandrasena DI, Felix-Bermudez NC and Storer NP, **2020**. Baseline of Susceptibility to the Cry1F Protein in Mexican Populations of Fall Armyworm. *Journal of Economic Entomology* 113, 390-398. 10.1093/jee/toz280
- Roberts A, Boeckman CJ, Muhl M, Romeis J, Teem JL, Valicente FH, Brown JK, Edwards MG, Levine SL, Melnick RL, Rodrigues TB, Velez AM, Zhou XG and Hellmich RL, **2020**. Sublethal Endpoints in Non-target Organism Testing for Insect-Active GE Crops. *Frontiers in Bioengineering and Biotechnology* 8, 10. 10.3389/fbioe.2020.00556
- Rolim GD, Plata-Rueda A, Martinez LC, Ribeiro GT, Serrao JE and Zanuncio JC, **2020**. Side effects of *Bacillus thuringiensis* on the parasitoid *Palmistichus elaeis* (Hymenoptera: Eulophidae). *Ecotoxicology and Environmental Safety* 189, 8. 10.1016/j.ecoenv.2019.109978
- Romeis J and Widmer F, **2020**. Assessing the Risks of Topically Applied dsRNA-Based Products to Non-target Arthropods. *Frontiers in Plant Science* 11, 11. 10.3389/fpls.2020.00679
- Rozadilla G, Cabrera NA, Virla EG, Greco NM and McCarthy CB, **2020**. Gut microbiota of *Spodoptera frugiperda* (JE Smith) larvae as revealed by metatranscriptomic analysis. *Journal of Applied Entomology* 144, 351-363. 10.1111/jen.12742
- Saikai Y, Hurley TM and Mitchell PD, **2021**. An agent-based model of insect resistance management and mitigation for Bt maize: a social science perspective. *Pest Management Science* 77, 273-284. 10.1002/ps.6016

- Samples CA, Kruger GR, Dodds DM, Irby JT, Reynolds DB and Catchot AL, **2021**. Injury Potential from Herbicide Combinations in Enlist (R) Cotton. *Journal of Cotton Science* 25, 51-57.
- Schmidt-Jeffris RA, Moretti EA, Wickings K, Wolfin MS, Northfield TD, Linn CE and Nault BA, **2021**. Conventional Soil Management May Promote Nutrients That Lure an Insect Pest to a Toxic Crop. *Environmental Entomology* 50, 433-443. 10.1093/ee/nvaa167
- Shin WR, Lee MJ, Sekhon SS, Kim JH, Kim SC, Cho BK, Ahn JY and Kim YN, **2020**. Aptamer-linked immobilized sorbent assay for detecting GMO marker, phosphinothricin acetyltransferase (PAT). *Molecular & Cellular Toxicology* 16, 253-261. 10.1007/s13273-020-00087-5
- Shrestha RB and Gassmann AJ, **2020**. Inheritance and Fitness Costs of Cry3Bb1 Resistance in Diapausing Field Strains of Western Corn Rootworm (Coleoptera: Chrysomelidae). *Journal of Economic Entomology* 113, 2873-2882. 10.1093/jee/toaa213
- Shwe SM, Prabu S, Chen Y, Li QC, Jing DP, Bai SX, He KL and Wang ZY, **2021**. Baseline Susceptibility and Laboratory Selection of Resistance to Bt Cry1Ab Protein of Chinese Populations of Yellow Peach Moth, *Conogethes punctiferalis* (Guenee). *Toxins* 13, 12. 10.3390/toxins13050335
- Shwe SM, Wang YQ, Gao ZP, Li X, Liu S, Bai SX, Zhang TT, He KL and Wang ZY, **2021**. Toxicity of Cry1-Class, Cry2Aa, and Vip3Aa19 Bt proteins and their interactions against yellow peach Moth, *Conogethes punctiferalis* (Guenee) (Lepidoptera: Crambidae). *Journal of Invertebrate Pathology* 178, 6. 10.1016/j.jip.2020.107507
- Shyam C, Chahal PS, Jhala AJ and Jugulam M, **2021**. Management of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) in 2,4-D-, glufosinate-, and glyphosate-resistant soybean. *Weed Technology* 35, 136-143. 10.1017/wet.2020.91
- Singh M, Randhawa G, Bhoge RK, Singh S, Kak A and Sangwan O, **2020**. Monitoring Adventitious Presence of Transgenes in Cotton Collections from Genebank and Experimental Plots: Ensuring GM-Free Conservation and Cultivation of Genetic Resources. *Agricultural Research* 9, 469-476. 10.1007/s40003-019-00449-z
- Soga K, Kimata S, Narushima J, Sato S, Sato E, Mano J, Takabatake R, Kitta K, Kawakami H, Akiyama H, Kondo K and Nakamura K, **2020**. Development and Testing of an Individual Kernel Detection System for Genetically Modified Soybean Events in Non-identity-preserved Soybean Samples. *Biological & Pharmaceutical Bulletin* 43, 1259-1266. 10.1248/bpb.b20-00382
- Souza CSF, Silveira LCP, Souza BHS, Nascimento PT, Damasceno NCR and Mendes SM, **2021**. Efficiency of biological control for fall armyworm resistant to the protein Cry1F. *Brazilian Journal of Biology* 81, 154-163. 10.1590/1519-6984.224774
- St Clair CR, Clifton EH, Dunbar MW, Masloski KE, Paolino AR, Shrestha RB and Gassmann AJ, **2020**. Applying a Selection Experiment to Test for Fitness Costs of Bt Resistance in Western Corn Rootworm (Coleoptera: Chrysomelidae) and the Effect of Density on Fitness Costs. *Journal of Economic Entomology* 113, 2473-2479. 10.1093/jee/toaa168
- St Clair CR, Head GP and Gassmann AJ, **2020**. Comparing Populations of Western Corn Rootworm (Coleoptera: Chrysomelidae) in Regions With and Without a History of Injury to Cry3 Corn. *Journal of Economic Entomology* 113, 1839-1849. 10.1093/jee/toaa106
- St Clair CR, Head GP and Gassmann AJ, **2020**. Western corn rootworm abundance, injury to corn, and resistance to Cry3Bb1 in the local landscape of previous problem fields. *PloS one* 15, 22. 10.1371/journal.pone.0237094

- St Clair CR and Gassmann AJ, **2021**. Linking land use patterns and pest outbreaks in Bt maize. *Ecological Applications* 31, 11. 10.1002/eap.2295
- Striegel A, Lawrence NC, Knezevic SZ, Krumm JT, Hein G and Jhala AJ, **2020**. Control of glyphosate/glufosinate-resistant volunteer corn in corn resistant to aryloxyphenoxypropionates. *Weed Technology* 34, 309-317. 10.1017/wet.2020.41
- Su HH, Jiang T, Sun Y, Gu HJ, Wu JJ and Yang YZ, **2020**. Effect of three insect-resistant maizes expressing Cry1Ie, Cry1Ab/Cry2Aj and Cry1Ab on the growth and development of armyworm *Mythimna separata* (Walker). *Journal of Integrative Agriculture* 19, 1842-1849. 10.1016/s2095-3119(20)63162-8
- Suby SB, Soujanya PL, Yadava P, Patil J, Subaharan K, Prasad GS, Babu KS, Jat SL, Yathish KR, Vadassery J, Kalia VK, Bakthavatsalam N, Shekhar JC and Rakshit S, **2020**. Invasion of fall armyworm (*Spodoptera frugiperda*) in India: nature, distribution, management and potential impact. *Current Science* 119, 44-51. 10.18520/cs/v119/i1/44-51
- Syed T, Askari M, Meng ZG, Li YY, Abid MA, Wei YX, Guo SD, Liang CZ and Zhang R, **2020**. Current Insights on Vegetative Insecticidal Proteins (Vip) as Next Generation Pest Killers. *Toxins* 12, 24. 10.3390/toxins12080522
- Tabashnik BE and Carriere Y, **2020**. Evaluating Cross-resistance Between Vip and Cry Toxins of *Bacillus thuringiensis*. *Journal of Economic Entomology* 113, 553-561. 10.1093/jee/toz308
- Tabashnik BE, Liesner LR, Ellsworth PC, Unnithan GC, Fabrick JA, Naranjo SE, Li XC, Dennehy TJ, Antilla L, Staten RT and Carriere Y, **2021**. Transgenic cotton and sterile insect releases synergize eradication of pink bollworm a century after it invaded the United States. *Proceedings of the National Academy of Sciences of the United States of America* 118, 5. 10.1073/pnas.2019115118
- Tessnow AE, Behmer ST and Sword GA, **2021**. Protein-carbohydrate regulation and nutritionally mediated responses to Bt are affected by caterpillar population history. *Pest Management Science* 77, 335-342. 10.1002/ps.6022
- Tonnang HEZ, Balemi T, Masuki KF, Mohammed I, Adewopo J, Adnan AA, Mudereri BT, Vanlauwe B and Craufurd P, **2020**. Rapid Acquisition, Management, and Analysis of Spatial Maize (*Zea mays* L.) Phenological Data-Towards 'Big Data' for Agronomy Transformation in Africa. *Agronomy-Basel* 10, 12. 10.3390/agronomy10091363
- Valadares NR, Soares MA, Ferreira EA, Mendes-Sa VG, Azevedo AM, Pires EM and Leite GLD, **2021**. Behavior and development of *Tetranychus ludeni* Zacher, 1913 (Acari: Tetranychidae) and physiological stress in genetically modified cotton expressing Cry1F and Cry1Ac proteins. *Brazilian Journal of Biology* 81, 251-257. 10.1590/1519-6984.222652
- Velez AM, Fishilevich E, Rangasamy M, Khajuria C, McCaskill DG, Pereira AE, Gandra P, Frey MLF, Worden SE, Whitlock SL, Lo W, Schnelle KD, Lutz JR, Narva KE and Siegfried BD, **2020**. Control of western corn rootworm via RNAi traits in maize: lethal and sublethal effects of Sec23 dsRNA. *Pest Management Science* 76, 1500-1512. 10.1002/ps.5666
- Vieira BC, Butts TR, Rodrigues AO, Schleier JJ, Fritz BK and Kruger GR, **2020**. Particle drift potential of glyphosate plus 2,4-D choline pre-mixture formulation in a low-speed wind tunnel. *Weed Technology* 34, 520-527. 10.1017/wet.2020.15
- Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, **2021**. Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. *Chemosphere* 264, 7. 10.1016/j.chemosphere.2020.128538

- Voothuluru P, Makela P, Zhu JM, Yamaguchi M, Cho IJ, Oliver MJ, Simmonds J and Sharp RE, **2020**. Apoplastic Hydrogen Peroxide in the Growth Zone of the Maize Primary Root. Increased Levels Differentially Modulate Root Elongation Under Well-Watered and Water-Stressed Conditions. *Frontiers in Plant Science* 11, 18. 10.3389/fpls.2020.00392
- Walsh GC, Avila CJ, Cabrera N, Nava DE, Pinto AD and Weber DC, **2020**. Biology and Management of Pest *Diabrotica* Species in South America. *Insects* 11, 18. 10.3390/insects11070421
- Wang WJ, Cai WL, Wang ZJ, Zhao J and Hua HX, **2020**. A new method for evaluating the effects of insecticidal proteins expressed by transgenic plants on ectoparasitoid of target pest. *Environmental Science and Pollution Research* 27, 29983-29992. 10.1007/s11356-020-08664-w
- Wang XL, Xu YJ, Huang JL, Jin WZ, Yang YH and Wu YD, **2020**. CRISPR-Mediated Knockout of the ABCC2 Gene in *Ostrinia furnacalis* Confers High-Level Resistance to the *Bacillus thuringiensis* Cry1Fa Toxin. *Toxins* 12, 12. 10.3390/toxins12040246
- Wang ZJ, Cai WL, Wang WJ, Zhao J, Li YF, Zou YL, Elgizawy KK and Hua HX, **2020**. Assessing the effects of Cry2Aa protein on *Habrobracon hebetor* (Hymenoptera: Braconidae), a parasitoid of Indian meal moth, *Plodia interpunctella* (Lepidoptera: Pyralidae). *Ecotoxicology and Environmental Safety* 194, 7. 10.1016/j.ecoenv.2020.110380
- Wang L, Wang XH, Gao FQ, Lv CN, Li LK, Han T and Chen FJ, **2021**. AMF Inoculation Can Enhance Yield of Transgenic Bt Maize and Its Control Efficiency Against *Mythimna separata* Especially Under Elevated CO<sub>2</sub>. *Frontiers in Plant Science* 12, 16. 10.3389/fpls.2021.655060
- Wheeler TA, Siders K, Monclova-Santana C and Dever JK, **2020**. The relationship between commercial cotton cultivars with varying *Meloidogyne incognita* resistance genes and yield. *Journal of Nematology* 52, 8. 10.21307/jofnem-2020-064
- Wolf SA and Ghosh R, **2020**. A practice-centered analysis of environmental accounting standards: integrating agriculture into carbon governance. *Land Use Policy* 96, 10. 10.1016/j.landusepol.2018.08.003
- Xu JY, Cao JJ, Zheng QY, Yang LL, Wang Y and Zou MQ, **2020**. High-throughput Identification and Detection of 17 Transgenic Maize Events Based on Taqman Microfluidic Chip Technology. *Chinese Journal of Analytical Chemistry* 48, 1477-1485. 10.19756/j.issn.0253-3820.201287
- Yan X, Lu J, Ren M, He Y, Wang Y, Wang Z and He K, **2020**. Insecticidal Activity of 11 Bt toxins and 3 Transgenic Maize Events Expressing Vip3Aa19 to Black Cutworm, *Agrotis ipsilon* (Hufnagel). *Insects* 11, 10. 10.3390/insects11040208
- Yang F, Gonzalez JCS, Little N, Reisig D, Payne G, Dos Santos RF, Jurat-Fuentes JL, Kurtz R and Kerns DL, **2020**. First documentation of major Vip3Aa resistance alleles in field populations of *Helicoverpa zea* (Boddie) (Lepidoptera: Noctuidae) in Texas, USA. *Scientific Reports* 10, 8. 10.1038/s41598-020-62748-8
- Yang F, Head GP, Price PA, Gonzalez JCS and Kerns DL, **2020**. Inheritance of *Bacillus thuringiensis* Cry2Ab2 protein resistance in *Helicoverpa zea* (Lepidoptera: Noctuidae). *Pest Management Science* 76, 3676-3684. 10.1002/ps.5916
- Yang F, Gonzalez JCS, Head GP, Price PA and Kerns DL, **2021**. Multiple and non-recessive resistance to Bt proteins in a Cry2Ab2-resistant population of *Helicoverpa zea*. *Crop Protection* 145, 5. 10.1016/j.cropro.2021.105650
- Yang F, Williams J, Huang FN and Kerns DL, **2021**. Genetic basis and cross-resistance of Vip3Aa resistance in *Spodoptera frugiperda* (Lepidoptera: Noctuidae) derived from Texas, USA. *Crop Protection* 147, 6. 10.1016/j.cropro.2021.105702

- Yang J, Sun XQ, Zhu-Salzman K, Qin QM, Feng HQ, Kong XD, Zhou XG and Cai QN, **2021**. Host-induced gene silencing of brown planthopper glutathione S-transferase gene enhances rice resistance to sap-sucking insect pests. *Journal of Pest Science* 94, 769-781. 10.1007/s10340-020-01296-6
- Yen S, Ren BY, Zeng B and Shen J, **2020**. Improving RNAi efficiency for pest control in crop species. *Biotechniques* 68, 283-290. 10.2144/btn-2019-0171
- Yin Y, Flasiński S, Moar W, Bowen D, Chay C, Milligan J, Kouadio JL, Pan A, Werner B, Buckman K, Zhang J, Mueller G, Preftakes C, Hibbard BE, Price P and Roberts J, **2020**. A new *Bacillus thuringiensis* protein for Western corn rootworm control. *PloS one* 15, 16. 10.1371/journal.pone.0242791
- Yu WB, Lin SC, Dimase M, Niu Y, Brown S, Head GP, Price PA, Reay-Jones FPF, Cook D, Reisig D, Thrash B, Ni XZ, Paula-Moraes SV and Huang FN, **2021**. Extended investigation of field-evolved resistance of the corn earworm *Helicoverpa zea* (Lepidoptera: Noctuidae) to *Bacillus thuringiensis* Cry1A.105 and Cry2Ab2 proteins in the southeastern United States. *Journal of Invertebrate Pathology* 183, 7. 10.1016/j.jip.2021.107560
- Zhang L, Liu B, Zheng WG, Liu CH, Zhang DN, Zhao SY, Li ZY, Xu PJ, Wilson K, Withers A, Jones CM, Smith JA, Chipabika G, Kachigamba DL, Nam K, D'Alencon E, Liu B, Liang XY, Jin MH, Wu C, Chakrabarty S, Yang XM, Jiang YY, Liu J, Liu XL, Quan WP, Wang GR, Fan W, Qian WQ, Wu KM and Xiao YT, **2020**. Genetic structure and insecticide resistance characteristics of fall armyworm populations invading China. *Molecular Ecology Resources* 20, 1682-1696. 10.1111/1755-0998.13219
- Zhao Z, Elisk CG, Hibbard BE and Shelby KS, Detection of alternative splicing in western corn rootworm (*Diabrotica virgifera virgifera* LeConte) in association with eCry3.1Ab resistance using RNA-seq and PacBio Iso-Seq. *Insect Molecular Biology* 10. 10.1111/imb.12709
- Zhou CZ, Luo XX, Chen NY, Zhang LL and Gao JT, **2020**. C-P Natural Products as Next-Generation Herbicides: Chemistry and Biology of Glufosinate. *Journal of Agricultural and Food Chemistry* 68, 3344-3353. 10.1021/acs.jafc.0c00052

## 2. Entries retrieved using CAB Abstracts

- Abdelgaffar H, Perera OP and Jurat-Fuentes JL, **2020**. ABC transporter mutations in Cry1F-resistant fall armyworm (*Spodoptera frugiperda*) do not result in altered susceptibility to selected small molecule pesticides. *Pest Management Science* 77, 949-955. 10.1002/ps.6106
- Ai Y, Yang F and Pan G, **2020**. FAPAS proficiency testing results and analysis of qualitative detection of genetically modified ingredients in baked food. *Journal of Food Safety and Quality* 11, 2427-2432.
- Albrecht AJP, Brito IPFSd, Albrecht LP, Silva AFM, Matos AKAd, Carbonari CA and Velini ED, **2020**. Metabolic changes, agronomic performance, and quality of seeds in soybean with the Pat gene after application of glufosinate. *Weed Science* 68, 594-604. 10.1017/wsc.2020.74
- Alvarez F, Georgiadis M, Messean A and Streissl F, **2020**. Assessment of the 2018 post-market environmental monitoring report on the cultivation of genetically modified maize MON 810 in the EU. *Efsa Journal* 18. 10.2903/j.efsa.2020.6245
- Anderson JA, Mickelson J, Challender M, Moellring E, Sult T, Teronde S, Walker C, Wang Y and Maxwell CA, **2020**. Agronomic and compositional assessment of genetically modified DP23211 maize for corn rootworm control. *GM Crops and Food: Biotechnology in Agriculture and the Food Chain* 11, 206-214. 10.1080/21645698.2020.1770556

- Aparna A and Deepa A, **2020**. The red flour beetle *Tribolium castaneum*: a model for host-microbiome interactions. *PloS one* 15. 10.1371/journal.pone.0239051
- Babu A, Reisig DD, Pes MP, Ranger CM, Chamkasem N and Reding ME, **2021**. Effects of chlorantraniliprole residual on *Helicoverpa zea* in Bt and non-Bt cotton. *Pest Management Science* 77, 2367-2374. 10.1002/ps.6263
- Barontini JM, Druetta MA, Luna IM, Torrico AK, Zanon MSA, Paccioretti PA, Maurino MF, Paz Gimenez Pecci Mdl and Chulze SN, **2020**. Performance of transgenic maize genotypes against ear caterpillars in Argentina. *Maydica* 65.
- Bengyella L, Hetsa BA, Fonmboh DJ and Jose RC, **2020**. Assessment of damage caused by evolved fall armyworm on native and transgenic maize in South Africa. *Phytoparasitica* 49, 1-12. 10.1007/s12600-020-00862-z
- Bertho L, Schmidt K, Schmidtke J, Brants I, Canton RF, Novillo C and Head G, **2020**. Results from ten years of post-market environmental monitoring of genetically modified MON 810 maize in the European Union. *PloS one* 15. 10.1371/journal.pone.0217272
- Bilbo TR, Reay-Jones FPF and Greene JK, **2020**. Evaluation of insecticide thresholds in late-planted Bt and non-Bt corn for management of fall armyworm (Lepidoptera: Noctuidae). *Journal of Economic Entomology* 113, 814-823. 10.1093/jee/toz364
- Boaventura D, Martin M, Pozzebon A, Mota-Sanchez D and Nauen R, **2020**. Monitoring of target-site mutations conferring insecticide resistance in *Spodoptera frugiperda*. *Insects* 11. 10.3390/insects11080545
- Camargo AM, Arias-Martin M, Castanera P and Farinos GP, **2020**. Performance of *Sesamia nonagrioides* on cultivated and wild host plants: implications for Bt maize resistance management. *Pest Management Science* 76, 3657-3666. 10.1002/ps.5913
- Carlson AB, Mukerji P, Mathesius CA, Huang E, Herman RA, Hoban D, Thurman JD and Roper JM, **2020**. DP-202216-6 maize does not adversely affect rats in a 90-day feeding study. *Regulatory Toxicology and Pharmacology* 117. 10.1016/j.yrtph.2020.104779
- Carriere Y, Degain BA, Harpold VS, Unnithan GC and Tabashnik BE, **2020**. Gene flow between Bt and non-Bt plants in a seed mixture increases dominance of resistance to pyramided Bt corn in *Helicoverpa zea* (Lepidoptera: Noctuidae). *Journal of Economic Entomology* 113, 2041-2051. 10.1093/jee/toaa138
- Carriere Y, Degain BA and Tabashnik BE, **2020**. Effects of gene flow between Bt and non-Bt plants in a seed mixture of Cry1A.105 + Cry2Ab corn on performance of corn earworm in Arizona. *Pest Management Science* 77, 2106-2113. 10.1002/ps.6239
- Coates BS, Abel CA, Swoboda-Bhattarai KA, Palmquist DE, Montezano DG, Zukoff SN, Wang Y, Bradshaw JD, Difonzo CD, Shields E, Tilmon KJ, Hunt TE and Peterson JA, **2020**. Geographic distribution of *Bacillus thuringiensis* Cry1F toxin resistance in western bean cutworm (Lepidoptera: Noctuidae) populations in the United States. *Journal of Economic Entomology* 113, 2465-2472. 10.1093/jee/toaa136
- Costa EN, Fernandes MG, Medeiros PH and Evangelista B, **2020**. Resistance of maize landraces from Brazil to fall armyworm (Lepidoptera: Noctuidae) in the winter and summer seasons. *Bragantia* 79, 377-386. 10.1590/1678-4499.20200034
- Dimase M, Oyediran I, Brown S, Walker W, Guo J, Yu W, Zhang Y, Chen J, Wen Z and Huang F, **2020**. Larval movement and survival of *Helicoverpa zea* (Boddie) in seed blends of non-Bt and Bt maize containing Agrisure Viptera trait: implications for resistance management. *Crop Protection* 138. 10.1016/j.cropro.2020.105339
- Dively GP, Huang F, Oyediran I, Burd T and Morsello S, **2020**. Evaluation of gene flow in structured and seed blend refuge systems of non-Bt and Bt corn. *Journal of Pest Science* 93, 439-447. 10.1007/s10340-019-01126-4

- Dively GP, Kuhar TP, Taylor S, Doughty HB, Holmstrom K, Gilrein D, Nault BA, Ingerson-Mahar J, Whalen J, Reisig D, Frank DL, Fleischer SJ, Owens D, Welty C, Reay-Jones FPF, Porter P, Smith JL, Saguez J, Murray S, Wallingford A, Byker H, Jensen B, Burkness E, Hutchison WD and Hamby KA, **2020**. Sweet corn sentinel monitoring for lepidopteran field-evolved resistance to Bt toxins. *Journal of Economic Entomology* 114, 307-319. 10.1093/jee/toaa264
- Fisher KE, Flexner JL and Mason CE, **2020**. Plant preferences of Z-pheromone race *Ostrinia nubilalis* (Lepidoptera: Crambidae) based on leaf tissue consumption rates. *Journal of Economic Entomology* 113, 1563-1567. 10.1093/jee/toaa047
- Fritz ML, Nunziata SO, Guo R, Tabashnik BE and Carriere Y, **2020**. Mutations in a novel cadherin gene associated with Bt resistance in *Helicoverpa zea*. *G3: Genes, Genomes, Genetics* 10, 1563-1574. 10.1534/g3.120.401053
- Garcia JR, Vargas AAM, Perboni LT, Souza EA, Tessaro D, Lucio FR and Agostinetto D, **2020**. Physiological attributes of enlist E3 soybean seed submitted to herbicides application. *Planta Daninha* 38. 10.1590/s0100-83582020380100088
- Gilreath RT, Kerns DL, Huang F and Yang F, **2020**. No positive cross-resistance to cry1 and cry2 proteins favors pyramiding strategy for management of vip3aa resistance in *Spodoptera frugiperda*. *Pest Management Science* 77, 1963-1970. 10.1002/ps.6224
- Gomez I, Ocelotl J, Sanchez J, Aguilar-Medel S, Pena-Chora G, Lina-Garcia L, Bravo A and Soberon M, **2020**. *Bacillus thuringiensis* Cry1Ab domain III beta-22 mutants with enhanced toxicity to *Spodoptera frugiperda* (j. e. Smith). *Applied and Environmental Microbiology* 86. 10.1128/aem.01580-20
- Goncalves J, Rodrigues JVC, Santos-Amaya OF, Paula-Moraes SV and Pereira EJG, **2020**. The oviposition behavior of fall armyworm moths is unlikely to compromise the refuge strategy in genetically modified Bt crops. *Journal of Pest Science* 93, 965-977. 10.1007/s10340-020-01219-5
- Guan F, Zhang J, Shen H, Wang X, Padovan A, Walsh TK, Tay WT, Gordon KHJ, James W, Czapak C, Otim MH, Kachigamba D and Wu Y, **2020**. Whole-genome sequencing to detect mutations associated with resistance to insecticides and Bt proteins in *Spodoptera frugiperda*. *Insect science* 28, 627-638. 10.1111/1744-7917.12838
- Gutierrez-Moreno R, Mota-Sanchez D, Blanco CA, Chandrasena D, Difonzo C, Conner J, Head G, Berman K and Wise J, **2020**. Susceptibility of fall armyworms (*Spodoptera frugiperda* j.e.) from Mexico and Puerto Rico to Bt proteins. *Insects* 11. 10.3390/insects11120831
- Han W, Zhu Y, Yin J, Li G, Xue Q, Zhang H, Shen H, Su Y, Dou X, Wang K and Zou J, **2020**. Study on genetic evolution of 19 indigenous chicken breeds based on RAD-seq. *Acta Veterinaria et Zootechnica Sinica* 51, 670-678. 10.11843/j.issn.0366-6964.2020.04.003
- Hao J, Li Y, Wang J, Xu C, Gao M, Chen W, Zhang X, Hu X, Liu Y and Liu X, **2020**. Screening and activity identification of an anti-idiotypic nanobody for Bt Cry1F toxin from the camelid naive antibody phage display library. *Food and Agricultural Immunology* 31, 1-16. 10.1080/09540105.2019.1691156
- Hill ZT, Barber LT, Doherty RC, Collie LM and Ross A, **2020**. Prickly sida and grass species control in xtend and enlist soybean systems. *BR Wells Rice Research Studies - Arkansas Agricultural Experiment Station, University of Arkansas System* 159-161.
- Huang F, **2020**. Resistance of the fall armyworm, *Spodoptera frugiperda*, to transgenic *Bacillus thuringiensis* cry1f corn in the Americas: lessons and implications for Bt

- corn irm in China. *Insect science* 28, 574-589. 10.1111/1744-7917.12826
- Jamshidnia M, Kazemitabar SK, Lindermayr C and Zarini HN, **2020**. Transformation of *Nicotiana tabacum* using the herbicide resistance bar gene as a selectable marker. *Acta Horticulturae* 455-461. 10.17660/ActaHortic.2020.1297.60
- Justiniano W, Fernandes MG and Raizer J, **2021**. Toxic bait as an alternative tool in the management of *Spodoptera frugiperda* in second corn crops. *Journal of Agricultural Science (Toronto)* 13, 102-112. 10.5539/jas.v13n3p102
- Krenchinski FH, Carbonari CA, Castro EBd, Rodrigues DM, Cesco VJS, Costa RN and Velini ED, **2020**. Post-emergence application of glufosinate on maize hybrids containing the phosphinothricin acetyltransferase gene (pat). *Australian Journal of Crop Science* 14, 1095-1101. 10.21475/ajcs.20.14.07.p2241
- Lawrie RD, Iii RDM, Deguenon JM, Ponnusamy L, Reisig D, Pozo-Valdivia Ad, Kurtz RW and Roe RM, **2020**. Multiple known mechanisms and a possible role of an enhanced immune system in Bt-resistance in a field population of the bollworm, *Helicoverpa zea*: differences in gene expression with RNAseq. *International Journal of Molecular Sciences* 21. 10.3390/ijms21186528/
- Lee MS, Ardanuy A, Juarez-Escario A and Albajes R, **2021**. Sampling and selection of butterfly indicators for general surveillance of genetically modified maize in north-east Spain. *Ecological Indicators* 124. 10.1016/j.ecolind.2021.107380
- Li G, Huang J, Ji T, Tian C, Zhao X and Feng H, **2020**. Baseline susceptibility and resistance allele frequency in *Ostrinia furnacalis* related to Cry1 toxins in the Huanghuaihai summer corn region of China. *Pest Management Science* 76, 4311-4317. 10.1002/ps.5999
- Li G, Ji T, Chen W, Zhao X, Huang J, Tian C and Feng H, **2020**. Pathological changes in larval midgut tissues of *Ostrinia furnacalis* (Lepidoptera: Crambidae) and *Mythimna separata* (Lepidoptera: Noctuidae) after feeding Cry1F protein. *Chinese Journal of Biological Control* 36, 288-293. 10.16409/j.cnki.2095-039x.2020.02.015
- Li X, Miyamoto K, Takasu Y, Wada S, Iizuka T, Adegawa S, Sato R and Watanabe K, **2020**. ATP-binding cassette subfamily a member 2 is a functional receptor for *Bacillus thuringiensis* Cry2A toxins in *Bombyx mori*, but not for Cry1A, Cry1C, Cry1D, Cry1F, or Cry9A toxins. *Toxins* 12. 10.3390/toxins12020104
- Liang P, Gu S, Zhang L and Gao X, **2020**. Research status and prospect of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in China. *Acta Entomologica Sinica* 63, 624-638. 10.16380/j.kcxb.2020.05.012
- Liu X, Bai S, Wang Z, Wang Y, Wang Q and He K, **2020**. Expression of cry1Ab/cry1Ac fusion protein in the transgenic cry1Ab/cry1Ac maize and its control efficacy against the Asian corn borer, *Ostrinia furnacalis* (Lepidoptera: Crambidae), in the laboratory. *Acta Entomologica Sinica* 63, 1201-1206. 10.16380/j.kcxb.2020.10.005
- Lohn AF, Trtikova M, Chapela I, Berg Jvd, Plessis Hd and Hilbeck A, **2020**. Transgene behavior in *Zea mays* L. crosses across different genetic backgrounds: segregation patterns, crylab transgene expression, insecticidal protein concentration and bioactivity against insect pests. *PloS one* 15. 10.1371/journal.pone.0238523
- Machado EP, Rodrigues Junior GLSd, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Cross-crop resistance of *Spodoptera frugiperda* selected on Bt maize to genetically-modified soybean expressing Cry1Ac and Cry1F proteins in Brazil. *Scientific Reports* 10. 10.1038/s41598-020-67339-1
- Machado EP, S Rodrigues Junior GLd, Somavilla JC, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Survival and development of *Spodoptera eridania*, *Spodoptera cosmioidea* and *Spodoptera albula*



- (Lepidoptera: Noctuidae) on genetically-modified soybean expressing Cry1Ac and Cry1F proteins. *Pest Management Science* 76, 4029-4035. 10.1002/ps.5955
- Machado RAR, Thonen L, Arce CCM, Theepan V, Prada F, Wuthrich D, Robert CAM, Vogiatzaki E, Shi Y, Schaeren OP, Notter M, Bruggmann R, Hapfelmeier S, Bode HB and Erb M, **2020**. Engineering bacterial symbionts of nematodes improves their biocontrol potential to counter the western corn rootworm. *Nature Biotechnology* 38, 600-608. 10.1038/s41587-020-0419-1
- Malaquias JB, Caprio MA, Godoy WAC, Omoto C, Ramalho FS and Pachu JKS, **2020**. Experimental and theoretical landscape influences on *Spodoptera frugiperda* movement and resistance evolution in contaminated refuge areas of Bt cotton. *Journal of Pest Science* 93, 329-340. 10.1007/s10340-019-01145-1
- Manjunath TM, **2020**. Role of transgenic Bt-crops in promoting biological control and integrated pest management. *Journal of Biological Control* 34, 1-7. 10.18311/jbc/2020/23252
- Matova PM, Kamutando CN, Magorokosho C, Kutywayo D, Gutsa F and Labuschagne M, **2020**. Fall-armyworm invasion, control practices and resistance breeding in sub-Saharan Africa. *Crop Science* 60, 2951-2970. 10.1002/csc2.20317
- McCormick AN, Smith LG, Dillon TW, Collie LM, Davis BM and Butts TR, **2020**. Nozzle type effect on coverage and canopy penetration using enlist one and liberty in enlist e3 soybean. *BR Wells Rice Research Studies - Arkansas Agricultural Experiment Station, University of Arkansas System* 140-145.
- Mendes RR, Franchini LHM, Lucio FR, Zobiolo LHS and Oliveira RS, Jr., **2020**. Aryloxyphenoxypropionates tolerant and non-tolerant corn: plant-back interval after acetyl-coA-carboxylase inhibitors applications. *Planta Daninha* 38. 10.1590/s0100-83582020380100062
- Meyer CJ, Norsworthy JK and Kruger GR, **2020**. What antagonistic interactions mean for Enlist and Roundup Ready Xtend technologies. *Crop, Forage & Turfgrass Management* 6. 10.1002/cft2.20044
- Monika S, Gurinderjit R, Bhoge RK, Sushmita S, Anjali K and Omender S, **2020**. Monitoring adventitious presence of transgenes in cotton collections from Genebank and experimental plots: ensuring GM-free conservation and cultivation of genetic resources. *Agricultural Research* 9, 469-476. 10.1007/s40003-019-00449-z
- Moscardini VF, Marques LH, Santos AC, Rossetto J, Silva OABN, Rampazzo PE and Castro BA, **2020**. Efficacy of *Bacillus thuringiensis* (Bt) maize expressing Cry1F, Cry1a.105, Cry2ab2 and Vip3aa20 proteins to manage the fall armyworm (Lepidoptera: Noctuidae) in Brazil. *Crop Protection* 137. 10.1016/j.cropro.2020.105269
- Muraro DS, Stacke RF, Cossa GE, Godoy DN, Garlet CG, Valmorbida I, O'Neal OIME and Bernardi O, **2020**. Performance of seed treatments applied on Bt and non-Bt maize against fall armyworm (Lepidoptera: Noctuidae). *Environmental Entomology* 49, 1137-1144. 10.1093/ee/nvaa088
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Alvarez FVF, Ardizzone M, Sanctis Gd, Devos Y, Dumont AF, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N and et al., **2020**. Assessment of genetically modified maize MZIR 098 for food and feed uses, under regulation (EC) no 1829/2003 (application EFSA -GMO -DE -2017-142). *Efsa Journal* 18. 10.2903/j.efsa.2020.6171
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G,

- Veromann E, Veronesi F, Alvarez F, Ardizzone M, Sanctis Gd, Devos Y, Fernandez A, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM and et al., **2021**. Assessment of genetically modified maize 1507 \* MIR162 \* MON810 \* NK603 and subcombinations, for food and feed uses, under regulation (EC) no 1829/2003 (application EFSA-GMO-NL-2015-127). Efsa Journal 19. 10.2903/j.efsa.2021.6348
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, Sanctis Gd, Fernandez A, Gennaro A, Ruiz JAG, Kagkli DM, Lanzoni A, Neri FM and et al., **2021**. Assessment of genetically modified maize MON 87427 \* MON 87460 \* MON 89034 \* 1507 \* MON 87411 \* 59122 and subcombinations, for food and feed uses, under regulation (EC) no 1829/2003 (application EFSA-GMO-NL-2017-139). Efsa Journal 19. 10.2903/j.efsa.2021.6351
- Nascimento PT, Pinho RRv, Fadini MAM, Souza CSF and Valicente FH, **2020**. Does singular and stacked corn affect choice behavior for oviposition and feed in *Spodoptera frugiperda* (Lepidoptera: Noctuidae)? Neotropical Entomology 49, 302-310. 10.1007/s13744-019-00750-0
- Nascimento PT, Fadini MAM, Rocha MS, Souza CSF, Barros BA, Melo JOF, Pinho RGv and Valicente FH, **2021**. Response of *Trichogramma pretiosum* females (Hymenoptera: Trichogrammatidae) to herbivore-induced Bt maize volatiles. Arthropod - Plant Interactions 15, 107-125. 10.1007/s11829-020-09801-5
- Nitovska IO, Abraimova OY, Duplij VP, Derkach KV, Satarova TM, Rudas VA, Cherchel VY, Dziubetskyi BV and Morgun BV, **2020**. Application of beta-glucuronidase transient expression for selection of maize genotypes competent for genetic transformation. Cytology and Genetics 53, 451-458. 10.3103/s0095452719060082
- Niz JM, Salvador R, Ferrelli ML, Cap ASd, Romanowski V and Berretta MF, **2020**. Genetic variants in Argentinean isolates of *Spodoptera frugiperda* Multiple Nucleopolyhedrovirus. Virus Genes 56, 401-405. 10.1007/s11262-020-01741-9
- Pareddy D, Chennareddy S, Anthony G, Sardesai N, Mall T, Minnicks T, Karpova O, Clark L, Griffin D, Bishop B, Shumway N, Samuel P, Smith K and Sarria R, **2020**. Improved soybean transformation for efficient and high throughput transgenic production. Transgenic Research 29, 267-281. 10.1007/s11248-020-00198-8
- Pavlovic S, Savic J, Milojevic J, Vinterhalter B, Girek Z, Adzic S, Zecevic B and Banjac N, **2020**. Introduction of the nicotiana protein kinase (NPK1) gene by combining *Agrobacterium*-mediated transformation and recurrent somatic embryogenesis to enhance salt tolerance in cauliflower. Plant Cell, Tissue and Organ Culture 143, 635-651. 10.1007/s11240-020-01948-6
- Pereira AE, Huynh MP, Sethi A, Miles AL, French BW, Ellersieck MR, Coudron TA, Shelby KS and Hibbard BE, **2020**. Baseline susceptibility of a laboratory strain of northern corn rootworm, *Diabrotica barberi* (Coleoptera: Chrysomelidae) to *Bacillus thuringiensis* traits in seedling, single plant, and diet-toxicity assays. Journal of Economic Entomology 113, 1955-1962. 10.1093/jee/toaa107
- Petkevicius K, Lofstedt C and Borodina I, **2020**. Insect sex pheromone production in yeasts and plants. Current Opinion in Biotechnology 65, 259-267. 10.1016/j.copbio.2020.07.011
- Pinos D, Chakroun M, Millan-Leiva A, Jurat-Fuentes JL, Wright DJ, Hernandez-Martinez P and Ferre J, **2020**. Reduced membrane-bound alkaline phosphatase does not affect binding of Vip3Aa in a *Heliothis virescens* resistant colony. Toxins 12. 10.3390/toxins12060409

- Portilla M, Blanco CA, Arias R and Zhu Y, **2020**. Effect of two *Bacillus thuringiensis* proteins on development of the fall armyworm after seven-day exposure. *Southwestern Entomologist* 45, 389-404. 10.3958/059.045.0208
- Pozo-Valdivia Aid, Reisig DD, Braswell L, Greene JK, Roberts P and Taylor SV, **2021**. Economic injury levels for Bt-resistant *Helicoverpa zea* (Lepidoptera: Noctuidae) in cotton. *Journal of Economic Entomology* 114, 747-756. 10.1093/je/toab012
- Pruter LS, Weaver M and Brewer MJ, **2020**. Overview of risk factors and strategies for management of insect-derived ear injury and aflatoxin accumulation for maize grown in subtropical areas of North America. *Journal of Integrated Pest Management* 11. 10.1093/jipm/pmaa005
- Rabelo MM, Matos JML, Orozco-Restrepo SM, Paula-Moraes SV and Pereira EJG, **2020**. Like parents, like offspring? Susceptibility to Bt toxins, development on dual-gene Bt cotton, and parental effect of Cry1Ac on a nontarget lepidopteran pest. *Journal of Economic Entomology* 113, 1234-1242. 10.1093/je/toaa051
- Rabelo MM, Matos JML, Santos-Amaya OF, Franca JC, Goncalves J, Paula-Moraes SV, Guedes RNC and Pereira EJG, **2020**. Bt-toxin susceptibility and hormesis-like response in the invasive southern armyworm (*Spodoptera eridania*). *Crop Protection* 132. 10.1016/j.cropro.2020.105129
- Rabelo MM, Paula-Moraes SV, Pereira EJG and Siegfried BD, **2020**. Demographic performance of *Helicoverpa zea* populations on dual and triple-gene Bt cotton. *Toxins* 12. 10.3390/toxins12090551
- Reay-Jones FPF, Bilbo TR and Reisig DD, **2020**. Decline in sublethal effects of Bt corn on corn earworm (Lepidoptera: Noctuidae) linked to increasing levels of resistance. *Journal of Economic Entomology* 113, 2241-2249. 10.1093/je/toaa163
- Rowen E and Tooker JF, **2020**. Fertilizing corn with manure decreases caterpillar performance but increases slug damage. *Environmental Entomology* 49, 141-150. 10.1093/ee/nvz145
- Rozadilla G, Cabrera NA, Virla EG, Greco NM and McCarthy CB, **2020**. Gut microbiota of *Spodoptera frugiperda* (J.E. Smith) larvae as revealed by metatranscriptomic analysis. *Journal of Applied Entomology* 144, 351-363. 10.1111/jen.12742
- Saikai Y, Hurley TM and Mitchell PD, **2020**. An agent-based model of insect resistance management and mitigation for Bt maize: a social science perspective. *Pest Management Science* 77, 273-284. 10.1002/ps.6016
- Shrestha RB and Gassmann AJ, **2020**. Inheritance and fitness costs of Cry3bb1 resistance in diapausing field strains of western corn rootworm (Coleoptera: Chrysomelidae). *Journal of Economic Entomology* 113, 2873-2882. 10.1093/je/toaa213
- Shwe S, Wang Y, Gao Z, Li X, Liu S, Bai S, Zhang T, He K and Wang Z, **2021**. Toxicity of Cry1-class, Cry2aa, and Vip3Aa19 Bt proteins and their interactions against yellow peach moth, *Conogethes punctiferalis* (Guenée) (Lepidoptera: Crambidae). *Journal of Invertebrate Pathology* 178. 10.1016/j.jip.2020.107507
- Shyam C, Chahal PS, Jhala AJ and Jugulam M, **2020**. Management of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) in 2,4-D-, glufosinate-, and glyphosate-resistant soybean. *Weed Technology* 35, 136-143. 10.1017/wet.2020.91
- Souza MWRd, Ferreira EA, Santos JBd, Soares MA, Castro e Castro BMd and Zanuncio JC, **2020**. Fluorescence of chlorophyll a in transgenic maize with herbicide application and attacked by *Spodoptera frugiperda* (Lepidoptera: Noctuidae). *Phytoparasitica* 48, 567-573. 10.1007/s12600-020-00816-5
- St. Clair CR, Clifton EH, Dunbar MW, Masloski KE, Paolino AR, Shrestha RB and Gassmann AJ, **2020**. Applying a selection experiment to test for fitness costs of Bt resistance in western corn rootworm (Coleoptera: Chrysomelidae) and the effect of

- density on fitness costs. *Journal of Economic Entomology* 113, 2473-2479. 10.1093/jee/toaa168
- St. Clair CR, Head GP and Gassmann AJ, **2020**. Western corn rootworm abundance, injury to corn, and resistance to Cry3Bb1 in the local landscape of previous problem fields. *PloS one* 15. 10.1371/journal.pone.0237094
- St. Clair CR, Head GP and Gassmann AJ, **2020**. Comparing populations of Western corn rootworm (Coleoptera: Chrysomelidae) in regions with and without a history of injury to Cry3 corn. *Journal of Economic Entomology* 113, 1839-1849. 10.1093/jee/toaa106
- Su H, Jiang T, Sun Y, Gu H, Wu J and Yang Y, **2020**. Effect of three insect-resistant maizes expressing Cry1Ie, Cry1Ab/Cry2Aj and Cry1Ab on the growth and development of armyworm *Mythimna separata* (Walker). *Journal of Integrative Agriculture* 19, 1842-1849. 10.1016/s2095-3119(20)63162-8
- Syed T, Askari M, Meng Z, Li Y, Abid MA, Wei Y, Guo S, Liang C and Zhang R, **2020**. Current insights on vegetative insecticidal proteins (Vip) as next generation pest killers. *Toxins* 12. 10.3390/toxins12080522
- Tavares CS, Santos-Amaya OF, Oliveira EE, Paula-Moraes SV and Pereira EJG, **2021**. Facing Bt toxins growing up: developmental changes of susceptibility to Bt corn hybrids in fall armyworm populations and the implications for resistance management. *Crop Protection* 146. 10.1016/j.cropro.2021.105664
- Tessnow AE, Behmera ST and Sworda GA, **2020**. Protein-carbohydrate regulation and nutritionally mediated responses to Bt are affected by caterpillar population history. *Pest Management Science* 77, 335-342. 10.1002/ps.6022
- Tonnang HEZ, Balemi T, Masuki KF, Mohammed I, Adewopo J, Adnan AA, Mudereri BT, Vanlauwe B and Craufurd P, **2020**. Rapid acquisition, management, and analysis of spatial maize (*Zea mays* L.) phenological data - towards 'big data' for agronomy transformation in Africa. *Agronomy* 10. 10.3390/agronomy10091363
- Velez AM, Fishilevich E, Rangasamy M, Khajuria C, McCaskill DG, Pereira AE, Gandra P, Frey ML, Worden SE, Whitlock SL, Lo W, Schnelle KD, Lutz JR, Narva KE and Siegfried BD, **2020**. Control of western corn rootworm via RNAi traits in maize: lethal and sublethal effects of Sec23 DsRNA. *Pest Management Science* 76, 1500-1512. 10.1002/ps.5666
- Velez-Gavilan J, **2020**. *Lemna aequinoctialis* (lesser duckweed). *Invasive Species Compendium*. 10.1079/isc.121132.20203483098
- Vieira BC, Butts TR, Rodrigues AO, Schleier JJS, III, Fritz BK and Kruger GR, **2020**. Particle drift potential of glyphosate plus 2,4-D choline pre-mixture formulation in a low-speed wind tunnel. *Weed Technology* 34, 520-527. 10.1017/wet.2020.15
- Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, **2021**. Assessing the effects of an acute exposure to worst-case concentration of cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. *Chemosphere* 264. 10.1016/j.chemosphere.2020.128538
- Visser A and Berg Jvd, **2020**. Bigger, faster, stronger: implications of inter-species interactions for IRM of lepidopteran pests of Bt maize in Africa. *Journal of Integrated Pest Management* 11. 10.1093/jipm/pmaa014
- Visser A, Plessis Hd, Erasmus A and Berg Jvd, **2020**. Plant abandonment by *Busseola fusca* (Lepidoptera: Noctuidae) larvae: do Bt toxins have an effect? *Insects* 11. 10.3390/insects11020077
- Visser A, Plessis Hd, Erasmus A and Berg Jvd, **2020**. Larval migration behaviour of *Busseola fusca* (Lepidoptera: Noctuidae) on Bt and non-Bt maize under semi-field and field conditions. *Insects* 11. 10.3390/insects11010016

- Walsh GC, Avila CJ, Cabrera N, Nava DE, Pinto AdS and Weber DC, **2020**. Biology and management of pest *Diabrotica* species in South America. *Insects* 11. 10.3390/insects11070421
- Wolf SA and Ghosh R, **2020**. A practice-centered analysis of environmental accounting standards: integrating agriculture into carbon governance. *Land Use Policy* 96. 10.1016/j.landusepol.2018.08.003
- Xu H, Wang J, Wei J, Zhu J and Lin F, **2020**. Insect population genetic regulation and reproductive characteristic interference and their prospects on controlling *Spodoptera frugiperda*. *Journal of South China Agricultural University* 41, 1-8. 10.7671/j.issn.1001-411X.201910031
- Yan X, Lu J, Ren M, He Y, Wang Y, Wang Z and He K, **2020**. Insecticidal activity of 11 Bt toxins and 3 transgenic maize events expressing Vip3Aa19 to black cutworm, *Agrotis ipsilon* (Hufnagel). *Insects* 11. 10.3390/insects11040208
- Yang F, Head GP, Price PA, Santiago Gonzalez JC and Kerns DL, **2020**. Inheritance of *Bacillus thuringiensis* Cry2Ab2 protein resistance in *Helicoverpa zea* (Lepidoptera: Noctuidae). *Pest Management Science* 76, 3676-3684. 10.1002/ps.5916
- Yang F, Kerns DL, Head GP, Price PA, Levy R, Niu Y and Huang F, **2020**. Extended evaluation of Bt protein cross-pollination in seed blend plantings on survival, growth, and development of *Helicoverpa zea* feeding on refuge ears. *Pest Management Science* 76, 1011-1019. 10.1002/ps.5611
- Yang F, Santiago Gonzalez JC, Little N, Reisig D, Payne G, Santos RFd, Jurat-Fuentes JL, Kurtz R and Kerns DL, **2020**. First documentation of major Vip3Aa resistance alleles in field populations of *Helicoverpa zea* (Boddie) (Lepidoptera: Noctuidae) in Texas, USA. *Scientific Reports* 10. 10.1038/s41598-020-62748-8
- Yang F, Gonzalez JCS, Sword GA and Kerns DL, **2021**. Genetic basis of resistance to the Vip3Aa Bt protein in *Helicoverpa zea*. *Pest Management Science* 77, 1530-1535. 10.1002/ps.6176
- Yang F, Williams J, Huang F and Kerns DL, **2021**. Genetic basis and cross-resistance of vip3aa resistance in *Spodoptera frugiperda* (Lepidoptera: Noctuidae) derived from Texas, USA. *Crop Protection* 147. 10.1016/j.cropro.2021.105702
- Yin Y, Flasiński S, Moar W, Bowen D, Chay C, Milligan J, Kouadio JL, Pan A, Werner B, Buckman K, Zhang J, Mueller G, Preftakes C, Hibbard BE, Price P and Roberts J, **2020**. A new *Bacillus thuringiensis* protein for western corn rootworm control. *PloS one* 15. 10.1371/journal.pone.0242791
- Yuanyuan J, Yi J, Yongmin L, Xiaoyun C, Junfeng X, Xiaoli X and Lianju M, **2020**. Safety evaluation of cry-transgenic insect-resistant maize on silkworm, *Bombyx mori*. *Acta Agriculturae Zhejiangensis* 32, 2042-2049. 10.3969/j.issn.1004-1524.2020.11.15
- Zhang X, Zhang R, Li L, Yang Y, Ding Y, Guan H, Wang X, Zhang A and Wen H, **2020**. Negligible transcriptome and metabolome alterations in RNAi insecticidal maize against *Monolepta hieroglyphica*. *Plant Cell Reports* 39, 1539-1547. 10.1007/s00299-020-02582-4

### **3. Entries retrieved using MEDLINE**

- Abdelgaffar H, Perera OP and Jurat-Fuentes JL, **2021**. ABC transporter mutations in Cry1F-resistant fall armyworm (*Spodoptera frugiperda*) do not result in altered susceptibility to selected small molecule pesticides. *Pest management science* 77, 949-955. 10.1002/ps.6106
- Alvarez-Alfageme F, Devos Y, Camargo AM, Arpaia S and Messean A, **2021**. Managing resistance evolution to transgenic Bt maize in corn borers in Spain. *Critical reviews in biotechnology* 1-19. 10.1080/07388551.2021.1931018

- Anderson JA, Mickelson J, Challender M, Moellring E, Sult T, TeRonde S, Walker C, Wang Y and Maxwell CA, **2020**. Agronomic and compositional assessment of genetically modified DP23211 maize for corn rootworm control. *GM crops & food* 11, 206-214. 10.1080/21645698.2020.1770556
- Babu A, Reisig DD, Pes MP, Ranger CM, Chamkasem N and Reding ME, **2021**. Effects of chlorantraniliprole residual on *Helicoverpa zea* in Bt and non-Bt cotton. *Pest management science* 77, 2367-2374. 10.1002/ps.6263
- Bilbo TR, Reay-Jones FPF and Greene JK, **2020**. Evaluation of Insecticide Thresholds in Late-Planted Bt and Non-Bt Corn for Management of Fall Armyworm (Lepidoptera: Noctuidae). *Journal of economic entomology* 113, 814-823. 10.1093/jee/toz364
- Boaventura D, Bolzan A, Padovez FE, Okuma DM, Omoto C and Nauen R, **2020**. Detection of a ryanodine receptor target-site mutation in diamide insecticide resistant fall armyworm, *Spodoptera frugiperda*. *Pest management science* 76, 47-54. 10.1002/ps.5505
- Boaventura D, Ulrich J, Lueke B, Bolzan A, Okuma D, Gutbrod O, Geibel S, Zeng Q, Dourado PM, Martinelli S, Flagel L, Head G and Nauen R, **2020**. Molecular characterization of Cry1F resistance in fall armyworm, *Spodoptera frugiperda* from Brazil. *Insect biochemistry and molecular biology* 116, 103280. 10.1016/j.ibmb.2019.103280
- Boonchaisri S, Rochfort S, Stevenson T and Dias DA, **2021**. LC-MS untargeted metabolomics assesses the delayed response of glufosinate treatment of transgenic glufosinate resistant (GR) buffalo grasses (*Stenotaphrum secundatum* L.). *Metabolomics : Official journal of the Metabolomic Society* 17, 28. 10.1007/s11306-021-01776-5
- Bouwer G, **2020**. A Framework for Effective Bt Maize IRM Programs: Incorporation of Lessons Learned From *Busseola fusca* Resistance Development. *Frontiers in Bioengineering and Biotechnology* 8, 717. 10.3389/fbioe.2020.00717
- Bowen D, Yin Y, Flasinski S, Chay C, Bean G, Milligan J, Moar W, Pan A, Werner B, Buckman K, Howe A, Ciche T, Turner K, Pleau M, Zhang J, Kouadio J-L, Hibbard BE, Price P and Roberts J, **2020**. Cry75Aa (Mpp75Aa) Insecticidal Proteins for Controlling the Western Corn Rootworm, *Diabrotica virgifera virgifera*, (Coleoptera: Chrysomelidae), Isolated from the Insect Pathogenic Bacteria *Brevibacillus laterosporus*. *Applied and Environmental Microbiology*. 10.1128/aem.02507-20
- Carlson AB, Mukerji P, Mathesius CA, Huang E, Herman RA, Hoban D, Thurman JD and Roper JM, **2020**. DP-202216-6 maize does not adversely affect rats in a 90-day feeding study. *Regulatory toxicology and pharmacology : RTP* 117, 104779. 10.1016/j.yrtph.2020.104779
- Carriere Y, Brown Z, Aglasan S, Dutilleul P, Carroll M, Head G, Tabashnik BE, Jorgensen PS and Carroll SP, **2020**. Crop rotation mitigates impacts of corn rootworm resistance to transgenic Bt corn. *Proceedings of the National Academy of Sciences of the United States of America* 117, 18385-18392. 10.1073/pnas.2003604117
- Carriere Y, Degain BA, Harpold VS, Unnithan GC and Tabashnik BE, **2020**. Gene Flow Between Bt and Non-Bt Plants in a Seed Mixture Increases Dominance of Resistance to Pyramided Bt Corn in *Helicoverpa zea* (Lepidoptera: Noctuidae). *Journal of economic entomology* 113, 2041-2051. 10.1093/jee/toaa138
- Chen D, Moar WJ, Jerga A, Gowda A, Milligan JS, Bretsynder EC, Rydel TJ, Baum JA, Semeao A, Fu X, Guzov V, Gabbert K, Head GP and Haas JA, **2021**. *Bacillus thuringiensis* chimeric proteins Cry1A.2 and Cry1B.2 to control soybean lepidopteran pests: New domain combinations enhance insecticidal spectrum of

- activity and novel receptor contributions. *PloS one* 16, e0249150. 10.1371/journal.pone.0249150
- Coates BS, Abel CA, Swoboda-Bhattarai KA, Palmquist DE, Montezano DG, Zukoff SN, Wang Y, Bradshaw JD, DiFonzo CD, Shields E, Tilmon KJ, Hunt TE and Peterson JA, **2020**. Geographic Distribution of *Bacillus thuringiensis* Cry1F Toxin Resistance in Western Bean Cutworm (Lepidoptera: Noctuidae) Populations in the United States. *Journal of economic entomology* 113, 2465-2472. 10.1093/jee/toaa136
- Deguenon JM, Dhammi A, Ponnusamy L, Travanty NV, Cave G, Lawrie R, Mott D, Reisig D, Kurtz R and Roe RM, **2021**. Bacterial Microbiota of Field-Collected *Helicoverpa zea* (Lepidoptera: Noctuidae) from Transgenic Bt and Non-Bt Cotton. *Microorganisms* 9. 10.3390/microorganisms9040878
- Del Pozo-Valdivia AI, Reisig DD, Braswell L, Greene JK, Roberts P and Taylor SV, **2021**. Economic Injury Levels for Bt-resistant *Helicoverpa zea* (Lepidoptera: Noctuidae) in Cotton. *Journal of economic entomology* 114, 747-756. 10.1093/jee/toab012
- Dively GP, Kuhar TP, Taylor S, Doughty HB, Holmstrom K, Gilrein D, Nault BA, Ingerson-Mahar J, Whalen J, Reisig D, Frank DL, Fleischer SJ, Owens D, Welty C, Reay-Jones FPF, Porter P, Smith JL, Saguez J, Murray S, Wallingford A, Byker H, Jensen B, Burkness E, Hutchison WD and Hamby KA, **2021**. Sweet Corn Sentinel Monitoring for Lepidopteran Field-Evolved Resistance to Bt Toxins. *Journal of economic entomology* 114, 307-319. 10.1093/jee/toaa264
- Fritz ML, Nunziata SO, Guo R, Tabashnik BE and Carriere Y, **2020**. Mutations in a Novel Cadherin Gene Associated with Bt Resistance in *Helicoverpa zea*. *G3 (Bethesda, Md)* 10, 1563-1574. 10.1534/g3.120.401053
- Garcia-Ruiz E, Cobos G, Sanchez-Ramos I, Pascual S, Chueca M-C, Escorial M-C, Santin-Montanya I, Loureiro I and Gonzalez-Nunez M, **2020**. Dynamics of canopy-dwelling arthropods under different weed management options, including glyphosate, in conventional and genetically modified insect-resistant maize. *Insect science*. 10.1111/1744-7917.12825
- Gassmann AJ, Shrestha RB, Kropf AL, St Clair CR and Brenizer BD, **2020**. Field-evolved resistance by western corn rootworm to Cry34/35Ab1 and other *Bacillus thuringiensis* traits in transgenic maize. *Pest management science* 76, 268-276. 10.1002/ps.5510
- Gassmann AJ, **2021**. Resistance to Bt Maize by Western Corn Rootworm: Effects of Pest Biology, the Pest-Crop Interaction and the Agricultural Landscape on Resistance. *Insects* 12. 10.3390/insects12020136
- Gilreath RT, Kerns DL, Huang F and Yang F, **2021**. No positive cross-resistance to Cry1 and Cry2 proteins favors pyramiding strategy for management of Vip3Aa resistance in *Spodoptera frugiperda*. *Pest management science* 77, 1963-1970. 10.1002/ps.6224
- Giron-Calva PS, Lopez C, Albacete A, Albajes R, Christou P and Eizaguirre M, **2021**. beta-carotene and *Bacillus thuringiensis* insecticidal protein differentially modulate feeding behaviour, mortality and physiology of European corn borer (*Ostrinia nubilalis*). *PloS one* 16, e0246696. 10.1371/journal.pone.0246696
- Gomez I, Ocelotl J, Sanchez J, Aguilar-Medel S, Pena-Chora G, Lina-Garcia L, Bravo A and Soberon M, **2020**. *Bacillus thuringiensis* Cry1Ab Domain III beta-22 Mutants with Enhanced Toxicity to *Spodoptera frugiperda* (J. E. Smith). *Applied and Environmental Microbiology* 86. 10.1128/aem.01580-20
- Gordy CL and Goller CC, **2020**. Using Metabolic Engineering to Connect Molecular Biology Techniques to Societal Challenges. *Frontiers in Microbiology* 11, 577004. 10.3389/fmicb.2020.577004

- Guan F, Zhang J, Shen H, Wang X, Padovan A, Walsh TK, Tay WT, Gordon KHJ, James W, Czepak C, Otim MH, Kachigamba D and Wu Y, **2021**. Whole-genome sequencing to detect mutations associated with resistance to insecticides and Bt proteins in *Spodoptera frugiperda*. *Insect science* 28, 627-638. 10.1111/1744-7917.12838
- Gupta M, Kumar H and Kaur S, **2021**. Vegetative Insecticidal Protein (Vip): A Potential Contender From *Bacillus thuringiensis* for Efficient Management of Various Detrimental Agricultural Pests. *Frontiers in Microbiology* 12, 659736. 10.3389/fmicb.2021.659736
- Gutierrez-Moreno R, Mota-Sanchez D, Blanco CA, Chandrasena D, Difonzo C, Conner J, Head G, Berman K and Wise J, **2020**. Susceptibility of Fall Armyworms (*Spodoptera frugiperda* J.E.) from Mexico and Puerto Rico to Bt Proteins. *Insects* 11. 10.3390/insects11120831
- Hu X, Boeckman CJ, Cong B, Steimel JP, Richtman NM, Sturtz K, Wang Y, Walker CA, Yin J, Unger A, Farris C and Lu AL, **2020**. Characterization of DvSSJ1 transcripts targeting the smooth septate junction (SSJ) of western corn rootworm (*Diabrotica virgifera virgifera*). *Scientific Reports* 10, 11139. 10.1038/s41598-020-68014-1
- Huang F, **2021**. Resistance of the fall armyworm, *Spodoptera frugiperda*, to transgenic *Bacillus thuringiensis* Cry1F corn in the Americas: lessons and implications for Bt corn IRM in China. *Insect science* 28, 574-589. 10.1111/1744-7917.12826
- Ingber DA, McDonald JH, Mason CE and Flexner L, **2021**. Oviposition preferences, Bt susceptibilities, and tissue feeding of fall armyworm (*Lepidoptera: Noctuidae*) host strains. *Pest management science*. 10.1002/ps.6434
- Lanzoni A, Bosi S, Bregola V, Camastra F, Ciaramella A, Staiano A, Dinelli G and Burgio G, **2021**. Assessing the effects of Bt maize on the non-target pest *Rhopalosiphum maidis* by demographic and life-history measurement endpoints. *Bulletin of entomological research* 1-15. 10.1017/s0007485321000481
- Lawrie RD, Mitchell Iii RD, Deguenon JM, Ponnusamy L, Reisig D, Pozo-Valdivia AD, Kurtz RW and Roe RM, **2020**. Multiple Known Mechanisms and a Possible Role of an Enhanced Immune System in Bt-Resistance in a Field Population of the Bollworm, *Helicoverpa zea*: Differences in Gene Expression with RNAseq. *International Journal of Molecular Sciences* 21. 10.3390/ijms21186528
- Li G, Huang J, Ji T, Tian C, Zhao X and Feng H, **2020**. Baseline susceptibility and resistance allele frequency in *Ostrinia furnacalis* related to Cry1 toxins in the Huanghuaihai summer corn region of China. *Pest management science* 76, 4311-4317. 10.1002/ps.5999
- Li X, Miyamoto K, Takasu Y, Wada S, Iizuka T, Adegawa S, Sato R and Watanabe K, **2020**. ATP-Binding Cassette Subfamily A Member 2 is a Functional Receptor for *Bacillus thuringiensis* Cry2A Toxins in *Bombyx mori*, but not for Cry1A, Cry1C, Cry1D, Cry1F, or Cry9A Toxins. *Toxins* 12. 10.3390/toxins12020104
- Li X-W, Du L-X, Zhang L, Peng Y-F, Hua H-X, Romeis J and Li Y-H, **2020**. Reduced *Mythimna separata* infestation on Bt corn could benefit aphids. *Insect science*. 10.1111/1744-7917.12833
- Li Y, Hallerman EM, Wu K and Peng Y, **2020**. Insect-Resistant Genetically Engineered Crops in China: Development, Application, and Prospects for Use. *Annual review of entomology* 65, 273-292. 10.1146/annurev-ento-011019-025039
- Li G, Feng H, Ji T, Huang J and Tian C, **2021**. What type of Bt corn is suitable for a region with diverse lepidopteran pests: A laboratory evaluation. *GM crops & food* 12, 115-124. 10.1080/21645698.2020.1831728
- Liu W, Liu X, Liu C, Zhang Z and Jin W, **2020**. Development of a sensitive monoclonal



- antibody-based sandwich ELISA to detect Vip3Aa in genetically modified crops. *Biotechnology Letters* 42, 1467-1478. 10.1007/s10529-020-02854-9
- Lohn AF, Trtikova M, Chapela I, Van den Berg J, du Plessis H and Hilbeck A, **2020**. Transgene behavior in *Zea mays* L. crosses across different genetic backgrounds: Segregation patterns, cry1Ab transgene expression, insecticidal protein concentration and bioactivity against insect pests. *PloS one* 15, e0238523. 10.1371/journal.pone.0238523
- Lovei GL, Lang A, Ferrante M and Bacle V, **2020**. Can the growing of transgenic maize threaten protected Lepidoptera in Europe? *Insect science*. 10.1111/1744-7917.12849
- Machado EP, Dos S Rodrigues Junior GL, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Cross-crop resistance of *Spodoptera frugiperda* selected on Bt maize to genetically-modified soybean expressing Cry1Ac and Cry1F proteins in Brazil. *Scientific Reports* 10, 10080. 10.1038/s41598-020-67339-1
- Machado EP, Dos S Rodrigues Junior GL, Somavilla JC, Fuhr FM, Zago SL, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Omoto C and Bernardi O, **2020**. Survival and development of *Spodoptera eridania*, *Spodoptera cosmioides* and *Spodoptera albula* (Lepidoptera: Noctuidae) on genetically-modified soybean expressing Cry1Ac and Cry1F proteins. *Pest management science* 76, 4029-4035. 10.1002/ps.5955
- Machado RAR, Thonen L, Arce CCM, Theepan V, Prada F, Wuthrich D, Robert CAM, Vogiatzaki E, Shi Y-M, Schaeren OP, Notter M, Bruggmann R, Hapfelmeier S, Bode HB and Erb M, **2020**. Engineering bacterial symbionts of nematodes improves their biocontrol potential to counter the western corn rootworm. *Nature Biotechnology* 38, 600-608. 10.1038/s41587-020-0419-1
- Marques LH, Lepping M, Castro BA, Santos AC, Rossetto J, Nunes MZ, Silva OABN, Moscardini VF, de Sa VGM, Nowatzki T, Dahmer ML and Gontijo PC, **2021**. Field efficacy of Bt cotton containing events DAS-21023-5 \* DAS-24236-5 \* SYN-IR102-7 against lepidopteran pests and impact on the non-target arthropod community in Brazil. *PloS one* 16, e0251134. 10.1371/journal.pone.0251134
- Martin M, Boaventura D and Nauen R, **2021**. Evaluation of Reference Genes and Expression Level of Genes Potentially Involved in the Mode of Action of Cry1Ac and Cry1F in a Susceptible Reference Strain of *Chrysodeixis includens*. *Insects* 12. 10.3390/insects12070598
- Matova PM, Kamutando CN, Magorokosho C, Kutywayo D, Gutsa F and Labuschagne M, **2020**. Fall-armyworm invasion, control practices and resistance breeding in Sub-Saharan Africa. *Crop Science* 60, 2951-2970. 10.1002/csc2.20317
- Meinke LJ, Souza D and Siegfried BD, **2021**. The Use of Insecticides to Manage the Western Corn Rootworm, *Diabrotica virgifera virgifera*, LeConte: History, Field-Evolved Resistance, and Associated Mechanisms. *Insects* 12. 10.3390/insects12020112
- Meissle M, Kloos S and Romeis J, **2021**. Fate of multiple Bt proteins from stacked Bt maize in the predatory lady beetle *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae). *Environmental pollution* (Barking, Essex : 1987) 268, 115421. 10.1016/j.envpol.2020.115421
- Muraro DS, Stacke RF, Cossa GE, Godoy DN, Garlet CG, Valmorbidia I, O'Neal ME and Bernardi O, **2020**. Performance of Seed Treatments Applied on Bt and Non-Bt Maize Against Fall Armyworm (Lepidoptera: Noctuidae). *Environmental entomology* 49, 1137-1144. 10.1093/ee/nvaa088
- Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P,

- Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Sanchez Serrano JJ, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Dumont AF, Federici S, Gennaro A, Gomez Ruiz JA, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Organisms EPoGM, **2020**. Scientific Opinion on application EFSA-GMO-NL-2016-132 for authorisation of genetically modified of insect-resistant and herbicide-tolerant soybean DAS-81419-2\*DAS-44406-6 for food and feed uses, import and processing submitted in accordance with Regulation (EC) No 1829/2003 by DowAgrosciencesLCC. EFSA journal European Food Safety Authority 18, e06302. 10.2903/j.efsa.2020.6302
- Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Sanchez Serrano JJ, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Fernandez A, Gennaro A, Gomez Ruiz JA, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Organisms EPGM, **2021**. Assessment of genetically modified maize 1507\*MIR162 \*MON810\*NK603 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2015-127). EFSA journal European Food Safety Authority 19, e06348. 10.2903/j.efsa.2021.6348
- Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Sanchez Serrano JJ, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Fernandez A, Gennaro A, Gomez Ruiz JA, Kagkli DM, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Organisms EPGM, **2021**. Assessment of genetically modified maize MON 87427 \* MON 87460 \* MON 89034 \* 1507 \* MON 87411 \* 59122 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2017-139). EFSA journal European Food Safety Authority 19, e06351. 10.2903/j.efsa.2021.6351
- Nascimento PT, Von Pinho RG, Fadini MAM, Souza CSF and Valicente FH, **2020**. Does Singular and Stacked Corn Affect Choice Behavior for Oviposition and Feed in *Spodoptera frugiperda* (Lepidoptera: Noctuidae)? Neotropical Entomology 49, 302-310. 10.1007/s13744-019-00750-0
- Niu X, Kassa A, Hasler J, Griffin S, Perez-Ortega C, Procyk L, Zhang J, Kapka-Kitzman DM, Nelson ME and Lu A, **2020**. Functional validation of DvABCB1 as a receptor of Cry3 toxins in western corn rootworm, *Diabrotica virgifera virgifera*. Scientific Reports 10, 15830. 10.1038/s41598-020-72572-9
- Niz JM, Salvador R, Ferrelli ML, de Cap AS, Romanowski V and Berretta MF, **2020**. Genetic variants in Argentinean isolates of *Spodoptera frugiperda* Multiple Nucleopolyhedrovirus. Virus Genes 56, 401-405. 10.1007/s11262-020-01741-9
- Pachu JKS, Macedo FCO, Malaquias JB, Ramalho FS, Oliveira RF, Franco FP and Godoy WAC, **2021**. Electrical signalling on Bt and non-Bt cotton plants under stress by *Aphis gossypii*. PloS one 16, e0249699. 10.1371/journal.pone.0249699
- Paddock KJ, Hibbard BE, Barry J, Sethi A, Mueller AL, Shelby KS and Pereira AE, **2021**. Restoration of susceptibility following removal of selection for Cry34/35Ab1 resistance documents fitness costs in resistant population of western corn rootworm, *Diabrotica virgifera virgifera*. Pest management science 77, 2385-2394. 10.1002/ps.6266
- Paddock KJ, Pereira AE, Finke DL, Ericsson AC, Hibbard BE and Shelby KS, **2021**. Host resistance to *Bacillus thuringiensis* is linked to altered bacterial community within a specialist insect herbivore. Molecular ecology. 10.1111/mec.15875
- Panevska A, Skocaj M, Modic S, Razinger J and Sepcic K, **2020**. Aegerolysins from the

- fungus genus *Pleurotus* - Bioinsecticidal proteins with multiple potential applications. *Journal of invertebrate pathology* 107474. 10.1016/j.jip.2020.107474
- Pareddy D, Chennareddy S, Anthony G, Sardesai N, Mall T, Minnicks T, Karpova O, Clark L, Griffin D, Bishop B, Shumway N, Samuel P, Smith K and Sarria R, **2020**. Improved soybean transformation for efficient and high throughput transgenic production. *Transgenic research* 29, 267-281. 10.1007/s11248-020-00198-8
- Pereira AE, Huynh MP, Sethi A, Miles AL, Wade French B, Ellersieck MR, Coudron TA, Shelby KS and Hibbard BE, **2020**. Baseline Susceptibility of a Laboratory Strain of Northern Corn Rootworm, *Diabrotica barberi* (Coleoptera: Chrysomelidae) to *Bacillus thuringiensis* Traits in Seedling, Single Plant, and Diet-Toxicity Assays. *Journal of economic entomology* 113, 1955-1962. 10.1093/jee/toaa107
- Perez Ortega C, Leininger C, Barry J, Poland B, Yalpani N, Altier D, Nelson ME and Lu AL, **2021**. Coordinated binding of a two-component insecticidal protein from *Alcaligenes faecalis* to western corn rootworm midgut tissue. *Journal of invertebrate pathology* 183, 107597. 10.1016/j.jip.2021.107597
- Pinos D, Chakroun M, Millan-Leiva A, Jurat-Fuentes JL, Wright DJ, Hernandez-Martinez P and Ferre J, **2020**. Reduced Membrane-Bound Alkaline Phosphatase Does Not Affect Binding of Vip3Aa in a *Heliothis virescens* Resistant Colony. *Toxins* 12. 10.3390/toxins12060409
- Quan Y, Yang J, Wang Y, Hernandez-Martinez P, Ferre J and He K, **2021**. The Rapid Evolution of Resistance to Vip3Aa Insecticidal Protein in *Mythimna separata* (Walker) Is Not Related to Altered Binding to Midgut Receptors. *Toxins* 13. 10.3390/toxins13050364
- Rabelo MM, Matos JML, Orozco-Restrepo SM, Paula-Moraes SV and Pereira EJG, **2020**. Like Parents, Like Offspring? Susceptibility to Bt Toxins, Development on Dual-Gene Bt Cotton, and Parental Effect of Cry1Ac on a Nontarget Lepidopteran Pest. *Journal of economic entomology* 113, 1234-1242. 10.1093/jee/toaa051
- Rabelo MM, Paula-Moraes SV, Pereira EJG and Siegfried BD, **2020**. Demographic Performance of *Helicoverpa zea* Populations on Dual and Triple-Gene Bt Cotton. *Toxins* 12. 10.3390/toxins12090551
- Reay-Jones FPF, Bilbo TR and Reisig DD, **2020**. Decline in Sublethal Effects of Bt Corn on Corn Earworm (Lepidoptera: Noctuidae) Linked to Increasing Levels of Resistance. *Journal of economic entomology* 113, 2241-2249. 10.1093/jee/toaa163
- Rivero-Borja M, Rodriguez-Maciel JC, Urzua Gutierrez JA, Silva-Aguayo G, Chandrasena DI, Felix-Bermudez NC and Storer NP, **2020**. Baseline of Susceptibility to the Cry1F Protein in Mexican Populations of Fall Armyworm. *Journal of economic entomology* 113, 390-398. 10.1093/jee/toz280
- Rowen E and Tooker JF, **2020**. Fertilizing Corn With Manure Decreases Caterpillar Performance but Increases Slug Damage. *Environmental entomology* 49, 141-150. 10.1093/ee/nvz145
- Shwe SM, Wang Y, Gao Z, Li X, Liu S, Bai S, Zhang T, He K and Wang Z, **2021**. Toxicity of Cry1-Class, Cry2Aa, and Vip3Aa19 Bt proteins and their interactions against yellow peach Moth, *Conogethes punctiferalis* (Guenee) (Lepidoptera: Crambidae). *Journal of invertebrate pathology* 178, 107507. 10.1016/j.jip.2020.107507
- Silva JB, Mori R, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Bing J, Gratao PL and Rossi GD, **2021**. Water Deprivation Induces Biochemical Changes Without Reduction in the Insecticidal Activity of Maize and Soybean Transgenic Plants. *Journal of economic entomology*. 10.1093/jee/toab109
- Souza CSF, Silveira LCP, Souza BHS, Nascimento PT, Damasceno NCR and Mendes SM, **2021**. Efficiency of biological control for fall armyworm resistant to the protein

- Cry1F. *Brazilian journal of biology* = *Revista brasileira de biologia* 81, 154-163. 10.1590/1519-6984.224774
- St Clair CR, Clifton EH, Dunbar MW, Masloski KE, Paolino AR, Shrestha RB and Gassmann AJ, **2020**. Applying a Selection Experiment to Test for Fitness Costs of Bt Resistance in Western Corn Rootworm (Coleoptera: Chrysomelidae) and the Effect of Density on Fitness Costs. *Journal of economic entomology* 113, 2473-2479. 10.1093/jee/toaa168
- St Clair CR, Head GP and Gassmann AJ, **2020**. Western corn rootworm abundance, injury to corn, and resistance to Cry3Bb1 in the local landscape of previous problem fields. *PloS one* 15, e0237094. 10.1371/journal.pone.0237094
- St Clair CR, Head GP and Gassmann AJ, **2020**. Comparing Populations of Western Corn Rootworm (Coleoptera: Chrysomelidae) in Regions With and Without a History of Injury to Cry3 Corn. *Journal of economic entomology* 113, 1839-1849. 10.1093/jee/toaa106
- St Clair CR and Gassmann AJ, **2021**. Linking land use patterns and pest outbreaks in Bt maize. *Ecological applications* : a publication of the Ecological Society of America 31, e02295. 10.1002/eap.2295
- Tessnow AE, Behmer ST and Sword GA, **2021**. Protein-carbohydrate regulation and nutritionally mediated responses to Bt are affected by caterpillar population history. *Pest management science* 77, 335-342. 10.1002/ps.6022
- Towles TB, Buntin GD, Catchot AL, Gore J, Cook DR, Caprio MA and Daves C, **2021**. Quantifying the Contribution of Seed Blended Refugia in Field Corn to *Helicoverpa zea* (Lepidoptera: Noctuidae) Populations. *Journal of economic entomology*. 10.1093/jee/toab097
- Valadares NR, Soares MA, Ferreira EA, Mendes-Sa VG, Azevedo AM, Pires EM and Leite GLD, **2021**. Behavior and development of *Tetranychus ludeni* Zacher, 1913 (Acari: Tetranychidae) and physiological stress in genetically modified cotton expressing Cry1F and Cry1Ac proteins. *Brazilian journal of biology* = *Revista brasileira de biologia* 81, 251-257. 10.1590/1519-6984.222652
- Velez AM, Fishilevich E, Rangasamy M, Khajuria C, McCaskill DG, Pereira AE, Gandra P, Frey ML, Worden SE, Whitlock SL, Lo W, Schnelle KD, Lutz JR, Narva KE and Siegfried BD, **2020**. Control of western corn rootworm via RNAi traits in maize: lethal and sublethal effects of Sec23 dsRNA. *Pest management science* 76, 1500-1512. 10.1002/ps.5666
- Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, **2021**. Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. *Chemosphere* 264, 128538. 10.1016/j.chemosphere.2020.128538
- Wang X, Xu Y, Huang J, Jin W, Yang Y and Wu Y, **2020**. CRISPR-Mediated Knockout of the ABCC2 Gene in *Ostrinia furnacalis* Confers High-Level Resistance to the *Bacillus thuringiensis* Cry1Fa Toxin. *Toxins* 12. 10.3390/toxins12040246
- Wang L, Wang X, Gao F, Lv C, Li L, Han T and Chen F, **2021**. AMF Inoculation Can Enhance Yield of Transgenic Bt Maize and Its Control Efficiency Against *Mythimna separata* Especially Under Elevated CO<sub>2</sub>. *Frontiers in plant science* 12, 655060. 10.3389/fpls.2021.655060
- Wheeler TA, Siders K, Monclova-Santana C and Dever JK, **2020**. The relationship between commercial cotton cultivars with varying *Meloidogyne incognita* resistance genes and yield. *Journal of Nematology* 52, 1-8. 10.21307/jofnem-2020-064
- Yan X, Lu J, Ren M, He Y, Wang Y, Wang Z and He K, **2020**. Insecticidal Activity of 11

- Bt toxins and 3 Transgenic Maize Events Expressing Vip3Aa19 to Black Cutworm, *Agrotis ipsilon* (Hufnagel). *Insects* 11. 10.3390/insects11040208
- Yang F, Gonzalez JCS, Little N, Reisig D, Payne G, Dos Santos RF, Jurat-Fuentes JL, Kurtz R and Kerns DL, **2020**. First documentation of major Vip3Aa resistance alleles in field populations of *Helicoverpa zea* (Boddie) (Lepidoptera: Noctuidae) in Texas, USA. *Scientific Reports* 10, 5867. 10.1038/s41598-020-62748-8
- Yin Y, Flasiński S, Moar W, Bowen D, Chay C, Milligan J, Kouadio J-L, Pan A, Werner B, Buckman K, Zhang J, Mueller G, Preftakes C, Hibbard BE, Price P and Roberts J, **2020**. A new *Bacillus thuringiensis* protein for Western corn rootworm control. *PloS one* 15, e0242791. 10.1371/journal.pone.0242791
- Zhang X, Zhang R, Li L, Yang Y, Ding Y, Guan H, Wang X, Zhang A and Wen H, **2020**. Negligible transcriptome and metabolome alterations in RNAi insecticidal maize against *Monolepta hieroglyphica*. *Plant Cell Reports* 39, 1539-1547. 10.1007/s00299-020-02582-4

#### 4. Entries retrieved using Europe PMC

- Alok D, Annapragada H, Singh S, Murugesan S and Singh NP, **2020**. Symbiotic nitrogen fixation and endophytic bacterial community structure in Bt-transgenic chickpea (*Cicer arietinum* L). In: *Scientific Reports*. p 5453. ^10.1038/s41598-020-62199-1
- Arpaia S, Christiaens O, Giddings K, Jones H, Mezzetti B, Moronta-Barrios F, Perry JN, Sweet JB, Taning CNT, Smagghe G and Dietz-Pfeilstetter A, **2020**. Biosafety of GM Crop Plants Expressing dsRNA: Data Requirements and EU Regulatory Considerations. In: *Frontiers in plant science*. p 940. ^10.3389/fpls.2020.00940
- Chatzopoulou S, Eriksson NL and Eriksson D, **2020**. Improving Risk Assessment in the European Food Safety Authority: Lessons From the European Medicines Agency. In: *Frontiers in plant science*. p 349. ^10.3389/fpls.2020.00349
- Devos Y, Sanctis GD, Maria Neri F and Messéan A, **2021**. EFSA is working to advance the environmental risk assessment of genetically modified crops to better protect butterflies and moths. In: *EFSA journal European Food Safety Authority*. p e0190301. ^10.2903/j.efsa.2021.e190301
- Gao H, Mutti J, Young JK, Yang M, Schroder M, Lenderts B, Wang L, Peterson D, St Clair G, Jones S, Feigenbutz L, Marsh W, Zeng M, Wagner S, Farrell J, Snopek K, Scelonge C, Sopko X, Sander JD, Betts S, Cigan AM and Chilcoat ND, **2020**. Complex Trait Loci in Maize Enabled by CRISPR-Cas9 Mediated Gene Insertion. In: *Frontiers in plant science*. p 535. ^10.3389/fpls.2020.00535
- Gimenez S, Abdelgaffar H, Goff GL, Hilliou F, Blanco CA, Hänniger S, Bretaudeau A, Legeai F, Nègre N, Jurat-Fuentes JL, d'Alençon E and Nam K, **2020**. Adaptation by copy number variation increases insecticide resistance in the fall armyworm. In: *Communications biology*. p 664. ^10.1038/s42003-020-01382-6
- Gupta M, Kumar H and Kaur S, **2021**. Vegetative Insecticidal Protein (Vip): A Potential Contender From *Bacillus thuringiensis* for Efficient Management of Various Detrimental Agricultural Pests. In: *Frontiers in Microbiology*. p 659736. ^10.3389/fmicb.2021.659736
- Gutierrez-Moreno R, Mota-Sanchez D, Blanco CA, Chandrasena D, Difonzo C, Conner J, Head G, Berman K and Wise J, **2020**. Susceptibility of Fall Armyworms (*Spodoptera frugiperda* J.E.) from Mexico and Puerto Rico to Bt Proteins. In: *Insects*. ^10.3390/insects11120831
- Huang F, **2021**. Resistance of the fall armyworm, *Spodoptera frugiperda*, to transgenic *Bacillus thuringiensis* Cry1F corn in the Americas: lessons and implications for Bt corn IRM in China. *Insect science* 28, 574-589. 10.1111/1744-7917.12826
- Jose M, Vertuan H, Soares D, Sordi D, Bellini LF, Kotsubo R and Berger GU, **2020**.

- Comparing agronomic and phenotypic plant characteristics between single and stacked events in soybean, maize, and cotton. In: PloS one. p e0231733. ^10.1371/journal.pone.0231733
- McDonald J, Burns A and Raybould A, **2020**. Advancing ecological risk assessment on genetically engineered breeding stacks with combined insect-resistance traits. Transgenic research 29, 135-148. 10.1007/s11248-019-00185-8
- Morcia C, Ghizzoni R, Delogu C, Andreani L, Carnevali P and Terzi V, **2020**. Digital PCR: What Relevance to Plant Studies? In: Biology. ^10.3390/biology9120433
- Myskja BK and Myhr AI, **2020**. Non-safety Assessments of Genome-Edited Organisms: Should They be Included in Regulation? Science and engineering ethics 26, 2601-2627. 10.1007/s11948-020-00222-4
- Niu Y, Oyediran I, Yu W, Lin S, Dimase M, Brown S, Reay-Jones FPF, Cook D, Reisig D, Thrash B, Ni X, Paula-Moraes SV, Zhang Y, Chen JS, Wen Z and Huang F, **2021**. Populations of *Helicoverpa zea* (Boddie) in the Southeastern United States are Commonly Resistant to Cry1Ab, but Still Susceptible to Vip3Aa20 Expressed in MIR 162 Corn. In: Toxins. ^10.3390/toxins13010063
- Organisms EPanel oGM, Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogu   F, Rostoks N, S  nchez Serrano JJ, Savoini G, Veromann E, Veronesi F,   lvarez F, Ardizzone M, De Sanctis G, Devos Y, Fernandez A, Gennaro A, G  mez Ruiz J  , Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K and Raffaello T, **2021**. Assessment of genetically modified maize 1507    MIR162    MON810    NK603 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2015-127). In: EFSA journal European Food Safety Authority. p e06348. ^10.2903/j.efsa.2021.6348
- Organisms EPanel oGM, Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogu   F, Rostoks N, S  nchez Serrano JJ, Savoini G, Veromann E, Veronesi F,   lvarez F, Ardizzone M, De Sanctis G, Fernandez A, Gennaro A, G  mez Ruiz J  , Kagkli DM, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K and Raffaello T, **2021**. Assessment of genetically modified maize MON 87427    MON 87460    MON 89034    1507    MON 87411    59122 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2017-139). In: EFSA journal European Food Safety Authority. p e06351. ^10.2903/j.efsa.2021.6351
- Organisms EPanel oGM, Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogu   F, Rostoks N, S  nchez Serrano JJ, Savoini G, Veromann E, Veronesi F,   lvarez F, Ardizzone M and Raffaello T, **2021**. Assessment of genetically modified maize Bt11 for renewal authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-016). In: EFSA journal European Food Safety Authority. p e06347. ^10.2903/j.efsa.2021.6347
- S  nchez MA, **2020**. Chile as a key enabler country for global plant breeding, agricultural innovation, and biotechnology. GM crops & food 11, 130-139. 10.1080/21645698.2020.1761757
- Silva JB, Mori R, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Bing J, Grat  o PL and Rossi GD, **2021**. Water Deprivation Induces Biochemical Changes Without Reduction in the Insecticidal Activity of Maize and Soybean Transgenic Plants. Journal of economic entomology. 10.1093/jee/toab109
- Syed T, Askari M, Meng Z, Li Y, Abid MA, Wei Y, Guo S, Liang C and Zhang R, **2020**. Current Insights on Vegetative Insecticidal Proteins (Vip) as Next Generation Pest

- Killers. In: Toxins. ^10.3390/toxins12080522
- Verginelli D, Paternò A, De Marchis ML, Quarchioni C, Vinciguerra D, Bonini P, Peddis S, Fusco C, Misto M, Marfoglia C, Pomilio F and Marchesi U, **2020**. Development and comparative study of a pat/bar real-time PCR assay for integrating the screening strategy of a GMO testing laboratory. *Journal of the science of food and agriculture* 100, 2121-2129. 10.1002/jsfa.10235
- Yan X, Lu J, Ren M, He Y, Wang Y, Wang Z and He K, **2020**. Insecticidal Activity of 11 Bt toxins and 3 Transgenic Maize Events Expressing Vip3Aa19 to Black Cutworm, *Agrotis ipsilon* (Hufnagel). In: *Insects*. ^10.3390/insects11040208
- Yin Y, Flasiński S, Moar W, Bowen D, Chay C, Milligan J, Kouadio J-L, Pan A, Werner B, Buckman K, Zhang J, Mueller G, Preftakes C, Hibbard BE, Price P and Roberts J, **2020**. A new *Bacillus thuringiensis* protein for Western corn rootworm control. In: *PloS one*. p e0242791. ^10.1371/journal.pone.0242791

**5. Entries retrieved using reference lists of opinions of regulatory bodies and screened on full text**

None

**6. New entries retrieved using all search strategies (excluding duplicates and studies retrieved by the previous searches conducted in 2020)**

- Albrecht AJP, de Brito I, Albrecht LP, Silva AFM, de Matos AKA, Carbonari CA and Velini ED, **2020**. Metabolic changes, agronomic performance, and quality of seeds in soybean with the pat gene after application of glufosinate. *Weed Science* 68, 594-604. 10.1017/wsc.2020.74
- Alvarez F, Georgiadis M, Messean A, Streissl F and European Food Safety Authority EFS, **2020**. Assessment of the 2018 post-market environmental monitoring report on the cultivation of genetically modified maize MON 810 in the EU. *Efsa Journal* 18, 42. 10.2903/j.efsa.2020.6245
- Alvarez-Alfageme F, Devos Y, Camargo AM, Arpaia S and Messean A, **2021**. Managing resistance evolution to transgenic Bt maize in corn borers in Spain. *Critical reviews in biotechnology* 1-19. 10.1080/07388551.2021.1931018
- Alves Leite N, Redaelli LR and Sant'Ana J, **2020**. Fitness, acceptance and olfactory responses of *Trichogramma pretiosum* on eggs of *Spodoptera frugiperda* fed with Cry1Ac soybean. *Bulletin of Insectology* 73, 217-224.
- Aparna A and Deepa A, **2020**. The red flour beetle *Tribolium castaneum*: a model for host-microbiome interactions. *PloS one* 15. 10.1371/journal.pone.0239051
- Arpaia S, **2021**. Environmental risk assessment in agro-ecosystems: Revisiting the concept of receiving environment after the EFSA guidance document. *Ecotoxicology and Environmental Safety* 208, 8. 10.1016/j.ecoenv.2020.111676
- Babu A, Reisig DD, Pes MP, Ranger CM, Chamkasem N and Reding ME, **2021**. Effects of chlorantraniliprole residual on *Helicoverpa zea* in Bt and non-Bt cotton. *Pest Management Science* 77, 2367-2374. 10.1002/ps.6263
- Bacalhau FB, Dourado PM, Horikoshi RJ, Carvalho RA, Semeao A, Martinelli S, Berger GU, Head GP, Salvadori JR and Bernardi O, **2020**. Performance of Genetically Modified Soybean Expressing the Cry1A.105, Cry2Ab2, and Cry1Ac Proteins Against Key Lepidopteran Pests in Brazil. *Journal of Economic Entomology* 113, 2883-2889. 10.1093/jee/toaa236
- Barontini JM, Druetta MA, Luna IM, Torrico AK, Zanon MSA, Paccioretti PA, Maurino MF, Paz Gimenez Pecci Mdl and Chulze SN, **2020**. Performance of transgenic maize genotypes against ear caterpillars in Argentina. *Maydica* 65.
- Bengyella L, Hetsa BA, Fonmboh DJ and Jose RC, **2021**. Assessment of damage caused by

- evolved fall armyworm on native and transgenic maize in South Africa. *Phytoparasitica* 49, 1-12. 10.1007/s12600-020-00862-z
- Boonchaisri S, Rochfort S, Stevenson T and Dias DA, **2021**. LC-MS untargeted metabolomics assesses the delayed response of glufosinate treatment of transgenic glufosinate resistant (GR) buffalo grasses (*Stenotaphrum secundatum* L.). *Metabolomics* 17, 17. 10.1007/s11306-021-01776-5
- Bowen D, Yin Y, Flasiński S, Chay C, Bean G, Milligan J, Moar W, Pan A, Werner B, Buckman K, Howe A, Ciche T, Turner K, Pleau M, Zhang J, Kouadio JL, Hibbard BE, Price P and Roberts J, **2021**. Cry75Aa (Mpp75Aa) Insecticidal Proteins for Controlling the Western Corn Rootworm, *Diabrotica virgifera virgifera* LeConte (Coleoptera: Chrysomelidae), Isolated from the Insect-Pathogenic Bacterium *Brevibacillus laterosporus*. *Applied and Environmental Microbiology* 87, 16. 10.1128/aem.02507-20
- Brewer TR and Bonsall MB, **2021**. Combining refuges with transgenic insect releases for the management of an insect pest with non-recessive resistance to Bt crops in agricultural landscapes. *Journal of Theoretical Biology* 509, 11. 10.1016/j.jtbi.2020.110514
- Brookes G and Dinh TX, **2021**. The impact of using genetically modified (GM) corn/maize in Vietnam: Results of the first farm-level survey. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 71-83. 10.1080/21645698.2020.1816800
- Camargo AM, Arias-Martin M, Castanera P and Farinos GP, **2020**. Performance of *Sesamia nonagrioides* on cultivated and wild host plants: implications for Bt maize resistance management. *Pest Management Science* 76, 3657-3666. 10.1002/ps.5913
- Carriere Y, Degain BA and Tabashnik BE, **2020**. Effects of gene flow between Bt and non-Bt plants in a seed mixture of Cry1A.105 + Cry2Ab corn on performance of corn earworm in Arizona. *Pest Management Science* 77, 2106-2113. 10.1002/ps.6239
- Chen D, Moar WJ, Jerga A, Gowda A, Milligan JS, Bretsynder EC, Rydel TJ, Baum JA, Semeao A, Fu X, Guzov V, Gabbert K, Head GP and Haas JA, **2021**. *Bacillus thuringiensis* chimeric proteins Cry1A.2 and Cry1B.2 to control soybean lepidopteran pests: New domain combinations enhance insecticidal spectrum of activity and novel receptor contributions. *PloS one* 16, e0249150. 10.1371/journal.pone.0249150
- Chung SH, Feng HL and Jander G, **2021**. Engineering pest tolerance through plant-mediated RNA interference. *Current Opinion in Plant Biology* 60, 9. 10.1016/j.pbi.2021.102029
- Deguenon JM, Dhammi A, Ponnusamy L, Travanty NV, Cave G, Lawrie R, Mott D, Reisig D, Kurtz R and Roe RM, **2021**. Bacterial Microbiota of Field-Collected *Helicoverpa zea* (Lepidoptera: Noctuidae) from Transgenic Bt and Non-Bt Cotton. *Microorganisms* 9. 10.3390/microorganisms9040878
- Devos Y, Sanctis GD, Maria Neri F and Messéan A, **2021**. EFSA is working to advance the environmental risk assessment of genetically modified crops to better protect butterflies and moths. In: EFSA journal European Food Safety Authority. p e0190301. ^10.2903/j.efsa.2021.e190301
- Dimase M, Oyediran I, Brown S, Walker W, Guo J, Yu W, Zhang Y, Chen J, Wen Z and Huang F, **2020**. Larval movement and survival of *Helicoverpa zea* (Boddie) in seed blends of non-Bt and Bt maize containing Agrisure Viptera trait: implications for resistance management. *Crop Protection* 138. 10.1016/j.cropro.2020.105339
- Dively GP, Kuhar TP, Taylor S, Doughty HB, Holmstrom K, Gilrein D, Nault BA, Ingerson-Mahar J, Whalen J, Reisig D, Frank DL, Fleischer SJ, Owens D, Welty C, Reay-Jones FPF, Porter P, Smith JL, Saguez J, Murray S, Wallingford A, Byker H,



- Jensen B, Burkness E, Hutchison WD and Hamby KA, **2021**. Sweet Corn Sentinel Monitoring for Lepidopteran Field-Evolved Resistance to Bt Toxins. *Journal of economic entomology* 114, 307-319. 10.1093/jee/toaa264
- Eghrari K, Oliveira SC, Nascimento AM, Queiroz B, Fatoretto J, de Souza BHS, Fernandes OA and Moro GV, The implications of homozygous vip3Aa20- and cry1Ab-maize on *Spodoptera frugiperda* control. *Journal of Pest Science* 13. 10.1007/s10340-021-01362-7
- Fabrick JA, LeRoy DM, Mathew LG, Wu YD, Unnithan GC, Yelich AJ, Carriere Y, Li XC and Tabashnik BE, **2021**. CRISPR-mediated mutations in the ABC transporter gene ABCA2 confer pink bollworm resistance to Bt toxin Cry2Ab. *Scientific Reports* 11, 11. 10.1038/s41598-021-89771-7
- Fanela TLM, Baldin ELL, Hunt TE and Faria RD, **2020**. Baseline Plant-to-Plant Larval Movement of *Spodoptera eridania* in Bt and Non-Bt Soybean and Its Possible Impacts on IRM. *Journal of Economic Entomology* 113, 1741-1752. 10.1093/jee/toaa079
- Garcia JR, Vargas AAM, Perboni LT, Souza EA, Tessaro D, Lucio FR and Agostinetto D, **2020**. Physiological attributes of Enlist E3 (TM) soybean seed submitted to herbicides application. *Planta Daninha* 38, 6. 10.1590/s0100-83582020380100088
- Gassmann AJ, **2021**. Resistance to Bt Maize by Western Corn Rootworm: Effects of Pest Biology, the Pest-Crop Interaction and the Agricultural Landscape on Resistance. *Insects* 12, 16. 10.3390/insects12020136
- Gilreath RT, Kerns DL, Huang FN and Yang F, **2021**. No positive cross-resistance to Cry1 and Cry2 proteins favors pyramiding strategy for management of Vip3Aa resistance in *Spodoptera frugiperda*. *Pest Management Science* 77, 1963-1970. 10.1002/ps.6224
- Gimenez S, Abdelgaffar H, Goff GL, Hilliou F, Blanco CA, Hänniger S, Bretaudeau A, Legeai F, Nègre N, Jurat-Fuentes JL, d'Alençon E and Nam K, **2020**. Adaptation by copy number variation increases insecticide resistance in the fall armyworm. In: *Communications biology*. p 664. ^10.1038/s42003-020-01382-6
- Giron-Calva PS, Lopez C, Albacete A, Albajes R, Christou P and Eizaguirre M, **2021**. beta-carotene and *Bacillus thuringiensis* insecticidal protein differentially modulate feeding behaviour, mortality and physiology of European corn borer (*Ostrinia nubilalis*). *PloS one* 16, e0246696. 10.1371/journal.pone.0246696
- Gordy CL and Goller CC, **2020**. Using Metabolic Engineering to Connect Molecular Biology Techniques to Societal Challenges. *Frontiers in Microbiology* 11, 7. 10.3389/fmicb.2020.577004
- Gupta M, Kumar H and Kaur S, **2021**. Vegetative Insecticidal Protein (Vip): A Potential Contender From *Bacillus thuringiensis* for Efficient Management of Various Detrimental Agricultural Pests. *Frontiers in Microbiology* 12, 28. 10.3389/fmicb.2021.659736
- Gutierrez-Moreno R, Mota-Sanchez D, Blanco CA, Chandrasena D, Difonzo C, Conner J, Head G, Berman K and Wise J, **2020**. Susceptibility of Fall Armyworms (*Spodoptera frugiperda* JE) from Mexico and Puerto Rico to Bt Proteins. *Insects* 11, 14. 10.3390/insects11120831
- Haile F, Nowatzki T and Storer N, **2021**. Overview of Pest Status, Potential Risk, and Management Considerations of *Helicoverpa armigera* (Lepidoptera: Noctuidae) for US Soybean Production. *Journal of Integrated Pest Management* 12, 10. 10.1093/jipm/pmaa030
- He LM, Zhao SY, Gao XW and Wu KM, **2021**. Ovipositional responses of *Spodoptera frugiperda* on host plants provide a basis for using Bt-transgenic maize as trap crop

- in China. *Journal of Integrative Agriculture* 20, 804-814. 10.1016/s2095-3119(20)63334-2
- Heckel DG, **2021**. The Essential and Enigmatic Role of ABC Transporters in Bt Resistance of Noctuids and Other Insect Pests of Agriculture. *Insects* 12, 16. 10.3390/insects12050389
- Hill ZT, Barber LT, Doherty RC, Collie LM and Ross A, **2020**. Prickly sida and grass species control in xtend and enlist soybean systems. *BR Wells Rice Research Studies - Arkansas Agricultural Experiment Station, University of Arkansas System* 159-161.
- Horikoshi RJ, Vertuan H, de Castro AA, Morrell K, Griffith C, Evans A, Tan JG, Asimwe P, Anderson H, Jose M, Dourado PM, Berger G, Martinelli S and Head G, A new generation of Bt maize for control of fall armyworm (*Spodoptera frugiperda*). *Pest Management Science* 10. 10.1002/ps.6334
- Huang FN, **2021**. Dominance and fitness costs of insect resistance to genetically modified *Bacillus thuringiensis* crops. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 192-211. 10.1080/21645698.2020.1852065
- Huseth AS, D'Ambrosio DA and Kennedy GG, **2020**. Understanding the potential impact of continued seed treatment use for resistance management in Cry5IAa2.834\_16 Bt cotton against *Frankliniella fusca*. *PloS one* 15, 12. 10.1371/journal.pone.0239910
- Ingber DA, McDonald JH, Mason CE and Flexner L, **2021**. Oviposition Preferences, Bt Susceptibilities, and Tissue Feeding of Fall Armyworm (*Lepidoptera: Noctuidae*) Host Strains. *Pest management science*. 10.1002/ps.6434
- Jamshidnia M, Kazemitabar SK, Lindermayr C and Zarini HN, **2020**. Transformation of *Nicotiana tabacum* using the herbicide resistance bar gene as a selectable marker. *Acta Horticulturae* 455-461. 10.17660/ActaHortic.2020.1297.60
- Jhala AJ, Beckie HJ, Peters TJ, Culpepper AS and Norsworthy JK, **2021**. Interference and management of herbicide-resistant crop volunteers. *Weed Science* 69, 257-273. 10.1017/wsc.2021.3
- Jin MH, Tao JH, Li Q, Cheng Y, Sun XX, Wu KM and Xiao YT, **2021**. Genome editing of the SfABCC2 gene confers resistance to Cry1F toxin from *Bacillus thuringiensis* in *Spodoptera frugiperda*. *Journal of Integrative Agriculture* 20, 815-820. 10.1016/s2095-3119(19)62772-3
- Justiniano W, Fernandes MG and Raizer J, **2021**. Toxic bait as an alternative tool in the management of *Spodoptera frugiperda* in second corn crops. *Journal of Agricultural Science (Toronto)* 13, 102-112. 10.5539/jas.v13n3p102
- Kerns DD, Kerns DL, Lorenz GM, Catchot AL and Stewart SD, **2020**. Impact of Various Bt Cotton Traits and the Application of an Insecticide on the Within Plant Distribution of *Helicoverpa zea* (*Lepidoptera: Noctuidae*) Larvae and Injured Floral Structures. *Journal of Cotton Science* 24, 148-158.
- Khan MH, Jander G, Mukhtar Z, Arshad M, Sarwar M and Asad S, **2020**. Comparison of in Vitro and in Planta Toxicity of Vip3A for Lepidopteran Herbivores. *Journal of Economic Entomology* 113, 2959-2971. 10.1093/jee/toaa211
- Lanzoni A, Bosi S, Bregola V, Camastra F, Ciaramella A, Staiano A, Dinelli G and Burgio G, **2021**. Assessing the effects of Bt maize on the non-target pest *Rhopalosiphum maidis* by demographic and life-history measurement endpoints. *Bulletin of entomological research* 1-15. 10.1017/s0007485321000481
- Lee MS, Ardanuy A, Juarez-Escario A and Albajes R, **2021**. Sampling and selection of butterfly indicators for general surveillance of genetically modified maize in north-east Spain. *Ecological Indicators* 124, 11. 10.1016/j.ecolind.2021.107380
- Li GP, Feng HQ, Ji TJ, Huang JR and Tian CH, **2021**. What type of Bt corn is suitable for

- a region with diverse lepidopteran pests: A laboratory evaluation. *Gm Crops & Food-Biotechnology in Agriculture and the Food Chain* 12, 115-124. 10.1080/21645698.2020.1831728
- Liang P, Gu S, Zhang L and Gao X, **2020**. Research status and prospect of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in China. *Acta Entomologica Sinica* 63, 624-638. 10.16380/j.kcxb.2020.05.012
- Liang JG, Zhang DD, Li DY, Zhao SY, Wang CY, Xiao YT, Xu D, Yang YZ, Li GP, Wang LL, Gao Y, Yang XQ, Yuan HB, Liu J, Zhang XJ and Wu KM, **2021**. Expression profiles of Cry1Ab protein and its insecticidal efficacy against the invasive fall armyworm for Chinese domestic GM maize DBN9936. *Journal of Integrative Agriculture* 20, 792-803. 10.1016/s2095-3119(20)63475-x
- Liu X, Bai S, Wang Z, Wang Y, Wang Q and He K, **2020**. Expression of cry1Ab/cry1Ac fusion protein in the transgenic cry1Ab/cry1Ac maize and its control efficacy against the Asian corn borer, *Ostrinia furnacalis* (Lepidoptera: Crambidae), in the laboratory. *Acta Entomologica Sinica* 63, 1201-1206. 10.16380/j.kcxb.2020.10.005
- Lohn AF, Trtikova M, Chapela I, Binimelis R and Hilbeck A, **2021**. Transgene behavior in genetically modified teosinte hybrid plants: transcriptome expression, insecticidal protein production and bioactivity against a target insect pest. *Environmental Sciences Europe* 33, 13. 10.1186/s12302-021-00506-x
- Marques LH, Lepping M, Castro BA, Santos AC, Rossetto J, Nunes MZ, Silva OABN, Moscardini VF, de Sa VGM, Nowatzki T, Dahmer ML and Gontijo PC, **2021**. Field efficacy of Bt cotton containing events DAS-21023-5 \* DAS-24236-5 \* SYN-IR102-7 against lepidopteran pests and impact on the non-target arthropod community in Brazil. *PloS one* 16, e0251134. 10.1371/journal.pone.0251134
- Martin M, Boaventura D and Nauen R, **2021**. Evaluation of Reference Genes and Expression Level of Genes Potentially Involved in the Mode of Action of Cry1Ac and Cry1F in a Susceptible Reference Strain of *Chrysodeixis includens*. *Insects* 12. 10.3390/insects12070598
- Matova PM, Kamutando CN, Magorokosho C, Kutywayo D, Gutsa F and Labuschagne M, **2020**. Fall-armyworm invasion, control practices and resistance breeding in sub-Saharan Africa. *Crop Science* 60, 2951-2970. 10.1002/csc2.20317
- McCormick AN, Smith LG, Dillon TW, Collie LM, Davis BM and Butts TR, **2020**. Nozzle type effect on coverage and canopy penetration using enlist one and liberty in enlist e3 soybean. *BR Wells Rice Research Studies - Arkansas Agricultural Experiment Station, University of Arkansas System* 140-145.
- Meinke LJ, Souza D and Siegfried BD, **2021**. The Use of Insecticides to Manage the Western Corn Rootworm, *Diabrotica virgifera virgifera*, LeConte: History, Field-Evolved Resistance, and Associated Mechanisms. *Insects* 12, 22. 10.3390/insects12020112
- Meissle M, Kloos S and Romeis J, **2021**. Fate of multiple Bt proteins from stacked Bt maize in the predatory lady beetle *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae). *Environmental Pollution* 268, 10. 10.1016/j.envpol.2020.115421
- Morcia C, Ghizzoni R, Delogu C, Andreani L, Carnevali P and Terzi V, **2020**. Digital PCR: What Relevance to Plant Studies? In: *Biology*. 10.3390/biology9120433
- Myskja BK and Myhr AI, **2020**. Non-safety Assessments of Genome-Edited Organisms: Should They be Included in Regulation? *Science and engineering ethics* 26, 2601-2627. 10.1007/s11948-020-00222-4
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Dumont

- AF, Federici S, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Modified EPG, **2020**. Scientific Opinion on application EFSA-GMO-NL-2016-132 for authorisation of genetically modified of insect-resistant and herbicide-tolerant soybean DAS-81419-2 x DAS-44406-6 for food and feed uses, import and processing submitted in accordance with Regulation (EC) No 1829/2003 by Dow Agrosciences LCC. *Efsa Journal* 18, 37. 10.2903/j.efsa.2020.6302
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Fernandez A, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Or EPGM, **2021**. Assessment of genetically modified maize 1507 x MIR162 x MON810 x NK603 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2015-127). *Efsa Journal* 19, 40. 10.2903/j.efsa.2021.6348
- Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Dumont AF, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, Raffaello T and Or EPGM, **2021**. Assessment of genetically modified maize MON 87427 x MON 87460 x MON 89034 x 1507 x MON 87411 x 59122 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2017-139). *Efsa Journal* 19, 45. 10.2903/j.efsa.2021.6351
- Nascimento PT, Fadini MAM, Rocha MS, Souza CSF, Barros BA, Melo JOF, Von Pinho RG and Valicente FH, **2021**. Response of *Trichogramma pretiosum* females (Hymenoptera: Trichogrammatidae) to herbivore-induced Bt maize volatiles. *Arthropod-Plant Interactions* 15, 107-125. 10.1007/s11829-020-09801-5
- Nitovska IO, Abrahimova OY, Duplij VP, Derkach KV, Satarova TM, Rudas VA, Cherchel VY, Dziubetskyi BV and Morgun BV, **2020**. Application of beta-glucuronidase transient expression for selection of maize genotypes competent for genetic transformation. *Cytology and Genetics* 53, 451-458. 10.3103/s0095452719060082
- Niu Y, Oyediran I, Yu W, Lin S, Dimase M, Brown S, Reay-Jones FPF, Cook D, Reisig D, Thrash B, Ni X, Paula-Moraes SV, Zhang Y, Chen JS, Wen Z and Huang F, **2021**. Populations of *Helicoverpa zea* (Boddie) in the Southeastern United States are Commonly Resistant to Cry1Ab, but Still Susceptible to Vip3Aa20 Expressed in MIR 162 Corn. In: *Toxins*. ^10.3390/toxins13010063
- Onstad DW, Caprio MA and Pan ZQ, **2020**. Models of Diabrotica Populations: Demography, Population Genetics, Geographic Spread, and Management. *Insects* 11, 23. 10.3390/insects11100712
- Organisms EPanel oGM, Naegeli H, Bresson J-L, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogu   F, Rostoks N, S  nchez Serrano JJ, Savoini G, Veromann E, Veronesi F,   lvarez F, Ardizzone M and Raffaello T, **2021**. Assessment of genetically modified maize Bt11 for renewal authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-016). In: *EFSA journal European Food Safety Authority*. p e06347. ^10.2903/j.efsa.2021.6347
- Overton K, Maino JL, Day R, Umina PA, Bett B, Carnovale D, Ekesi S, Meagher R and Reynolds OL, **2021**. Global crop impacts, yield losses and action thresholds for fall armyworm (*Spodoptera frugiperda*): A review. *Crop Protection* 145, 15.

- 10.1016/j.cropro.2021.105641
- Pachu JKS, Macedo FCO, Malaquias JB, Ramalho FS, Oliveira RF, Franco FP and Godoy WAC, **2021**. Electrical signalling on Bt and non-Bt cotton plants under stress by *Aphis gossypii*. *PloS one* 16, e0249699. 10.1371/journal.pone.0249699
- Paddock KJ, Hibbard BE, Barry J, Sethi A, Mueller AL, Shelby KS and Pereira AE, **2021**. Restoration of susceptibility following removal of selection for Cry34/35Ab1 resistance documents fitness costs in resistant population of western corn rootworm, *Diabrotica virgifera virgifera*. *Pest Management Science* 77, 2385-2394. 10.1002/ps.6266
- Paddock KJ, Pereira AE, Finke DL, Ericsson AC, Hibbard BE and Shelby KS, **2021**. Host resistance to *Bacillus thuringiensis* is linked to altered bacterial community within a specialist insect herbivore. *Molecular ecology*. 10.1111/mec.15875
- Pavlovic S, Savic J, Milojevic J, Vinterhalter B, Girek Z, Adzic S, Zecevic B and Banjac N, **2020**. Introduction of the nicotiana protein kinase (NPK1) gene by combining *Agrobacterium*-mediated transformation and recurrent somatic embryogenesis to enhance salt tolerance in cauliflower. *Plant Cell, Tissue and Organ Culture* 143, 635-651. 10.1007/s11240-020-01948-6
- Perez Ortega C, Leininger C, Barry J, Poland B, Yalpani N, Altier D, Nelson ME and Lu AL, **2021**. Coordinated binding of a two-component insecticidal protein from *Alcaligenes faecalis* to western corn rootworm midgut tissue. *Journal of invertebrate pathology* 107597. 10.1016/j.jip.2021.107597
- Petkevicius K, Lofstedt C and Borodina I, **2020**. Insect sex pheromone production in yeasts and plants. *Current Opinion in Biotechnology* 65, 259-267. 10.1016/j.copbio.2020.07.011
- Pozo-Valdivia AId, Reisig DD, Braswell L, Greene JK, Roberts P and Taylor SV, **2021**. Economic injury levels for Bt-resistant *Helicoverpa zea* (Lepidoptera: Noctuidae) in cotton. *Journal of Economic Entomology* 114, 747-756. 10.1093/jee/toab012
- Quan YD, Yang J, Wang YQ, Hernandez-Martinez P, Ferre J and He KL, **2021**. The Rapid Evolution of Resistance to Vip3Aa Insecticidal Protein in *Mythimna separata* (Walker) Is Not Related to Altered Binding to Midgut Receptors. *Toxins* 13, 8. 10.3390/toxins13050364
- Riaz S, Johnson JB, Ahmad M, Fitt GP and Naiker M, A review on biological interactions and management of the cotton bollworm, *Helicoverpa armigera* (Lepidoptera: Noctuidae). *Journal of Applied Entomology* 32. 10.1111/jen.12880
- Samples CA, Kruger GR, Dodds DM, Irby JT, Reynolds DB and Catchot AL, **2021**. Injury Potential from Herbicide Combinations in Enlist (R) Cotton. *Journal of Cotton Science* 25, 51-57.
- Sánchez MA, **2020**. Chile as a key enabler country for global plant breeding, agricultural innovation, and biotechnology. *GM crops & food* 11, 130-139. 10.1080/21645698.2020.1761757
- Schmidt-Jeffris RA, Moretti EA, Wickings K, Wolfen MS, Northfield TD, Linn CE and Nault BA, **2021**. Conventional Soil Management May Promote Nutrients That Lure an Insect Pest to a Toxic Crop. *Environmental Entomology* 50, 433-443. 10.1093/ee/nvaa167
- Shrestha RB and Gassmann AJ, **2020**. Inheritance and Fitness Costs of Cry3Bb1 Resistance in Diapausing Field Strains of Western Corn Rootworm (Coleoptera: Chrysomelidae). *Journal of Economic Entomology* 113, 2873-2882. 10.1093/jee/toaa213
- Shwe SM, Prabu S, Chen Y, Li QC, Jing DP, Bai SX, He KL and Wang ZY, **2021**. Baseline Susceptibility and Laboratory Selection of Resistance to Bt Cry1Ab Protein of

- Chinese Populations of Yellow Peach Moth, *Conogethes punctiferalis* (Guenee). *Toxins* 13, 12. 10.3390/toxins13050335
- Shwe SM, Wang YQ, Gao ZP, Li X, Liu S, Bai SX, Zhang TT, He KL and Wang ZY, **2021**. Toxicity of Cry1-Class, Cry2Aa, and Vip3Aa19 Bt proteins and their interactions against yellow peach Moth, *Conogethes punctiferalis* (Guenee) (Lepidoptera: Crambidae). *Journal of Invertebrate Pathology* 178, 6. 10.1016/j.jip.2020.107507
- Shyam C, Chahal PS, Jhala AJ and Jugulam M, **2021**. Management of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) in 2,4-D-, glufosinate-, and glyphosate-resistant soybean. *Weed Technology* 35, 136-143. 10.1017/wet.2020.91
- Silva JB, Mori R, Marques LH, Santos AC, Nowatzki T, Dahmer ML, Bing J, Gratao PL and Rossi GD, **2021**. Water Deprivation Induces Biochemical Changes Without Reduction in the Insecticidal Activity of Maize and Soybean Transgenic Plants. *Journal of economic entomology*. 10.1093/jee/toab109
- St Clair CR and Gassmann AJ, **2021**. Linking land use patterns and pest outbreaks in Bt maize. *Ecological applications : a publication of the Ecological Society of America* e02295. 10.1002/eap.2295
- Tabashnik BE, Liesner LR, Ellsworth PC, Unnithan GC, Fabrick JA, Naranjo SE, Li XC, Dennehy TJ, Antilla L, Staten RT and Carriere Y, **2021**. Transgenic cotton and sterile insect releases synergize eradication of pink bollworm a century after it invaded the United States. *Proceedings of the National Academy of Sciences of the United States of America* 118, 5. 10.1073/pnas.2019115118
- Tavares CS, Santos-Amaya OF, Oliveira EE, Paula-Moraes SV and Pereira EJG, **2021**. Facing Bt toxins growing up: developmental changes of susceptibility to Bt corn hybrids in fall armyworm populations and the implications for resistance management. *Crop Protection* 146. 10.1016/j.cropro.2021.105664
- Tonnang HEZ, Balemi T, Masuki KF, Mohammed I, Adewopo J, Adnan AA, Mudereri BT, Vanlauwe B and Craufurd P, **2020**. Rapid Acquisition, Management, and Analysis of Spatial Maize (*Zea mays* L.) Phenological Data-Towards 'Big Data' for Agronomy Transformation in Africa. *Agronomy-Basel* 10, 12. 10.3390/agronomy10091363
- Towles TB, Buntin GD, Catchot AL, Gore J, Cook DR, Caprio MA and Daves C, **2021**. Quantifying the Contribution of Seed Blended Refugia in Field Corn to *Helicoverpa zea* (Lepidoptera: Noctuidae) Populations. *Journal of economic entomology*. 10.1093/jee/toab097
- Velez-Gavilan J, **2020**. *Lemna aequinoctialis* (lesser duckweed). *Invasive Species Compendium*. 10.1079/isc.121132.20203483098
- Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, **2021**. Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. *Chemosphere* 264, 7. 10.1016/j.chemosphere.2020.128538
- Visser A and Berg Jvd, **2020**. Bigger, faster, stronger: implications of inter-species interactions for IRM of lepidopteran pests of Bt maize in Africa. *Journal of Integrated Pest Management* 11. 10.1093/jipm/pmaa014
- Wang L, Wang XH, Gao FQ, Lv CN, Li LK, Han T and Chen FJ, **2021**. AMF Inoculation Can Enhance Yield of Transgenic Bt Maize and Its Control Efficiency Against *Mythimna separata* Especially Under Elevated CO<sub>2</sub>. *Frontiers in Plant Science* 12, 16. 10.3389/fpls.2021.655060
- Xu H, Wang J, Wei J, Zhu J and Lin F, **2020**. Insect population genetic regulation and reproductive characteristic interference and their prospects on controlling *Spodoptera frugiperda*. *Journal of South China Agricultural University* 41, 1-8.

- 10.7671/j.issn.1001-411X.201910031
- Xu JY, Cao JJ, Zheng QY, Yang LL, Wang Y and Zou MQ, **2020**. High-throughput Identification and Detection of 17 Transgenic Maize Events Based on Taqman Microfluidic Chip Technology. *Chinese Journal of Analytical Chemistry* 48, 1477-1485. 10.19756/j.issn.0253-3820.201287
- Yang J, Sun XQ, Zhu-Salzman K, Qin QM, Feng HQ, Kong XD, Zhou XG and Cai QN, Host-induced gene silencing of brown planthopper glutathione S-transferase gene enhances rice resistance to sap-sucking insect pests. *Journal of Pest Science* 13. 10.1007/s10340-020-01296-6
- Yang F, Kerns DL, Head GP, Price PA, Levy R, Niu Y and Huang F, **2020**. Extended evaluation of Bt protein cross-pollination in seed blend plantings on survival, growth, and development of *Helicoverpa zea* feeding on refuge ears. *Pest Management Science* 76, 1011-1019. 10.1002/ps.5611
- Yang F, Gonzalez JCS, Head GP, Price PA and Kerns DL, **2021**. Multiple and non-recessive resistance to Bt proteins in a Cry2Ab2-resistant population of *Helicoverpa zea*. *Crop Protection* 145, 5. 10.1016/j.cropro.2021.105650
- Yang F, Gonzalez JCS, Sword GA and Kerns DL, **2021**. Genetic basis of resistance to the Vip3Aa Bt protein in *Helicoverpa zea*. *Pest Management Science* 77, 1530-1535. 10.1002/ps.6176
- Yang F, Williams J, Huang FN and Kerns DL, **2021**. Genetic basis and cross-resistance of Vip3Aa resistance in *Spodoptera frugiperda* (Lepidoptera: Noctuidae) derived from Texas, USA. *Crop Protection* 147, 6. 10.1016/j.cropro.2021.105702
- Yin Y, Flasiński S, Moar W, Bowen D, Chay C, Milligan J, Kouadio JL, Pan A, Werner B, Buckman K, Zhang J, Mueller G, Preftakes C, Hibbard BE, Price P and Roberts J, **2020**. A new *Bacillus thuringiensis* protein for Western corn rootworm control. *PloS one* 15, 16. 10.1371/journal.pone.0242791
- Yu WB, Lin SC, Dimase M, Niu Y, Brown S, Head GP, Price PA, Reay-Jones FPF, Cook D, Reisig D, Thrash B, Ni XZ, Paula-Moraes SV and Huang FN, **2021**. Extended investigation of field-evolved resistance of the corn earworm *Helicoverpa zea* (Lepidoptera: Noctuidae) to *Bacillus thuringiensis* Cry1A.105 and Cry2Ab2 proteins in the southeastern United States. *Journal of Invertebrate Pathology* 183, 7. 10.1016/j.jip.2021.107560
- Yuanyuan J, Yi J, Yongmin L, Xiaoyun C, Junfeng X, Xiaoli X and Lianju M, **2020**. Safety evaluation of cry-transgenic insect-resistant maize on silkworm, *Bombyx mori*. *Acta Agriculturae Zhejiangensis* 32, 2042-2049. 10.3969/j.issn.1004-1524.2020.11.15
- Zhang X, Zhang R, Li L, Yang Y, Ding Y, Guan H, Wang X, Zhang A and Wen H, **2020**. Negligible transcriptome and metabolome alterations in RNAi insecticidal maize against *Monolepta hieroglyphica*. *Plant Cell Reports* 39, 1539-1547. 10.1007/s00299-020-02582-4
- Zhao Z, Elisk CG, Hibbard BE and Shelby KS, Detection of alternative splicing in western corn rootworm (*Diabrotica virgifera virgifera* LeConte) in association with eCry3.1Ab resistance using RNA-seq and PacBio Iso-Seq. *Insect Molecular Biology* 10. 10.1111/imb.12709

#### Appendix 4. Publications screened for relevance based on the full text

**Table 4.1.** Report of all relevant publications retrieved after detailed assessment of full-text documents for relevance

Category of information/ data requirement(s)	Reference (Author, year, title, source)
Toxicological assessment of the newly expressed protein(s)	Vieira L, Hissa DC, Souza T, Goncalves IFS, Evaristo JAM, Nogueira FCS, Carvalho AFU and Farias D, <b>2021</b> . Assessing the effects of an acute exposure to worst-case concentration of Cry proteins on zebrafish using the embryotoxicity test and proteomics analysis. Chemosphere 264, 7.

**Table 4.2.** Report of publications excluded from the risk assessment after detailed assessment of full-text documents

Reference (Author, year, title, source)	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Appendix 2
Lohn AF, Trtikova M, Chapela I, Binimelis R and Hilbeck A, <b>2021</b> . Transgene behavior in genetically modified teosinte hybrid plants: transcriptome expression, insecticidal protein production and bioactivity against a target insect pest. Environmental Sciences Europe 33, 13.	Intervention/exposure (not on authorised GM maize); Population (mainly relevant for cultivation in the EU) <sup>4</sup>
Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Devos Y, Fernandez A, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K and Raffaello T, <b>2021</b> . Assessment of genetically modified maize 1507 x MIR162 x MON810 x NK603 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2015-127). EFSA Journal 19, 40.	Reporting format (not a primary study)
Naegeli H, Bresson JL, Dalmay T, Dewhurst IC, Epstein MM, Firbank LG, Guerche P, Hejatko J, Moreno FJ, Mullins E, Nogue F, Rostoks N, Serrano JJS, Savoini G, Veromann E, Veronesi F, Alvarez F, Ardizzone M, De Sanctis G, Dumont AF, Gennaro A, Ruiz JAG, Lanzoni A, Neri FM, Papadopoulou N, Paraskevopoulos K, and Raffaello T. <b>2021</b> . Assessment of genetically modified maize MON 87427 x MON 87460 x MON 89034 x 1507 x MON	Reporting format (not a primary study)

<sup>4</sup> The EFSA Working Group on Comparative analysis and Environmental Risk Assessment has previously assessed this publication (see the [minutes of the 228th meeting](#) held on 6 July 2021): it does not invalidate the assumptions made by EFSA.



87411 x 59122 and subcombinations, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL-2017-139). EFSA Journal 19, 45. 10.2903/j.efsa.2021.6351	
Shwe SM, Wang YQ, Gao ZP, Li X, Liu S, Bai SX, Zhang TT, He KL and Wang ZY, <b>2021</b> . Toxicity of Cry1-Class, Cry2Aa, and Vip3Aa19 Bt proteins and their interactions against yellow peach Moth, <i>Conogethes punctiferalis</i> (Guenée) (Lepidoptera: Crambidae). Journal of Invertebrate Pathology 178, 6.	Population; Intervention/exposure (relevant protein combinations for these GM maize not assessed)

**Table 4.3.** Report of unobtainable/unclear publications

Reference (Author, year, title, source)	Description of (unsuccessful) methods used to try to obtain a copy of the publication
None	Not applicable