Isocycloseram/Emamectin Benzoate

Isocycloseram/Emamectin Benzoate SC (A23220A) - *Salmonella Typhimurium* and *Escherichia Coli* Reverse Mutation Assay

Final Report

TEST GUIDELINE(S): OECD 471 (1997)

AUTHOR(S): Dr. Steffi Chang

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PERFORMING LABORATORY: ICCR-Roßdorf GmbH
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SPONSOR(S): Syngenta Ltd.
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Bracknell, Berkshire RG42 6EY, United Kingdom

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This study performed in the test facility of ICCR-Roßdorf GmbH, In den Leppsteinswiesen 19, 64380 Rossdorf, Germany was conducted in compliance with Good Laboratory Practice Regulations:

Chemikaliengesetz (Chemicals Act) of the Federal Republic of Germany, "Anhang 1" (Annex 1), in its currently valid version

OECD Principles of Good Laboratory Practice, (as revised in 1997), ENV/MC/CHEM(98)17

EC Commission Directive 2004/10/EC

These procedures are compatible with Good Laboratory Practice regulations specified by regulatory authorities throughout the European Community, the United States (EPA and FDA), and Japan (MHW, MAFF, and METI), and other countries that are signatories to the OECD Mutual Acceptance of Data Agreement.

There were no circumstances that may have affected the quality or integrity of the study.

Dr. Steffi Chang
Study Director Bacterial Systems

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FLAGGING STATEMENT

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QUALITY ASSURANCE STATEMENT

ICCR Study Number: 2106900
Test substance: Isocycloseram/Emamectin Benzoate SC (A23220A)
Study director: Dr. Steffi Chang
Study Title: Isocycloseram/Emamectin Benzoate SC (A23220A) - *Salmonella Typhimurium* and *Escherichia Coli* Reverse Mutation Assay

Study based activities at the Test Facility ICCR-Roßdorf GmbH were audited and inspected. The details of these audits and inspections are given below.

Type of Inspection	Date(s) of Inspection	Date Reporting to Study Director, Test Facility Management
Study Plan Verification	23 April 2020	23 April 2020
Process – based Assessment of Response	13 May 2020	13 May 2020
Report Audit	25 June 2020	25 June 2020

General facilities and activities where this study was conducted were inspected on an annual basis and results are reported to the relevant responsible person and Management.

The statement is to confirm, that this report reflects the raw data.

H. Pilawa
Quality Assurance Auditor
ICCR-Roßdorf GmbH

20 July 2020
Date

PROJECT STAFF SIGNATURE

Study Director — Dr. Steffi Chang

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Date: 20 July 2020

GENERAL INFORMATION

Contributors
The following contributed to this report in the capacities indicated:

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Study Dates
Study initiation date: 24 April 2020
Experimental start date: 30 April 2020
Experimental completion date: 04 June 2020

Deviations from the Guidelines
None

Retention of Samples
None

Performing Laboratory Test Substance Reference Number
S 2092211

Other
ICCR-Roßdorf GmbH will archive:
Records and documentation relating to this study will be maintained in the archives of ICCR-Roßdorf GmbH for a period of 4 years from the date on which the Study Director signs the final report. This will include electronic and paper raw data, and report that support the reconstruction of the study.

At termination of the aforementioned period, the records and documentation will be transferred to the GLP compliant Archive of Rhenus Archiv Services GmbH, Frankfurt am Main for further archiving up to a total archiving period of 15 years.

A sample of the test item will not be archived.

ICCR Roßdorf GmbH will retain in its archive a copy of the study plan and final report, and any amendments indefinitely.

Deviations from the study plan
The following deviations from GSP471.Ames.Syngenta.10 occurred:
3.9 Major Computerized Systems
The manufacturer of the major computerized system Petri Viewer Sorcerer Colony Counter has changed it`s company name to Instem.

Appendix 1: Historical Control Data
These data represent the laboratory´s historical control data from November 2016 until August 2018 representing approx. 600 experiments (WP2 pKM101, WP2 uvrA pKM101 the historical data are based on approx. 60 experiments).

These deviations are considered to have not affected the integrity or validity of the study.

Distribution of the report

Sponsor	2 × electronic copy (1 × pdf-file, 1 × Word-file)
Study Director	1 × (original)

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1.0 EXECUTIVE SUMMARY

1.1 Study Design

This study was performed to investigate the potential of Isocycloseram/Emamectin Benzoate SC (A23220A) to induce gene mutations in the plate incorporation test (Experiment I) and the pre-incubation test (Experiment II) using the *Salmonella typhimurium (S. typhimurium)* strains TA1535, TA1537, TA98, and TA100, and the *Escherichia coli (E. coli)* strains WP2 *uvrA* (pKM101) and WP2 (pKM101).

1.2 Results

The plates incubated with the test item showed normal background growth up to the maximal concentration of 5000 µg/plate with and without S9 mix in all strains used.

No cytotoxic effects, evident as a reduction in the number of revertants (below the indication factor of 0.5), occurred in all strains with and without metabolic activation.

No relevant increase in revertant colony numbers of any of the six tester strains was observed following treatment with Isocycloseram/Emamectin Benzoate SC (A23220A) at any concentration, neither in the presence nor absence of metabolic activation (S9 mix). There was also no observed tendency of higher mutation rates with increasing concentrations in the range below the generally acknowledged border of biological relevance.

Appropriate reference mutagens were used as positive controls, which showed a distinct increase of induced revertant colonies confirming the correct performance of the assay and the activity of the S9-mix.

1.3 Conclusion

In conclusion, it can be stated that during the described mutagenicity tests and under the experimental conditions reported, Isocycloseram/Emamectin Benzoate SC (A23220A) did not induce gene mutations by base pair changes or frameshifts in the genome of the strains used. Therefore, Isocycloseram/Emamectin Benzoate SC (A23220A) is considered to be non-mutagenic in the *Salmonella typhimurium* and *Escherichia coli* reverse mutation assay.

2.0 INTRODUCTION

2.1 Purpose

These experiments were performed to assess the potential of the test substance to induce gene mutations by means of the *S. typhimurium* and *E. coli* reverse mutation assay. Experiment I was performed as a plate incorporation assay. Since a negative result was obtained in this experiment, Experiment II was performed as a pre-incubation assay.

The most widely used assays for detecting gene mutations are those using bacteria (1). They are relatively simple and rapid to perform, and give reliable data on the ability of an agent to interact with DNA and produce mutations.

Reverse mutation assays determine the frequency with which an agent reverses or suppresses the effect of the forward mutation. The genetic target presented to an agent is therefore small, specific and selective. Several bacterial strains, or a single strain with multiple markers are necessary to assure reliable detection of mutagens that may be specific to one tester strain or locus. The reversion of bacteria from growth-dependence on a particular amino acid to growth in the absence of that amino acid (reversion from auxotrophy to prototrophy) is the most widely used marker.

The S. *typhimurium* histidine (his) and the *E. coli* tryptophan (trp) reversion system measures $his^- \rightarrow his^+$ and $trp^- \rightarrow trp^+$ reversions, respectively. The *S. typhimurium* and *E. coli* strains are constructed to differentiate between base pair (TA1535, TA100, WP2 *uvrA* (pKM101), and WP2 (pKM101)) and frameshift (TA1537, TA98) mutations.

According to the direct plate incorporation and pre-incubation method the bacteria are exposed to the test substance with and without metabolic activation and plated on selective medium. After a suitable period of incubation, revertant colonies are counted.

To establish a concentration response effect at least six concentrations with adequately spaced intervals were tested. The maximum concentration was 5000 µg/plate.

To validate the test, reference mutagens were tested in parallel to the test substance.

2.2 Test Guideline(s)

This study followed the procedures indicated by the following internationally accepted guideline and recommendations:

"Ninth Addendum to OECD Guidelines for Testing of Chemicals", Section 4, No. 471: "Bacterial Reverse Mutation Test", adopted July 21, 1997

3.0 MATERIALS AND METHODS

3.1 Test Substance

Information as provided by the Sponsor.

Identification:	Isocycloseram/Emamectin Benzoate SC (A23220A)
Batch:	TSC002-041-001
Content of isocycloseram: Content of emamectin benzoate:	17.5% w/w corresponding to 201 g/L 4.18% w/w corresponding to 48.1 g/L
Appearance:	Brown liquid
Recertification Date:	31 January 2023
Storage Conditions:	At room temperature
Stability in Solvent:	Not indicated by the Sponsor

The test substance concentrations were not adjusted for the content of Isocycloseram/Emamectin Benzoate SC (A23220A).

On the day of the experiment (immediately before use), the test substance was suspended in deionised water. The solvent was chosen as the best suitable solvent compared to DMSO and ethanol, according to its solubilisation properties and its relative non-toxicity to the bacteria (2).

All formulations were prepared freshly before treatment and used within two hours of preparation. The formulation was assumed to be stable for this period unless specified otherwise by the Sponsor.

3.2 Controls

3.2.1 Negative controls

Concurrent untreated and solvent controls were performed.

3.2.2 Positive control substances

Without metabolic activation

Strains:	TA1535, TA100
Name:	Sodium azide, (NaN_3)
Supplier:	SERVA, 69042 Heidelberg, Germany
Batch No.:	150564
Purity:	≥ 99%
Dissolved in:	Deionised water
Concentration:	10 µg/plate

Strains:	TA1537, TA98
Name:	4-nitro-o-phenylene-diamine, (4-NOPD)
Supplier:	Sigma-Aldrich, 82024 Taufkirchen, Germany
Batch No.:	MKBM 5257V
Purity:	≥ 98%
Dissolved in:	DMSO (purity >99 %, Fisher Leics LE11 5RG, United Kingdom)
Concentration:	10 µg/plate in strain TA 98, 50 µg/plate in strain TA 1537

Strains:	WP2 *uvrA* (pKM101), WP2 (pKM101)
Name:	Methyl methane sulfonate, (MMS)
Supplier:	Sigma-Aldrich, 82024 Taufkirchen, Germany
Batch No.:	MKCG 1346
Purity:	≥ 99%
Dissolved in:	Deionised water
Concentration:	2.0 µL/plate

With metabolic activation

Strains:	TA1535, TA1537, TA98, TA100, WP2 *uvrA* (pKM101), WP2 (pKM 101)
Name:	2-aminoanthracene, (2-AA)
Supplier:	Sigma-Aldrich, 82024 Taufkirchen, Germany
Batch No.:	STBG 0630V
Purity:	≥ 96%
Dissolved in:	DMSO (purity > 99 %, Fisher Leics LE11 5RG, United Kingdom)
Concentration:	2.5 µg/plate (TA1535, TA1537, TA98, TA100), 10 µg/plate (WP2 *uvrA* (pKM101), WP2 (pKM101))

The stability of the positive control substances in solution is unknown but a mutagenic response in the expected range is sufficient evidence of biological activity.

3.3 Experimental Design

3.3.1 Characterisation of the *Salmonella typhimurium* and *E. coli* strains

The histidine dependent strains are derived from *S. typhimurium* strain LT2 through mutations in the histidine locus. Additionally, due to the "deep rough" (*rfa*$^-$) mutation they possess a faulty lipopolysaccharide envelope which enables substances to penetrate the cell wall more easily. A further mutation causes a reduction in the activity of an excision repair system. The last alteration includes mutational processes in the nitrate reductase and biotin genes produced in a UV-sensitive area of the gene named *uvrB*$^-$. In the strains TA98 and TA100 the R-factor plasmid pKM101 carries the ampicillin resistance marker (3).

Strain WP2 (4) and its derivatives all carry the same defect in one of the genes for tryptophan biosynthesis. Tryptophan-independent (*Trp*$^+$) mutants (revertants) can arise either by a base change at the site of the original alteration or by a base change elsewhere in the chromosome so that the original defect is suppressed. This second possibility can occur in several different ways so that the system seems capable of detecting all types of mutagen which substitute one base for another. Additionally, the *uvrA* derivative is deficient in the DNA repair process (excisable repair damage). Such a repair-deficient strain may be more readily mutated by agents. The *E. coli* strains WP2 *uvrA* (pKM101) and WP2 (pKM101) are constructed by introduction of the R-factor plasmid pKM101.

When summarized, the mutations of the *S. typhimurium* and *E. coli* strains used in this study can be described as follows:

Strains	**Genotype**	**Type of mutations indicated**
Salmonella typhimurium		
TA1537	*his* C 3076; *rfa*$^-$; *uvrB*$^-$	frame shift mutations
TA98	*his* D 3052; *rfa*$^-$; *uvrB*$^-$; R-factor	" "
TA1535	*his* G 46; *rfa*$^-$; *uvrB*$^-$	base-pair substitutions
TA100	*his* G 46; *rfa*$^-$; *uvrB*$^-$; R-factor	" "
Escherichia coli		
WP2 *uvrA* (pKM101)	*trp* E 56 *uvrA*$^-$; R-factor	base-pair substitutions and others
WP2 (pKM101)	*trp* E 56; R-factor	" "

Regular checking of the properties of the *S.typhimurium* and *E. coli* strains regarding the membrane permeability and ampicillin resistance; UV sensitivity, and amino acid requirement as well as normal spontaneous mutation rates is performed by ICCR-Roßdorf GmbH according to Ames *et al.* (5), Maron and Ames (3), and Mortelmans and Riccio (7). In this way it is ensured that the experimental conditions set down by Ames are fulfilled.

The bacterial strains TA1535, TA1537, TA98, TA100, WP2 *uvrA* (pKM101), and WP2 (pKM101) were obtained from Trinova Biochem GmbH (35394 Gießen, Germany).

3.3.2 Storage

The strain cultures were stored as stock cultures in ampoules with nutrient broth + 5 % DMSO (Fisher Leics, LE11 5RG, United Kingdom) in liquid nitrogen.

3.3.3 Precultures

The thawed bacterial suspension was transferred into 250 mL Erlenmeyer flasks containing nutrient medium (50 mL). A solution of ampicillin (50 µL, 25 µg/mL) was added to the strains TA98, TA100, WP2 *uvrA* (pKM101), and WP2 (pKM101). This nutrient medium contains per liter:

8 g Nutrient Broth (MERCK, 64293 Darmstadt, Germany)
5 g NaCl (MERCK, 64293 Darmstadt, Germany)

The bacterial cultures were incubated in a shaking water bath for 4 hours at 37 °C. The optical density of the bacteria was determined by absorption measurement and the obtained values indicated that the bacteria were harvested at the late exponential or early stationary phase (10^8-10^9 cells/mL).

3.3.4 Selective agar

Plates with selective agar (without Histidine/Tryptophan) were used.

3.3.5 Overlay agar

The overlay agar contained per litre:

for *Salmonella* strains:	for *Escherichia coli* strains:
7.0 g Agar Agar*	7.0 g Agar Agar*
6.0 g NaCl*	6.0 g NaCl*
10.5 mg L-Histidine×HCl×H_2O*	10.2 mg Tryptophan*
12.2 mg Biotin*	

* (MERCK, 64293 Darmstadt, Germany)

Sterilisations were performed at 121 °C in an autoclave.

3.4 Mammalian Microsomal Fraction S9 Mix

The bacteria used in this assay do not possess the enzyme systems which, in mammals, are known to convert promutagens into active DNA damaging metabolites. In order to overcome this major drawback an exogenous metabolic system is added in the form of mammalian microsome enzyme activation mixture.

3.4.1 S9 (Preparation by ICCR-Roßdorf GmbH)

Phenobarbital/ß-naphthoflavone induced rat liver S9 was used as the metabolic activation system. The S9 was prepared from male Wistar rats (RjHan:WI; weight approx. 220 – 320 g, Janvier Labs, 53941 Saint-Berthevin Cedex, France) induced by peroral administration of 80 mg/kg b.w. phenobarbital (Sigma-Aldrich Chemie GmbH, 82024 Taufkirchen, Germany) and by peroral administrations of ß-naphthoflavone (Acros Organics, 2440 Geel, Belgium) each, on three consecutive days. The livers were prepared 24 hours after the last treatment. The S9 fractions were produced by dilution of the liver homogenate with a KCl solution (1+3 parts) followed by centrifugation at 9000 g. Aliquots of the supernatant were frozen and stored in ampoules at –80 °C. Small numbers of the ampoules can be kept at –20 °C for up to one week. Each batch of S9 mix is routinely tested with 2-aminoanthracene as well as benzo[a]pyrene (Appendix 3).

The protein concentration in the S9 preparation was 29.7 mg/mL (lot no. 281119B) in both experiments.

3.4.2 S9 mix

Before the experiment an appropriate quantity of S9 supernatant was thawed and mixed with S9 cofactor solution. The amount of S9 supernatant was 10% v/v in the S9 mix. Cofactors were added to the S9 mix to reach the following concentrations in the S9 mix:

8	mM	$MgCl_2$
33	mM	KCl
5	mM	Glucose-6-phosphate
4	mM	NADP

in 100 mM sodium-ortho-phosphate-buffer, pH 7.4.
During the experiment the S9 mix was stored in an ice bath. The S9 mix preparation was performed according to Ames *et al.*(5).

3.5 Pre-Experiment for Cytotoxicity

To evaluate the cytotoxicity of the test substance a pre-experiment was performed with all strains. Eight concentrations were tested for cytotoxicity and mutation induction each with three replicate plates. The experimental conditions in this pre-experiment are described in section 3.7 (plate incorporation test).

Cytotoxicity of the test substance results in a reduction in the number of spontaneous revertants (below a factor of 0.5) or a clearing of the bacterial background lawn.

The pre-experiment is reported as the Main Experiment I since the criteria mentioned in Section 3.8.2 Acceptability of the Assay were met.

3.6 Concentration Selection

In the pre-experiment the concentration range of the test substance was 3 - 5000 µg/plate. The pre-experiment is reported as Experiment I. Since no cytotoxic effects were observed 5000 µg/plate was chosen as the maximal concentration in Experiment II.

The concentration range included two logarithmic decades. The following concentrations were tested in Experiment II:

33; 100; 333; 1000; 2500; and 5000 µg/plate

3.7 Experimental Performance

For each strain and concentration including the controls, three plates were used.

The following materials were mixed in a test tube and poured onto the selective agar plates:

100 µL	Test solution at each concentration, solvent (negative control) or reference mutagen solution (positive control),
500 µL	S9 mix (for test with metabolic activation) or S9 mix substitution buffer* (for test without metabolic activation),
100 µL	Bacteria suspension (cf. test system, pre-culture of the strains; OD = 1.0 - 1.2; wavelength = 500 nm; approx. $8x10^8$ cells/mL),
2000 µL	Overlay agar

For the pre-incubation method test solution (100 µL) (solvent or reference mutagen solution (positive control)), S9 mix / S9 mix substitution buffer* (500 µL) and bacteria suspension (100 µL) were mixed in a test tube and incubated at 37 C ± 1.5° C for 60 minutes. After pre-incubation overlay agar (2.0 mL, 45 °C) was added to each tube. The mixture was poured on selective agar plates.

After solidification the plates were incubated upside down for 72 hours at 37 C ± 1.5° C in the dark, plates were then stored at 4 °C until counted (6).

In parallel to each test a sterile control of the test substance was performed and documented in the raw data. Therefore, stock solution (100 µL) and S9 mix / S9 mix substitution buffer* (500 µL) were mixed with overlay agar (2.0 mL) and poured on minimal agar plates.

* Substitution buffer: 7 parts of the 100 mM sodium-ortho-phosphate-buffer pH 7.4 with 3 parts of KCl solution 0.15 M

3.8 Data Evaluation

3.8.1 Data recording

The colonies were counted using a Petri Viewer with the software program Ames Study Manager (see section 3.9, Major computerized systems). The evaluation unit was connected

to a PC with printer to print out the individual values, the means from the plates for each concentration together with standard deviations and enhancement factors as compared to the spontaneous reversion rates (see tables of results). The print outs are kept with the raw data.

3.8.2 Acceptability of the assay

The *Salmonella typhimurium* and *Escherichia coli* reverse mutation assay is considered acceptable if it meets the following criteria:

- regular background growth in the negative and solvent control
- the spontaneous reversion rates in the negative and solvent control are in the range of the historical data
- the positive control substances should produce an increase in mutant colony frequencies of at least 2-fold concurrent control
- a minimum of five analysable concentrations should be present with at least four showing no signs of toxic effects, evident as a reduction in the number of revertants below the indication factor of 0.5.

3.8.3 Evaluation of results

A test substance is considered as a mutagen if a biologically relevant increase in the number of revertants of twice or above the spontaneous mutation rate of the corresponding solvent control is observed (1).

A concentration dependent increase is considered biologically relevant if the threshold is reached or exceeded at more than one concentration (6).

An increase of revertant colonies equal or above the threshold at only one concentration is judged as biologically relevant if reproduced in an independent second experiment.

A concentration dependent increase in the number of revertant colonies below the threshold is regarded as an indication of a mutagenic potential if reproduced in an independent second experiment. However, whenever the colony counts remain within the historical range of negative and solvent controls, such an increase is not considered biologically relevant.

3.8.4 Biometry

According to the OECD guideline 471, a statistical analysis of the data is not mandatory.

3.9 Major Computerized System

Petri Viewer Sorcerer Colony Counter 3.0 (Instem, Suffolk IP33 3TA, UK) with the software program Ames Study Manager (v1.24) and Ames Archive Manager (v1.01).

4.0 RESULTS AND DISCUSSION

The test substance, Isocycloseram/Emamectin Benzoate SC (A23220A), was assessed for its potential to induce gene mutations in the plate incorporation test (Experiment I) and the pre-incubation test (Experiment II) using *S. typhimurium* strains TA1535, TA1537, TA98, and TA100, and the *E. coli* strains WP2 (pKM101) and WP2 *uvrA* (pKM101).

In the pre-experiment the concentration range of the test substance was 3 - 5000 µg/plate. The pre-experiment is reported as Experiment I. Since no cytotoxic effects were observed, 5000 µg/plate was chosen as the maximal concentration in Experiment II.

The assay was performed with and without liver microsomal activation. Each concentration, including the controls, was tested in triplicate. The concentration range included two logarithmic decades. The test substance was tested at the following concentrations:

Pre-Experiment/Experiment I:	3; 10; 33; 100; 333; 1000; 2500; and 5000 µg/plate
Experiment II:	33; 100; 333; 1000; 2500; and 5000 µg/plate

The test item precipitated in the overlay agar in the test tubes from 1000 to 5000 µg/plate. In Experiment I precipitation of the test item occurred in the overlay agar on the incubated agar plates at 5000 µg/plate. The undissolved particles had no influence on the data recording. In Experiment II no precipitation of the test substance occurred in the overlay agar on the incubated agar plates.

The plates incubated with the test item showed normal background growth up to the maximal concentration of 5000 µg/plate with and without S9 mix in all strains used.

No cytotoxic effects, evident as a reduction in the number of revertants (below the indication factor of 0.5), occurred in the test groups with and without metabolic activation.

No substantial increase in revertant colony numbers in any of the six tester strains was observed following treatment with Isocycloseram/Emamectin Benzoate SC (A23220A) at any concentration, neither in the presence nor absence of metabolic activation (S9 mix). There was also no tendency of higher mutation rates with increasing concentrations in the range below the generally acknowledged border of biological relevance.

Appropriate reference mutagens were used as positive controls. They showed a distinct in-crease in induced revertant colonies confirming the correct performance of the assay and the activity of the S9-mix.

5.0 CONCLUSIONS

In conclusion, it can be stated that during the described mutagenicity tests and under the experimental conditions reported, Isocycloseram/Emamectin Benzoate SC (A23220A) did not induce gene mutations by base pair changes or frameshifts in the genome of the strains used. Therefore, Isocycloseram/Emamectin Benzoate SC (A23220A) is considered to be non-mutagenic in the *Salmonella typhimurium* and *Escherichia coli* reverse mutation assay.

6.0 REFERENCES

1. Hollstein, M., J. McCann, F.A. Angelosanto, and W.W. Nichols (1979)
   Short-term tests for carcinogens and mutagens
   Mutation Res. 65, 133-226

2. Maron, D.M., J. Katzenellenbogen, and B.N. Ames (1981)
   Compatibility of organic solvents with the Salmonella/Microsome Test
   Mutation Res. 88, 343-350

3. Maron, D.M. and B.N. Ames (1983)
   Revised methods for the Salmonella mutagenicity test
   Mutation Res. 113, 173-215

4. Green, M.H.L. and W.J. Muriel (1976)
   Mutagen Testing Using TRP^+ Reversion in Escherichia Coli
   Mutation Res. 38, 3-32

5. Ames, B.N., J. McCann, and E. Yamasaki (1977)
   Methods for detecting carcinogens and mutagens with the Salmonella/mammalian microsome mutagenicity test
   In: B.J. Kilbey et al. (Eds.)"Handbook of Mutagenicity Test Procedures" Elsevier, Amsterdam, 1-17

6. de Serres, F.J. and M.D. Shelby (1979)
   Recommendations on data production and analysis using the Salmonella/microsome mutagenicity assay
   Mutation Res. 64, 159-165

7. Mortelmans, K. and E.S. Riccio (2000)
   The bacterial tryptophan reverse mutation assay with Escherichia coli WP2
   Mutation Res. 455, 61-69

TABLES SECTION

TABLE 1 Summary of Results Pre-Experiment/Experiment I

Study Name: 2106900
Experiment: 2106900 VV Plate
Assay Conditions:

Study Code: ICCR 2106900
Date Plated: 30.04.2020
Date Counted: 07.05.2020

Metabolic Activation	Test Group	Concen-tration (per plate)	Revertant Colony Counts (Mean ±SD)					
			TA 1535	TA 1537	TA 98	TA 100	WP2 pKM101	WP2 uvrA pKM101
Without Activation	Deionised water		11 ± 1	14 ± 1	29 ± 8	92 ± 11	265 ± 22	334 ± 8
	Untreated		12 ± 4	15 ± 5	26 ± 7	93 ± 9	278 ± 13	356 ± 25
	Isocycloseram/	3 µg	8 ± 2	15 ± 1	30 ± 9	91 ± 6	272 ± 32	347 ± 17
	Emamectin	10 µg	9 ± 2	12 ± 3	30 ± 3	88 ± 11	257 ± 20	353 ± 6
	Benzoate SC	33 µg	10 ± 2	12 ± 4	33 ± 11	109 ± 12	277 ± 16	362 ± 20
	(A23220A)	100 µg	11 ± 3	11 ± 1	28 ± 3	92 ± 13	261 ± 9	362 ± 5
		333 µg	7 ± 2	10 ± 1	31 ± 12	112 ± 16	281 ± 17	347 ± 5
		1000 µg	9 ± 3	10 ± 1	21 ± 8	118 ± 1	307 ± 9	356 ± 10
		2500 µg	10 ± 3	10 ± 4	21 ± 4	97 ± 4	261 ± 2	347 ± 18
		5000 µg	8 ± 2 [P]	9 ± 2 [P]	21 ± 4 [P]	98 ± 6 [P]	231 ± 33 [P]	302 ± 9 [P]
	NaN3	10 µg	1088 ± 7			1654 ± 33		
	4-NOPD	10 µg			358 ± 35			
	4-NOPD	50 µg		78 ± 5				
	MMS	2.0 µL					3510 ± 26	3389 ± 61
With Activation	Deionised water		13 ± 6	16 ± 4	34 ± 6	89 ± 10	287 ± 27	393 ± 11
	Untreated		11 ± 1	13 ± 4	42 ± 3	91 ± 10	298 ± 22	373 ± 13
	Isocycloseram/	3 µg	12 ± 2	14 ± 3	46 ± 5	82 ± 10	299 ± 5	381 ± 17
	Emamectin	10 µg	13 ± 5	16 ± 5	37 ± 12	83 ± 11	312 ± 20	373 ± 14
	Benzoate SC	33 µg	9 ± 2	13 ± 3	42 ± 1	88 ± 9	271 ± 12	383 ± 14
	(A23220A)	100 µg	14 ± 3	13 ± 2	43 ± 7	96 ± 15	265 ± 24	403 ± 19
		333 µg	12 ± 3	16 ± 5	41 ± 6	101 ± 6	277 ± 19	391 ± 36
		1000 µg	13 ± 1	15 ± 4	38 ± 6	114 ± 2	264 ± 31	403 ± 30
		2500 µg	11 ± 1	13 ± 2	34 ± 4	133 ± 7	260 ± 16	345 ± 7
		5000 µg	14 ± 2 [P]	12 ± 3 [P]	37 ± 4 [P]	92 ± 8 [P]	292 ± 5 [P]	349 ± 31 [P]
	2-AA	2.5 µg	270 ± 20	377 ± 21	2983 ± 308	2795 ± 96		
	2-AA	10.0 µg					1087 ± 15	1991 ± 109

Key to Positive Controls

NaN3	sodium azide
2-AA	2-aminoanthracene
4-NOPD	4-nitro-o-phenylene-diamine
MMS	methyl methane sulfonate

Key to Plate Postfix Codes

P	Precipitate

TABLE 2 Summary of Results Experiment II

Study Name: 2106900
Experiment: 2106900 HV2 Pre
Assay Conditions:

Study Code: ICCR 2106900
Date Plated: 28.05.2020
Date Counted: 04.06.2020

Metabolic Activation	Test Group	Concentration (per plate)	Revertant Colony Counts (Mean ±SD)					
			TA 1535	TA 1537	TA 98	TA 100	WP2 pKM101	WP2 uvrA pKM101
Without Activation	Deionised water		9 ± 1	10 ± 3	25 ± 7	100 ± 6	262 ± 6	325 ± 22
	Untreated		9 ± 2	13 ± 3	32 ± 2	96 ± 12	252 ± 15	301 ± 3
	Isocycloseram/	33 µg	9 ± 0	13 ± 1	34 ± 7	120 ± 13	266 ± 11	335 ± 28
	Emamectin	100 µg	11 ± 1	14 ± 3	27 ± 12	102 ± 18	273 ± 6	364 ± 30
	Benzoate SC	333 µg	13 ± 4	13 ± 2	33 ± 5	120 ± 9	249 ± 13	330 ± 8
	(A23220A)	1000 µg	12 ± 2	9 ± 2	27 ± 6	101 ± 6	272 ± 8	316 ± 14
		2500 µg	9 ± 2	13 ± 2	18 ± 4	106 ± 18	262 ± 19	289 ± 16
		5000 µg	10 ± 1	8 ± 1	20 ± 5	100 ± 10	266 ± 8	297 ± 5
	NaN3	10 µg	1102 ± 90			1858 ± 170		
	4-NOPD	10 µg			939 ± 81			
	4-NOPD	50 µg		92 ± 9				
	MMS	2.0 µL					2947 ± 610	3187 ± 36
With Activation	Deionised water		14 ± 3	16 ± 4	36 ± 1	101 ± 23	298 ± 15	331 ± 32
	Untreated		17 ± 4	15 ± 4	37 ± 1	99 ± 11	304 ± 10	373 ± 18
	Isocycloseram/	33 µg	14 ± 2	17 ± 3	43 ± 3	99 ± 25	279 ± 38	375 ± 16
	Emamectin	100 µg	13 ± 3	20 ± 1	46 ± 4	118 ± 21	270 ± 17	364 ± 10
	Benzoate SC	333 µg	14 ± 2	16 ± 4	42 ± 9	130 ± 23	258 ± 19	386 ± 29
	(A23220A)	1000 µg	13 ± 2	13 ± 2	45 ± 12	133 ± 6	313 ± 12	390 ± 17
	Isocycloseram/	2500 µg	15 ± 3	16 ± 5	28 ± 9	132 ± 10	302 ± 37	380 ± 2
		5000 µg	13 ± 1	15 ± 4	36 ± 5	98 ± 7	314 ± 40	368 ± 23
	2-AA	2.5 µg	289 ± 6	349 ± 36	3518 ± 298	2318 ± 231		
	2-AA	10.0 µg					1037 ± 21	1739 ± 73

Key to Positive Controls

NaN3	sodium azide
2-AA	2-aminoanthracene
4-NOPD	4-nitro-o-phenylene-diamine
MMS	methyl methane sulfonate

TABLE 3 Pre-Experiment and Experiment I: 2106900 VV Plate Incorporation Without Metabolic Activation

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 VV Plate Date Plated: 30.04.2020
Assay Conditions: Date Counted: 07.05.2020

Without metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 1535	**Isocycloseram/**	3 µg	*8.3*	*2.3*	*0.7*	7, 11, 7
	Emamectin	10 µg	*9.0*	*2.0*	*0.8*	9, 11, 7
	Benzoate SC	33 µg	*10.0*	*1.7*	*0.9*	9, 9, 12
	(A23220A)	100 µg	*11.0*	*3.5*	*1.0*	9, 15, 9
		333 µg	*7.3*	*1.5*	*0.6*	9, 7, 6
		1000 µg	*9.3*	*2.5*	*0.8*	9, 7, 12
		2500 µg	*10.3*	*2.9*	*0.9*	12, 7, 12
		5000 µg	*7.7*	*2.1*	*0.7*	10 P, 7 P, 6 P
	Deionised water		*11.3*	*0.6*		12, 11, 11
	Untreated Control		*11.7*	*3.8*		10, 16, 9
TA 1537	**Isocycloseram/**	3 µg	*15.0*	*1.0*	*1.0*	14, 15, 16
	Emamectin	10 µg	*12.3*	*2.5*	*0.9*	12, 10, 15
	Benzoate SC	33 µg	*12.0*	*4.4*	*0.8*	10, 9, 17
	(A23220A)	100 µg	*11.0*	*1.0*	*0.8*	12, 10, 11
		333 µg	*10.3*	*0.6*	*0.7*	11, 10, 10
		1000 µg	*10.0*	*1.0*	*0.7*	10, 11, 9
		2500 µg	*10.3*	*3.5*	*0.7*	7, 10, 14
		5000 µg	*8.7*	*2.3*	*0.6*	6 P, 10 P, 10 P
	Deionised water		*14.3*	*0.6*		14, 15, 14
	Untreated		*14.7*	*4.5*		10, 15, 19
TA 98	**Isocycloseram/**	3 µg	*30.3*	*8.7*	*1.1*	23, 28, 40
	Emamectin	10 µg	*30.3*	*3.1*	*1.1*	33, 27, 31
	Benzoate SC	33 µg	*33.0*	*10.6*	*1.2*	41, 37, 21
	(A23220A)	100 µg	*28.0*	*3.0*	*1.0*	31, 25, 28
		333 µg	*30.7*	*11.6*	*1.1*	25, 44, 23
		1000 µg	*20.7*	*8.1*	*0.7*	30, 15, 17
		2500 µg	*20.7*	*4.0*	*0.7*	20, 25, 17
		5000 µg	*21.3*	*4.0*	*0.7*	25 P, 17 P, 22 P
	Deionised water		*28.7*	*8.0*		21, 28, 37
	Untreated		*26.0*	*6.6*		25, 20, 33

Key to Plate Postfix Codes

P Precipitate

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 VV Plate Date Plated: 30.04.2020
Assay Conditions: Date Counted: 07.05.2020

Without metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 100	**Isocycloseram/**	3 µg	*91.3*	*5.5*	*1.0*	94, 85, 95
	Emamectin	10 µg	*88.0*	*11.1*	*1.0*	86, 78, 100
	Benzoate SC	33 µg	*109.0*	*12.1*	*1.2*	120, 111, 96
	(A23220A)	100 µg	*92.0*	*13.1*	*1.0*	101, 98, 77
		333 µg	*112.3*	*16.2*	*1.2*	102, 104, 131
		1000 µg	*118.3*	*1.2*	*1.3*	119, 119, 117
		2500 µg	*97.0*	*4.4*	*1.1*	94, 95, 102
		5000 µg	*97.7*	*5.5*	*1.1*	104 P, 95 P, 94 P
	Deionised water		*92.3*	*10.7*		90, 104, 83
	Untreated		*93.3*	*9.3*		101, 83, 96
WP2	**Isocycloseram/**	3 µg	*272.0*	*32.4*	*1.0*	237, 301, 278
pKM101	**Emamectin**	10 µg	*257.3*	*20.1*	*1.0*	274, 235, 263
	Benzoate SC	33 µg	*276.7*	*15.5*	*1.0*	283, 288, 259
	(A23220A)	100 µg	*260.7*	*9.1*	*1.0*	262, 269, 251
		333 µg	*280.7*	*17.0*	*1.1*	261, 290, 291
		1000 µg	*306.7*	*9.1*	*1.2*	317, 300, 303
		2500 µg	*261.0*	*2.0*	*1.0*	261, 259, 263
		5000 µg	*231.3*	*32.9*	*0.9*	259 P, 240 P, 195 P
	Deionised water		*264.7*	*22.2*		241, 268, 285
	Untreated		*278.3*	*12.7*		270, 293, 272
WP2	**Isocycloseram/**	3 µg	*347.3*	*17.0*	*1.0*	367, 338, 337
uvrA	**Emamectin**	10 µg	*352.7*	*5.7*	*1.1*	351, 359, 348
pKM101	**Benzoate SC**	33 µg	*362.3*	*20.3*	*1.1*	346, 356, 385
	(A23220A)	100 µg	*361.7*	*5.0*	*1.1*	367, 357, 361
		333 µg	*347.0*	*5.0*	*1.0*	352, 342, 347
		1000 µg	*356.0*	*10.0*	*1.1*	346, 356, 366
		2500 µg	*347.3*	*17.6*	*1.0*	366, 331, 345
		5000 µg	*302.3*	*9.0*	*0.9*	293 P, 303 P, 311 P
	Deionised water		*333.7*	*8.3*		327, 331, 343
	Untreated		*356.3*	*25.1*		330, 359, 380
TA 1535	**NaN3**	10 µg	*1088.3*	*6.7*	*96.0*	1081, 1094, 1090
TA 1537	**4-NOPD**	50 µg	*77.7*	*5.0*	*5.4*	83, 77, 73
TA 98	**4-NOPD**	10 µg	*358.3*	*34.6*	*12.5*	362, 391, 322
TA 100	**NaN3**	10 µg	*1654.3*	*33.3*	*17.9*	1642, 1629, 1692
WP2 pKM101	**MMS**	2.0 µL	*3510.3*	*26.4*	*13.3*	3505, 3487, 3539
WP2 uvrA pKM101	**MMS**	2.0 µL	*3389.0*	*60.6*	*10.2*	3454, 3379, 3334

Key to Positive Controls

NaN3	sodium azide
4-NOPD	4-nitro-o-phenylene-diamine
MMS	methyl methane sulfonate

Key to Plate Postfix Codes

P	Precipitate

TABLE 4 Pre-Experiment and Experiment I: 2106900 VV Plate Incorporation With Metabolic Activation

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 VV Plate Date Plated: 30.04.2020
Assay Conditions: Date Counted: 07.05.2020

With metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 1535	**Isocycloseram/**	3 µg	*12.3*	*1.5*	*0.9*	11, 14, 12
	Emamectin	10 µg	*13.3*	*4.9*	*1.0*	10, 11, 19
	Benzoate SC	33 µg	*9.3*	*2.1*	*0.7*	11, 7, 10
	(A23220A)	100 µg	*13.7*	*3.2*	*1.0*	15, 10, 16
		333 µg	*12.3*	*2.9*	*0.9*	14, 9, 14
		1000 µg	*12.7*	*1.2*	*0.9*	12, 14, 12
		2500 µg	*11.0*	*1.0*	*0.8*	12, 10, 11
		5000 µg	*13.7*	*1.5*	*1.0*	15 P, 14 P, 12 P
	Deionised water		*13.3*	*5.8*		20, 10, 10
	Untreated		*11.3*	*1.2*		10, 12, 12
TA 1537	**Isocycloseram/**	3 µg	*13.7*	*3.2*	*0.8*	10, 15, 16
	Emamectin	10 µg	*16.3*	*4.6*	*1.0*	19, 19, 11
	Benzoate SC	33 µg	*13.0*	*3.5*	*0.8*	11, 17, 11
	(A23220A)	100 µg	*12.7*	*2.1*	*0.8*	11, 15, 12
		333 µg	*16.0*	*4.6*	*1.0*	17, 11, 20
		1000 µg	*15.0*	*4.0*	*0.9*	19, 11, 15
		2500 µg	*13.3*	*2.3*	*0.8*	16, 12, 12
		5000 µg	*12.3*	*2.9*	*0.8*	14 P, 9 P, 14 P
	Deionised water		*16.3*	*4.0*		21, 14, 14
	Untreated		*12.7*	*3.8*		11, 10, 17
TA 98	**Isocycloseram/**	3 µg	*46.0*	*5.0*	*1.4*	46, 51, 41
	Emamectin	10 µg	*37.0*	*12.5*	*1.1*	27, 33, 51
	Benzoate SC	33 µg	*42.0*	*1.0*	*1.2*	42, 43, 41
	(A23220A)	100 µg	*42.7*	*7.4*	*1.3*	40, 51, 37
		333 µg	*40.7*	*5.5*	*1.2*	38, 47, 37
		1000 µg	*38.0*	*6.2*	*1.1*	31, 40, 43
		2500 µg	*33.7*	*4.0*	*1.0*	33, 30, 38
		5000 µg	*37.3*	*4.0*	*1.1*	35 P, 42 P, 35 P
	Deionised water		*33.7*	*5.9*		36, 27, 38
	Untreated		*42.3*	*3.2*		46, 41, 40

Key to Plate Postfix Codes

P Precipitate

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 VV Plate Date Plated: 30.04.2020
Assay Conditions: Date Counted: 07.05.2020

With metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 100	**Isocycloseram/**	3 µg	*82.0*	*9.5*	*0.9*	72, 91, 83
	Emamectin	10 µg	*83.3*	*11.1*	*0.9*	82, 73, 95
	Benzoate SC	33 µg	*88.3*	*9.0*	*1.0*	93, 94, 78
	(A23220A)	100 µg	*95.7*	*14.6*	*1.1*	102, 79, 106
		333 µg	*101.3*	*5.5*	*1.1*	104, 105, 95
		1000 µg	*113.7*	*1.5*	*1.3*	114, 115, 112
		2500 µg	*133.3*	*6.8*	*1.5*	128, 131, 141
		5000 µg	*91.7*	*8.3*	*1.0*	89 P, 101 P, 85 P
	Deionised water		*89.0*	*10.0*		79, 99, 89
	Untreated		*90.7*	*10.2*		95, 98, 79
WP2 pKM101	**Isocycloseram/**	3 µg	*299.0*	*5.3*	*1.0*	301, 303, 293
	Emamectin	10 µg	*312.0*	*20.1*	*1.1*	335, 298, 303
	Benzoate SC	33 µg	*270.7*	*12.1*	*0.9*	280, 257, 275
	(A23220A)	100 µg	*264.7*	*24.2*	*0.9*	237, 282, 275
		333 µg	*277.3*	*18.6*	*1.0*	256, 286, 290
		1000 µg	*264.0*	*31.2*	*0.9*	268, 231, 293
		2500 µg	*260.3*	*16.2*	*0.9*	275, 243, 263
		5000 µg	*291.7*	*4.9*	*1.0*	295 P, 286 P, 294 P
	Deionised water		*287.0*	*27.2*		283, 316, 262
	Untreated		*298.0*	*22.3*		316, 305, 273
WP2 uvrA pKM101	**Isocycloseram/**	3 µg	*381.3*	*16.9*	*1.0*	377, 367, 400
	Emamectin	10 µg	*372.7*	*13.7*	*0.9*	385, 375, 358
	Benzoate SC	33 µg	*382.7*	*13.5*	*1.0*	369, 383, 396
	(A23220A)	100 µg	*403.0*	*19.1*	*1.0*	405, 421, 383
		333 µg	*391.0*	*36.0*	*1.0*	426, 393, 354
		1000 µg	*403.3*	*29.9*	*1.0*	393, 380, 437
		2500 µg	*345.0*	*7.0*	*0.9*	353, 340, 342
		5000 µg	*348.7*	*30.7*	*0.9*	375 P, 315 P, 356 P
	Deionised water		*392.7*	*11.0*		399, 399, 380
	Untreated		*373.0*	*13.2*		368, 388, 363
TA 1535	**2-AA**	2.5 µg	*270.0*	*19.5*	*20.2*	290, 269, 251
TA 1537	**2-AA**	2.5 µg	*376.7*	*20.5*	*23.1*	388, 353, 389
TA 98	**2-AA**	2.5 µg	*2983.0*	*308.4*	*88.6*	2934, 2702, 3313
TA 100	**2-AA**	2.5 µg	*2794.7*	*96.4*	*31.4*	2906, 2739, 2739
WP2 pKM101	**2-AA**	10.0 µg	*1087.0*	*14.7*	*3.8*	1090, 1100, 1071
WP2 uvrA pKM101	**2-AA**	10.0 µg	*1991.3*	*108.8*	*5.1*	1928, 1929, 2117

Key to Positive Controls

2-AA	2-aminoanthracene

Key to Plate Postfix Codes

P	Precipitate

TABLE 5 Experiment II: 2106900 HV2 Pre Incubation Without Metabolic Activation

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 HV2 Pre Date Plated: 28.05.2020
Assay Conditions: Date Counted: 04.06.2020

Without metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 1535	**Isocycloseram/**	33 µg	*9.0*	*0.0*	*1.0*	9, 9, 9
	Emamectin	100 µg	*10.7*	*1.2*	*1.1*	12, 10, 10
	Benzoate SC	333 µg	*13.0*	*3.6*	*1.4*	12, 10, 17
	(A23220A)	1000 µg	*11.7*	*2.1*	*1.2*	10, 14, 11
		2500 µg	*8.7*	*1.5*	*0.9*	9, 7, 10
		5000 µg	*10.3*	*1.2*	*1.1*	11, 11, 9
	Deionised water		*9.3*	*0.6*		10, 9, 9
	Untreated		*9.0*	*2.0*		9, 7, 11
TA 1537	**Isocycloseram/**	33 µg	*12.7*	*1.2*	*1.2*	14, 12, 12
	Emamectin	100 µg	*13.7*	*3.2*	*1.3*	10, 16, 15
	Benzoate SC	333 µg	*12.7*	*2.1*	*1.2*	11, 12, 15
	(A23220A)	1000 µg	*8.7*	*1.5*	*0.8*	9, 7, 10
		2500 µg	*12.7*	*2.1*	*1.2*	12, 15, 11
		5000 µg	*7.7*	*1.2*	*0.7*	7, 7, 9
	Deionised water		*10.3*	*2.9*		7, 12, 12
	Untreated		*13.3*	*3.1*		10, 16, 14
TA 98	**Isocycloseram/**	33 µg	*34.3*	*7.1*	*1.4*	33, 28, 42
	Emamectin	100 µg	*26.7*	*11.5*	*1.1*	20, 40, 20
	Benzoate SC	333 µg	*32.7*	*5.0*	*1.3*	28, 38, 32
	(A23220A)	1000 µg	*27.3*	*5.5*	*1.1*	33, 27, 22
		2500 µg	*18.0*	*4.4*	*0.7*	15, 23, 16
		5000 µg	*20.0*	*5.2*	*0.8*	23, 14, 23
	Deionised water		*25.0*	*7.0*		33, 20, 22
	Untreated		*32.3*	*2.3*		31, 35, 31
TA 100	**Isocycloseram/**	33 µg	*119.7*	*12.7*	*1.2*	127, 105, 127
	Emamectin	100 µg	*101.7*	*17.8*	*1.0*	98, 86, 121
	Benzoate SC	333 µg	*119.7*	*9.1*	*1.2*	110, 121, 128
	(A23220A)	1000 µg	*101.3*	*5.5*	*1.0*	101, 107, 96
		2500 µg	*106.0*	*18.3*	*1.1*	86, 110, 122
		5000 µg	*100.3*	*10.0*	*1.0*	101, 110, 90
	Deionised water		*100.3*	*5.9*		98, 96, 107
	Untreated		*96.3*	*11.7*		101, 105, 83

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 HV2 Pre Date Plated: 28.05.2020
Assay Conditions: Date Counted: 04.06.2020

Without metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
WP2	**Isocycloseram/**	33 µg	*265.7*	*11.2*	*1.0*	263, 278, 256
pKM101	**Emamectin**	100 µg	*273.3*	*5.7*	*1.0*	278, 275, 267
	Benzoate SC	333 µg	*249.3*	*12.5*	*1.0*	249, 262, 237
	(A23220A)	1000 µg	*272.3*	*7.6*	*1.0*	274, 279, 264
		2500 µg	*262.3*	*19.1*	*1.0*	280, 265, 242
		5000 µg	*266.3*	*7.6*	*1.0*	258, 268, 273
	Deionised water		*262.3*	*5.7*		256, 264, 267
	Untreated		*252.0*	*14.8*		269, 242, 245
WP2	**Isocycloseram/**	33 µg	*335.0*	*28.2*	*1.0*	303, 346, 356
uvrA	**Emamectin**	100 µg	*364.3*	*30.2*	*1.1*	331, 390, 372
pKM101	**Benzoate SC**	333 µg	*330.0*	*7.9*	*1.0*	321, 333, 336
	(A23220A)	1000 µg	*316.3*	*13.6*	*1.0*	301, 321, 327
		2500 µg	*288.7*	*16.2*	*0.9*	298, 298, 270
		5000 µg	*297.0*	*5.3*	*0.9*	293, 295, 303
	Deionised water		*325.0*	*21.5*		304, 324, 347
	Untreated		*301.0*	*3.5*		299, 299, 305
TA 1535	**NaN3**	10 µg	*1102.0*	*90.1*	*118.1*	1005, 1118, 1183
TA 1537	**4-NOPD**	50 µg	*91.7*	*8.6*	*8.9*	90, 84, 101
TA 98	**4-NOPD**	10 µg	*939.3*	*80.6*	*37.6*	851, 1009, 958
TA 100	**NaN3**	10 µg	*1857.7*	*170.0*	*18.5*	2026, 1861, 1686
WP2 pKM101	**MMS**	2.0 µL	*2947.0*	*609.8*	*11.2*	2394, 2846, 3601
WP2 uvrA pKM101	**MMS**	2.0 µL	*3187.0*	*36.0*	*9.8*	3187, 3151, 3223

Key to Positive Controls

NaN3	sodium azide
4-NOPD	4-nitro-o-phenylene-diamine
MMS	methyl methane sulfonate

TABLE 6 Experiment II: 2106900 HV2 Pre Incubation With Metabolic Activation

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 HV2 Pre Date Plated: 28.05.2020
Assay Conditions: Date Counted: 04.06.2020

With metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
TA 1535	**Isocycloseram/**	33 µg	*13.7*	*2.3*	*1.0*	15, 11, 15
	Emamectin	100 µg	*12.7*	*3.2*	*0.9*	14, 9, 15
	Benzoate SC	333 µg	*14.0*	*1.7*	*1.0*	15, 15, 12
	(A23220A)	1000 µg	*13.3*	*2.3*	*1.0*	16, 12, 12
		2500 µg	*15.0*	*2.6*	*1.1*	17, 16, 12
		5000 µg	*13.3*	*1.2*	*1.0*	14, 14, 12
	Deionised water		*13.7*	*3.2*		15, 16, 10
	Untreated		*17.3*	*4.2*		16, 22, 14
TA 1537	**Isocycloseram/**	33 µg	*17.3*	*2.9*	*1.1*	19, 19, 14
	Emamectin	100 µg	*19.7*	*0.6*	*1.2*	20, 20, 19
	Benzoate SC	333 µg	*16.0*	*3.6*	*1.0*	12, 17, 19
	(A23220A)	1000 µg	*13.3*	*2.1*	*0.8*	11, 15, 14
		2500 µg	*15.7*	*4.5*	*1.0*	11, 16, 20
		5000 µg	*15.0*	*3.6*	*0.9*	12, 19, 14
	Deionised water		*16.3*	*4.0*		20, 12, 17
	Untreated		*15.0*	*4.0*		19, 15, 11
TA 98	**Isocycloseram/**	33 µg	*43.3*	*3.1*	*1.2*	44, 40, 46
	Emamectin	100 µg	*45.7*	*3.5*	*1.3*	49, 46, 42
	Benzoate SC	333 µg	*41.7*	*9.0*	*1.2*	52, 37, 36
	(A23220A)	1000 µg	*45.0*	*11.5*	*1.3*	56, 33, 46
		2500 µg	*28.3*	*8.5*	*0.8*	37, 20, 28
		5000 µg	*36.0*	*4.6*	*1.0*	37, 40, 31
	Deionised water		*35.7*	*1.2*		35, 37, 35
	Untreated		*37.0*	*1.0*		37, 38, 36
TA 100	**Isocycloseram/**	33 µg	*98.7*	*25.5*	*1.0*	82, 86, 128
	Emamectin	100 µg	*118.3*	*21.2*	*1.2*	142, 112, 101
	Benzoate SC	333 µg	*130.3*	*22.5*	*1.3*	152, 132, 107
	(A23220A)	1000 µg	*132.7*	*5.5*	*1.3*	138, 133, 127
		2500 µg	*131.7*	*10.0*	*1.3*	142, 131, 122
		5000 µg	*97.7*	*6.7*	*1.0*	101, 90, 102
	Deionised water		*100.7*	*22.9*		86, 127, 89
	Untreated		*98.7*	*10.8*		94, 91, 111

Study Name: 2106900 Study Code: ICCR 2106900
Experiment: 2106900 HV2 Pre Date Plated: 28.05.2020
Assay Conditions: Date Counted: 04.06.2020

With metabolic activation

Strain	Compound	Concen-tration per plate	Mean revertants per plate	Standard Deviation	Ratio treated / solvent	Individual revertant colony counts
WP2	**Isocycloseram/**	33 µg	*279.0*	*38.0*	*0.9*	321, 269, 247
pKM101	**Emamectin**	100 µg	*270.3*	*17.2*	*0.9*	263, 258, 290
	Benzoate SC	333 µg	*257.7*	*18.8*	*0.9*	241, 254, 278
	(A23220A)	1000 µg	*312.7*	*12.1*	*1.0*	322, 299, 317
		2500 µg	*301.7*	*37.0*	*1.0*	338, 303, 264
		5000 µg	*314.0*	*39.7*	*1.1*	270, 325, 347
	Deionised water		*298.3*	*15.3*		289, 290, 316
	Untreated		*304.0*	*9.5*		310, 309, 293
WP2	**Isocycloseram/**	33 µg	*374.7*	*16.2*	*1.1*	384, 384, 356
uvrA	**Emamectin**	100 µg	*364.0*	*10.4*	*1.1*	352, 370, 370
pKM101	**Benzoate SC**	333 µg	*386.3*	*29.3*	*1.2*	408, 353, 398
	(A23220A)	1000 µg	*390.0*	*16.5*	*1.2*	409, 382, 379
		2500 µg	*380.0*	*2.0*	*1.1*	380, 378, 382
		5000 µg	*368.0*	*22.6*	*1.1*	362, 349, 393
	Deionised water		*330.7*	*31.7*		364, 301, 327
	Untreated		*372.7*	*17.9*		377, 388, 353
TA 1535	**2-AA**	2.5 µg	*289.0*	*6.2*	*21.1*	291, 294, 282
TA 1537	**2-AA**	2.5 µg	*349.3*	*35.7*	*21.4*	362, 309, 377
TA 98	**2-AA**	2.5 µg	*3518.3*	*298.5*	*98.6*	3347, 3345, 3863
TA 100	**2-AA**	2.5 µg	*2318.3*	*230.5*	*23.0*	2520, 2368, 2067
WP2 pKM101	**2-AA**	10.0 µg	*1037.0*	*20.7*	*3.5*	1020, 1031, 1060
WP2 uvrA pKM101	**2-AA**	10.0 µg	*1738.7*	*72.9*	*5.3*	1656, 1794, 1766

Key to Positive Controls

2-AA	2-aminoanthracene

APPENDICES SECTION

APPENDIX 1 Historical Control Data

These data represent the laboratory´s historical control data from November 2016 until August 2018 representing approx. 600 experiments (WP2 pKM101, WP2 uvrA pKM101 the historical data are based on approx. 60 experiments).

The positive controls that used to compile the historical positive control data correspond to the positive control substances described in Methods; section 3.2.2 (Positive control substances).

Strain		without S9 mix				with S9 mix			
		Mean	SD	Min	Max	Mean	SD	Min	Max
TA 1535	Solvent control	11	2.3	6	22	12	2.3	7	22
	Untreated control	11	2.9	6	28	12	2.8	7	23
	Positive control	1245	161.4	367	1791	398	61.0	183	613
TA 1537	Solvent control	10	2.2	6	19	13	3.2	7	30
	Untreated control	10	2.7	5	21	14	3.6	6	29
	Positive control	94	30.0	48	231	170	64.8	81	421
TA 98	Solvent control	26	4.2	13	43	36	6.1	12	56
	Untreated control	27	4.7	14	40	39	6.4	12	59
	Positive control	421	176.8	196	2068	3908	815.0	223	5918
TA 100	Solvent control	160	29.3	79	214	148	31.3	76	216
	Untreated control	181	26.1	80	235	171	27.7	87	218
	Positive control	2074	262.7	511	2850	3626	981.9	553	5860
WP2 pKM101	Solvent control	205	27.6	171	289	233	29.3	194	310
	Untreated control	220	32.2	167	297	259	33.4	204	338
	Positive control	3894	522.5	2576	5458	1277	403.5	950	4063
WP2 uvrA pKM101	Solvent control	324	39.5	243	389	378	48.0	277	469
	Untreated control	339	32.3	279	402	389	39.2	302	476
	Positive control	3706	589.3	2754	5261	2191	252.7	1720	2731

Mean = mean value of revertants/plate
SD = standard deviation
Min = minimal value
Max = maximal value

APPENDIX 2 Copy of GLP Certificate

HESSEN

Gute Laborpraxis/Good Laboratory Practice

GLP-Bescheinigung/Statement of GLP Compliance
(gemäß/according to § 19b Abs. 1 Chemikaliengesetz)

Eine GLP-Inspektion zur Überwachung der Einhaltung der GLP-Grundsätze gemäß Chemikaliengesetz bzw. Richtlinie 2004/9/EG wurde durchgeführt in

Assessment of conformity with GLP according to Chemikaliengesetz and Directive 2004/9/EEC at:

☒ Prüfeinrichtung/Test facility ☐ Prüfstandort/Test site

ICCR-Roßdorf GmbH
Institute for Competent Contract Research
In den Leppsteinswiesen 19
64380 Roßdorf

(Unverwechselbare Bezeichnung und Adresse/Unequivocal name and adress)

Prüfungen nach Kategorien/Areas of Expertise
(gemäß/according ChemVwV-GLP Nr. 5.3/OECD guidance)

2 Prüfungen zur Bestimmung der toxikologischen Eigenschaften	**2** Toxicity studies
3 Prüfungen zur Bestimmung der erbgutverändernden Eigenschaften (in vitro und in vivo)	**3** Mutagenicity studies
8 Analytische Prüfungen an biologischen Materialien	**8** Analytical and clinical chemistry testing

22.11.2018, 21.02.2019, 12. bis 14.03.2019
Datum der Inspektion/Date of Inspection
(Tag Monat Jahr/day month year)

Die genannte Prüfeinrichtung befindet sich im nationalen GLP-Überwachungsverfahren und wird regelmäßig auf Einhaltung der GLP-Grundsätze überwacht.

The above mentioned test facility is included in the national GLP Compliance Programme and is inspected on a regular basis.

Auf der Grundlage des Inspektionsberichtes wird hiermit bestätigt, dass in dieser Prüfeinrichtung die oben genannten Prüfungen unter Einhaltung der GLP- Grundsätze durchgeführt werden können.

Based on the inspection report it can be confirmed, that this test facility is able to conduct the aforementioned studies in compliance with the Principles of GLP.

Im Auftrag

Brandt

Dr. Astrid Brandt, Referentin, Wiesbaden, den **23. Oktober 2019**
(Name und Funktion der verantwortlichen Person/
Name and function of responsible person)

HESSISCHES MINISTERIUM FÜR UMWELT, KLIMASCHUTZ, LANDWIRTSCHAFT UND VERBRAUCHERSCHUTZ

Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz,
Mainzer Straße 80, D 65189 Wiesbaden
(Name und Adresse der GLP-Überwachungsbehörde/Name and address of the GLP Monitoring Authority)

English name and address of the GLP Monitoring Authority: Hessian Ministry for Environment, Energy, Agriculture and Consumer Protection; Department II 10; P.O. Box 31 09; 65189 Wiesbaden
Translation of stamp inscription:
Hessian Ministry for Environment, Rural Regions and Consumer Protection

APPENDIX 3 Certificate of S9

ICCR ROßDORF

CERTIFICATE

ICCR-Roßdorf S9 Preparation Lot No. 281119B

Date of preparation: November 28, 2019
Release date: December 10, 2019

Protein assay: 29.7 mg protein / ml S9

Sterility: 0 colonies / ml S9 on glucose-minimal-agar

Salmonella typhimurium assay (AMES-test)

Treatment	µl S9 / plate	number of revertants in TA 98
negative	0	25
control	100	44
10 µg/plate	0	44
2-Aminoanthracene	100	2058
10 µg/plate	0	34
Benzo(a)pyrene	100	113

The S9 was obtained from the livers of male Wistar rats which received triple treatments of 80 mg / kg body weight Phenobarbital and ß-Naphthoflavone orally on consecutive days. The livers were prepared 24 hours after the last treatment.

Quality Assurance Auditor
ICCR-Roßdorf GmbH Marina Hahn

18. DEZ. 2019
Date

Dr. Steffen Naumann
Study Director
ICCR-Roßdorf GmbH

18. DEZ. 2019
Date

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Registergericht Darmstadt, HRB 6837, USt.-ID DE812333696
Geschäftsführer: Dr. Markus Schulz

SOP Origin TS-SOP S9_21

APPENDIX 4 Certificate of Analysis

syngenta

Syngenta Crop Protection AG
GLP Testing Facility WMU
Analytical Development & Product Chemistry
Breitenloh 5
4333 Münchwilen, Switzerland

Certificate of Analysis

A23220A

isocycloseram/emamectin benzoate SC (200/050)

TSC002-041-001

Batch Identification	**TSC002-041-001**
Other Batch ID	1122866
Product Code	**A23220A**
Other Product Code(s)	isocycloseram/emamectin benzoate SC (200/050)
Chemical Analysis (Active Ingredient content)	
- **Identity of the Active Ingredient(s)***	**confirmed**
- **Content of isocycloseram***	**17.5 % w/w corresponding to 201 g/l**
- **Content of emamectin benzoate***	**4.18 % w/w corresponding to 48.1 g/l**
	The Active Ingredient(s) content is within the FAO limits.
Methodology used for Characterization / Recertification	LC, chiral LC, oscillating density meter
Physical Analysis	
– **Appearance**	**brown liquid**
- **Density***	**1150 kg/m³**
Stability:	
– **Storage Temperature**	**< 30°C**
– **Recertification Date**	**End of January 2023**

If stored under the conditions given above, this test substance can be considered stable until the recertification date is reached.
This Certificate of Analysis summarizes data which originates either from a single study or from several individual studies. Tests marked with an asterisk (*) have been conducted in compliance with GLP.
Raw data, documentation, study plans, any amendments to study plans and reports pertaining to this/these study/studies are stored under the study number(s) referenced below within the archives of the GLP Testing Facility WMU at Syngenta Crop Protection AG, Switzerland

Study number of batch characterization: CHMU200180
Study number(s) of batch recertification:

Authorization: 19-Feb-2020

Dr. Karine Heintz
Analytical Development & Product Chemistry

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